## Texas Commission on Environmental Quality

# Waste Permits Division Correspondence Cover Sheet

Date: 11/21/2022
Facility Name: Oak Grove Steam Electric Station
Permit or Registration No.: CCR106

Nature of Correspondence:
☐ Initial/New
☒ Response/Revision to TCEQ Tracking No.: 27237042 (from subject line of TCEQ letter regarding initial submission)

Affix this cover sheet to the front of your submission to the Waste Permits Division. Check appropriate box for type of correspondence. Contact WPD at (512) 239-2335 if you have questions regarding this form.

**Table 1 - Municipal Solid Waste Correspondence**

| Applications | Reports and Notifications |
|---|---|
| ☐ New Notice of Intent | ☐ Alternative Daily Cover Report |
| ☐ Notice of Intent Revision | ☐ Closure Report |
| ☐ New Permit (including Subchapter T) | ☐ Compost Report |
| ☐ New Registration (including Subchapter T) | ☐ Groundwater Alternate Source Demonstration |
| ☐ Major Amendment | ☐ Groundwater Corrective Action |
| ☐ Minor Amendment | ☐ Groundwater Monitoring Report |
| ☐ Limited Scope Major Amendment | ☐ Groundwater Background Evaluation |
| ☐ Notice Modification | ☐ Landfill Gas Corrective Action |
| ☐ Non-Notice Modification | ☐ Landfill Gas Monitoring |
| ☐ Transfer/Name Change Modification | ☐ Liner Evaluation Report |
| ☐ Temporary Authorization | ☐ Soil Boring Plan |
| ☐ Voluntary Revocation | ☐ Special Waste Request |
| ☐ Subchapter T Disturbance Non-Enclosed Structure | ☐ Other: |
| ☐ Other: | |

**Table 2 - Industrial & Hazardous Waste Correspondence**

| Applications | Reports and Responses |
|---|---|
| ☐ New | ☐ Annual/Biennial Site Activity Report |
| ☐ Renewal | ☐ CPT Plan/Result |
| ☐ Post-Closure Order | ☐ Closure Certification/Report |
| ☐ Major Amendment | ☐ Construction Certification/Report |
| ☐ Minor Amendment | ☐ CPT Plan/Result |
| ☒ CCR Registration | ☐ Extension Request |
| ☐ CCR Registration Major Amendment | ☐ Groundwater Monitoring Report |
| ☐ CCR Registration Minor Amendment | ☐ Interim Status Change |
| ☐ Class 3 Modification | ☐ Interim Status Closure Plan |
| ☐ Class 2 Modification | ☐ Soil Core Monitoring Report |
| ☐ Class 1 ED Modification | ☐ Treatability Study |
| ☐ Class 1 Modification | ☐ Trial Burn Plan/Result |
| ☐ Endorsement | ☐ Unsaturated Zone Monitoring Report |
| ☐ Temporary Authorization | ☐ Waste Minimization Report |
| ☐ Voluntary Revocation | ☐ Other: |
| ☐ 335.6 Notification | |
| ☐ Other: | |

Luminant

**Renee Collins**
Sr. Director
Environmental Services
Renee.collins@luminant.com

**Luminant**
6555 Sierra Drive.
Irving, TX 75039

**T** 214.875.8383
**C** 214.406.2452
**F** 214.875.8699

*Delivered Electronically via IHWPER@tceq.texas.gov*

November 21, 2022

Texas Commission on Environmental Quality
Industrial and Hazardous Waste Permits Section - MC-130
12100 Park 35 Circle
Austin, TX 78753

RE: Response to Email NOD New Registration No. CCR106
Oak Grove Management Company LLC – Franklin, Robertson County
Industrial Solid Waste Registration No. 32043
EPA Identification No. TXD000728956
Tracking No. 27237042; RN100216191/CN602881955

Oak Grove Management Company LLC has prepared written responses for the deficiencies identified in the "Email NOD - New Registration – Oak Grove Managements Company LLC – Registration No. CCR106" received via email from TCEQ on September 22, 2022. The written responses are in Table 1. Updated application and appendix revisions are attached for review.

If you have any questions or require any additional information, please contact Eric Chavers at 903-389-6062 or by e-mail at eric.chavers@luminant.com.

Sincerely,

Renee Collins

Attachments: CCR106 Application-Revision 2
CCR106 Application Revision 2 REDLINE
APPENDIX E-Revision 1
APPENDIX F-Revision 1
APPENDIX G-Revision 1
APPENDIX H-Revision 1

cc with attachments:

Umair Hassan (umair.hassan@tceq.texas.gov)
Daniella Ortiz de Montellano (daniela.ortiz-demontellano@tceq.texas.gov)

Table 1 - NOD Summary and Response
Registration No. CCR106 - Oak Grove Management Company LLC
Application Deficiencies - Technical NOD 2

| ID[1] | App. Section | App. Sub Section | Location[2] | Citation | Deficiency Description/Resolution | Response |
|---|---|---|---|---|---|---|
| 1 | I, IV | I.20, IV.A | TCEQ-20870 p. 8 [Appendix A-Process Flow Diagram and narrative, Site Plan] | 40 CFR 257.53 | a. Revise the flow diagram and narrative to add FGD Gypsum that is "temporarily" stored in Cell 4 prior to transporting for beneficial use. Define "temporarily" using a time frame.<br><br>b. Provide information to explain how the beneficial reuse of CCR meets the definition of beneficial use per 40 CFR 257.53. Add a statement to indicate that beneficial reuse determination records will be kept on-site.<br><br>c. Clarify, if the Cell 4 is currently or in the very near future will be used for CCR disposal. Indicate which portion of the Cell 4 will be used for CCR disposal and the portion used for storage of FGD Gypsum for beneficial reuse. Provide clear delineation between storage area of FGD gypsum and disposal area of CCR. Also, explain methods used to prevent any potential releases from CCR stored on a portion of the Cell 4. The application shall also include a statement that when Cell 4 is going to be used for disposal of CCR instead of storing of FGP Gypsum, then Oak grove shall provide appropriate notification and shall include the notification in the operating records. | Cell 4 is active and used for CCR disposal. The eastern portion of the cell is currently used for contact water management. The narrative in Section IV.25.A. has been updated to correctly reflect the gypsum as being managed as waste and reference to storage removed to eliminate confusion. |
| 2 | IV | IV.25.F | Table IV.D | Application Instructions; 40 CFR 257.84(a)(i) | Revise to indicate that weekly inspection items will be conducted at intervals not exceeding 7 days. | Table IV.D. has been revised to contain the following language: "Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.84(a)." Table V.J. has been revised to contain the following language: "Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.83(a)." |
| 3 | V | V.26.A.4 | TCEQ-208-70, p.38; V.26.A.4/5 | Application Instructions; 40 CFR 257.73(d); 30 TAC 352.731 | Remove the term "NA" and provide a dike certification (TCEQ-20870 version 09-27-2021) form. | "N/A" removed and following statement added at Section V.26.A.5. In October 2016, the initial certified Periodic Hazard Potential Classification Assessments, Periodic Structural Stability Assessments, and Periodic Safety Factor Assessments were completed for each FGD Pond (FGD-A, FGD-B, FGD-C) as required by 40 CFR 257.73(a), 257.73(d), and 257.73(e). In October 2021, the certified 5-Year Updates to these assessments were completed as required by 40 CFR 257.73 and 30 TAC 352.731, which identified no structural deficiencies. The most recent 2021 5-Year Assessment Updates are located in APPENDIX E. Based on the conclusion in the certified 5-year updates that no structural deficiencies exist, the facility is submitting these documents in lieu of the Dike Certification. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | V | V.J. | Table V.J. | Application Instructions; 40 CFR 257.83(a)(1)(iii); 30 TAC 352.831(a) | Revise table to include inspections of CCR unit monitoring equipment at a frequency not exceeding 30 days. | Table V.J. has been revised to contain the following language: "Unit instrumentation (water level gauge) is inspected and monitored at intervals not exceeding 30 days per 40 CFR 257.83(a)(1)(iii)." |
| 5 | V | V.26.B | [Appendix E – History of Construction] Pg. 2 | 40 CFR 257.73 (c)(1)(iv) | Provide the name and size in acres of the watershed within which the FGD ponds are located. | Watershed information has been added in the report, "History of Construction-Addendum No. 1" located in APPENDIX E. |
| 6 | V | V.26.G | [Appendix E - Structural Stability Assessment] | 40 CFR 257.73 (a) (1) | Indicate whether permanent identification markers have been placed on or adjacent to each CCR unit. | Permanent identification markers have been placed on or adjacent to each CCR unit as specified in 30 TAC 352.731(a) and 40 CFR 257.73(a)(1). |
| 7 | V | V.26.G | [Appendix E] | 30 TAC §352.731(a); 40 CFR §257.73(d)(1)(iv) | Provide a statement indicating that vegetated slopes of dikes and surrounding areas will not exceed a height of 6-inches above the slope of the dike. | As referenced in the Federal Register notice approving Texas's CCR program (86 Fed. Reg. 33,892, 33,893 n.1 (June 28, 2021)), on June 14, 2016, the D.C Circuit Court vacated the phrase "not to exceed a height of 6 inches above the slope of the dike" within 40 CFR 257.73(a)(4), 257.73(d)(1)(iv), 257.74(a)(4), and 257.74(d)(1)(iv). Accordingly, that language should not be part of the approved Texas CCR rule. USEPA proposed slope protection requirements in a March 2018 proposal, but it has not yet finalized those requirements. |
| 8 | VI | VI.27.G | [Appendix F - Ash Landfill and FGD Ponds] | Application Instructions; 30 TAC 352.911; 40 CFR 257.91€ | Provide well construction details for up gradient and downgradient monitoring wells. | Well construction details for all groundwater monitoring wells are located in the "Groundwater Monitoring System Certification Report" as well as the "Groundwater Monitoring Plan" for the Ash Landfill and the FGD Ponds. Both reports can be found in APPENDIX F of the application. |
| 9 | VI | VI.29 | Table VI.C-1 | Application Instructions; 40 CFR 257.94 Appendix III | Add and complete attached "Table VI.C-1 – Groundwater Detection Monitoring Parameters.", if applicable. This table was inadvertently omitted in the application form. | Table VI.C-1 has been inserted into application and completed. |
| 10 | VI | VI.30.H | Table VI.D-2 | Application Instructions | Replace title of "Table VI.D.2 – Groundwater Detection Monitoring Parameters" with "Table VI.D-2 – Groundwater Assessment Monitoring Parameters" and complete if applicable. | Table VI.D-2 has been inserted into application and completed. |
| 11 | VII | VII.31 | (Appendix G (Page 6175) | 40 CFR 257.102(d)(1)(iii) | Provide the slope stability analysis using the available site-specific geotechnical data instead of generally accepted assumptions. | "Closure Plan-Addendum No. 1" for both the FGD Ponds and Ash Landfill 1 provide confirmation that the Slope Stablitiy Model will be updated using site-specific geotechnical data during final closure are in APPENDIX F. |
| 12 | VII | VII.32 | [Appendix H] | 30 TAC 352.131(a) and (b); 30 TAC 352.1101 | a. Include the year in terms of dollars that the estimate was made.<br>b. Remove any post-closure plan and cost estimate information that is not applicable to facility. | A) The "Post Closure Care Cost Estimate" located in APPENDIX H is based on 2021 dollars as noted in Tables 1 and 2.<br>B) The "Post Closure Care Cost Estimate" located in APPENDIX H has been updated to only include the Oak Grove facility. |
| 13 | VIII | VIII.34 | VIII.34 | 30 TAC 352.1101 | Provide a statement that a Financial Assurance mechanism will be provided within 90 days if a registration is issued. For assistance, contact Mr. Mark Stoebner, Financial Analyst at mark.stoebner@tceq.texas.gov. | Oak Grove Management Company LLC will provide an acceptable financial assurance mechanism per 30 TAC 352.1101 no more than 90 days after the executive director's approval of the registration. |

[1] Deficiency ID – Key: Use this number to identify the NOD response .

[2] Location of deficiency in submittal/application. Items in square brackets [ ] refer to applicant's supplemental information submitted as attachments/appendices to the application form.

## Texas Commission on Environmental Quality

**Registration Application for Coal Combustion Residuals (CCR) Waste Management**

# I. General Information

## 1. Reason for Submittal

Type of Registration Application

☐ New ☐ Major Amendment ☐ Minor Amendment

☒ Notice of Deficiency (NOD) Response ☐ Transfer ☐ Name Change

☐ Other

## 2. Application Fees

☒ $150 Application Fee

Payment Method

☐ Check ☒ Online through ePay portal <www3.tceq.texas.gov/epay/>

If paid online, enter ePay Trace Number: 582EA000467512

## 3. Facility Information

*Facility information must match regulated entity information on the Core Data Form.*

Applicant: ☐ Owner ☐ Operator ☒ Owner/Operator

Facility TCEQ Solid Waste Registration No: 32043

Facility EPA ID: TXD000728956

Regulated Entity Reference No. (if issued): RN100216191

Facility Name: OAK GROVE STEAM ELECTRIC STATION

Facility (Area Code) Telephone Number: 214-875-8338

Facility physical street address (city, state, zip code, county): 8127 OAK GROVE ROAD, FRANKLIN, TX, 77856, ROBERTSON

Facility mailing address (city, state, zip code, county): 6555 SIERRA DR, DALLAS, TX 75039, DALLAS

Latitude (Degrees, Minutes Seconds): 31° 11′ 06″

Longitude (Degrees, Minutes Seconds): 96° 29′ 07″

## 4. Publicly Accessible Website

Provide the URL address of a publicly accessible website where the owner or operator of a CCR unit will post information.
https://www.luminant.com/ccr/

## 5. Facility Landowner(s) Information

Facility landowner(s) name: OAK GROVE MANAGEMENT COMPANY LLC

Facility landowner mailing address: 6555 SIERRA DR

City: Irving State: TX Zip Code: 75039

(Area Code) Telephone Number: 214-875-8338

Email Address (optional):

## 6. CCR Waste Management Unit(s)

☒ Landfill Unit(s) ☒ Surface Impoundment(s)

For each existing landfill, new landfill and lateral expansion, existing surface impoundment, and new surface impoundment and lateral expansion(s) provide information on type of waste, the registered unit(s) in which they are managed, and sampling and analytical methods.

Submit the following tables:

Table I.6. – CCR Waste Management Units

Table I.6.A. – Waste Management Information

Table I.6.B. – Waste Managed in Registered Units

Table I.6.C. – Sampling and Analytical Methods

## 7. Description of Proposed Activities or Changes to Existing Facility

Provide a brief description of the proposed activities if application is for a new facility, or the proposed changes to an existing facility or registration conditions, if the application is for an amendment.

Oak Grove Management Company, LLC (Oak Grove) operates the Oak Grove Steam Electric Station (OGSES), which is located approximately 10 miles north of the town of Franklin in Robertson County, Texas. The OGSES consists of two coal/lignite-fired units with a combined operating capacity of approximately 1600 megawatts. Coal combustion residuals (CCR) including fly ash, bottom ash, and flue gas desulfurization (FGD) gypsum are generated as part of OGSES unit operation. The Texas Commission on Environmental Quality (TCEQ) Solid Waste Registration Number (SWR No.) for the OGSES is 32043. CCR is managed in one onsite landfill, Ash Landfill 1, and three surface impoundments, FGD-A, FGD-B, and FGD-C.

Ash Landfill 1 is the primary disposal facility for CCR generated at the OGSES and is located approximately 1200 feet southwest of the OGSES. Ash Landfill 1 is listed on the Notice of Registration (NOR) for the OGSES as Unit No. 010 and is regulated as a Class 2 non-hazardous industrial solid waste landfill under 30 TAC §335.

Gyspum/scrubber sludge that cannot be recycled and selected process wastewaters are managed in FGD-A, FGD-B, and FGD-C ponds. These ponds are collectively referred to as the FGD Ponds. Solids from the FGD Ponds are routinely removed as part of on-going operations and maintenance activities. These solids are placed in Ash Landfill 1 (WMU 010). The FGD Ponds are located approximately 1500 feet northwest of the OGSES. The FGD Ponds are list on the NOR for the OGSES as waste management units 011 (FGD-A), 012 (FGD-B), and 013 (FGD-C). The FGD Ponds are regulated as Class 2 non-hazardous surface impoundments under 30 TAC §335.

## 8. Primary Contact Information

Contact Name: Renee Collins Title: Sr. Director, Environmental Services

Contact mailing address: 6555 Sierra Drive
City: Irving County: Dallas State: Texas Zip Code: 75039
(Area Code) Telephone Number: 214-875-8338

Email Address (optional): renee.collins@luminant.com

## 9. Notice Publishing

Party responsible for publishing notice:
☒ Applicant ☐ Consultant ☐ Agent in Service

Contact Name: Renee Collins Title: Sr. Director, Environmental Services

Contact mailing address: 6555 Sierra Drive
City: Irving County: Dallas State: Texas Zip Code: 75039
(Area Code) Telephone Number: 214-875-8338

## 10. Alternative Language Notice

Is an alternative language notice required for this application? For determination, refer to Alternative Language Checklist on the Public Notice Verification Form (TCEQ-20244-Waste-NORI).

☐ Yes ☒ No

## 11. Public Place Location of Application

Name of the Public Place: Robertson County Carnegie Library
Physical Address: 315 East Dechard Street
City: Franklin County: Robertson State: TX Zip Code: 77856
(Area code) Telephone Number: 979-828-4331

## 12. Ownership Status of the Facility

☐ Corporation ☐ Limited Partnership
☐ Sole Proprietorship ☐ General Partnership ☒ Other (specify): Limited Liability Company

Does the Site Owner (Permittee/Registrant) own all the CCR units and all the facility property?

☒ Yes ☐ No

## 13. Property / Legal Description Information

Provide a legal description and supporting documents of the property where the management of CCR waste will occur; including a survey plat and a boundary metes and bounds description (30 TAC §352.231(g)).

Submit the following documents:

a. Property Legal Description
b. Property Metes and Bounds Description
c. Metes and Bounds Drawings
d. On-Site Easements Drawings

See APPENDIX A for Property/Legal Description Information for the following CCR units:
Ash Landfill 1
FGD Pond A
FGD Pond B
FGD Pond C

Property Owner Affidavit also located in APPENDIX A.

## 14. Operator Information

Identify the entity who will conduct facility operations, if the owner and operator are not the same.

Operator Name: Same as Owner

Operator mailing address:

City: State: Zip Code:

(Area Code) Telephone Number:

Email Address (optional):

## 15. Confidential Documents

Does the application contain confidential documents?

☐ Yes ☒ No

If "Yes", cross-reference the confidential documents throughout the application and submit as a separate attachment in a binder clearly marked "CONFIDENTIAL."

## 16. Permits and Construction Approvals

| Permit or Approval | Received | Pending | Not Applicable |
|---|---|---|---|
| Hazardous Waste Management Program under the Texas Solid Waste Disposal Act | ☒ | ☐ | ☐ |
| Underground Injection Control Program under the Texas Injection Well Act | ☐ | ☐ | ☒ |
| National Pollutant Discharge Elimination System Program under the Clean Water Act and Waste Discharge Program under Texas Water Code, Chapter 26 | ☒ | ☐ | ☐ |
| Prevention of Significant Deterioration Program under the Federal Clean Air Act (FCAA). | ☒ | ☐ | ☐ |
| National Emission Standards for Hazardous Air Pollutants Preconstruction Approval under the FCAA | ☐ | ☐ | ☒ |
| Other (describe): | ☐ | ☐ | ☐ |
| Other (describe): | ☐ | ☐ | ☐ |
| Other (describe) | ☐ | ☐ | ☐ |

## 17. Legal Authority

The owner and operator of the facility shall submit verification of their legal status with the application. This shall be a one-page certificate of incorporation issued by the secretary of state. The owner or operator shall list all persons having over a 20% ownership in the facility.

See APPENDIX A for Certificate of Authority.

## 18. TCEQ Core Data Form

The TCEQ requires that a Core Data Form (TCEQ-10400) be submitted on all incoming applications, unless a Regulated Entity and Customer Reference Number has been issued by the TCEQ and no core data information has changed. For more information regarding the Core Data Form, call (512) 239-5175 or visit the TCEQ Website.

See APPENDIX A for TCEQ Core Data Form.

## 19. Other Governmental Entities Information

**Coastal Management Program**

Is the facility within the Coastal Management Program boundary?

☐ Yes ☒ No

**Local Government Jurisdiction (If Applicable)**
Within City Limits of: N/A
Within Extraterritorial Jurisdiction of: N/A

Is the facility located in an area in which the governing body of the municipality or county has prohibited the storage, processing or disposal of municipal or industrial solid waste?

☐ Yes ☒ No If "Yes", provide a copy of the ordinance or order as an attachment.

## 20. Attachments

Does the application include the following?

| | | |
|---|---|---|
| General Maps | ☒ Yes | ☐ No |
| General Topographic Map | ☒ Yes | ☐ No |
| Facility Layout Map | ☒ Yes | ☐ No |
| Surrounding Features Map | ☒ Yes | ☐ No |
| Process Flow Diagram | ☒ Yes | ☐ No |
| Land Ownership Map | ☒ Yes | ☐ No |
| Land Ownership List | ☒ Yes | ☐ No |
| Pre-printed Mailing Labels | ☒ Yes | ☐ No |

Maps and drawings shall be legible and easily readable by eye without magnification. Scales and paper size shall be chosen based on the type of map submitted, the land area covered, and the amount of detail to be shown. See instructions for details regarding maps and drawings to be submitted in application.

See APPENDIX A for Attachments detailed in Item 20.

Per TCEQ request, a Process Flow Narrative has been included at the end of the Attachments found in APPENDIX A.

## 21. Verification of Compliance

Does the owner and operator verify that the design, construction, and operation of CCR landfill(s) and surface impoundment(s) meets the requirements of 30 TAC §352.231(f) (30 TAC §352.2; 40 CFR §257.52, and 40 CFR §§257.3-1 – 257.3-3).

☒ Yes ☐ No

As requested by TCEQ, please see the "Response to TCEQ CCR Unit Registration Comments" memorandums for Ash Landfill 1 and FGD Ponds provided by Golder in APPENDIX A.

# II. Location Restrictions and Geology

See Instructions and Technical Guidance

## 22. Location Restrictions

Submit certifications and technical reports demonstrating compliance of CCR unit(s) with applicable location restrictions (30 TAC 352, Subchapter E) and comply with 30 TAC §352.231(d) and 30 TAC §352.4 for submission of engineering and geoscientific information.

A. **Placement above the uppermost aquifer** (30 TAC §352.601) (40 CFR §257.60). For those CCR units whose base is less than five feet above the upper limit of the uppermost aquifer, please submit a copy of the demonstration showing evidence of compliance with 40 CFR §257.60(a) – (c).

B. **Wetlands** (30 TAC §352.611) (40 CFR §257.61). For CCR units located in wetlands, please submit a copy of the demonstration showing evidence of compliance with 40 CFR §257.61(a) – (c).

C. **Fault areas** (30 TAC §352.621) (40 CFR §257.62). For CCR units located within 200 feet of the outermost damage zone of a fault, please submit a copy of the demonstration showing evidence of compliance with 40 CFR §257.62(a) – (c).

D. **Seismic impact zones** (30 TAC §352.631) (40 CFR §257.63). For CCR units located in a seismic impact zone, please submit a copy of the demonstration showing evidence of compliance with 40 CFR §257.63(a) – (c).

E. **Unstable areas** (30 TAC §352.641) (40 CFR §257.64). For CCR units located in unstable areas, please submit a copy of the demonstration showing evidence of compliance with 40 CFR §257.64(a) – (d).

Location Restriction Demonstration reports for Ash Landfill 1 and FGD Ponds located in APPENDIX B. Location Restriction Evaluation memorandums also located in APPENDIX B.

### 23. Geology Summary Report

Submit a summary of the geologic conditions at the facility, including the relation of the geologic condition to each CCR unit. The summary must include enough information and data and include sources and references for the information. Include all groundwater monitoring data required by 40 CFR Part 257, Subpart D, (30 TAC §352.241, §352.601, §352.621, §352.631, and §352.641) and submitted in accordance of 30 TAC §352.4.

**Note:** Previously prepared documents may be submitted but must be supplemented or updated as necessary to provide the requested information (30 TAC §352.241(b)).

For Geology Summary, please refer to "Groundwater Monitoring System Certification" reports for Ash Landfill 1 and FGD Ponds located in APPENDIX F. The Local Geology and Hydrogeology summary is located in Section 2.2 of each report.

All groundwater monitoring data summarized in "2020 Annual Groundwater Monitoring and Corrective Action Report" for Ash Landfill 1 and FGD Ponds located in APPENDIX F.

## III. Fugitive Dust Control Plan

### 24. Fugitive Dust Control Plan

A. **Submit a copy of the CCR Fugitive Dust Control Plan** (30 TAC §352.801) (40 CFR §257.80(b)), or the most recently amended plan. The initial plan or subsequent amended plan must be certified by a qualified Texas licensed professional engineer (Texas P.E.) that the plan meets the requirements of 30 TAC Chapter 352.

B. **Submit the most recent Annual CCR Fugitive Dust Control Report** (30 TAC §352.801) (40 CFR §257.80(c)) and include the report information.

CCR Fugitive Dust Control Plan and the 2021Annual CCR Fugitive Dust Control Report located in APPENDIX C.

# IV. Landfill Criteria

See Instructions and Technical Guidance – No. 30 Coal Combustion Residuals Landfill

## 25. Landfill(s) for CCR Waste

Provide the following information below if there is a landfill; if there is more than one landfill, separate information is required for each landfill.

### A. Landfill Characteristics

Describe the design, installation, construction, and operation of the landfill and submit a completed Table IV.A. – Landfill Characteristics.

Ash Landfill 1 consists of four landfill cells (Cells 1 through 4), each constructed with a 3-foot thick compacted clay liner (hydraulic conductivity ≤ 1×10-7 cm/sec). The landfill is constructed above-grade and is surrounded by an earthen perimeter berm that are also provided with a 3-foot-thick compacted clay liner. CCR placement extends above the top of the perimeter berms and the sides of the CCR placed above the berms are graded to slopes of approximately 3H:1V.
Ash Landfill 1 has been in operation since 2008. The current status of Cells 1 through 4 is as follows:

- Cell 1 has received CCR and is inactive. A final cover consisting of a 3-ft thick clay soil (hydraulic conductivity ≤ 1×10-7 cm/sec) overlain with 1.5-ft thick vegetative cover was placed over Cell 1 in 2015.
- Cell 2 has received CCR and is inactive. A final cover consisting of a 40-mil linear low-density polyethylene (LLDPE) geomembrane overlain with a geosynthetic drainage layer and 18 inches of soil was placed over Cell 2 in 2019.
- Cell 3 is active and used for CCR (primarily bottom ash) disposal.
- Cell 4 is active and used for CCR (primarily FGD gypsum) disposal. The eastern portion of Cell 4 is currently used to manage contact water.

### B. Liner Design

1. For existing landfills, provide attachments describing how the facility will comply with 30 TAC 352, Subchapter F (Design Criteria).

   Ash Landfill 1 is an Existing CCR Landfill as defined by the CCR rule. There are no design criteria for Existing CCR Landfills in either the state or federal CCR rule. 30 TAC 352, Subchapter F or 40 CFR 257.70

2. For new landfills or lateral expansions of existing landfills, submit pages describing how the facility will comply with 30 TAC §352.261 and 30 TAC §352.701. N/A

3. Complete Table IV.B. - Landfill Liner System and specify the type of liner used for the landfill.

4. Provide attachments describing the design, installation, and operation of the liner and leak detection system. The description must demonstrate that the liner and leak detection system will prevent discharge to the land, groundwater, and surface water. Submit a quality assurance project plan (QAPP) to ensure that each analysis is performed appropriately.

   The following Soil Liner Evaluation Reports (SLERs) are located in APPENDIX D for the construction of cells 1-4 of Ash Landfill 1:
   SLER-Phase 1 Ash Landfill
   SLER-Cell 1 West Dike Clay Liner Construction

SLER-Cell 2 Ash Landfill
SLER-Cell 3 Ash Landfill
SLER-Cell 4 Ash Landfill

**C. Leachate Collection and Removal**

Submit design information and description of leachate collection and removal system in accordance with 30 TAC §352.701. N/A

Complete Table IV.C. - Landfill Leachate Collection System. N/A

**D. Design of Liner and Leachate Collection and Removal System.**

For a new landfill or lateral expansion of a CCR landfill, provide a qualified Texas P.E. certification and technical report that the design of the liner and the leachate collection and removal system meets the requirements of 30 TAC §352.711. N/A

**E. Run-on and Run-off Controls**

At time of application, attach pages describing how the facility will comply with the run-on and run-off system plan for an existing, new, or lateral expansion of a CCR landfill information. Provide a qualified Texas P.E. certification and technical report that the run-on and run-off control system plans meet the requirements of 30 TAC §352.811.

"Run-on and Run-off Control System Plan" for Ash Landfill 1 is located in APPENDIX D.

**F. Inspection for Landfills**

At time of application, attach pages describing how the facility will comply 30 TAC §352.841 and complete Table IV.D. – Inspection Schedule for Landfills. For existing CCR landfills, provide the most recent inspection report. All CCR landfills and any lateral expansions of a CCR landfill must be inspected for any structural weakness, malfunction, deterioration conditions which are disrupting or have the potential to disrupt the operation or safety of the CCR unit, or any other conditions which may cause harm to human health and environment at a frequency specified in 40 CFR §257.84(a) and (b).

The 2021 Annual CCR Landfill inspection report is located in APPENDIX D.

# V. Surface Impoundment Criteria

See Instructions and Technical Guidance – No. 31 Coal Combustion Residuals Surface Impoundment

## 26. Surface Impoundment(s) for CCR Waste

Provide the following information below if there is a surface impoundment; if there is more than one surface impoundment, separate information is required for each surface impoundment.

**A. General Surface Impoundment(s) Characteristics**

Provide information about the characteristics of the surface impoundment(s): incised, surface area (acres), storage volume (acres-feet), and depth (feet).

For all surface impoundment(s), include the following information:

1. Complete Table V.A. - Surface Impoundments Characteristics. List the surface impoundment(s) to be registered as a CCR unit(s), the wastes managed in each unit, and the rated capacity or size of each unit.

2. Describe the surface impoundment(s) and provide a plan view drawing with cross-sections, if available.

   See “History of Construction” report in APPENDIX E. A summary description of the impoundments is located in Section 3.5 and drawings are included in Attachment 1. “History of Construction-Addendum No. 1” in APPENDIX E provides updates on the completed retrofit of FGD Pond A.

3. Specify the minimum freeboard to be maintained and the basis of the design to prevent overtopping resulting from normal or abnormal operation; overfilling; wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, and other equipment; and human error. Show that adequate freeboard will be available to prevent overtopping from a 100-year, 24-hour storm.

   Minimum freeboard of 2 feet in FGD-A and FGD-B and minimum freeboard 3 feet in FGD-C. See “Inflow Design Flood Control System Plan”, Section 2.4 for FGD Ponds in APPENDIX E.

4. Waste Flow
   Describe the means that will be used to immediately shut off the flow of waste to the impoundment in the event of liner failure or to prevent overtopping.

   All inflows are controlled via pumps under controlled conditions, see “Inflow Design Flood Control System Plan”, Section 2.0 for FGD Ponds in APPENDIX E.

5. Dike Construction ☒ Yes ☐ No

   If Yes, submit the dike certification (located at the end of the application).

   In October 2016, the initial certified Periodic Hazard Potential Classification Assessments, Periodic Structural Stability Assessments, and Periodic Safety Factor Assessments were completed for each FGD Pond (FGD-A, FGD-B, FGD-C) as required by 40 CFR 257.73(a), 257.73(d), and 257.73(e). In October 2021, the certified 5-Year Updates to these assessments were completed as required by 40 CFR 257.73 and 30 TAC 352.731, which identified no structural deficiencies. The most recent 2021 5-Year Assessment Updates are located in APPENDIX E. Based on the conclusion in the certified 5-year updates that no structural deficiencies exist, the facility is submitting these documents in lieu of the Dike Certification.

   The structural integrity of the dike system must be certified by a qualified Texas P.E. before the registration is issued. If the impoundment is not being used, the dike system must be certified before it can be put into use. The certification must be sealed by a qualified Texas P.E., along with the engineering firm’s name and registration number (30 TAC §352.4).

   A report shall accompany the dike certification which summarizes the activities, calculations, and laboratory and field analyses performed in support of the dike certification. Describe the design basis used in construction of the dikes. A QAPP should be included in the report to ensure that each analysis is performed appropriately and include:

   (1) Slope Stability Analysis

   (2) Hydrostatic and Hydrodynamic Analysis

   (3) Storm Loading

   (4) Rapid Drawdown

Earthen dikes should have a protective cover to minimize wind and water erosion and to preserve the structural integrity of the dike. Describe the protective cover used and describe its installation and maintenance procedures.

## B. Liner Design

For surface impoundment(s), provide information about how the facility will comply with 30 TAC §352.711 for existing CCR surface impoundments. For new and lateral expansion of CCR surface impoundments provide information on how the facility will comply with 30 TAC §352.261, and 30 TAC §352.721, see Instructions and Technical Guidance No. 31 Coal Combustion Residuals Surface Impoundment. The qualified Texas P.E. must certify that the design of the liner complies with the requirements of 30 TAC Chapter 352 and 40 CFR Part 257, Subpart D, where required.

Is the CCR surface impoundment unlined? ☒ Yes ☐ No

FGD Pond A, FGD Pond B, and FGD Pond C are lined per 40 CFR § 257.71.

If "Yes", the CCR unit is subject to the closure requirements under 30 TAC Chapter 352 and 40 CFR §257.101(a) to retrofit or close. A notification must be prepared stating that an assessment of corrective measures has been initiated.

1. Complete Table V.B. - Surface Impoundment Liner System for each surface impoundment to be registered.
2. Describe the design, installation and operation of liner and leak detection components. The description must demonstrate that the liner and leak detection system will prevent discharge to the land and surface water. Submit a QAPP report to ensure that each analysis is performed appropriately.

   See "History of Construction" and "History of Construction-Addendum No.1"reports for all ponds. Also see "Construction Completion and Quality Assurance Report" for FGD-A and "Liner Evaluation Reports" for FGD-B and FGD-C in APPENDIX E.
3. For new or laterally expansions of existing surface impoundments, provide a subsurface soil investigation report that must include:
   a. A description of all borings drilled, at the unit location, to test soils and characterize groundwater;
   b. A unit map drawn to scale showing the surveyed locations and elevations of the borings, including location of permanent identification markers ((30 TAC §352.731) and (40 CFR §257.73(a)(1));
   c. Cross-sections prepared from the borings depicting the generalized strata at the unit;
   d. Boring logs, including a description of materials encountered, and any discontinuities such as fractures, fissures, slickensides, lenses or seams;
   e. A description of the geotechnical data and the geotechnical properties of the subsurface soil materials, including the suitability of the soils and strata for the intended uses; and
   f. A demonstration that all geotechnical tests were performed in accordance with industry practices and recognized procedures.

   N/A

## C. Hazard Potential Classification

Provide the current hazard potential classification assessment and associated documentation, as required by 30 TAC §352.731 or §352.741 and 40 CFR §257.73(a)(2) or §257.74(a)(2). The qualified Texas P.E. must certify that the initial hazard potential classification and any subsequent periodic classification was conducted in accordance with the requirements of 30 TAC Chapter 352, where required.

Hazard Potential Classification: **LOW**

See “Hazard Potential Classification Assessment” located in APPENDIX E.

**D. Emergency Action Plan for High or Significantly High Hazard Potential**

Provide the current Emergency Action Plan that has been certified by a qualified Texas P.E. and includes the following requirements from 30 TAC 352, Subchapter F and 40 CFR §257.73(a)(3)(i)(A) - (E) or 40 CFR §257.74 (a)(3)(i)(A) - (E). The qualified Texas P.E. must certify that the written Emergency Action Plan and any subsequent amendment of the plan complies with the requirements of 30 TAC 352, Subchapter F, where required.

N/A

Complete Table V.J. - Inspection of Surface Impoundments

**E. Inflow Design Flood Control System Plan**

Describe how the surface impoundment(s) system will manage stormwater run-on away from the surface impoundment(s) (30 TAC §352.821 and 40 CFR §257.82(a) and (c)). Stormwater run-on must be diverted away from a surface impoundment, based on the hazard potential. Where dikes are used to divert run-on, they must be protected from erosion. Include all analyses used to calculate run-on volumes. Provide the inflow design flood control system plan. Provide qualified Texas P.E. certification that the initial and periodic inflow design flood control system plans meet the requirements of 30 TAC §352.821, where required.

See “Inflow Design Flood Control System Plan” located in APPENDIX E.

**F. History of Construction for Existing CCR Surface Impoundment(s), or the Design and Construction Plans for New and Lateral Expansions**

Provide information on the history of construction for each existing CCR surface impoundment (30 TAC §352.731 and 40 CFR §257.73(c)) or the design and construction plans for new and lateral expansions of each CCR surface impoundment (30 TAC §352.741) and (40 CFR §257.74(c)).

See “History of Construction” and “History of Construction-Addendum No. 1” in APPENDIX E.

**G. Structural Stability Assessment**

Provide the most recent structural stability assessment of the surface impoundments. Include the combined capacity of all surface impoundment spillways with calculations; the peak discharge the unit must meet for all combined spillways; probable maximum flood-high hazard, 1,000-yr-significant high hazard, 100-yr-low hazard; identify if there were any structural stability deficiencies in last assessment; identify how these deficiencies were managed and corrected; and qualified Texas P.E. certification. The structural stability assessment must include all information required in 30 TAC §352.731 for existing surface impoundments or 30 TAC §352.741 for new or laterally expanding surface impoundments.

See “Structural Stability Assessment” located in APPENDIX E.

**H. Safety Factor Assessment**

The current safety factor assessment must be submitted with the application. It must include documentation that demonstrates whether the calculated factors of safety for each CCR surface impoundment achieve the minimum safety factors specified in 30 TAC 352, Subchapter F and 40 CFR §257.73(e)(1)(i) - (iv) and 40 CFR §257.74(e)(1)(i) - (iv) for the critical cross-section of the embankment. The critical cross-section is the cross-section anticipated to be the most susceptible to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations and certified by a qualified Texas P.E.

See "Safety Factor Assessment" located in APPENDIX E.

# VI. Groundwater Monitoring and Corrective Action (30 TAC 352, Subchapter H)

See Instructions and Technical Guidance – No. 32 Coal Combustion Residuals Groundwater Monitoring and Corrective Action

## 27. Groundwater Monitoring System

**A.** Complete Table VI.A. - Unit Groundwater Detection Monitoring System.

**B.** Provide a map showing location of wells, groundwater elevations, and groundwater flow direction.

See Groundwater Potentiometric Surface Maps in Appendix C of the "Groundwater Monitoring System Certification" reports for Ash Landfill 1 and FGD Ponds located in APPENDIX F.

**C.** Provide attachments describing how the facility will comply with the requirements in 30 TAC §352.911 and provide a certification by a qualified Texas P.E or qualified Texas P.G. that the groundwater monitoring system design and construction meet the requirements of 30 TAC Chapter 352.

See "Groundwater Monitoring System Certification" reports for Ash Landfill 1 and FGD Ponds located in APPENDIX F.

**D.** Provide a figure showing the geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities and effective porosities.

See Figures 3,4,5 in the "Groundwater Monitoring System Certification" report for Ash Landfill 1 located in APPENDIX F.

See Figures 3, 4,5,6 in the "Groundwater Monitoring System Certification" report for FGD Ponds located in APPENDIX F.

**E.** For a multiunit groundwater monitoring system, demonstrate that the groundwater monitoring system will be equally as capable of detecting monitored constituents at the waste boundary of the CCR unit as the individual groundwater monitoring system for each CCR unit by providing at minimum the following information:

1. Number, spacing, and orientation of each CCR unit;

2. Hydrogeologic setting; and

3. Site history.

See "Groundwater Monitoring System Certification" report for FGD Ponds located in APPENDIX F.

**F.** Has there been any sampling concentrations of one or more constituents listed in Appendix IV detected at statistically significant levels above the groundwater protection standard (GWPS)? ☒ Yes ☐ No

FGD Ponds

**G.** Provide information on how monitoring wells have been constructed and cased in a manner that maintains the integrity of the monitoring well borehole and to prevent contamination of samples and the groundwater.

See Appendix A in the "Groundwater Monitoring System Certification" reports for Ash Landfill 1 and FGD Ponds located in APPENDIX F.

## 28. Groundwater Monitoring Sampling and Analysis Program

Provide a sampling and analysis plan that includes procedures and techniques; sampling and analytical methods that are appropriate for groundwater sampling; and that address the requirements of 30 TAC §352.931 and 40 CFR §257.93. Provide a P.E or P.G. certification that describes the statistical method selected to evaluate the groundwater monitoring data and certifies that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR management area. Refer to TG-32 for information and guidance.

See "Groundwater Monitoring Plan-Revision 2" and "Statistical Analysis Plan-Revision 1" for Ash Landfill 1 and FGD Ponds located in APPENDIX F.

## 29. CCR Unit(s) in a Detection Monitoring Program

Does the facility have CCR unit(s) in a Detection Monitoring Program?

☒ Yes ☐ No

Ash Landfill 1

If "Yes", Submit the following information:

**A.** Submit Table VI.C. – Facility CCR Units Under Detection Monitoring.

**B.** Provide a Background Evaluation Report.

Background data was derived from the eight independent sampling events required under 40 CFR 257.94(b). A summary of the background monitoring program can be found in Section 3.0 of the "2017 Annual Groundwater Monitoring Report". Background water quality data is summarized in Tables 3 and 4 and laboratory analytical reports are located in Appendix A of the 2017 report.

The "2017 Annual Groundwater Monitoring Report" for Ash Landfill 1 is in APPENDIX F.

**C.** Provide a report with the results of semiannual monitoring events.

The "2020 Annual Groundwater Monitoring and Corrective Action Report" and the "2021 Annual Groundwater Monitoring and Corrective Action Report-Revision 1" for Ash Landfill 1 is in APPENDIX F.

1. Has a statistically significant increase (SSI) been detected for one or more of the constituents listed in Appendix III at any monitoring well?

   ☒ Yes ☐ No

2. Has a notification to the executive director been sent within 14 days?

   ☒ Yes ☐ No

3. Date assessment monitoring program will start: N/A Due to successful ASDs

4. Do you plan to provide an alternative source demonstration (ASD)?

   ☒ Yes ☐ No

## 30. CCR Unit(s) in an Assessment Monitoring Program

Does the facility have CCR unit(s) in an Assessment Monitoring Program?

☒ Yes ☐ No

FGD Ponds

If "Yes", Submit information related for units.

**A.** Complete Table VI.D. – CCR Units Under Assessment Monitoring.

**B.** Provide, for each well in assessment monitoring status, the recorded concentrations lab sheets and results in a tabulated form.

See summary tables 3 and 4 for all results in tabulated form in the "2020 Annual Groundwater Monitoring and Corrective Action Report" for the FGD Ponds in APPENDIX F. The "2021 Annual Groundwater Monitoring and Corrective Action Report-Revision 1" for the FGD Ponds is also in APPENDIX F.

**C.** Have the concentrations of all constituents listed in Appendices III and IV been at or below background values, using the statistical procedures in 30 TAC §352.931 and 40 CFR §257.93(g), for two consecutive sampling events for the CCR unit(s)? ☐ Yes ☒ No

If answer to above is yes, detection monitoring may resume. The owner or operator must prepare a notification stating that detection monitoring is resuming for the CCR unit and obtain written approval from the executive director.

**D.** Are there any concentrations of any constituent in Appendices III and IV above background values? ☒ Yes ☐ No

1. Has a notification to the executive director been sent within 14 days?

   ☒ Yes ☐ No

**E.** Date assessment of corrective measures will be initiated (must be within **90 days** of finding a statistically significant level above the GWPS) for the CCR unit(s): April 8, 2019

**F.** Will you provide an ASD (see TG-32 for an acceptable submittal)? ☐ Yes ☒ No

**G.** Date assessment of corrective measures will be initiated if ASD is not accepted? N/A

**H.** Complete Table VI.D-2. - Groundwater Detection Monitoring Parameters

**Note**: Refer to TG-32 regarding establishing a GWPS for each constituent in Appendix IV detected in the groundwater and attach as table.

**I.** Have you completed the assessment of corrective measures? ☒ Yes ☐ No
If "Yes", date assessment of corrective measures was completed: September 5, 2019
If "No", date assessment of corrective measures will be completed:
Expected date of submittal of amendment (see note below):
Provide completed assessment of corrected measures materials.

"CCR Assessment of Corrective Measures-Revision 1" dated May 2021 can be found in APPENDIX F.

**Note**: Within **30 days** of completing the assessment of corrective measures, and before remedy implementation, the owner or operator shall submit an application for amendment to the registration. In some circumstance"s, the assessment of corrective measures and selected remedy may be approved as part of the initial application for the CCR unit registration.

**J.** Have you selected a remedy? ☒ Yes ☐ No

"Remedy Selection Report" located in APPENDIX F.

Provide public meeting documentation under 30 TAC §352.961 and a report under 30 TAC §352.971 and 40 CFR §257.97.

"Assessment of Corrective Measures Public Meeting Documents" located in APPENDIX F.

# VII. Closure and Post-Closure Care

See Instructions and Technical Guidance

Submit a full closure plan and post-closure plan and all information describing how the owner or operator will comply with 30 TAC 352, Subchapter J and 40 CFR §§257.100 - 257.104. The owner of property on which an existing disposal facility is located, following the closure of a unit, must also submit documentation that a notation has been placed in the deed to the facility that will in perpetuity notify any potential purchasers of the property that the land has been used to manage CCR wastes and its use is restricted (30 TAC §352.1221 and 40 CFR §257.102(i)). For CCR units, closed after October 19, 2015, that were closed before submission of the application, the applicant should submit documentation to show that notices required under 30 TAC 352, Subchapter K and 40 CFR §257.105 or §257.106 have been filed.

## 31. Closure Plan

This section applies to the owners and operators of all CCR units required to be registered. The applicant must close the facility in a manner that minimizes need for further maintenance and controls, or eliminates, to the extent necessary to protect human health and the environment, the post-closure release of CCR waste, chemical constituents of concern, leachate, contaminated rainfall, or waste decomposition products to the groundwater, surface waters, or to the atmosphere.

The type of unit to be closed can determine the level of detail sufficient for a closure plan. CCR units which have been certified closed after October 19, 2015, must provide documentation to demonstrate compliance with state and federal regulations.

For each unit to be registered, complete Table VII.A.1. - Unit Closure and list the CCR Unit components to be decontaminated, possible methods of decontamination, and possible methods of disposal of wastes and waste residues generated during unit closure. All ancillary components must be decontaminated, and the generated waste disposed of appropriately.

See "Closure Plan" and "Closure Plan-Addendum No. 1" for Ash Landfill 1 and FGD Ponds in APPENDIX G.

Information about CCR units closed or to be closed under alternative closure requirements must be provided in Table VII.A.2. - CCR Units Under Alternative Closure Notification.

Guidance on design of a closure cap and final cover for non-hazardous industrial solid wastes landfills is provided in EPA publication 530-SW-85-014, TCEQ Technical Guidance No. 3 and TCEQ publication, RG-534, "Guidance for Liner Construction and Testing for a Municipal Solid Waste Landfill".

## 32. Post-Closure Care Plan

Provide a post-closure care plan that complies with the requirements of 30 TAC §352.1241.

See "Post-Closure Plan" for Ash Landfill 1 and FGD Ponds in APPENDIX G.

Post-closure care of each CCR unit must continue for at least 30 years after the date of completing closure of the unit and must consist of monitoring and reporting of the groundwater monitoring systems, in addition to the maintenance and monitoring of CCR unit. Continuation of certain security requirements may be necessary after the date of closure. Post-closure use of property on or in which waste remains after closure must never be allowed to disrupt the integrity of the containment system. In addition, submit the following information:

- The name, address, and phone number of the person or office to contact about the CCR unit during the post-closure period; and

  Luminant-Environmental Services
  Renee Collins-Senior Environmental Director
  6555 Sierra Drive
  Irving, TX 75039
  214-875-8338
  CCRPostClosurePlan@Luminant.com

- A discussion of the future use of the land associated with each unit.

  See section 5.0 of the "Post-Closure Plans" for Ash Landfill 1 and FGD Ponds in APPENDIX G.

Landfills and surface impoundments which have been certified closed after October 19, 2015, must be included in post-closure care plans, unless they have been determined to have been closed by waste removal equivalent to the closure standards in 30 TAC §352.1221 and 40 CFR §257.102 or 30 TAC §352.1231 and 40 CFR §257.103. If such a demonstration has been made pursuant to 40 CFR §257.102 or §257.103, but an equivalency determination has not been made, please submit a copy of the demonstration documentation. If an equivalency determination has been made, applicant should submit a copy of this determination.

# VIII. Financial Assurance

## 33. Post-Closure Care Cost Estimate

Financial assurance for post-closure care (30 TAC §352.1101) applies to owners or operators of all CCR units, except CCR units from which the owner or operator intends to remove wastes and perform clean closure. Provide a written cost estimate in current dollars of the total cost of the 30-year (or longer, if applicable under 30 TAC §352.1101(d)) post-closure care period to perform post-closure care requirements as prescribed in 30 TAC §352.1241. The cost estimate must be based on the costs of hiring a third party to conduct post-closure care maintenance.

Complete Table VIII.A.1 – Post-Closure Cost Summary for Existing Registered Units

See Post-Closure Care Cost Estimates in APPENDIX H. Cost estimates for the FGD Pond Area are summarized in Table 1. Cost estimates for Ash Landfill 1 are summarized in Table 2.

Complete Table VIII.A.2. - Post-Closure Cost Summary for Proposed Registered Units

## 34. Financial Assurance Mechanism

The financial assurance for post-closure care is required in accordance with 30 TAC §352.1101. The applicant shall demonstrate the financial assurance within 90 days after approval of the registration with a financial mechanism acceptable to TCEQ in compliance with 30 TAC §352.1101(c) and 30 TAC §37, Subchapters A through D, except as indicated in 30 TAC §352.1111, in an amount no less than the amount specified in the approved Post-Closure Care Cost Summary. Provide a description of the proposed financial assurance mechanism.

Oak Grove Management Company LLC will provide an acceptable financial assurance mechanism per 30 TAC 352.1101 no more than 90 days after the executive director's approval of the registration.

Complete Table VIII.B. - Post-Closure Period, for the authorized post-closure period, to meet the requirements of 30 TAC §352.1241(a) through (c).

**Signature Page**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

**Applicant** Signature: _____ Date: _____

Name and Official Title (type or print): _____

**Owner or Operator** Signature: _____ Date: _____

Name and Official Title (type or print): _____

To be completed by the owner or operator if the application is signed by an authorized representative for the operator

I, _____ hereby designate _____
(operator) (authorized representative)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a CCR waste management registration. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any registration which might be issued based upon this application.

_____
Printed or Typed Name of Applicant or Principal Executive Officer

_____
Signature

(Note: Application Must Bear Signature & Seal of Notary Public)

**Subscribed and sworn** to before me by the said _____ on this

_____ day of _____, _____.

My commission expires on the _____ day of _____, _____

(Seal) Notary Public in and for _____ County, Texas

**Registration Application for Coal Combustion Residuals Waste Management**

| **Attachments and Tables** | **Attachment No.** |
|---|---|
| General Information | Appendix A |
| Property/Legal Description | |
| Property Owner Affidavit | |
| Legal Authority | |
| Delegation of Signature Authority | |
| TCEQ Core Data Form | |
| Attachments | |
| Response to TCEQ CCR Unit Registration Comments (Item 21) – Ash Landfill 1 | |
| Response to TCEQ CCR Unit Registration Comments (Item 21) – FGD Ponds | |
| Location Restrictions & Geology | Appendix B |
| Location Restriction Demonstration-Ash Landfill 1 | |
| Location Restriction Evaluation-Ash Landfill 1 | |
| Location Restriction Demonstration-FGD Ponds | |
| Location Restriction Evaluation-FGD Ponds | |
| Fugitive Dust Control Plan | Appendix C |
| CCR Fugitive Dust Control Plan | |
| 2021 Annual CCR Fugitive Dust Control Report | |
| Landfill Criteria | Appendix D |
| Soil Liner Evaluation Reports | |
| Run-on and Run-off Control System Plan | |
| 2021 Annual CCR Unit Inspection Report-Ash Landfill 1 | |
| Surface Impoundment Design and Operating Criteria | Appendix E |
| Construction Completion and Quality Assurance Report-FGD A | |
| Liner Evaluation Report-FGD B | |
| Liner Evaluation Report-FGD C | |
| Retrofit Plan – FGD A | |
| Intent to Retrofit Notification – FGD A | |
| FGD Pond A Retrofit Construction Plans | |
| Hazard Potential Classification Assessment | |
| Inflow Design Flood Control System Plan | |
| History of Construction | |
| History of Construction-Addendum No.1 | |
| Structural Stability Assessment | |
| Safety Factor Assessment | |
| Groundwater Monitoring and Corrective Action | Appendix F |
| Groundwater Monitoring System Certification-Ash Landfill 1 | |
| Groundwater Monitoring System Certification-FGD Ponds | |
| Groundwater Monitoring Plan-Revision 2 – Ash Landfill 1 | |
| Groundwater Monitoring Plan-Revision 2 – FGD Ponds | |
| Statistical Analysis Plan-Revision 1-Ash Landfill 1 | |
| Statistical Analysis Plan-Revision 1-FGD Ponds | |
| 2017 Annual Groundwater Monitoring Report-Ash Landfill 1 | |
| 2020 Groundwater Monitoring and Corrective Action Report-Ash Landfill 1 | |
| 2020 Groundwater Monitoring and Corrective Action Report-FGD Ponds | |
| 2021 Groundwater Monitoring and Corrective Action Report-Revision 1-Ash Landfill 1 | |
| 2021 Groundwater Monitoring and Corrective Action Report-Revision 1-FGD Ponds | |
| CCR Assessment of Corrective Measures-Revision 1-FGD Ponds | |
| Assessment of Corrective Measures Public Meeting Documents | |

Remedy Selection Report – FGD Ponds

Closure and Post-Closure Care — Appendix G

Closure Plan-Ash Landfill 1
Closure Plan-Addendum No. 1-Ash Landfill 1
Closure Plan-FGD Ponds
Closure Plan-Addendum No. 1-FGD Ponds
Post-Closure Plan-Ash Landfill 1
Post-Closure Plan-FGD Ponds

Financial Assurance — Appendix H

Post-Closure Care Cost Estimates **Tables**

| Tables | Submitted | Not Applicable |
|---|---|---|
| Table I.6. - CCR Waste Management Units | ☒ | ☐ |
| Table I.6.A. - Waste Management Information | ☒ | ☐ |
| Table I.6.B. - Wastes Managed in Registered Units | ☒ | ☐ |
| Table I.6.C. - Sampling and Analytical Methods | ☒ | ☐ |
| Table IV.A. - Landfill Characteristics | ☒ | ☐ |
| Table IV.B. - Landfill Liner System | ☒ | ☐ |
| Table IV.C. - Landfill Leachate Collection System | ☐ | ☒ |
| Table IV.D. - Inspection Schedule of Landfills | ☒ | ☐ |
| Table V.A. - Surface Impoundments Characteristics | ☒ | ☐ |
| Table V.B. - Surface Impoundment Liner System | ☒ | ☐ |
| Table V.J. - Inspection of Surface Impoundments | ☒ | ☐ |
| Table VI.A. - Unit Groundwater Detection Monitoring System | ☒ | ☐ |
| Table VI.C. - CCR Units Under Detection Monitoring | ☒ | ☐ |
| Table VI.C-1. - Groundwater Detection Monitoring Parameters | ☒ | ☐ |
| Table VI.D. - CCR Units Under Assessment Monitoring | ☒ | ☐ |
| Table VI.D-2. - Groundwater Assessment Monitoring Parameters | ☒ | ☐ |
| Table VII.A.1. - Unit Closure | ☒ | ☐ |
| Table VII.A.2. - CCR Units Under Alternative Closure Notification | ☐ | ☒ |
| Table VIII.A.1. - Post-Closure Cost Summary for Existing Registered Units | ☒ | ☐ |
| Table VIII.A.2. - Post-Closure Cost Summary for Proposed Registered Units | ☐ | ☒ |
| Table VIII.B. - Post-Closure Period | ☐ | ☒ |
| Engineering Certification(s) - Dike Construction | ☐ | ☒ |

**Additional Attachments as Applicable - Select all those apply and add as necessary**

☒ TCEQ Core Data Form(s) Appendix A
☒ Signatory Authority Delegation Appendix A
☐ Fee Payment Receipt
☐ Confidential Documents
☒ Certificate of Fact (Certificate of Incorporation) Appendix A
☐ Assumed Name Certificate

**Table I.6. – CCR Waste Management Units**

| CCR Unit No.[1] | Unit Name | N.O.R. No.[1] | Unit Description[3] | Capacity | Unit Status[2] |
|---|---|---|---|---|---|
| 010 | Ash Landfill 1 | 010 | Landfill | 22.16 million cubic yards | Active |
| 011 | FGD-A Pond | 011 | Surface Impoundment | 172 ac-ft | Active |
| 012 | FGD-B Pond | 012 | Surface Impoundment | 104 ac-ft | Active |
| 013 | FGD-C Pond | 013 | Surface Impoundment | 218 ac-ft | Active |
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1 Registered Unit No. and N.O.R. No. cannot be reassigned to new units or used more than once.
2 Unit Status options: Active, Closed, Inactive (built but not managing waste), Proposed (not yet built), Never Built, Transferred, Post-Closure.
3 If a unit has been transferred, the applicant should indicate which facility/permit it has been transferred to in the Unit Description column.

**Table I.6.A. – Waste Management Information**

| Waste No.[1] | Waste Type(s) | Source | Volume (tons/year)[2] |
|---|---|---|---|
| 1 | FGD Gypsum | Coal Combustion Byproduct | 837,000 tons |
| 2 | Fly Ash | Coal Combustion Byproduct | 49,000 tons |
| 3 | Bottom Ash | Coal Combustion Byproduct | 332,000 tons |
| 4 | Class 2 Non-Hazardous Sandblast Grit | Misc. Maintenance Activities | < 10 tons |
| 5 | Construction Debris | Misc. Maintenance Activities | < 100 tons |
| 6 | Filters | Misc. Maintenance Activities | < 50 tons |
| 7 | Metal Scrap | Misc. Maintenance Activities | 0 |
| 8 | Activated Carbon Waste | Unused material for Flue Gas Treatment | 0 |
| 9 | Spent Desiccant | Misc. Maintenance Activities | 0 |
| 10 | Spent Ion Exchange Resins | Boiler Water Treatment | < 20 tons |
| 11 | Waste Catalyst | SCR Unit | 150 tons |
| 12 | Supplemental Plant Production Refuse | Plant Laboratory Operations | 0 |
| 13 | Plant Trash | Misc. Plant Operations | 0 |
| | | | |

1 Assign waste number sequentially. Do not remove waste number wastes which are no longer generated

2 Reflects 2020 records

Table I.6.B. – Wastes Managed in Registered Units

| Waste No.[1] | Waste | TCEQ Waste Form Codes and Classification Codes |
|---|---|---|
| 1 | FGD Gypsum | TWC-30013922, TX Form Code-392, Class 2 |
| 2 | Fly Ash | TWC-30023042, TX Form Code-304, Class 2 |
| 3 | Bottom Ash | TWC-30053042, TX Form Code-304, Class 2 |
| 4 | Class 2 Non- Hazardous Sandblast Grit | TWC-37013902, TX Form Code-389, Class 2 |
| 5 | Construction Debris | TWC-37043902, TX Form Code-390, Class 2 |
| 6 | Filters | TWC-37063102, TX Form Code-310, Class 2 |
| 7 | Metal Scrap | TWC-37133072, TX Form Code-307, Class 2 |
| 8 | Activated Carbon Waste | TWC-37184042, TX Form Code-404, Class 2 |
| 9 | Spent Desiccant | TWC-37203192, TX Form Code-319, Class 2 |
| 10 | Spent Ion Exchange Resins | TWC-37264032, TX Form Code-403, Class 2 |
| 11 | Waste Catalyst | TWC-37503932, TX Form Code-393, Class 2 |
| 12 | Supplemental Plant Production Refuse | TWC-39019022, TX Form Code-902, Class 2 |
| 13 | Plant Trash | TWC-39109992, TX Form Code-999, Class 2 |
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1 from Table I.6.A., first column

**Table I.6.C – Sampling and Analytical Methods**

| Waste No.[1] | Sampling Location | Sampling Method | Frequency | Parameter | Test Method | Desired Accuracy Level |
|---|---|---|---|---|---|---|
| 1 | Gypsum dewatering belt | Grab | <5 years | TCLP Metals | SW1311/7470A SW1311/6020B | See below [2] |
| 2 | Fly ash loading silo | Grab | <5 years | TCLP Metals | SW1311/7470A SW1311/6020B | See below [2] |
| 3 | Bottom ash bunker | Grab | <5 years | TCLP Metals | SW1311/7470A SW1311/6020B | See below [2] |
| 4 | Varies by project | Composite | Each project | TCLP Metals | SW1311/7470A SW1311/6020B | See below [2] |
| 5 | Varies by project | Composite | As needed | TCLP metals, TPH | SW1311/7470A SW1311/6020B TX1005 | See below [2] |
| 6 | None-process knowledge | NA | NA | SDS and flyash analysis (Waste no. 2) | NA | NA |
| 7 | None-process knowledge | NA | NA | None | NA | NA |
| 8 | None-process knowledge | NA | NA | SDS and process knowledge | NA | NA |
| 9 | None-process knowledge | NA | NA | SDS | NA | NA |
| 10 | Spent resin drum | Composite | <5 years | TCLP Metals | SW1311/7470A SW1311/6020B | See below [2] |
| 11 | None-process knowledge | NA | NA | SDS and flyash analysis (Waste no. 2) | NA | NA |
| 12 | None-process knowledge | NA | NA | None | NA | NA |
| 13 | None-process knowledge | NA | NA | None | NA | NA |

1 from Table I.6.A., first column

2 Analytical protocol will meet EPA quality control and accuracy specifications as published in the SW-846 Methods. The laboratory will be TCEQ accredited.

**Table IV.A. – Landfills Characteristics**

| Registered Unit No. | Landfill | N.O.R. No. | Waste Nos.[1] | Rated Capacity | Dimensions[2] | Distance from lowest liner to groundwater | Action Leakage Rate (if required) | Unit will manage CCR Waste and non-CCR Waste (state all that apply) |
|---|---|---|---|---|---|---|---|---|
| 010 | Ash Landfill 1 | 010 | 1 thru 13 | 22.16 million cubic yards | 3200 ft L x 2100 ft W x 190 ft H (height @ max design)<br>155 acres | N/A | N/A | Waste numbers 1-13 as described in Table I.6.A. |
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1 From Table I.6.A., first column
2 Dimensions should be provided as average length, width and depth, also include the surface acreage for the unit.

**Table IV.B. – Landfill Liner System**

| Registered Unit No.* | Landfill | Geomembrane Liner Material | Geomembrane Liner Permeability (cm/sec) | Geomembrane Liner Thickness | Soil Liner Material | Soil Liner Permeability (cm/sec) | Soil Liner Thickness |
|---|---|---|---|---|---|---|---|
| 010 | Ash Landfill 1 | N/A | N/A | N/A | Compacted clay | $<1x10^{-7}$ cm/sec | Minimum 3 ft |
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* This number should match the Registration Unit No. given on Table IV.A.

## Table IV.C. – Landfill Leachate Collection System

| Registered Unit No. | Landfill Name | Drainage Media | Collection Pipes (including risers) | Filter Fabric | Geofabric | Sump Material |
|---|---|---|---|---|---|---|
| N/A | | | | | | |
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**Table IV.D. – Inspection Schedule of Landfills**

| Facility Unit(s) and Basic Elements | Possible Error, Malfunction, or Deterioration | Frequency of Inspection |
|---|---|---|
| 010-Ash Landfill 1 | Inspect for any appearances of actual or potential structural weakness and other conditions which are disrupting of have the potential to disrupt the operation and safety of the CCR unit | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.84(a). |
| Embankments | Surface cracking, animal burrows, misalignments, slides, vegetative cover, rutting, erosion, seepage, slope protection/chutes | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.84(a). |
| Capped Areas | Animal burrows, vegetative cover, rutting, surface cracking | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.84(a). |
| Active Work Area | Contact water, dusting | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.84(a). |
| Groundwater Monitoring Wells | Deterioration of pads, bollards, missing locks, compromise of casing integrity | Semi-Annual Inspection |
| | | |
| 010-Ash Landfill 1 | | Annually per 40 CFR 257.84(b) |
| | Inspect for any changed in geometry of the structure since the previous annual inspection. | Annual Inspection |
| | Estimate the approximate volume of CCR contained in the unit at the time of the inspection. | Annual Inspection |
| | Inspect for any appearance of actual or potential structural weakness of the CCR unit, and any conditions that are disrupting or have the potential to disrupt the operation and safety of the unit. | Annual Inspection |
| | Inspect for any other change(s) which have affected the stability or operation of the CCR unit since the previous inspection | Annual Inspection |
| | | |

**Table V.A. – Surface Impoundment Characteristics**

| Registered Unit No. | Surface Impoundment Name | N.O.R. No. | Waste Nos.[1] | Rated Capacity | Dimensions[2] | Distance from lowest liner to groundwater | Action Leakage Rate (if required) | Unit will manage CCR Waste and non-CCR Waste (state all that apply) |
|---|---|---|---|---|---|---|---|---|
| 011 | FGD Pond A | 011 | 1 | 172 acre-feet | 875 ft x 500 ft x 28 ft<br>9.4 acres | >5 feet | N/A | FGD gypsum |
| 012 | FGD Pond B | 012 | 1 | 104 acre-feet | 640 ft x 700 ft x 15 ft<br>11.3 acres | <5', see location restriction report, Section 2.0, last paragraph | N/A | FGD gypsum |
| 013 | FGD Pond C | 013 | 1 | 218 acre-feet | 1200 ft x 550 ft x 22 ft<br>17 acres | >5 feet | N/A | FGD gypsum |
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1 From Table I.6.A., first column
2 Dimensions should be provided as average length, width and depth, also include the surface acreage for the unit.

**Table V.B. – Surface Impoundment Liner System**

| Registered Unit No.* | Surface Impoundment Name | Geomembrane Liner Material | Geomembrane Liner Permeability (cm/sec) | Geomembrane Liner Thickness | Soil Liner Material | Soil Liner Permeability (cm/sec) | Soil Liner Thickness |
|---|---|---|---|---|---|---|---|
| 011 | FGD Pond A | 60 mil HDPE | < $1.00x10^{-7}$ cm/sec** | 60-mil HDPE | clay | < $1x10^{-7}$ cm/sec | 2’ |
| 012 | FGD Pond B | 60 mil HDPE | < $1.00x10^{-7}$ cm/sec | 60-mil HDPE | clay | < $1x10^{-7}$ cm/sec | 2’ |
| 013 | FGD Pond C | 60 mil HDPE | < $1.00x10^{-7}$ cm/sec | 60-mil HDPE | clay | < $1x10^{-7}$ cm/sec | 2’ |
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* This number should match the Registration Unit No. given on Table V.A.
**FGD Pond A currently being retrofitted.

**Table V.J. – Inspection Schedule of Surface Impoundments**

| Facility Unit(s) and Basic Elements | Possible Error, Malfunction, or Deterioration | Frequency of Inspection |
|---|---|---|
| 011-FGD Pond A, 012-FGD Pond B, and 013-FGD Pond C | | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.83(a). |
| Above-grade piping | Deteriorating of piping/connections | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.83(a). |
| Truck Access Ramp | Spills, Deterioration | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.83(a)., spills inspected and reported within 24-hrs |
| Containment Dike | Spills, excessive water levels, surface cracking, animal burrows, misalignments, slides, vegetative cover, rutting, erosion, seepage, slope protection/chutes | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.83(a)., spills inspected and reported within 24-hrs |
| Instrumentation | Monitor water level | Unit instrumentation (water level gauge) is inspected and monitored at intervals not exceeding 30 days per 40 CFR 257.83(a)(1)(iii). |
| Groundwater | Deterioration of pads, bollards, missing locks, compromise of casing integrity | Semi-Annual Inspection |
| 011-FGD Pond A, 012-FGD Pond B, and 013-FGD Pond C | | Annually per 40 CFR 257.83(b) |
| | Inspect for any changes in geometry of the structure since the previous annual inspection. | Annual Inspection |
| | Evaluate the approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since previous annual inspection. | Annual Inspection |
| | Evaluate the storage capacity at the time of the inspection. | Annual Inspection |
| | Estimate the approximate volume of the impounded water and CCR contained in the unit at the time of the inspection. | Annual Inspection |
| | Inspect for any other change(s) which have affected the stability or operation of the CCR unit since the previous inspection | Annual Inspection |

Table VI.A.1. - Unit Groundwater Detection Monitoring Systems

| Waste Management Unit/Area Name[1] | **WMU 010 - Ash Landfill 1** | | | | | |
|---|---|---|---|---|---|---|
| Well Number(s): | MW-02 | MW-05 | MW-07 | MW-08R | MW-09 | AL-10 |
| Hydrogeologic Unit Monitored | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group |
| Type (e.g., point of compliance, background, observation, etc.) | POC | POC | POC | POC | POC | POC |
| Up or Down Gradient | Up | Down | Down | Down | Down | Up |
| Casing Diameter and Material | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC |
| Screen Diameter and Material | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC |
| Screen Slot Size (in.) | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" |
| Top of Casing Elevation (Ft, Mean Sea Level *[MSL]* ) | 463.14 | 436.98 | 438.84 | 443.84 | 461.46 | 460.81 |
| Grade or Surface Elevation (Ft, MSL) | 459.9 | 434.73 | 436.93 | 441.22 | 459.24 | 457.54 |
| Well Depth (Ft, Below Grade Surface *[BGS]* ) | 66 | 50 | 50 | 52.5 | 67 | 60.3 |
| Well Depth (Ft, Below Top of Casing *[BTOC]* ) | 69.24 | 52.25 | 51.91 | 55.12 | 69.22 | 63.57 |
| Screen Interval | | | | | | |
| From (Ft, BGS) | 45 | 29 | 29 | 32.5 | 46 | 50.3 |
| To (Ft, BGS) | 65 | 49 | 49 | 52.5 | 66 | 60.3 |
| Screen Interval | | | | | | |
| From (Ft, BTOC) | 48.24 | 31.25 | 30.91 | 35.12 | 48.22 | 53.57 |
| To (Ft, BTOC) | 68.24 | 51.25 | 50.91 | 55.12 | 68.22 | 63.57 |

1 From Tables in Section I.; *MSL* : Mean Sea Level; *BGS* : Below Grade Surface; *BTOC* : Below Top of Casing

Table VI.A.2. - Unit Groundwater Detection Monitoring Systems

| Waste Management Unit/Area Name[1] | **WMUs 011, 012, 013 - FGD Ponds** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Well Number(s): | FGD-8 | FGD-11 | FGD-1 | FGD-2 | FGD-3 | FGD-4 | FGD-5 | FGD-6 | FGD-12 | FGD-14* | FGD-15* | FGD-16* |
| Hydrogeologic Unit Monitored | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group |
| Type (e.g., point of compliance, background, observation, etc.) | POC | POC | POC | POC | POC | POC | POC | POC | POC | POC | POC | POC |
| Up or Down Gradient | Up | Up | Down | Down | Down | Down | Down | Down | Down | Down | Down | Down |
| Casing Diameter and Material | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC |
| Screen Diameter and Material | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC |
| Screen Slot Size (in.) | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" |
| Top of Casing Elevation (Ft, Mean Sea Level *[MSL]* ) | 440.15 | 452.22 | 424.44 | 439.36 | 434.9 | 432.03 | 433.01 | 428.62 | 443.16 | 428.91 | 437.17 | 444.3 |
| Grade or Surface Elevation (Ft, MSL) | 436.8 | 448.8 | 421.71 | 436.58 | 432.2 | 429.34 | 430.2 | 425.42 | 439.46 | 426.21 | 434.17 | 441.3 |
| Well Depth (Ft, Below Grade Surface *[BGS]* ) | 40 | 50.8 | 34 | 52 | 48 | 44 | 50 | 28 | 40.7 | 30 | 35 | 40 |
| Well Depth (Ft, Below Top of Casing *[BTOC]* ) | 43.35 | 54.22 | 36.73 | 54.78 | 50.7 | 46.69 | 52.81 | 31.2 | 44.4 | 32.7 | 38 | 43 |
| Screen Interval | | | | | | | | | | | | |
| From (Ft, BGS) | 30 | 40.8 | 13 | 31 | 27 | 22.5 | 40 | 18 | 30.7 | 20 | 25 | 30 |
| To (Ft, BGS) | 40 | 49.8 | 33 | 51 | 47 | 42.5 | 50 | 28 | 39.7 | 30 | 35 | 40 |
| Screen Interval | | | | | | | | | | | | |
| From (Ft, BTOC) | 33.35 | 44.22 | 15.73 | 33.78 | 29.7 | 25.19 | 42.81 | 21.2 | 34.4 | 22.7 | 28 | 33 |
| To (Ft, BTOC) | 43.35 | 53.22 | 35.73 | 53.78 | 49.7 | 45.19 | 52.81 | 31.2 | 43.4 | 32.7 | 38 | 43 |

1 From Tables in Section I.; *MSL* : Mean Sea Level; *BGS* : Below Grade Surface; *BTOC* : Below Top of Casing

*Wells FGD-14, FGD-15, FGD-16 added to network as part of ACM completed September 2019

**Table VI.C. – CCR Units Under Detection Monitoring**

| N.O.R. Unit No. | Unit Description[1,2] | Well(s) | Constituent(s) | Date of SSI Determination | Date of Assessment Monitoring Notification[3] |
|---|---|---|---|---|---|
| 010 | Ash Landfill 1 | MW-02, MW-07 | B (MW-02, MW-07) | 2/13/19 | N/A - ASD Successful (4/10/19) |
| 010 | Ash Landfill 1 | MW-05, MW-07 | B (MW-07)<br>F (MW-05) | 11/28/19 | N/A - ASD Successful (2/24/20) |
| 010 | Ash Landfill 1 | MW-05, MW-07, MW-09 | B (MW-05, MW-07)<br>SO4 (MW-07, MW-09) | 12/7/20 | N/A - ASD Successful (3/5/21) |
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1 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been requested pursuant to 40 CFR §257.103.
2 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been made pursuant to 40 CFR §257.103.
3 Enter month, day, and year.

**Table VI.C-1. – Groundwater Detection Monitoring Parameters**

| Parameter | Sampling Frequency | Analytical Method | Practical Quantification Limit (units) | Concentration Limit[1] |
|---|---|---|---|---|
| **Ash Landfill 1** | | | | |
| Boron | Semi-Annual | SW6020B | 0.0100 mg/L | 0.124 mg/L |
| Calcium | Semi-Annual | SW6020B | 0.10 mg/L | 74.9 mg/L |
| Chloride | Semi-Annual | E300 | 0.30 mg/L | 353 mg/L |
| Fluoride | Semi-Annual | E300 | 0.100 mg/L | 0.4 mg/L |
| Sulfate | Semi-Annual | E300 | 1.00 mg/L | 97.4 mg/L |
| Total Dissolved Solids | Semi-Annual | M2540C | 10.0 mg/L | 948 mg/L |
| pH | Semi-Annual | Field Measured | s.u. | 6.31 su<br>7.09 su |
| | | | | |
| **FGD PONDS** | | | | |
| Boron | Semi-Annual | SW6020B | 0.0100 mg/L | 0.141 mg/L |
| Calcium | Semi-Annual | SW6020B | 0.10 mg/L | 471 mg/L |
| Chloride | Semi-Annual | E300 | 0.30 mg/L | 6340 mg/L |
| Fluoride | Semi-Annual | E300 | 0.100 mg/L | 0.781 mg/L |
| Sulfate | Semi-Annual | E300 | 1.00 mg/L | 409 mg/L |
| Total Dissolved Solids | Semi-Annual | M2540C | 10.0 mg/L | 13000 mg/L |
| pH | Semi-Annual | Field Measured | s.u. | 6.10 su<br>7.23 su |

1 The concentration limit is the basis for determining whether a release has occurred from the CCR unit/area.

**Table VI.D. – CCR Units Under Assessment Monitoring**

| N.O.R. Unit No. | Unit Description[1,2] | Well(s) | Constituent(s) | Date of SSI Determination | Date of Assessment Monitoring Notification[3] |
|---|---|---|---|---|---|
| 011, 012, 013 | FGD Ponds | FGD-2, FGD-3, FGD-4, FGD-5 | B | 1/16/2018 | 7/16/2018 |
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1 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been requested pursuant to 40 CFR §257.103.
2 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been made pursuant to 40 CFR §257.103.
3 Enter month, day, and year

**Table VI.D-2. – Groundwater Assessment Monitoring Parameters**

| Parameter | Sampling Frequency | Analytical Method | Practical Quantification Limit (units) | Concentration Limit[1] |
|---|---|---|---|---|
| **FGD PONDS** | | | | |
| Antimony | Semi-Annual | SW6020B | 0.000800 mg/L | 0.006 mg/L |
| Arsenic | Semi-Annual | SW6020B | 0.00200 mg/L | 0.0146 mg/L |
| Barium | Semi-Annual | SW6020B | 0.00300 mg/L | 2 mg/L |
| Beryllium | Semi-Annual | SW6020B | 0.000300 mg/L | 0.004 mg/L |
| Cadmium | Semi-Annual | SW6020B | 0.000300 mg/L | 0.005 mg/L |
| Chromium | Semi-Annual | SW6020B | 0.00200 mg/L | 0.1 mg/L |
| Cobalt | Semi-Annual | SW6020B | 0.00300 mg/L | 0.0158 mg/L |
| Flouride | Semi-Annual | SW6020B | 0.100 mg/L | 4 mg/L |
| Lead | Semi-Annual | SW6020B | 0.000300 mg/L | 0.015 mg/L |
| Lithium | Semi-Annual | SW6020B | 0.00500 mg/L | 0.149 mg/L |
| Mercury | Semi-Annual | SW7470A | 0.0000800 mg/L | 0.002 mg/L |
| Molybdenum | Semi-Annual | SW6020B | 0.00200 mg/L | 0.1 mg/L |
| Selenium | Semi-Annual | SW6020B | 0.00200 mg/L | 0.05 mg/L |
| Thallium | Semi-Annual | SW6020B | 0.000500 mg/L | 0.002 mg/L |
| Radium 226+228 | Semi-Annual | 904 + SM7500Ra B M | varies | 11.2 pCi/L |
| | | | | |

[1] The concentration limit is the basis for determining whether a release has occurred from the CCR unit/area.

**Table VII.A.1. – Unit Closure**

For each unit to be registered, list the unit components to be decontaminated, the possible methods of decontamination, and the possible methods of disposal of wastes and waste residues generated during unit closure.

| Equipment or CCR Unit | Possible Methods of Decontamination[1] | Possible Methods of Disposal[1] |
|---|---|---|
| 010-Ash Landfill 1 | Close in Place | No disposal |
| 011-FGD A Pond Piping | Removal | Landfill |
| 011-FGD A Pond | Close in Place | No disposal |
| 012-FGD B Pond Piping | Removal | Landfill |
| 012-FGD B Pond | Close in Place | No disposal |
| 013-FGD C Pond Piping | Removal | Landfill |
| 013-FGD Pond | Close in Place | No disposal |
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1 Applicants may list more than one appropriate method.

**Table VII.A.2. – CCR Units Under Alternative Closure Notification**

| Registered Unit No. | N.O.R. Unit No. | Unit Description[1,2] | Date of Receipt of Last Waste[3] | Date of Closure Notification[3] |
|---|---|---|---|---|
| N/A | | | | |
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1 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been requested pursuant to 40 CFR §257.103.
2 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been made pursuant to 40 CFR §257.103.
3 Enter month, day, and year.

**Table VIII.A.1. – Post-Closure Cost Summary for Existing Registered Units**

| Unit | Cost |
|---|---|
| 010-Ash Landfill 1 | $2,326,837 |
| 011, 012, 013-FGD Pond Area | $2,168,817 |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| Total Existing Unit Post-Closure Cost Estimate | $4,495,654 (in 2021 Dollars)[1] |
| | |

**Table VIII.A.2. - Post-Closure Cost Summary for Proposed Registered Units**

| Unit | Cost |
|---|---|
| N/A | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

1 As units are added or deleted from these tables through future registration amendments, the remaining itemized unit costs should be updated for inflation when re-calculating the revised total cost in current dollars.

**Table VIII.B. – Post-Closure Period**

| Unit Name | Date Certified Closed | Authorized Post-Closure Period (Yrs.) | Earliest Date Post-Closure Ends (See Note 1) |
|---|---|---|---|
| **[Unit Example 1]** | **[1/1/1995]** | 30 years | **[1/1/2025]** |
| **[Unit Example 2]** | **[1/1/1990]** | 30 years | **[1/1/2020]** |
| **[Unit Example 3]** | **[1/1/1984]** | 30 years | **[1/1/2014]** |

Note 1 – Post-Closure Care shall continue beyond the specified date until the Executive Director has approved the applicant's request to reduce or terminate the post-closure period, consistent with 30 TAC §352.1241 – Post-Closure Care Requirements.

N/A

## Texas Commission on Environmental Quality

**Registration Application for Coal Combustion Residuals (CCR) Waste Management**

# I. General Information

## 1. Reason for Submittal

Type of Registration Application

☐ New ☐ Major Amendment ☐ Minor Amendment

☒ Notice of Deficiency (NOD) Response ☐ Transfer ☐ Name Change

☐ Other

## 2. Application Fees

☒ $150 Application Fee

Payment Method

☐ Check ☒ Online through ePay portal <www3.tceq.texas.gov/epay/>

If paid online, enter ePay Trace Number: 582EA000467512

## 3. Facility Information

*Facility information must match regulated entity information on the Core Data Form.*

Applicant: ☐ Owner ☐ Operator ☒ Owner/Operator

Facility TCEQ Solid Waste Registration No: 32043

Facility EPA ID: TXD000728956

Regulated Entity Reference No. (if issued): RN100216191

Facility Name: OAK GROVE STEAM ELECTRIC STATION

Facility (Area Code) Telephone Number: 214-875-8338

Facility physical street address (city, state, zip code, county): 8127 OAK GROVE ROAD, FRANKLIN, TX, 77856, ROBERTSON

Facility mailing address (city, state, zip code, county): 6555 SIERRA DR, DALLAS, TX 75039, DALLAS

Latitude (Degrees, Minutes Seconds): 31° 11′ 06″

Longitude (Degrees, Minutes Seconds): 96° 29′ 07″

## 4. Publicly Accessible Website

Provide the URL address of a publicly accessible website where the owner or operator of a CCR unit will post information.
https://www.luminant.com/ccr/

## 5. Facility Landowner(s) Information

Facility landowner(s) name: OAK GROVE MANAGEMENT COMPANY LLC

Facility landowner mailing address: 6555 SIERRA DR

City: Irving State: TX Zip Code: 75039

(Area Code) Telephone Number: 214-875-8338

Email Address (optional):

## 6. CCR Waste Management Unit(s)

☒ Landfill Unit(s) ☒ Surface Impoundment(s)

For each existing landfill, new landfill and lateral expansion, existing surface impoundment, and new surface impoundment and lateral expansion(s) provide information on type of waste, the registered unit(s) in which they are managed, and sampling and analytical methods.

Submit the following tables:

Table I.6. – CCR Waste Management Units

Table I.6.A. – Waste Management Information

Table I.6.B. – Waste Managed in Registered Units

Table I.6.C. – Sampling and Analytical Methods

## 7. Description of Proposed Activities or Changes to Existing Facility

Provide a brief description of the proposed activities if application is for a new facility, or the proposed changes to an existing facility or registration conditions, if the application is for an amendment.

Oak Grove Management Company, LLC (Oak Grove) operates the Oak Grove Steam Electric Station (OGSES), which is located approximately 10 miles north of the town of Franklin in Robertson County, Texas. The OGSES consists of two coal/lignite-fired units with a combined operating capacity of approximately 1600 megawatts. Coal combustion residuals (CCR) including fly ash, bottom ash, and flue gas desulfurization (FGD) gypsum are generated as part of OGSES unit operation. The Texas Commission on Environmental Quality (TCEQ) Solid Waste Registration Number (SWR No.) for the OGSES is 32043. CCR is managed in one onsite landfill, Ash Landfill 1, and three surface impoundments, FGD-A, FGD-B, and FGD-C.

Ash Landfill 1 is the primary disposal facility for CCR generated at the OGSES and is located approximately 1200 feet southwest of the OGSES. Ash Landfill 1 is listed on the Notice of Registration (NOR) for the OGSES as Unit No. 010 and is regulated as a Class 2 non-hazardous industrial solid waste landfill under 30 TAC §335.

Gyspum/scrubber sludge that cannot be recycled and selected process wastewaters are managed in FGD-A, FGD-B, and FGD-C ponds. These ponds are collectively referred to as the FGD Ponds. Solids from the FGD Ponds are routinely removed as part of on-going operations and maintenance activities. These solids are placed in Ash Landfill 1 (WMU 010). The FGD Ponds are located approximately 1500 feet northwest of the OGSES. The FGD Ponds are list on the NOR for the OGSES as waste management units 011 (FGD-A), 012 (FGD-B), and 013 (FGD-C). The FGD Ponds are regulated as Class 2 non-hazardous surface impoundments under 30 TAC §335.

## 8. Primary Contact Information

Contact Name: Renee Collins Title: Sr. Director, Environmental Services

Contact mailing address: 6555 Sierra Drive
City: Irving County: Dallas State: Texas Zip Code: 75039
(Area Code) Telephone Number: 214-875-8338

Email Address (optional): renee.collins@luminant.com

## 9. Notice Publishing

Party responsible for publishing notice:
☒ Applicant ☐ Consultant ☐ Agent in Service

Contact Name: Renee Collins Title: Sr. Director, Environmental Services

Contact mailing address: 6555 Sierra Drive
City: Irving County: Dallas State: Texas Zip Code: 75039
(Area Code) Telephone Number: 214-875-8338

## 10. Alternative Language Notice

Is an alternative language notice required for this application? For determination, refer to Alternative Language Checklist on the Public Notice Verification Form (TCEQ-20244-Waste-NORI).

☐ Yes ☒ No

## 11. Public Place Location of Application

Name of the Public Place: Robertson County Carnegie Library
Physical Address: 315 East Dechard Street
City: Franklin County: Robertson State: TX Zip Code: 77856
(Area code) Telephone Number: 979-828-4331

## 12. Ownership Status of the Facility

☐ Corporation ☐ Limited Partnership
☐ Sole Proprietorship ☐ General Partnership ☒ Other (specify): Limited Liability Company

Does the Site Owner (Permittee/Registrant) own all the CCR units and all the facility property?

☒ Yes ☐ No

## 13. Property / Legal Description Information

Provide a legal description and supporting documents of the property where the management of CCR waste will occur; including a survey plat and a boundary metes and bounds description (30 TAC §352.231(g)).

Submit the following documents:

a. Property Legal Description
b. Property Metes and Bounds Description
c. Metes and Bounds Drawings
d. On-Site Easements Drawings

See APPENDIX A for Property/Legal Description Information for the following CCR units:
Ash Landfill 1
FGD Pond A
FGD Pond B
FGD Pond C

Property Owner Affidavit also located in APPENDIX A.

## 14. Operator Information

Identify the entity who will conduct facility operations, if the owner and operator are not the same.

Operator Name: Same as Owner

Operator mailing address:

City: State: Zip Code:

(Area Code) Telephone Number:

Email Address (optional):

## 15. Confidential Documents

Does the application contain confidential documents?

☐ Yes ☒ No

If "Yes", cross-reference the confidential documents throughout the application and submit as a separate attachment in a binder clearly marked "CONFIDENTIAL."

## 16. Permits and Construction Approvals

| Permit or Approval | Received | Pending | Not Applicable |
|---|---|---|---|
| Hazardous Waste Management Program under the Texas Solid Waste Disposal Act | ☒ | ☐ | ☐ |
| Underground Injection Control Program under the Texas Injection Well Act | ☐ | ☐ | ☒ |
| National Pollutant Discharge Elimination System Program under the Clean Water Act and Waste Discharge Program under Texas Water Code, Chapter 26 | ☒ | ☐ | ☐ |
| Prevention of Significant Deterioration Program under the Federal Clean Air Act (FCAA). | ☒ | ☐ | ☐ |
| National Emission Standards for Hazardous Air Pollutants Preconstruction Approval under the FCAA | ☐ | ☐ | ☒ |
| Other (describe): | ☐ | ☐ | ☐ |
| Other (describe): | ☐ | ☐ | ☐ |
| Other (describe) | ☐ | ☐ | ☐ |

## 17. Legal Authority

The owner and operator of the facility shall submit verification of their legal status with the application. This shall be a one-page certificate of incorporation issued by the secretary of state. The owner or operator shall list all persons having over a 20% ownership in the facility.

See APPENDIX A for Certificate of Authority.

## 18. TCEQ Core Data Form

The TCEQ requires that a Core Data Form (TCEQ-10400) be submitted on all incoming applications, unless a Regulated Entity and Customer Reference Number has been issued by the TCEQ and no core data information has changed. For more information regarding the Core Data Form, call (512) 239-5175 or visit the TCEQ Website.

See APPENDIX A for TCEQ Core Data Form.

## 19. Other Governmental Entities Information

**Coastal Management Program**

Is the facility within the Coastal Management Program boundary?

☐ Yes ☒ No

**Local Government Jurisdiction (If Applicable)**
Within City Limits of: N/A
Within Extraterritorial Jurisdiction of: N/A

Is the facility located in an area in which the governing body of the municipality or county has prohibited the storage, processing or disposal of municipal or industrial solid waste?

☐ Yes ☒ No If "Yes", provide a copy of the ordinance or order as an attachment.

## 20. Attachments

Does the application include the following?

| | | |
|---|---|---|
| General Maps | ☒ Yes | ☐ No |
| General Topographic Map | ☒ Yes | ☐ No |
| Facility Layout Map | ☒ Yes | ☐ No |
| Surrounding Features Map | ☒ Yes | ☐ No |
| Process Flow Diagram | ☒ Yes | ☐ No |
| Land Ownership Map | ☒ Yes | ☐ No |
| Land Ownership List | ☒ Yes | ☐ No |
| Pre-printed Mailing Labels | ☒ Yes | ☐ No |

Maps and drawings shall be legible and easily readable by eye without magnification. Scales and paper size shall be chosen based on the type of map submitted, the land area covered, and the amount of detail to be shown. See instructions for details regarding maps and drawings to be submitted in application.

See APPENDIX A for Attachments detailed in Item 20.

Per TCEQ request, a Process Flow Narrative has been included at the end of the Attachments found in APPENDIX A.

## 21. Verification of Compliance

Does the owner and operator verify that the design, construction, and operation of CCR landfill(s) and surface impoundment(s) meets the requirements of 30 TAC §352.231(f) (30 TAC §352.2; 40 CFR §257.52, and 40 CFR §§257.3-1 – 257.3-3).

☒ Yes ☐ No

As requested by TCEQ, please see the "Response to TCEQ CCR Unit Registration Comments" memorandums for Ash Landfill 1 and FGD Ponds provided by Golder in APPENDIX A.

# II. Location Restrictions and Geology

See Instructions and Technical Guidance

## 22. Location Restrictions

Submit certifications and technical reports demonstrating compliance of CCR unit(s) with applicable location restrictions (30 TAC 352, Subchapter E) and comply with 30 TAC §352.231(d) and 30 TAC §352.4 for submission of engineering and geoscientific information.

A. **Placement above the uppermost aquifer** (30 TAC §352.601) (40 CFR §257.60). For those CCR units whose base is less than five feet above the upper limit of the uppermost aquifer, please submit a copy of the demonstration showing evidence of compliance with 40 CFR §257.60(a) – (c).

B. **Wetlands** (30 TAC §352.611) (40 CFR §257.61). For CCR units located in wetlands, please submit a copy of the demonstration showing evidence of compliance with 40 CFR §257.61(a) – (c).

C. **Fault areas** (30 TAC §352.621) (40 CFR §257.62). For CCR units located within 200 feet of the outermost damage zone of a fault, please submit a copy of the demonstration showing evidence of compliance with 40 CFR §257.62(a) – (c).

D. **Seismic impact zones** (30 TAC §352.631) (40 CFR §257.63). For CCR units located in a seismic impact zone, please submit a copy of the demonstration showing evidence of compliance with 40 CFR §257.63(a) – (c).

E. **Unstable areas** (30 TAC §352.641) (40 CFR §257.64). For CCR units located in unstable areas, please submit a copy of the demonstration showing evidence of compliance with 40 CFR §257.64(a) – (d).

Location Restriction Demonstration reports for Ash Landfill 1 and FGD Ponds located in APPENDIX B. Location Restriction Evaluation memorandums also located in APPENDIX B.

### 23. Geology Summary Report

Submit a summary of the geologic conditions at the facility, including the relation of the geologic condition to each CCR unit. The summary must include enough information and data and include sources and references for the information. Include all groundwater monitoring data required by 40 CFR Part 257, Subpart D, (30 TAC §352.241, §352.601, §352.621, §352.631, and §352.641) and submitted in accordance of 30 TAC §352.4.

**Note:** Previously prepared documents may be submitted but must be supplemented or updated as necessary to provide the requested information (30 TAC §352.241(b)).

For Geology Summary, please refer to "Groundwater Monitoring System Certification" reports for Ash Landfill 1 and FGD Ponds located in APPENDIX F. The Local Geology and Hydrogeology summary is located in Section 2.2 of each report.

All groundwater monitoring data summarized in "2020 Annual Groundwater Monitoring and Corrective Action Report" for Ash Landfill 1 and FGD Ponds located in APPENDIX F.

## III. Fugitive Dust Control Plan

### 24. Fugitive Dust Control Plan

A. **Submit a copy of the CCR Fugitive Dust Control Plan** (30 TAC §352.801) (40 CFR §257.80(b)), or the most recently amended plan. The initial plan or subsequent amended plan must be certified by a qualified Texas licensed professional engineer (Texas P.E.) that the plan meets the requirements of 30 TAC Chapter 352.

B. **Submit the most recent Annual CCR Fugitive Dust Control Report** (30 TAC §352.801) (40 CFR §257.80(c)) and include the report information.

CCR Fugitive Dust Control Plan and the 2021Annual CCR Fugitive Dust Control Report located in APPENDIX C.

# IV. Landfill Criteria

See Instructions and Technical Guidance – No. 30 Coal Combustion Residuals Landfill

## 25. Landfill(s) for CCR Waste

Provide the following information below if there is a landfill; if there is more than one landfill, separate information is required for each landfill.

### A. Landfill Characteristics

Describe the design, installation, construction, and operation of the landfill and submit a completed Table IV.A. – Landfill Characteristics.

Ash Landfill 1 consists of four landfill cells (Cells 1 through 4), each constructed with a 3-foot thick compacted clay liner (hydraulic conductivity ≤ 1×10-7 cm/sec). The landfill is constructed above-grade and is surrounded by an earthen perimeter berm that are also provided with a 3-foot-thick compacted clay liner. CCR placement extends above the top of the perimeter berms and the sides of the CCR placed above the berms are graded to slopes of approximately 3H:1V.
Ash Landfill 1 has been in operation since 2008. The current status of Cells 1 through 4 is as follows:

- Cell 1 has received CCR and is inactive. A final cover consisting of a 3-ft thick clay soil (hydraulic conductivity ≤ 1×10-7 cm/sec) overlain with 1.5-ft thick vegetative cover was placed over Cell 1 in 2015.
- Cell 2 has received CCR and is inactive. A final cover consisting of a 40-mil linear low-density polyethylene (LLDPE) geomembrane overlain with a geosynthetic drainage layer and 18 inches of soil was placed over Cell 2 in 2019.
- Cell 3 is active and used for CCR (primarily bottom ash) disposal.
- ~~Cell 4 is active and used for temporary storage of FGD gypsum from the OGSES FGD Ponds prior to sale for reuse. The eastern portion of Cell 4 is currently used to manage contact water.~~ Cell 4 is active and used for CCR (primarily FGD gypsum) disposal. The eastern portion of Cell 4 is currently used to manage contact water.

### B. Liner Design

1. For existing landfills, provide attachments describing how the facility will comply with 30 TAC 352, Subchapter F (Design Criteria).

   Ash Landfill 1 is an Existing CCR Landfill as defined by the CCR rule. There are no design criteria for Existing CCR Landfills in either the state or federal CCR rule. 30 TAC 352, Subchapter F or 40 CFR 257.70

2. For new landfills or lateral expansions of existing landfills, submit pages describing how the facility will comply with 30 TAC §352.261 and 30 TAC §352.701. N/A

3. Complete Table IV.B. - Landfill Liner System and specify the type of liner used for the landfill.

4. Provide attachments describing the design, installation, and operation of the liner and leak detection system. The description must demonstrate that the liner and leak detection system will prevent discharge to the land, groundwater, and surface water. Submit a quality assurance project plan (QAPP) to ensure that each analysis is performed appropriately.

The following Soil Liner Evaluation Reports (SLERs) are located in APPENDIX D for the construction of cells 1-4 of Ash Landfill 1:
SLER-Phase 1 Ash Landfill
SLER-Cell 1 West Dike Clay Liner Construction
SLER-Cell 2 Ash Landfill
SLER-Cell 3 Ash Landfill
SLER-Cell 4 Ash Landfill

**C. Leachate Collection and Removal**

Submit design information and description of leachate collection and removal system in accordance with 30 TAC §352.701. N/A

Complete Table IV.C. - Landfill Leachate Collection System. N/A

**D. Design of Liner and Leachate Collection and Removal System.**

For a new landfill or lateral expansion of a CCR landfill, provide a qualified Texas P.E. certification and technical report that the design of the liner and the leachate collection and removal system meets the requirements of 30 TAC §352.711. N/A

**E. Run-on and Run-off Controls**

At time of application, attach pages describing how the facility will comply with the run-on and run-off system plan for an existing, new, or lateral expansion of a CCR landfill information. Provide a qualified Texas P.E. certification and technical report that the run-on and run-off control system plans meet the requirements of 30 TAC §352.811.

"Run-on and Run-off Control System Plan" for Ash Landfill 1 is located in APPENDIX D.

**F. Inspection for Landfills**

At time of application, attach pages describing how the facility will comply 30 TAC §352.841 and complete Table IV.D. – Inspection Schedule for Landfills. For existing CCR landfills, provide the most recent inspection report. All CCR landfills and any lateral expansions of a CCR landfill must be inspected for any structural weakness, malfunction, deterioration conditions which are disrupting or have the potential to disrupt the operation or safety of the CCR unit, or any other conditions which may cause harm to human health and environment at a frequency specified in 40 CFR §257.84(a) and (b).

The 2021 Annual CCR Landfill inspection report is located in APPENDIX D.

# V. Surface Impoundment Criteria

See Instructions and Technical Guidance – No. 31 Coal Combustion Residuals Surface Impoundment

## 26. Surface Impoundment(s) for CCR Waste

Provide the following information below if there is a surface impoundment; if there is more than one surface impoundment, separate information is required for each surface impoundment.

**A. General Surface Impoundment(s) Characteristics**

Provide information about the characteristics of the surface impoundment(s): incised, surface area (acres), storage volume (acres-feet), and depth (feet).

For all surface impoundment(s), include the following information:

1. Complete Table V.A. - Surface Impoundments Characteristics. List the surface impoundment(s) to be registered as a CCR unit(s), the wastes managed in each unit, and the rated capacity or size of each unit.

2. Describe the surface impoundment(s) and provide a plan view drawing with cross-sections, if available.

   See "History of Construction" report in APPENDIX E. A summary description of the impoundments is located in Section 3.5 and drawings are included in Attachment 1. "History of Construction-Addendum No. 1" in APPENDIX E provides updates on the completed retrofit of FGD Pond A.

   ~~Please note that FGD Pond A is currently being retrofitted, detailed construction plans can also be found in APPENDIX E.~~

3. Specify the minimum freeboard to be maintained and the basis of the design to prevent overtopping resulting from normal or abnormal operation; overfilling; wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, and other equipment; and human error. Show that adequate freeboard will be available to prevent overtopping from a 100-year, 24-hour storm.

   Minimum freeboard of 2 feet in FGD-A and FGD-B and minimum freeboard 3 feet in FGD-C. See "Inflow Design Flood Control System Plan", Section 2.4 for FGD Ponds in APPENDIX E.

~~3.~~4. Waste Flow
Describe the means that will be used to immediately shut off the flow of waste to the impoundment in the event of liner failure or to prevent overtopping.

All inflows are controlled via pumps under controlled conditions, see "Inflow Design Flood Control System Plan", Section 2.0 for FGD Ponds in APPENDIX E.

~~4.~~5. Dike Construction ☒ Yes ☐ No

~~N/A-Section not required per TCEQ due to Structural Stability Assessment requirement.~~

If Yes, submit the dike certification (located at the end of the application).

In October 2016, the initial certified Periodic Hazard Potential Classification Assessments, Periodic Structural Stability Assessments, and Periodic Safety Factor Assessments were completed for each FGD Pond (FGD-A, FGD-B, FGD-C) as required by 40 CFR 257.73(a), 257.73(d), and 257.73(e). In October 2021, the certified 5-Year Updates to these assessments were completed as required by 40 CFR 257.73 and 30 TAC 352.731, which identified no structural deficiencies. The most recent 2021 5-Year Assessment Updates are located in APPENDIX E. Based on the conclusion in the certified 5-year updates that no structural deficiencies exist, the facility is submitting these documents in lieu of the Dike Certification.

The structural integrity of the dike system must be certified by a qualified Texas P.E. before the registration is issued. If the impoundment is not being used, the dike system must be certified before it can be put into use. The certification must be sealed by a qualified Texas P.E., along with the engineering firm's name and registration number (30 TAC §352.4).

A report shall accompany the dike certification which summarizes the activities, calculations, and laboratory and field analyses performed in support of the dike certification. Describe the design basis used in construction of the dikes. A QAPP should be included in the report to ensure that each analysis is performed appropriately and include:

(1) Slope Stability Analysis

(2) Hydrostatic and Hydrodynamic Analysis

(3) Storm Loading

(4) Rapid Drawdown

Earthen dikes should have a protective cover to minimize wind and water erosion and to preserve the structural integrity of the dike. Describe the protective cover used and describe its installation and maintenance procedures.

**B. Liner Design**

For surface impoundment(s), provide information about how the facility will comply with 30 TAC §352.711 for existing CCR surface impoundments. For new and lateral expansion of CCR surface impoundments provide information on how the facility will comply with 30 TAC §352.261, and 30 TAC §352.721, see Instructions and Technical Guidance No. 31 Coal Combustion Residuals Surface Impoundment. The qualified Texas P.E. must certify that the design of the liner complies with the requirements of 30 TAC Chapter 352 and 40 CFR Part 257, Subpart D, where required.

Is the CCR surface impoundment unlined? ☒~~☐~~ Yes ☐ No

FGD Pond A, FGD Pond B, and FGD Pond C are lined per 40 CFR § 257.71.

~~FGD Pond A does not meet the liner requirement in 40 CFR § 257.71. FGD Pond A was removed from service prior to April 11, 2021, and is currently in the retrofit process. The Retrofit Plan and the Intent to Retrofit Notification are located in APPENDIX E.~~

If "Yes", the CCR unit is subject to the closure requirements under 30 TAC Chapter 352 and 40 CFR §257.101(a) to retrofit or close. A notification must be prepared stating that an assessment of corrective measures has been initiated.

1. Complete Table V.B. - Surface Impoundment Liner System for each surface impoundment to be registered.
2. Describe the design, installation and operation of liner and leak detection components. The description must demonstrate that the liner and leak detection system will prevent discharge to the land and surface water. Submit a QAPP report to ensure that each analysis is performed appropriately.

   See "History of Construction" and "History of Construction-Addendum No.1" reports for all ponds. Also see ~~and~~ "Construction Completion and Quality Assurance Report" for FGD-A and "Liner Evaluation Reports" for FGD-B and FGD-C~~each surface impoundment (FGD-A, FGD-B, FGD-C)~~ in APPENDIX E. ~~As noted previously, FGD-A ceased receipt of waste prior to April 11, 2021 and will be retrofitted with a compliant liner by early 2022. The "History of Construction" and "Liner Evaluation Report" report reflects the previous liner system in FGD-A. A liner evaluation report for FGD-A is not yet available so the construction design plans have been included in APPENDIX E for review.~~
3. For new or laterally expansions of existing surface impoundments, provide a subsurface soil investigation report that must include:

a. A description of all borings drilled, at the unit location, to test soils and characterize groundwater;

b. A unit map drawn to scale showing the surveyed locations and elevations of the borings, including location of permanent identification markers ((30 TAC §352.731) and (40 CFR §257.73(a)(1));

c. Cross-sections prepared from the borings depicting the generalized strata at the unit;

d. Boring logs, including a description of materials encountered, and any discontinuities such as fractures, fissures, slickensides, lenses or seams;

e. A description of the geotechnical data and the geotechnical properties of the subsurface soil materials, including the suitability of the soils and strata for the intended uses; and

f. A demonstration that all geotechnical tests were performed in accordance with industry practices and recognized procedures.

N/A

**C. Hazard Potential Classification**

Provide the current hazard potential classification assessment and associated documentation, as required by 30 TAC §352.731 or §352.741 and 40 CFR §257.73(a)(2) or §257.74(a)(2). The qualified Texas P.E. must certify that the initial hazard potential classification and any subsequent periodic classification was conducted in accordance with the requirements of 30 TAC Chapter 352, where required.

Hazard Potential Classification: **LOW**

See “Hazard Potential Classification Assessment” located in APPENDIX E.

**D. Emergency Action Plan for High or Significantly High Hazard Potential**

Provide the current Emergency Action Plan that has been certified by a qualified Texas P.E. and includes the following requirements from 30 TAC 352, Subchapter F and 40 CFR §257.73(a)(3)(i)(A) - (E) or 40 CFR §257.74 (a)(3)(i)(A) - (E). The qualified Texas P.E. must certify that the written Emergency Action Plan and any subsequent amendment of the plan complies with the requirements of 30 TAC 352, Subchapter F, where required.

N/A

Complete Table V.J. - Inspection of Surface Impoundments

**E. Inflow Design Flood Control System Plan**

Describe how the surface impoundment(s) system will manage stormwater run-on away from the surface impoundment(s) (30 TAC §352.821 and 40 CFR §257.82(a) and (c)). Stormwater run-on must be diverted away from a surface impoundment, based on the hazard potential. Where dikes are used to divert run-on, they must be protected from erosion. Include all analyses used to calculate run-on volumes. Provide the inflow design flood control system plan. Provide qualified Texas P.E. certification that the initial and periodic inflow design flood control system plans meet the requirements of 30 TAC §352.821, where required.

See “Inflow Design Flood Control System Plan” located in APPENDIX E.

**F. History of Construction for Existing CCR Surface Impoundment(s), or the Design and Construction Plans for New and Lateral Expansions**

Provide information on the history of construction for each existing CCR surface impoundment (30 TAC §352.731 and 40 CFR §257.73(c)) or the design and construction plans for new and lateral expansions of each CCR surface impoundment (30 TAC §352.741) and (40 CFR §257.74(c)).

See "History of Construction" and "History of Construction-Addendum No. 1" ~~report~~ in APPENDIX E.

**G. Structural Stability Assessment**

Provide the most recent structural stability assessment of the surface impoundments. Include the combined capacity of all surface impoundment spillways with calculations; the peak discharge the unit must meet for all combined spillways; probable maximum flood-high hazard, 1,000-yr-significant high hazard, 100-yr-low hazard; identify if there were any structural stability deficiencies in last assessment; identify how these deficiencies were managed and corrected; and qualified Texas P.E. certification. The structural stability assessment must include all information required in 30 TAC §352.731 for existing surface impoundments or 30 TAC §352.741 for new or laterally expanding surface impoundments.

See "Structural Stability Assessment" located in APPENDIX E.

**H. Safety Factor Assessment**

The current safety factor assessment must be submitted with the application. It must include documentation that demonstrates whether the calculated factors of safety for each CCR surface impoundment achieve the minimum safety factors specified in 30 TAC 352, Subchapter F and 40 CFR §257.73(e)(1)(i) - (iv) and 40 CFR §257.74(e)(1)(i) - (iv) for the critical cross-section of the embankment. The critical cross-section is the cross-section anticipated to be the most susceptible to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations and certified by a qualified Texas P.E.

See "Safety Factor Assessment" located in APPENDIX E.

# VI. Groundwater Monitoring and Corrective Action (30 TAC 352, Subchapter H)

See Instructions and Technical Guidance – No. 32 Coal Combustion Residuals Groundwater Monitoring and Corrective Action

## 27. Groundwater Monitoring System

**A.** Complete Table VI.A. - Unit Groundwater Detection Monitoring System.

**B.** Provide a map showing location of wells, groundwater elevations, and groundwater flow direction.

See Groundwater Potentiometric Surface Maps in Appendix C of the "Groundwater Monitoring System Certification" reports for Ash Landfill 1 and FGD Ponds located in APPENDIX F.

**C.** Provide attachments describing how the facility will comply with the requirements in 30 TAC §352.911 and provide a certification by a qualified Texas P.E or qualified Texas P.G. that the groundwater monitoring system design and construction meet the requirements of 30 TAC Chapter 352.

See "Groundwater Monitoring System Certification" reports for Ash Landfill 1 and FGD Ponds located in APPENDIX F.

**D.** Provide a figure showing the geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities and effective porosities.

See Figures 3,4,5 in the "Groundwater Monitoring System Certification" report for Ash Landfill 1 located in APPENDIX F.

See Figures 3, 4,5,6 in the "Groundwater Monitoring System Certification" report for FGD Ponds located in APPENDIX F.

**E.** For a multiunit groundwater monitoring system, demonstrate that the groundwater monitoring system will be equally as capable of detecting monitored constituents at the waste boundary of the CCR unit as the individual groundwater monitoring system for each CCR unit by providing at minimum the following information:

1. Number, spacing, and orientation of each CCR unit;
2. Hydrogeologic setting; and
3. Site history.

See "Groundwater Monitoring System Certification" report for FGD Ponds located in APPENDIX F.

**F.** Has there been any sampling concentrations of one or more constituents listed in Appendix IV detected at statistically significant levels above the groundwater protection standard (GWPS)? ☒ Yes ☐ No

FGD Ponds

**G.** Provide information on how monitoring wells have been constructed and cased in a manner that maintains the integrity of the monitoring well borehole and to prevent contamination of samples and the groundwater.

See Appendix A in the "Groundwater Monitoring System Certification" reports for Ash Landfill 1 and FGD Ponds located in APPENDIX F.

## 28. Groundwater Monitoring Sampling and Analysis Program

Provide a sampling and analysis plan that includes procedures and techniques; sampling and analytical methods that are appropriate for groundwater sampling; and that address the requirements of 30 TAC §352.931 and 40 CFR §257.93. Provide a P.E or P.G. certification that describes the statistical method selected to evaluate the groundwater monitoring data and certifies that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR management area. Refer to TG-32 for information and guidance.

See "Groundwater Monitoring Plan-Revision 2" and "Statistical Analysis Plan-Revision 1" for Ash Landfill 1 and FGD Ponds located in APPENDIX F.

## 29. CCR Unit(s) in a Detection Monitoring Program

Does the facility have CCR unit(s) in a Detection Monitoring Program?

☒ Yes ☐ No

Ash Landfill 1

If "Yes", Submit the following information:

**A.** Submit Table VI.C. – Facility CCR Units Under Detection Monitoring.

**B.** Provide a Background Evaluation Report.

Background data was derived from the eight independent sampling events required under 40 CFR 257.94(b). A summary of the background monitoring program can be found in Section 3.0 of the "2017 Annual Groundwater Monitoring Report". Background water quality data is summarized in Tables 3 and 4 and laboratory analytical reports are located in Appendix A of the 2017 report.

The "2017 Annual Groundwater Monitoring Report" for Ash Landfill 1 is in APPENDIX F.

**C.** Provide a report with the results of semiannual monitoring events.

~~See the~~The "2020 Annual Groundwater Monitoring and Corrective Action Report" and the "2021 Annual Groundwater Monitoring and Corrective Action Report-Revision 1" for Ash Landfill 1 is in APPENDIX F.

1. Has a statistically significant increase (SSI) been detected for one or more of the constituents listed in Appendix III at any monitoring well?

   ☒ Yes ☐ No

2. Has a notification to the executive director been sent within 14 days?

   ☒ Yes ☐ No

3. Date assessment monitoring program will start: N/A Due to successful ASDs

4. Do you plan to provide an alternative source demonstration (ASD)?

   ☒ Yes ☐ No

## 30. CCR Unit(s) in an Assessment Monitoring Program

Does the facility have CCR unit(s) in an Assessment Monitoring Program?

☒ Yes ☐ No

FGD Ponds

If "Yes", Submit information related for units.

**A.** Complete Table VI.D. – CCR Units Under Assessment Monitoring.

**B.** Provide, for each well in assessment monitoring status, the recorded concentrations lab sheets and results in a tabulated form.

See summary tables 3 and 4 for all results in tabulated form in the "2020 Annual Groundwater Monitoring and Corrective Action Report" for the FGD Ponds in APPENDIX F. The "2021 Annual Groundwater Monitoring and Corrective Action Report-Revision 1" for the FGD Ponds is also in APPENDIX F.

**C.** Have the concentrations of all constituents listed in Appendices III and IV been at or below background values, using the statistical procedures in 30 TAC §352.931 and 40 CFR §257.93(g), for two consecutive sampling events for the CCR unit(s)? ☐ Yes ☒ No

If answer to above is yes, detection monitoring may resume. The owner or operator must prepare a notification stating that detection monitoring is resuming for the CCR unit and obtain written approval from the executive director.

**D.** Are there any concentrations of any constituent in Appendices III and IV above background values? ☒ Yes ☐ No

1. Has a notification to the executive director been sent within 14 days?

   ☒ Yes ☐ No

**E.** Date assessment of corrective measures will be initiated (must be within **90 days** of finding a statistically significant level above the GWPS) for the CCR unit(s):
April 8, 2019

**F.** Will you provide an ASD (see TG-32 for an acceptable submittal)? ☐ Yes ☒ No

**G.** Date assessment of corrective measures will be initiated if ASD is not accepted?
N/A

**H.** Complete Table VI.D-2. - Groundwater Detection Monitoring Parameters

**Note**: Refer to TG-32 regarding establishing a GWPS for each constituent in Appendix IV detected in the groundwater and attach as table.

**I.** Have you completed the assessment of corrective measures? ☒ Yes ☐ No
If "Yes", date assessment of corrective measures was completed: September 5, 2019
If "No", date assessment of corrective measures will be completed:
Expected date of submittal of amendment (see note below):
Provide completed assessment of corrected measures materials.

"CCR Assessment of Corrective Measures-Revision 1" dated May 2021 can be found in APPENDIX F.

**Note**: Within **30 days** of completing the assessment of corrective measures, and before remedy implementation, the owner or operator shall submit an application for amendment to the registration. In some circumstance"s, the assessment of corrective measures and selected remedy may be approved as part of the initial application for the CCR unit registration.

**J.** Have you selected a remedy? ☒ Yes ☐ No

"Remedy Selection Report" located in APPENDIX F.

Provide public meeting documentation under 30 TAC §352.961 and a report under 30 TAC §352.971 and 40 CFR §257.97.

"Assessment of Corrective Measures Public Meeting Documents" located in APPENDIX F.

# VII. Closure and Post-Closure Care

## See Instructions and Technical Guidance

Submit a full closure plan and post-closure plan and all information describing how the owner or operator will comply with 30 TAC 352, Subchapter J and 40 CFR §§257.100 - 257.104. The owner of property on which an existing disposal facility is located, following the closure of a unit, must also submit documentation that a notation has

been placed in the deed to the facility that will in perpetuity notify any potential purchasers of the property that the land has been used to manage CCR wastes and its use is restricted (30 TAC §352.1221 and 40 CFR §257.102(i)). For CCR units, closed after October 19, 2015, that were closed before submission of the application, the applicant should submit documentation to show that notices required under 30 TAC 352, Subchapter K and 40 CFR §257.105 or §257.106 have been filed.

## 31. Closure Plan

This section applies to the owners and operators of all CCR units required to be registered. The applicant must close the facility in a manner that minimizes need for further maintenance and controls, or eliminates, to the extent necessary to protect human health and the environment, the post-closure release of CCR waste, chemical constituents of concern, leachate, contaminated rainfall, or waste decomposition products to the groundwater, surface waters, or to the atmosphere.

The type of unit to be closed can determine the level of detail sufficient for a closure plan. CCR units which have been certified closed after October 19, 2015, must provide documentation to demonstrate compliance with state and federal regulations.

For each unit to be registered, complete Table VII.A.1. - Unit Closure and list the CCR Unit components to be decontaminated, possible methods of decontamination, and possible methods of disposal of wastes and waste residues generated during unit closure. All ancillary components must be decontaminated, and the generated waste disposed of appropriately.

See "Closure Plan" and "Closure Plan-Addendum No. 1" for Ash Landfill 1 and FGD Ponds in APPENDIX G.

Information about CCR units closed or to be closed under alternative closure requirements must be provided in Table VII.A.2. - CCR Units Under Alternative Closure Notification.

Guidance on design of a closure cap and final cover for non-hazardous industrial solid wastes landfills is provided in EPA publication 530-SW-85-014, TCEQ Technical Guidance No. 3 and TCEQ publication, RG-534, "Guidance for Liner Construction and Testing for a Municipal Solid Waste Landfill".

## 32. Post-Closure Care Plan

Provide a post-closure care plan that complies with the requirements of 30 TAC §352.1241.

See "Post-Closure Plan" for Ash Landfill 1 and FGD Ponds in APPENDIX G.

Post-closure care of each CCR unit must continue for at least 30 years after the date of completing closure of the unit and must consist of monitoring and reporting of the groundwater monitoring systems, in addition to the maintenance and monitoring of CCR unit. Continuation of certain security requirements may be necessary after the date of closure. Post-closure use of property on or in which waste remains after closure must never be allowed to disrupt the integrity of the containment system. In addition, submit the following information:

- The name, address, and phone number of the person or office to contact about the CCR unit during the post-closure period; and

  Luminant-Environmental Services
  Renee Collins-Senior Environmental Director
  6555 Sierra Drive
  Irving, TX 75039
  214-875-8338

CCRPostClosurePlan@Luminant.com

- A discussion of the future use of the land associated with each unit.

  See section 5.0 of the "Post-Closure Plans" for Ash Landfill 1 and FGD Ponds in APPENDIX G.

Landfills and surface impoundments which have been certified closed after October 19, 2015, must be included in post-closure care plans, unless they have been determined to have been closed by waste removal equivalent to the closure standards in 30 TAC §352.1221 and 40 CFR §257.102 or 30 TAC §352.1231 and 40 CFR §257.103. If such a demonstration has been made pursuant to 40 CFR §257.102 or §257.103, but an equivalency determination has not been made, please submit a copy of the demonstration documentation. If an equivalency determination has been made, applicant should submit a copy of this determination.

# VIII. Financial Assurance

## 33. Post-Closure Care Cost Estimate

Financial assurance for post-closure care (30 TAC §352.1101) applies to owners or operators of all CCR units, except CCR units from which the owner or operator intends to remove wastes and perform clean closure. Provide a written cost estimate in current dollars of the total cost of the 30-year (or longer, if applicable under 30 TAC §352.1101(d)) post-closure care period to perform post-closure care requirements as prescribed in 30 TAC §352.1241. The cost estimate must be based on the costs of hiring a third party to conduct post-closure care maintenance.

Complete Table VIII.A.1 – Post-Closure Cost Summary for Existing Registered Units

See Post-Closure Care Cost Estimates ~~Memo from Golder~~ in APPENDIX H. Cost estimates for the FGD Pond Area are summarized in Table ~~4~~1. Cost estimates for Ash Landfill 1 are summarized in Table ~~5~~2.

Complete Table VIII.A.2. - Post-Closure Cost Summary for Proposed Registered Units

## 34. Financial Assurance Mechanism

The financial assurance for post-closure care is required in accordance with 30 TAC §352.1101. The applicant shall demonstrate the financial assurance within 90 days after approval of the registration with a financial mechanism acceptable to TCEQ in compliance with 30 TAC §352.1101(c) and 30 TAC §37, Subchapters A through D, except as indicated in 30 TAC §352.1111, in an amount no less than the amount specified in the approved Post-Closure Care Cost Summary. Provide a description of the proposed financial assurance mechanism.

Oak Grove Management Company LLC will provide an acceptable financial assurance mechanism per 30 TAC 352.1101 no more than 90 days after the executive director's approval of the registration.

~~Vistra Corporation currently uses AEGIS Insurance Services Endorsement No. 60 (TCEQ Endorsement for Closure, Post-Closure or Corrective Action) as an approved financial assurance mechanism at other Vistra owned facilities. Applicant intends to add post-closure coverage amounts detailed in Table VIII.A.1. to current policy.~~

Complete Table VIII.B. - Post-Closure Period, for the authorized post-closure period, to meet the requirements of 30 TAC §352.1241(a) through (c).

**Signature Page**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

**Applicant** Signature: _____ Date: _____

Name and Official Title (type or print): _____

**Owner or Operator** Signature: _____ Date: _____

Name and Official Title (type or print): _____

To be completed by the owner or operator if the application is signed by an authorized representative for the operator

I, _____ hereby designate _____
(operator) (authorized representative)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a CCR waste management registration. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any registration which might be issued based upon this application.

_____
Printed or Typed Name of Applicant or Principal Executive Officer

_____
Signature

(Note: Application Must Bear Signature & Seal of Notary Public)

**Subscribed and sworn** to before me by the said _____ on this

_____ day of _____, _____.

My commission expires on the _____ day of _____, _____

(Seal) Notary Public in and for _____ County, Texas

**Registration Application for Coal Combustion Residuals Waste Management**

| **Attachments and Tables** | **Attachment No.** |
|---|---|
| General Information | Appendix A |
| Property/Legal Description | |
| Property Owner Affidavit | |
| Legal Authority | |
| Delegation of Signature Authority | |
| TCEQ Core Data Form | |
| Attachments | |
| Response to TCEQ CCR Unit Registration Comments (Item 21) – Ash Landfill 1 | |
| Response to TCEQ CCR Unit Registration Comments (Item 21) – FGD Ponds | |
| Location Restrictions & Geology | Appendix B |
| Location Restriction Demonstration-Ash Landfill 1 | |
| Location Restriction Evaluation-Ash Landfill 1 | |
| Location Restriction Demonstration-FGD Ponds | |
| Location Restriction Evaluation-FGD Ponds | |
| Fugitive Dust Control Plan | Appendix C |
| CCR Fugitive Dust Control Plan | |
| 2021 Annual CCR Fugitive Dust Control Report | |
| Landfill Criteria | Appendix D |
| Soil Liner Evaluation Reports | |
| Run-on and Run-off Control System Plan | |
| 2021 Annual CCR Unit Inspection Report-Ash Landfill 1 | |
| Surface Impoundment Design and Operating Criteria | Appendix E |
| ~~Liner Evaluation Report~~Construction Completion and Quality Assurance Report-FGD A | |
| Liner Evaluation Report-FGD B | |
| Liner Evaluation Report-FGD C | |
| Retrofit Plan – FGD A | |
| Intent to Retrofit Notification – FGD A | |
| FGD Pond A Retrofit Construction Plans | |
| Hazard Potential Classification Assessment | |
| Inflow Design Flood Control System Plan | |
| History of Construction | |
| History of Construction-Addendum No.1 | |
| Structural Stability Assessment | |
| Safety Factor Assessment | |
| Groundwater Monitoring and Corrective Action | Appendix F |
| Groundwater Monitoring System Certification-Ash Landfill 1 | |
| Groundwater Monitoring System Certification-FGD Ponds | |
| Groundwater Monitoring Plan-Revision 2 – Ash Landfill 1 | |
| Groundwater Monitoring Plan-Revision 2 – FGD Ponds | |
| Statistical Analysis Plan-Revision 1-Ash Landfill 1 | |
| Statistical Analysis Plan-Revision 1-FGD Ponds | |
| 2017 Annual Groundwater Monitoring Report-Ash Landfill 1 | |
| 2020 Groundwater Monitoring and Corrective Action Report-Ash Landfill 1 | |
| 2020 Groundwater Monitoring and Corrective Action Report-FGD Ponds | |
| 2021 Groundwater Monitoring and Corrective Action Report-Revision 1-Ash Landfill 1 | |
| 2021 Groundwater Monitoring and Corrective Action Report-Revision 1-FGD Ponds | |
| CCR Assessment of Corrective Measures-Revision 1-FGD Ponds | |
| Assessment of Corrective Measures Public Meeting Documents | |

Remedy Selection Report – FGD Ponds

| | |
|---|---|
| Closure and Post-Closure Care | Appendix G |
| Closure Plan-Ash Landfill 1 | |
| Closure Plan-Addendum No. 1-Ash Landfill 1 | |
| Closure Plan-FGD Ponds | |
| Closure Plan-Addendum No. 1-FGD Ponds | |
| Post-Closure Plan-Ash Landfill 1 | |
| Post-Closure Plan-FGD Ponds | |
| Financial Assurance | Appendix H |
| Post-Closure Care Cost Estimates ~~Memo~~ | |

Tables

| Tables | Submitted | Not Applicable |
|---|---|---|
| Table I.6. - CCR Waste Management Units | ☒ | ☐ |
| Table I.6.A. - Waste Management Information | ☒ | ☐ |
| Table I.6.B. - Wastes Managed in Registered Units | ☒ | ☐ |
| Table I.6.C. - Sampling and Analytical Methods | ☒ | ☐ |
| Table IV.A. - Landfill Characteristics | ☒ | ☐ |
| Table IV.B. - Landfill Liner System | ☒ | ☐ |
| Table IV.C. - Landfill Leachate Collection System | ☐ | ☒ |
| Table IV.D. - Inspection Schedule of Landfills | ☒ | ☐ |
| Table V.A. - Surface Impoundments Characteristics | ☒ | ☐ |
| Table V.B. - Surface Impoundment Liner System | ☒ | ☐ |
| Table V.J. - Inspection of Surface Impoundments | ☒ | ☐ |
| Table VI.A. - Unit Groundwater Detection Monitoring System | ☒ | ☐ |
| Table VI.C. - CCR Units Under Detection Monitoring | ☒ | ☐ |
| Table VI.C-1. - Groundwater Detection Monitoring Parameters | ☒ | ☐ |
| Table VI.D. - CCR Units Under Assessment Monitoring | ☒ | ☐ |
| Table VI.D-2. - Groundwater ~~Detection~~ Assessment Monitoring Parameters | ☒ | ☐ |
| Table VII.A.1. - Unit Closure | ☒ | ☐ |
| Table VII.A.2. - CCR Units Under Alternative Closure Notification | ☐ | ☒ |
| Table VIII.A.1. - Post-Closure Cost Summary for Existing Registered Units | ☒ | ☐ |
| Table VIII.A.2. - Post-Closure Cost Summary for Proposed Registered Units | ☐ | ☒ |
| Table VIII.B. - Post-Closure Period | ☐ | ☒ |
| Engineering Certification(s) - Dike Construction | ☐ | ☒ |

**Additional Attachments as Applicable - Select all those apply and add as necessary**

☒ TCEQ Core Data Form(s) Appendix A
☒ Signatory Authority Delegation Appendix A
☐ Fee Payment Receipt
☐ Confidential Documents
☒ Certificate of Fact (Certificate of Incorporation) Appendix A

☐ Assumed Name Certificate

**Table I.6. – CCR Waste Management Units**

| CCR Unit No.[1] | Unit Name | N.O.R. No.[1] | Unit Description[3] | Capacity | Unit Status[2] |
|---|---|---|---|---|---|
| 010 | Ash Landfill 1 | 010 | Landfill | 22.16 million cubic yards | Active |
| 011 | FGD-A Pond | 011 | Surface Impoundment | 172 ac-ft | Active |
| 012 | FGD-B Pond | 012 | Surface Impoundment | 104 ac-ft | Active |
| 013 | FGD-C Pond | 013 | Surface Impoundment | 218 ac-ft | Active |
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1 Registered Unit No. and N.O.R. No. cannot be reassigned to new units or used more than once.
2 Unit Status options: Active, Closed, Inactive (built but not managing waste), Proposed (not yet built), Never Built, Transferred, Post-Closure.
3 If a unit has been transferred, the applicant should indicate which facility/permit it has been transferred to in the Unit Description column.

**Table I.6.A. – Waste Management Information**

| Waste No.[1] | Waste Type(s) | Source | Volume (tons/year)[2] |
|---|---|---|---|
| 1 | FGD Gypsum | Coal Combustion Byproduct | 837,000 tons |
| 2 | Fly Ash | Coal Combustion Byproduct | 49,000 tons |
| 3 | Bottom Ash | Coal Combustion Byproduct | 332,000 tons |
| 4 | Class 2 Non-Hazardous Sandblast Grit | Misc. Maintenance Activities | < 10 tons |
| 5 | Construction Debris | Misc. Maintenance Activities | < 100 tons |
| 6 | Filters | Misc. Maintenance Activities | < 50 tons |
| 7 | Metal Scrap | Misc. Maintenance Activities | 0 |
| 8 | Activated Carbon Waste | Unused material for Flue Gas Treatment | 0 |
| 9 | Spent Desiccant | Misc. Maintenance Activities | 0 |
| 10 | Spent Ion Exchange Resins | Boiler Water Treatment | < 20 tons |
| 11 | Waste Catalyst | SCR Unit | 150 tons |
| 12 | Supplemental Plant Production Refuse | Plant Laboratory Operations | 0 |
| 13 | Plant Trash | Misc. Plant Operations | 0 |
| | | | |

1 Assign waste number sequentially. Do not remove waste number wastes which are no longer generated

2 Reflects 2020 records

Table I.6.B. – Wastes Managed in Registered Units

| Waste No.[1] | Waste | TCEQ Waste Form Codes and Classification Codes |
|---|---|---|
| 1 | FGD Gypsum | TWC-30013922, TX Form Code-392, Class 2 |
| 2 | Fly Ash | TWC-30023042, TX Form Code-304, Class 2 |
| 3 | Bottom Ash | TWC-30053042, TX Form Code-304, Class 2 |
| 4 | Class 2 Non- Hazardous Sandblast Grit | TWC-37013902, TX Form Code-389, Class 2 |
| 5 | Construction Debris | TWC-37043902, TX Form Code-390, Class 2 |
| 6 | Filters | TWC-37063102, TX Form Code-310, Class 2 |
| 7 | Metal Scrap | TWC-37133072, TX Form Code-307, Class 2 |
| 8 | Activated Carbon Waste | TWC-37184042, TX Form Code-404, Class 2 |
| 9 | Spent Desiccant | TWC-37203192, TX Form Code-319, Class 2 |
| 10 | Spent Ion Exchange Resins | TWC-37264032, TX Form Code-403, Class 2 |
| 11 | Waste Catalyst | TWC-37503932, TX Form Code-393, Class 2 |
| 12 | Supplemental Plant Production Refuse | TWC-39019022, TX Form Code-902, Class 2 |
| 13 | Plant Trash | TWC-39109992, TX Form Code-999, Class 2 |
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1 from Table I.6.A., first column

**Table I.6.C – Sampling and Analytical Methods**

| Waste No.[1] | Sampling Location | Sampling Method | Frequency | Parameter | Test Method | Desired Accuracy Level |
|---|---|---|---|---|---|---|
| 1 | Gypsum dewatering belt | Grab | <5 years | TCLP Metals | SW1311/7470A SW1311/6020B | See below [2] |
| 2 | Fly ash loading silo | Grab | <5 years | TCLP Metals | SW1311/7470A SW1311/6020B | See below [2] |
| 3 | Bottom ash bunker | Grab | <5 years | TCLP Metals | SW1311/7470A SW1311/6020B | See below [2] |
| 4 | Varies by project | Composite | Each project | TCLP Metals | SW1311/7470A SW1311/6020B | See below [2] |
| 5 | Varies by project | Composite | As needed | TCLP metals, TPH | SW1311/7470A SW1311/6020B TX1005 | See below [2] |
| 6 | None-process knowledge | NA | NA | SDS and flyash analysis (Waste no. 2) | NA | NA |
| 7 | None-process knowledge | NA | NA | None | NA | NA |
| 8 | None-process knowledge | NA | NA | SDS and process knowledge | NA | NA |
| 9 | None-process knowledge | NA | NA | SDS | NA | NA |
| 10 | Spent resin drum | Composite | <5 years | TCLP Metals | SW1311/7470A SW1311/6020B | See below [2] |
| 11 | None-process knowledge | NA | NA | SDS and flyash analysis (Waste no. 2) | NA | NA |
| 12 | None-process knowledge | NA | NA | None | NA | NA |
| 13 | None-process knowledge | NA | NA | None | NA | NA |

1 from Table I.6.A., first column

2 Analytical protocol will meet EPA quality control and accuracy specifications as published in the SW-846 Methods. The laboratory will be TCEQ accredited.

**Table IV.A. – Landfills Characteristics**

| Registered Unit No. | Landfill | N.O.R. No. | Waste Nos.[1] | Rated Capacity | Dimensions[2] | Distance from lowest liner to groundwater | Action Leakage Rate (if required) | Unit will manage CCR Waste and non-CCR Waste (state all that apply) |
|---|---|---|---|---|---|---|---|---|
| 010 | Ash Landfill 1 | 010 | 1 thru 13 | 22.16 million cubic yards | 3200 ft L x 2100 ft W x 190 ft H (height @ max design)<br>155 acres | N/A | N/A | Waste numbers 1-13 as described in Table I.6.A. |
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1 From Table I.6.A., first column
2 Dimensions should be provided as average length, width and depth, also include the surface acreage for the unit.

**Table IV.B. – Landfill Liner System**

| Registered Unit No.* | Landfill | Geomembrane Liner Material | Geomembrane Liner Permeability (cm/sec) | Geomembrane Liner Thickness | Soil Liner Material | Soil Liner Permeability (cm/sec) | Soil Liner Thickness |
|---|---|---|---|---|---|---|---|
| 010 | Ash Landfill 1 | N/A | N/A | N/A | Compacted clay | $<1x10^{-7}$ cm/sec | Minimum 3 ft |
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* This number should match the Registration Unit No. given on Table IV.A.

## Table IV.C. – Landfill Leachate Collection System

| Registered Unit No. | Landfill Name | Drainage Media | Collection Pipes (including risers) | Filter Fabric | Geofabric | Sump Material |
|---|---|---|---|---|---|---|
| N/A | | | | | | |
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**Table IV.D. – Inspection Schedule of Landfills**

| Facility Unit(s) and Basic Elements | Possible Error, Malfunction, or Deterioration | Frequency of Inspection |
|---|---|---|
| 010-Ash Landfill 1 | Inspect for any appearances of actual or potential structural weakness and other conditions which are disrupting of have the potential to disrupt the operation and safety of the CCR unit | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.84(a).~~Weekly Inspection per 40 CFR 257.84(a)~~ |
| Embankments | Surface cracking, animal burrows, misalignments, slides, vegetative cover, rutting, erosion, seepage, slope protection/chutes | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.84(a).~~Weekly Inspection~~ |
| Capped Areas | Animal burrows, vegetative cover, rutting, surface cracking | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.84(a).~~Weekly Inspection~~ |
| Active Work Area | Contact water, dusting | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.84(a).~~Weekly Inspection~~ |
| Groundwater Monitoring Wells | Deterioration of pads, bollards, missing locks, compromise of casing integrity | Semi-Annual Inspection |
| | | |
| 010-Ash Landfill 1 | | Annually per 40 CFR 257.84(b) |
| | Inspect for any changed in geometry of the structure since the previous annual inspection. | Annual Inspection |
| | Estimate the approximate volume of CCR contained in the unit at the time of the inspection. | Annual Inspection |
| | Inspect for any appearance of actual or potential structural weakness of the CCR unit, and any conditions that are disrupting or have the potential to disrupt the operation and safety of the unit. | Annual Inspection |
| | Inspect for any other change(s) which have affected the stability or operation of the CCR unit since the previous inspection | Annual Inspection |
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**Table V.A. – Surface Impoundment Characteristics**

| Registered Unit No. | Surface Impoundment Name | N.O.R. No. | Waste Nos.[1] | Rated Capacity | Dimensions[2] | Distance from lowest liner to groundwater | Action Leakage Rate (if required) | Unit will manage CCR Waste and non-CCR Waste (state all that apply) |
|---|---|---|---|---|---|---|---|---|
| 011 | FGD Pond A | 011 | 1 | 172 acre-feet | 875 ft x 500 ft x 28 ft<br>9.4 acres | >5 feet | N/A | FGD gypsum |
| 012 | FGD Pond B | 012 | 1 | 104 acre-feet | 640 ft x 700 ft x 15 ft<br>11.3 acres | <5', see location restriction report, Section 2.0, last paragraph | N/A | FGD gypsum |
| 013 | FGD Pond C | 013 | 1 | 218 acre-feet | 1200 ft x 550 ft x 22 ft<br>17 acres | >5 feet | N/A | FGD gypsum |
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1 From Table I.6.A., first column
2 Dimensions should be provided as average length, width and depth, also include the surface acreage for the unit.

**Table V.B. – Surface Impoundment Liner System**

| Registered Unit No.* | Surface Impoundment Name | Geomembrane Liner Material | Geomembrane Liner Permeability (cm/sec) | Geomembrane Liner Thickness | Soil Liner Material | Soil Liner Permeability (cm/sec) | Soil Liner Thickness |
|---|---|---|---|---|---|---|---|
| 011 | FGD Pond A | 60 mil HDPE | < $1.00x10^{-7}$ cm/sec** | 60-mil HDPE | clay | < $1x10^{-7}$ cm/sec | 2’ |
| 012 | FGD Pond B | 60 mil HDPE | < $1.00x10^{-7}$ cm/sec | 60-mil HDPE | clay | < $1x10^{-7}$ cm/sec | 2’ |
| 013 | FGD Pond C | 60 mil HDPE | < $1.00x10^{-7}$ cm/sec | 60-mil HDPE | clay | < $1x10^{-7}$ cm/sec | 2’ |
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* This number should match the Registration Unit No. given on Table V.A.
**FGD Pond A currently being retrofitted.

**Table V.J. – Inspection Schedule of Surface Impoundments**

| Facility Unit(s) and Basic Elements | Possible Error, Malfunction, or Deterioration | Frequency of Inspection |
|---|---|---|
| 011-FGD Pond A, 012-FGD Pond B, and 013-FGD Pond C | | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.83(a).~~Weekly per 40 CFR 257.83(a)~~ |
| Above-grade piping | Deteriorating of piping/connections | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.83(a).~~Weekly Inspection~~ |
| Truck Access Ramp | Spills, Deterioration | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.83(a).~~Weekly Inspection~~, spills inspected and reported within 24-hrs |
| Containment Dike | Spills, excessive water levels, surface cracking, animal burrows, misalignments, slides, vegetative cover, rutting, erosion, seepage, slope protection/chutes | Weekly inspections are performed at intervals not exceeding seven days per 40 CFR 257.83(a).~~Weekly Inspection~~, spills inspected and reported within 24-hrs |
| Instrumentation | Monitor water level | Unit instrumentation (water level gauge) is inspected and monitored at intervals not exceeding 30 days per 40 CFR 257.83(a)(1)(iii). |
| Groundwater | Deterioration of pads, bollards, missing locks, compromise of casing integrity | Semi-Annual Inspection |
| 011-FGD Pond A, 012-FGD Pond B, and 013-FGD Pond C | | Annually per 40 CFR 257.83(b) |
| | Inspect for any changes in geometry of the structure since the previous annual inspection. | Annual Inspection |
| | Evaluate the approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since previous annual inspection. | Annual Inspection |
| | Evaluate the storage capacity at the time of the inspection. | Annual Inspection |
| | Estimate the approximate volume of the impounded water and CCR contained in the unit at the time of the inspection. | Annual Inspection |
| | Inspect for any other change(s) which have affected the stability or operation of the CCR unit since the previous inspection | Annual Inspection |

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Table VI.A.1. - Unit Groundwater Detection Monitoring Systems

| Waste Management Unit/Area Name[1] | **WMU 010 - Ash Landfill 1** | | | | | |
|---|---|---|---|---|---|---|
| Well Number(s): | MW-02 | MW-05 | MW-07 | MW-08R | MW-09 | AL-10 |
| Hydrogeologic Unit Monitored | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group |
| Type (e.g., point of compliance, background, observation, etc.) | POC | POC | POC | POC | POC | POC |
| Up or Down Gradient | Up | Down | Down | Down | Down | Up |
| Casing Diameter and Material | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC |
| Screen Diameter and Material | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC |
| Screen Slot Size (in.) | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" |
| Top of Casing Elevation (Ft, Mean Sea Level *[MSL]* ) | 463.14 | 436.98 | 438.84 | 443.84 | 461.46 | 460.81 |
| Grade or Surface Elevation (Ft, MSL) | 459.9 | 434.73 | 436.93 | 441.22 | 459.24 | 457.54 |
| Well Depth (Ft, Below Grade Surface *[BGS]* ) | 66 | 50 | 50 | 52.5 | 67 | 60.3 |
| Well Depth (Ft, Below Top of Casing *[BTOC]* ) | 69.24 | 52.25 | 51.91 | 55.12 | 69.22 | 63.57 |
| Screen Interval | | | | | | |
| From (Ft, BGS) | 45 | 29 | 29 | 32.5 | 46 | 50.3 |
| To (Ft, BGS) | 65 | 49 | 49 | 52.5 | 66 | 60.3 |
| Screen Interval | | | | | | |
| From (Ft, BTOC) | 48.24 | 31.25 | 30.91 | 35.12 | 48.22 | 53.57 |
| To (Ft, BTOC) | 68.24 | 51.25 | 50.91 | 55.12 | 68.22 | 63.57 |

1 From Tables in Section I.; *MSL* : Mean Sea Level; *BGS* : Below Grade Surface; *BTOC* : Below Top of Casing

Table VI.A.2. - Unit Groundwater Detection Monitoring Systems

| Waste Management Unit/Area Name[1] | **WMUs 011, 012, 013 - FGD Ponds** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Well Number(s): | FGD-8 | FGD-11 | FGD-1 | FGD-2 | FGD-3 | FGD-4 | FGD-5 | FGD-6 | FGD-12 | FGD-14* | FGD-15* | FGD-16* |
| Hydrogeologic Unit Monitored | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group | Wilcox Group |
| Type (e.g., point of compliance, background, observation, etc.) | POC | POC | POC | POC | POC | POC | POC | POC | POC | POC | POC | POC |
| Up or Down Gradient | Up | Up | Down | Down | Down | Down | Down | Down | Down | Down | Down | Down |
| Casing Diameter and Material | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC |
| Screen Diameter and Material | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC | 2" PVC |
| Screen Slot Size (in.) | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" | 0.010" |
| Top of Casing Elevation (Ft, Mean Sea Level *[MSL]* ) | 440.15 | 452.22 | 424.44 | 439.36 | 434.9 | 432.03 | 433.01 | 428.62 | 443.16 | 428.91 | 437.17 | 444.3 |
| Grade or Surface Elevation (Ft, MSL) | 436.8 | 448.8 | 421.71 | 436.58 | 432.2 | 429.34 | 430.2 | 425.42 | 439.46 | 426.21 | 434.17 | 441.3 |
| Well Depth (Ft, Below Grade Surface *[BGS]* ) | 40 | 50.8 | 34 | 52 | 48 | 44 | 50 | 28 | 40.7 | 30 | 35 | 40 |
| Well Depth (Ft, Below Top of Casing *[BTOC]* ) | 43.35 | 54.22 | 36.73 | 54.78 | 50.7 | 46.69 | 52.81 | 31.2 | 44.4 | 32.7 | 38 | 43 |
| Screen Interval | | | | | | | | | | | | |
| From (Ft, BGS) | 30 | 40.8 | 13 | 31 | 27 | 22.5 | 40 | 18 | 30.7 | 20 | 25 | 30 |
| To (Ft, BGS) | 40 | 49.8 | 33 | 51 | 47 | 42.5 | 50 | 28 | 39.7 | 30 | 35 | 40 |
| Screen Interval | | | | | | | | | | | | |
| From (Ft, BTOC) | 33.35 | 44.22 | 15.73 | 33.78 | 29.7 | 25.19 | 42.81 | 21.2 | 34.4 | 22.7 | 28 | 33 |
| To (Ft, BTOC) | 43.35 | 53.22 | 35.73 | 53.78 | 49.7 | 45.19 | 52.81 | 31.2 | 43.4 | 32.7 | 38 | 43 |

1 From Tables in Section I.; *MSL* : Mean Sea Level; *BGS* : Below Grade Surface; *BTOC* : Below Top of Casing

*Wells FGD-14, FGD-15, FGD-16 added to network as part of ACM completed September 2019

**Table VI.C. – CCR Units Under Detection Monitoring**

| N.O.R. Unit No. | Unit Description[1,2] | Well(s) | Constituent(s) | Date of SSI Determination | Date of Assessment Monitoring Notification[3] |
|---|---|---|---|---|---|
| 010 | Ash Landfill 1 | MW-02, MW-07 | B (MW-02, MW-07) | 2/13/19 | N/A - ASD Successful (4/10/19) |
| 010 | Ash Landfill 1 | MW-05, MW-07 | B (MW-07)<br>F (MW-05) | 11/28/19 | N/A - ASD Successful (2/24/20) |
| 010 | Ash Landfill 1 | MW-05, MW-07, MW-09 | B (MW-05, MW-07)<br>SO4 (MW-07, MW-09) | 12/7/20 | N/A - ASD Successful (3/5/21) |
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1 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been requested pursuant to 40 CFR §257.103.
2 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been made pursuant to 40 CFR §257.103.
3 Enter month, day, and year.

**Table VI.~~D-2~~C-1. – Groundwater Detection Monitoring Parameters**

| Parameter | Sampling Frequency | Analytical Method | Practical Quantification Limit (units) | Concentration Limit[1] |
|---|---|---|---|---|
| **Ash Landfill 1** | | | | |
| Boron | Semi-Annual | SW6020B | 0.0100 mg/L | 0.124 mg/L |
| Calcium | Semi-Annual | SW6020B | 0.10 mg/L | 74.9 mg/L |
| Chloride | Semi-Annual | E300 | 0.30 mg/L | 353 mg/L |
| Fluoride | Semi-Annual | E300 | 0.100 mg/L | 0.4 mg/L |
| Sulfate | Semi-Annual | E300 | 1.00 mg/L | 97.4 mg/L |
| Total Dissolved Solids | Semi-Annual | M2540C | 10.0 mg/L | 948 mg/L |
| pH | Semi-Annual | Field Measured | s.u. | 6.31 su<br>7.09 su |
| | | | | |
| **FGD PONDS** | | | | |
| Boron | Semi-Annual | SW6020B | 0.0100 mg/L | 0.141 mg/L |
| Calcium | Semi-Annual | SW6020B | 0.10 mg/L | 471 mg/L |
| Chloride | Semi-Annual | E300 | 0.30 mg/L | 6340 mg/L |
| Fluoride | Semi-Annual | E300 | 0.100 mg/L | 0.781 mg/L |
| Sulfate | Semi-Annual | E300 | 1.00 mg/L | 409 mg/L |
| Total Dissolved Solids | Semi-Annual | M2540C | 10.0 mg/L | 13000 mg/L |
| pH | Semi-Annual | Field Measured | s.u. | 6.10 su<br>7.23 su |

1 The concentration limit is the basis for determining whether a release has occurred from the CCR unit/area.

**Table VI.D. – CCR Units Under Assessment Monitoring**

| N.O.R. Unit No. | Unit Description[1,2] | Well(s) | Constituent(s) | Date of SSI Determination | Date of Assessment Monitoring Notification[3] |
|---|---|---|---|---|---|
| 011, 012, 013 | FGD Ponds | FGD-2, FGD-3, FGD-4, FGD-5 | B | 1/16/2018 | 7/16/2018 |
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1 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been requested pursuant to 40 CFR §257.103.
2 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been made pursuant to 40 CFR §257.103.
3 Enter month, day, and year

**Table VI.D-2. – Groundwater Assessment Monitoring Parameters**

| Parameter | Sampling Frequency | Analytical Method | Practical Quantification Limit (units) | Concentration Limit[1] |
|---|---|---|---|---|
| **FGD PONDS** | | | | |
| Antimony | Semi-Annual | SW6020B | 0.000800 mg/L | 0.006 mg/L |
| Arsenic | Semi-Annual | SW6020B | 0.00200 mg/L | 0.0146 mg/L |
| Barium | Semi-Annual | SW6020B | 0.00300 mg/L | 2 mg/L |
| Beryllium | Semi-Annual | SW6020B | 0.000300 mg/L | 0.004 mg/L |
| Cadmium | Semi-Annual | SW6020B | 0.000300 mg/L | 0.005 mg/L |
| Chromium | Semi-Annual | SW6020B | 0.00200 mg/L | 0.1 mg/L |
| Cobalt | Semi-Annual | SW6020B | 0.00300 mg/L | 0.0158 mg/L |
| Flouride | Semi-Annual | SW6020B | 0.100 mg/L | 4 mg/L |
| Lead | Semi-Annual | SW6020B | 0.000300 mg/L | 0.015 mg/L |
| Lithium | Semi-Annual | SW6020B | 0.00500 mg/L | 0.149 mg/L |
| Mercury | Semi-Annual | SW7470A | 0.0000800 mg/L | 0.002 mg/L |
| Molybdenum | Semi-Annual | SW6020B | 0.00200 mg/L | 0.1 mg/L |
| Selenium | Semi-Annual | SW6020B | 0.00200 mg/L | 0.05 mg/L |
| Thallium | Semi-Annual | SW6020B | 0.000500 mg/L | 0.002 mg/L |
| Radium 226+228 | Semi-Annual | 904 + SM7500Ra B M | varies | 11.2 pCi/L |
| | | | | |

[1] The concentration limit is the basis for determining whether a release has occurred from the CCR unit/area.

**Table VII.A.1. – Unit Closure**

For each unit to be registered, list the unit components to be decontaminated, the possible methods of decontamination, and the possible methods of disposal of wastes and waste residues generated during unit closure.

| Equipment or CCR Unit | Possible Methods of Decontamination[1] | Possible Methods of Disposal[1] |
|---|---|---|
| 010-Ash Landfill 1 | Close in Place | No disposal |
| 011-FGD A Pond Piping | Removal | Landfill |
| 011-FGD A Pond | Close in Place | No disposal |
| 012-FGD B Pond Piping | Removal | Landfill |
| 012-FGD B Pond | Close in Place | No disposal |
| 013-FGD C Pond Piping | Removal | Landfill |
| 013-FGD Pond | Close in Place | No disposal |
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1 Applicants may list more than one appropriate method.

**Table VII.A.2. – CCR Units Under Alternative Closure Notification**

| Registered Unit No. | N.O.R. Unit No. | Unit Description[1,2] | Date of Receipt of Last Waste[3] | Date of Closure Notification[3] |
|---|---|---|---|---|
| N/A | | | | |
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1 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been requested pursuant to 40 CFR §257.103.
2 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been made pursuant to 40 CFR §257.103.
3 Enter month, day, and year.

**Table VIII.A.1. – Post-Closure Cost Summary for Existing Registered Units**

| Unit | Cost |
|---|---|
| 010-Ash Landfill 1 | $2,326,837 |
| 011, 012, 013-FGD Pond Area | $2,168,817 |
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| Total Existing Unit Post-Closure Cost Estimate | $4,495,654 (in 2021 Dollars)[1] |
| | |

**Table VIII.A.2. - Post-Closure Cost Summary for Proposed Registered Units**

| Unit | Cost |
|---|---|
| N/A | |
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1 As units are added or deleted from these tables through future registration amendments, the remaining itemized unit costs should be updated for inflation when re-calculating the revised total cost in current dollars.

**Table VIII.B. – Post-Closure Period**

| Unit Name | Date Certified Closed | Authorized Post-Closure Period (Yrs.) | Earliest Date Post-Closure Ends (See Note 1) |
|---|---|---|---|
| **[Unit Example 1]** | **[1/1/1995]** | 30 years | **[1/1/2025]** |
| **[Unit Example 2]** | **[1/1/1990]** | 30 years | **[1/1/2020]** |
| **[Unit Example 3]** | **[1/1/1984]** | 30 years | **[1/1/2014]** |

Note 1 – Post-Closure Care shall continue beyond the specified date until the Executive Director has approved the applicant's request to reduce or terminate the post-closure period, consistent with 30 TAC §352.1241 – Post-Closure Care Requirements.

N/A

# APPENDIX E – SURFACE IMPOUNDMENT DESIGN AND OPERATING CRITERIA

**Construction Completion and Quality Assurance Report – FGD Pond A**
**Liner Evaluation Report – FGD Pond B**
**Liner Evaluation Report – FGD Pond C**
**Hazard Potential Classification Assessment**
**Inflow Design Flood Control System Plan**
**History of Construction**
**History of Construction-Addendum No. 1**
**Structural Stability Assessment**
**Safety Factor Assessment**

# Construction Completion and Construction Quality Assurance Report

Oak Grove Management Company LLC
Oak Grove Steam Electric Station
Robertson County, Texas
CCR Impoundment FGD-A Pond Retrofit

SCS ENGINEERS

16221045.00 | July 2022

12651 Briar Forest Dr. Suite 205
Houston, Texas 77077
281-293-8494

# Narrative

# Construction Completion and Construction Quality Assurance Report

Oak Grove Management Company LLC
Oak Grove Steam Electric Station
Robertson County, Texas
CCR Impoundment FGD-A Pond Retrofit

SCS ENGINEERS

16221045.00 | July 2022

12651 Briar Forest Dr. Suite 205
Houston, Texas 77077
281-293-8494

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A.2 FGD-A Pond Retrofit Technical Specifications
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GCL
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C.4 Concrete Revetment Product Data

HYDROTEX Fabric Forms
Fine Aggregate Concrete Mix

**D Construction**

D.1 Soils

Field Densities

D.2 Geosynthetic

Trial Weld
Panel Placement
Panel Seaming
Non-destruct
Destruct
Repairs

**E Resumes**

CQA
Geosynthetic

**F Record Drawings**

# 1.0 INTRODUCTION

## 1.1 GENERAL

On behalf of Oak Grove Management Company LLC (OGMC), SCS Engineers (SCS) has prepared this report detailing the construction and construction quality assurance (CQA) activities associated with the retrofit of FGD-A Pond at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas. The retrofit of the FGD-A Pond was performed in accordance with 40 C.F.R. § 257.102(k), with the new liner satisfying the requirements set forth in 40 C.F.R. § 257.72, which has been adopted by reference in 30 TAC §352.721. The initial written Retrofit Plan for FGD-A Pond was placed in the facility's operating record on March 31, 2020. The Retrofit Plan was later amended to extend the completion date. The amended Retrofit Plan was placed in the operating record on July 19, 2021. This report is accompanied by record (as-built) drawings, daily field reports, and test results, including pre-construction and construction testing, which document the construction and CQA oversight work performed to reline the FGD-A Pond. SCS was retained to complete the FGD-A Pond retrofit CQA oversight during construction and prepare this comprehensive report at the conclusion of the project.

The construction of the FGD-A Pond Retrofit generally followed the design and requirements contained in the following project related documents (see Appendix A – Pertinent Information):

- Oak Grove Steam Electric Station FGD-A Pond Retrofit construction drawings, prepared by Golder Associates Inc. and dated January 2021, revised November 2021.
- Oak Grove Steam Electric Station FGD-A Pond Retrofit Technical Specifications, prepared by Golder Associates Inc. and dated January 2021.
- Oak Grove Steam Electric Station Liner Quality Control Plan (LQCP), prepared by Golder Associates and dated January 2021, revised November 2021.
- 40 C.F.R. § 257.72 related to liner system requirements.

As evidenced by the project documentation and testing program results, the new FGD-A Pond liner was constructed in accordance with 40 C.F.R. § 257.72 and the FGD-A Pond Retrofit construction drawings, technical specifications, and LQCP. References to the LQCP and technical specifications will be referred to as "specifications."

## 1.2 PROJECT SUMMARY

The OGSES is owned and operated by OGMC and is located near Franklin, Texas. The FGD-A Pond, approximately 9.4 acres in size, is a Class 2 industrial waste surface impoundment receiving coal combustion residual (CCR) materials generated during the production of power at the OGSES. The FGD-A Pond is located on the north side of the OGSES and is adjacent to the FGD-B Pond as shown in Figure 1 below. The FGD-A Pond is registered under the site's TCEQ Solid Waste Registration 32043 as Waste Management Unit 011.

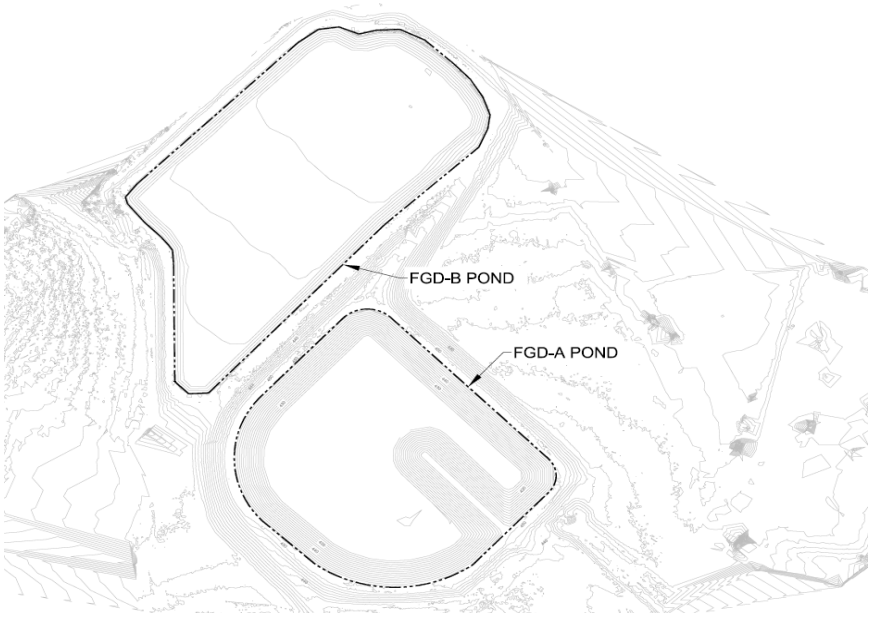



*Figure 1: FGD-A Pond Location*

This project generally consisted of removing water and CCR material from the FGD-A Pond, constructing a new liner system for the entire FGD-A pond (9.4 acres), placing a 1.5-foot thick layer of protective cover on the pond floor, and installing a concrete revetment around the crest of FGD-A Pond. The new liner system consisted of two different configurations depending on the condition of the existing 3-foot thick clay liner. In instances where the existing 3-foot clay liner was in acceptable condition, the top one-foot of the existing clay liner was excavated to the new geosynthetic liner subgrade. A 2-foot thick clay liner remained in place to establish the new geosynthetic liner subgrade. The 2-foot thick clay liner was overlain with a 60-mil textured high density polyethylene (HDPE) black geomembrane liner (2.6 Acres). In instances where the existing 3-foot clay liner was not in acceptable condition due to damage associated with over-excavation below the new geosynthetic liner subgrade, the non-acceptable areas were backfilled with clean soil structural fill and compacted to establish the new geosynthetic liner subgrade elevations and overlain with a geosynthetic clay liner (GCL) then a 60-mil textured HDPE black geomembrane liner (6.8 Acres). A more detailed list of construction activities is presented below:

- Contact water was pumped from the FGD-A Pond to the lined FGD-B Pond.
- CCR material was removed from the interior of the pond using an excavator and off-road articulated haul trucks.
- Off-road articulated haul trucks transported the CCR material to the on-site CCR Ash Landfill 1 for disposal.
- Clean soil from the stockpile (located southwest of FGD-A pond) was used as structural fill to backfill damaged areas that were over-excavated below the new geosynthetic liner subgrade during the cleanout of FGD-A Pond.
- Structural fill soil was placed in compacted lifts and tested for moisture/density, which only occurred in the areas of over-excavation to achieve the new geosynthetic liner subgrade elevations.
- Areas that had acceptable 2-foot thick clay liner were moisture and density tested and sampled using Shelby tubes to test for hydraulic conductivity.

- The total geosynthetic liner subgrade surface (9.4 acres) was field surveyed.
- The total geosynthetic liner subgrade surface was smooth rolled and nominally compacted with a smooth steel roller.
- GCL was installed on top of the smooth rolled geosynthetic liner subgrade of the areas that required structural fill placement to repair the unacceptable 2-foot thick clay liner. GCL was not installed on areas with an acceptable 2-foot thick clay liner.
- A 60-mil HDPE textured liner was installed on top of the entire pond area, all areas with either a GCL or acceptable 2-foot thick clay liner.

Golder Associates Inc. served as the design engineer for the FGD-A Pond retrofit project, while SCS served as the CQA engineers. SCS's CQA team was comprised of SCS staff which provided construction oversight and CQA services during construction. Construction progress was documented and photographed in daily field reports (DFRs) based on daily observations. The DFRs can be found in Appendix A.4 – Daily Field Reports.

## 1.3 KEY PERSONNEL

A list of key organizations that participated in relining the FGD-A Pond, along with their respective roles and key personnel is presented below:

OWNER
Oak Grove Management Company LLC

DESIGN ENGINEER
Golder Associates, Inc.; Houston, TX

CQA AND CERTIFYING ENGINEER
SCS Engineers; Houston, TX

| | |
|---|---|
| J. Roy Murray, P.E. | CQA Project Director |
| Samuel Franco, P.E. | CQA Project Manager |
| Danny Rennicks | CQA Monitor |
| Paul Vaillancourt | CQA Monitor |

RECORD SURVEYOR
Ray W. Davis Consulting Engineers, Inc.; Henderson, TX

| | |
|---|---|
| Jeremy Davis, P.E., R.P.L.S. | CQA Record Surveyor |

SITE GENERAL CONTRACTOR
Mine Services, Inc. (MSI); Rockdale, TX

| | |
|---|---|
| Eddie Noak | Project Principal |
| Scott Mendoza | Project Director |
| Jeff Hoffman | Site Superintendent |

GEOSYNTHETIC LINER INSTALLER
Lone Star Lining Company; Cedar Hill, TX

| | |
|---|---|
| Pat Kamesch | Project Manager |
| Mariano Tello | Site Superintendent |

GEOSYNTHETIC MATERIALS TESTING LABORATORY

TRI Environmental; Anaheim, CA

| | |
|---|---|
| Christian Sebastian | Laboratory Manager |

GEOTECHNICAL MATERIAL TESTING LABORATORY

CQA Testing Laboratory; Livingston, LA

| | |
|---|---|
| Mike Griggs | Laboratory Manager |

GEOMEMBRANE LINER MANUFACTURER

Solmax Geosynthetics, LLC; Houston, TX

GEOSYNTHETIC CLAY LINER MANUFACTURER

Colloid Environmental Technologies Company LLC (CETCO); Lovell, WY

CONCRETE REVETMENT INSTALLER

M&R Geotechnical Services (MR Geo); Baltimore, MD

| | |
|---|---|
| Brad Reitz | Project Manager |
| Steve Phongvilakoun | Site Superintendent |

# 2.0 CCR MATERIAL REMOVAL

Contact water and any precipitation accumulations in FGD-A Pond was pumped by the contractor to lined FGD-B Pond.

As the interior of FGD-A Pond dried, an excavator loaded CCR material into haul trucks for transportation and disposal in the on-site CCR Ash Landfill 1.

Once all of the CCR material had been removed to a visual standard, in accordance with the specifications, the CQA Project Director and Manager gave the final acceptance approval to continue liner construction.

The CCR removal from FGD A Pond was completed on November 7, 2021.

# 3.0 LINER INSTALLATION PREPARATION

## 3.1 CLAY LINER AND STRUCTURAL FILL PREPARATION

After the CCR material was removed, the interior of FGD-A Pond was surveyed by Ray W. Davis Consulting Engineers (Davis). It was determined that 6.8 acres of FGD-A Pond had been over-excavated below the targeted geosynthetic liner subgrade elevations. The areas over-excavated below the geosynthetic liner subgrade elevations did not meet the requirement of a minimum 2-foot clay liner. Clean soil was placed as structural fill in the over-excavated areas to raise the over-excavated areas to FGD-A Pond design geosynthetic liner subgrade elevations. Structural fill was placed in 6-inch lifts at 95% compaction and a moisture content in the range of -1 to +3 percent of the soil's optimum moisture content. All structural fill was moisture and density tested at a frequency of 1 test per 8,000 square feet per 6-inch lift consistent with the specifications, and all test results were acceptable.

A peninsula ramp was constructed on the southern side of the FGD-A Pond peninsula. The ramp was constructed from the same clean soil source that was used as structural fill to backfill areas of clay liner over-excavation. The peninsula ramp structural fill was constructed in 6-inch compacted lifts and was moisture and density tested to verify a compaction of 95% and a moisture content range of -1 to +3 percent of the soil's optimum moisture content at a frequency of 1 test per 8,000 square feet per 6-inch lift. Consistent with the specifications, and all test results were acceptable.

The areas with new structural fill and the peninsula ramp were overlain with GCL.

The remaining 2.6 acres (111,108 square feet) were tested and verified as acceptable 2-foot clay liner in accordance with the specifications. The lower 18-inches of the existing clay liner were tested for hydraulic conductivity at a frequency of 1 Shelby tube per 100,000 square feet. The top 6-inches of the clay liner were recompacted and moisture and density tested at a frequency of 1 test per 8,000 square feet and 1 Shelby tube per 40,000 square feet. A Troxler 3440 Plus nuclear moisture and density gauge was used to conduct all moisture and density testing. All moisture and density tests were conducted to verify a minimum of 95% compaction and a moisture content in the range of 0 to +6 percent of the soil's optimum moisture content. Fourteen moisture and density tests were performed and approved on the upper 6-inches of clay liner. Powdered bentonite was used to backfill all gauge and Shelby tube perforations. The clay liner construction testing requirements are noted in Table 1 below:

| Test Parameter | Testing Procedure | Frequency |
|---|---|---|
| In-place Moisture/Density | ASTM D6938, D2937, or D1556 | 1 per 8,000 $ft^2$/upper 6 inches |
| Percent Finer Than No. 200 Sieve | ASTM D1140 or D422 | 1 per 40,000 $ft^2$/upper 6 inches<br>1 per 100,000 $ft^2$/lower 1.5 feet |
| Atterberg Limits | ASTM D4318 | |
| Hydraulic Conductivity | ASTM D5084<br>Max. $1x10^{-7}$ cm/sec | |

Table 1: Clay Liner Construction Testing Requirements*

*Clay Liner Construction Testing Requirements provided by Oak Grove Steam Electric Station Liner Quality Control Plan, revised by Golder Associates Inc. on November 2021.

Two Shelby tubes (ST-1 and ST-2) were collected from the bottom 18-inches of clay liner. Fourteen moisture and density tests were taken and three Shelby tubes (ST-3, ST-4, and ST-5) were collected for the top 6-inches of clay liner. Clay liner moisture and density tests and lab results were reviewed and found to be in conformance with the specifications. Clay liner moisture and density tests, sampling locations, and lab results are located in Appendix D.1 - Soils.

Once subgrade elevations were achieved, the surveyor verified the elevations were within the tolerance allowed (+0.1 feet) at the certification points identified in the construction plans. Areas between certification points were visually verified by the CQA Monitor to verify grades were continuous with no visual deviations. Any areas not within the tolerance were regraded to an acceptable elevation. A Subgrade As-Built, certified by a registered surveyor in the State of Texas, is contained in Appendix F - Record Drawings.

## 3.2 GEOSYNTHETIC LINER SUBGRADE PREPARATION

The final geosynthetic liner subgrade surface represented the top of the structural fill and the top of the 2-foot thick clay liner. This surface served as the subgrade that the GCL and/or HDPE geomembrane liner were installed on. The geosynthetic liner subgrade was smooth rolled and nominally compacted with a smooth steel roller. The geosynthetic liner subgrade surface was continuously inspected and approved by the CQA Monitor and the geosynthetic liner installer immediately prior to GCL and HDPE geomembrane liner installation.

## 3.3 ANCHOR TRENCH

An anchor trench was constructed at the crest of sideslope around the outside perimeter of the FGD-A Pond by MSI. The anchor trench was offset 2-feet from the crest of the FGD-A Pond sideslope. The anchor trench was used to secure the GCL, HDPE geomembrane liner, and the concrete revetment. The anchor trench was constructed just prior to, and concurrent with the GCL and HDPE geomembrane liner installation by Lone Star Lining (LSL).

To avoid having open trenches and avoid the trenches being filled with stormwater during rain events, the anchor trenches were excavated as the project progressed. Generally, the anchor trench was dug the day before, or day of, the GCL and HDPE geomembrane liner installation. Prior to the concrete revetment installation, LSL placed sandbags into the anchor trench to prevent any GCL and HDPE geomembrane liner from lifting due to high winds. Backfilling of the anchor trenches did not occur until the concrete revetment was installed in the anchor trench.

# 4.0 GEOSYNTHETIC LINER INSTALLATION

## 4.1 GCL CHARACTERISTICS

The Resistex U40 CN9 Geosynthetic Clay Liner, manufactured by CETCO, was used to reline the FGD-A Pond in areas that required structural fill placement to repair the unacceptable 2-foot thick clay liner. This material is a needle punched reinforced composite GCL comprised of a uniform layer of polymer enhanced granular sodium bentonite encapsulated between a woven and a nonwoven geotextile. The woven side of the GCL was installed in contact with the geosynthetic liner subgrade and the non-woven side was installed to be in contact with the overlying HDPE geomembrane liner.

CETCO provided manufacturer quality control (MQC) tests for the geotextile and bentonite, and SCS verified conformance with the specifications. Per the specifications, CETCO was requested to submit the twenty previous hydraulic conductivity test results. However, due to the new nature of the manufactured GCL, only nine hydraulic conductivity test results were available. The MQC test reports for the GCL are included in Appendix C.2 - Geosynthetic Manufacturer's Quality Assurance and Quality Control (QA/QC). The test results indicated the GCL rolls were manufactured in conformance with the specifications.

TRI Environmental, Inc. (TRI) collected samples of the GCL at the manufacturer's plant and conducted third-party conformance testing of the GCL in accordance with the specifications. TRI tested for bentonite mass per unit area and hydraulic conductivity. The results of the conformance testing are included in Appendix C.3 – Geosynthetic Conformance. The test results indicated the GCL was in conformance with the specifications.

Each GCL roll measured approximately 150-feet by 14.5-feet. Each seam had a minimum 6-inch overlap and granular bentonite was placed in the overlaps. LSL installed approximately 294,262 square feet of GCL using 161 rolls. A total of 354,525 square feet, 163 rolls, was ordered to fulfill the installation quantity. The square footage ordered accounted for sideslopes, overlap, and waste.

The following tests are based on 354,525 square feet of GCL installed at the FGD-A Pond. SCS reviewed the Manufacturer's Quality Control Test and Conformance Test results and verified the GCL was in conformance with specifications.

| Test | Type of Test | Frequency of Testing | Minimum Required | Actual Quantity | Passing Quantity |
|---|---|---|---|---|---|
| Manufacturer's Quality Control | Bentonite | | | | |
| | Fluid Loss | 1 per 50 tons or every truck | 5 | 5 | 5 |
| | Free Swell | | 5 | 5 | 5 |
| | Geotextile | | | | |
| | Mass per Unit Area | Per 200,000 ft$^2$ | 2 | 40 | 40 |
| | Tensile Properties | | 2 | 40 | 40 |
| | GCL Product | | | | |
| | Bentonite Mass | Per 40,000 ft$^2$ | 9 | 11 | 11 |
| | GCL Moisture Content | | 9 | 11 | 11 |
| | Peel Strength | | 9 | 11 | 11 |
| | Grab Tensile Strength | Per 200,000 | 2 | 11 | 11 |
| | Hydraulic Conductivity | 1 per week for each production line | 3 | 3 | 3 |
| Conformance Testing | Bentonite Mass/Unit | Per 100,000 ft$^2$ | 4 | 4 | 4 |
| | Hydraulic Conductivity | | 4 | 4 | 4 |

*Table 2: GCL Manufacturer's Quality Control and Conformance Test Summary*

The GCL rolls were manufactured on May 14, October 25, and December 6, 2021. These rolls were delivered to the site on June 22 and 23, November 24, December 28 and 30, 2021 and January 3 and 6, 2022. Each roll was assigned a unique number identifier by the manufacturer and wrapped in plastic for shipping. Upon arrival at the site, SCS's CQA Monitor inspected the rolls for damage and verified the roll identifications met the shipping manifest. A Genie forklift with a spreader bar attachment was used to offload the GCL rolls from the delivery trucks. The Genie forklift then stockpiled the rolls adjacent to the FGD-A Pond on a prepared soil pad that had compacted soil 6-inches above natural ground. The rolls remained sealed in their protective wrap and covered with an additional plastic tarp to prevent damage until ready for deployment consistent with specifications.

## 4.2 HDPE GEOMEMBRANE LINER CHARACTERISTICS

The 60-mil HDPE textured black geomembrane liner manufactured by Solmax was used to reline the FGD-A Pond. This liner is a co-extruded textured HDPE geomembrane liner.

Solmax provided MQC tests for the HDPE geomembrane liner to verify conformance with the specifications. The MQC test reports for the HDPE geomembrane liner are included in Appendix C.2 - Geosynthetic Manufacturers QA/QC, and SCS verified conformance with the specifications.

The following tests are based on 468,000 ft$^2$ of 60-mil textured HDPE geomembrane liner and 22,711 feet of seam installed at the FGD-A Pond. SCS reviewed the MQC test and conformance test results and verified the HDPE geomembrane liner was in conformance with specifications.

| Test | Type of Test | Frequency of Testing | Minimum Required | Actual Quantity | Passing Quantity |
|---|---|---|---|---|---|
| Manufacturer's Quality Control | Thickness | Each roll | 40 | 40 | 40 |
| | Density | Every 10 rolls | 4 | 4 | 4 |
| | Carbon Black Content | Every 2 rolls | 20 | 20 | 20 |
| | Carbon Black Dispersion | Every 10 rolls | 4 | 4 | 4 |
| | Tensile Strength | Every 2 rolls | 20 | 20 | 20 |
| | Tear Resistance | Every 5 rolls | 8 | 8 | 8 |
| | Puncture Resistance | Every 5 rolls | 8 | 8 | 8 |
| | Asperity Height | Every roll | 40 | 40 | 40 |
| Conformance Testing | Thickness | Per 100,000 $ft^2$ and every resin lot | 13 | 13 | 13 |
| | Density | | 13 | 13 | 13 |
| | Carbon Black Content | | 13 | 13 | 13 |
| | Carbon Black Dispersion | | 13 | 13 | 13 |
| | Tensile Properties | | 13 | 13 | 13 |
| Destructive Lab Tests | Seam Shear Strength | Per 500 linear feet of seam | 46 | 51 | 51 |
| | Seam Peel Strength | | 46 | 51 | 51 |

*Table 3: Geomembrane Manufacturer's Quality Control and Conformance Test Summary*

The HDPE geomembrane liner rolls were manufactured on June 18, April 17, September 8 and 9, and October 22 and 27, 2020; and April 2, 11, and May 2 through 4, 2021. These rolls were delivered to the site on June 22 and 23, 2021. Each roll was assigned a unique number identifier by the manufacturer. Upon arrival at the site, SCS's CQA Team inspected the rolls for damage and verified the roll identifications met the shipping manifest. A Genie forklift with a spreader bar attachment was used to offload the HDPE geomembrane liner rolls from the delivery trucks. The Genie forklift then stockpiled the rolls adjacent to the FGD-A Pond on a prepared soil pad that had compacted soil 6-inches above natural ground consistent with specifications.

## 4.3 CONSTRUCTION QUALITY CONTROL AND CONSTRUCTION QUALITY ASSURANCE

Construction Quality Control (CQC) was provided by Lone Star Lining, Inc., personnel on a full-time basis during the liner installation.

CQA monitoring of the installation and construction of the GCL and HDPE geomembrane liner systems was performed on a full-time basis by two qualified CQA Monitors under the direct supervision of the CQA Project Manager. CQA Monitors observed and documented deployment of the GCL and HDPE geomembrane liner, proper overlap configuration, proper orientation of panels, all seaming operations and non-destructive and destructive seam testing of the HDPE geomembrane liner, measured seam lengths, recorded panel dimensions, located all patches and repairs, and monitored ambient temperature readings 6 inches above the HDPE geomembrane liner. Inspection reports. Test results from the CQA effort on the HDPE geomembrane liner are located in Appendix D.2 – Geosynthetics.

## 4.4 GEOSYNTHETIC LINER INSTALLATION

The geosynthetic liner included a textured 60-mil HDPE geomembrane black liner installed in areas that required structural fill placement to repair the unacceptable 2-foot thick clay liner and over the

new GCL. The installation of the HDPE geomembrane liner and GCL occurred concurrently, during times that both materials were being installed. This allowed for the GCL to be placed on the geosynthetic liner subgrade and be covered and protected with the geomembrane within 3 hours of its placement.

The overall geosynthetic liner deployment began along the interior embankment sideslope at the southern end of the FGD-A Pond and then proceeded in a clockwise manner to the western corner and along the northwest embankment to the northern corner. For this deployment, the geosynthetic liner extended from the anchor trench to a minimum of 5 feet onto the pond floor. The deployment then transitioned along the northern corner working counterclockwise to the southeast along the northeast embankment. The liner along the northeast embankment started at the anchor trench and extended across the length of the floor until it met the liner placed along the northern and western embankment. The deployment continued on the west end of the peninsula, deploying from north to south, on the west peninsula embankment sideslope and pond floor. This deployment continued until it met geosynthetic liner on the southern embankment and the southern corner, west of the peninsula. The geosynthetic liner deployment then transitioned to the north tip of the peninsula, extending on the floor until it met prior geosynthetic liner deployed on the floor. Deployment then transitioned back to the northeastern embankment to the southeastern corner, and then proceeded in a clockwise manner to the southern corner, west of the peninsula. For this deployment, the geosynthetic liner extended from the anchor trench to approximately 5 feet onto the pond floor. The final deployment area took place from the north tip of the peninsula to the southern corner, west of the peninsula. Deployment occurred from north to south on the east peninsula embankment side slope, until it met geosynthetic liner deployed on the northeastern embankment.

### 4.4.1 Geosynthetic Clay Liner Installation

A Genie forklift with the spreader bar attachment was also used to deploy the GCL on the FGD-A Pond sideslopes and floor. For these operations, the Genie forklift would be positioned at the top of the pond adjacent to the anchor trench. A utility terrain vehicle (UTV) used clamps to secure the GCL at the top of the pond. The UTV would then drive down the interior sideslope of the pond and cover the sideslope and floor. Once the GCL had been placed, it was manually adjusted to the proper overlap utilizing the alignment markings placed on the edge by the manufacturer. The granular bentonite was placed on the seams to seal the edges and heat was applied to the longitudinal seams to bond (leister) the ends using a heat gun or butane torch. Loose panel ends were anchored by sandbags and all wrinkles and fish mouths were worked out or reduced. Each panel was assigned a unique number.

GCL panels were deployed such that GCL was exposed for a maximum of 3 hours before being covered by the HDPE geomembrane liner. No GCL was damaged, subject to rain or being wet, or otherwise compromised throughout the duration of GCL and HDPE geomembrane liner installation. Installed GCL was covered by HDPE geomembrane liner at the end of each workday.

### 4.4.2 60-Mil HDPE Geomembrane Liner Installation

The Genie forklift, with the spreader bar attachment, was used to deploy each HDPE geomembrane liner roll. For these operations, the Genie forklift would be positioned at the top of the pond adjacent to the anchor trench. A UTV would use clamps to secure the HDPE geomembrane liner at the top of the pond. The UTV would then drive down the interior sideslope of the pond and cover the placed GCL. Once the HDPE geomembrane liner was placed over the GCL, it would be manually adjusted to a minimum overlap of 4 inches. Loose panel ends were anchored by sandbags and all wrinkles and fish

mouths were worked out or reduced. Each panel was assigned a unique number. The seam area was cleaned using rags and brushes to remove all grease, moisture, dirt, and debris prior to seaming.

#### 4.4.2.1 Geomembrane Seaming

Before the start of the day's seaming operations, each operator performed trial seams on their seaming equipment. These tests were also performed after the noon break and at other times deemed necessary by the CQA Monitor, in accordance with the specifications. Each operator welded a minimum of 3-feet of HDPE geomembrane liner together for their trial seams and cut 4 sample bones from this section for testing. Two of the bones were tested in the peel mode and two were tested in shear mode using a field tensiometer provided by LSL. The minimum passing criteria is shown in Table 3: Minimum Required Seam Strength.

| Failure Mode | Test Method | Value (psi) |
|---|---|---|
| Shear | ASTM D6392 | 120 |
| Peel (Fusion) | ASTM D6392 | 91 |
| Peel (Extrusion) | ASTM D6392 | 78 |

*Table 4: Minimum Required Seam Strength*

Only equipment that passed the trial seam test was permitted to be used to seam the HDPE geomembrane liner. CQA test results documenting the trial seam, the welder, the welding apparatus number, time, date, ambient temperature, welding machine temperature, and speed are located in Appendix D.2 – Geosynthetics – Trial Weld.

The HDPE geomembrane liner seaming process occurred concurrently with the panel deployment. LSL primarily used hot wedge double track fusion welders to seam the overlap where two sections of HDPE geomembrane liner met. Extrusion welders were primarily used to seam patches at panel intersections (tees and cross joints) and HDPE pipe penetrations (FGD-A Pond to pump station pipe, drain line, and FGD-A/B Pond crossover pipe). The patches were installed using the same material as the HDPE geomembrane liner. The seaming operations were observed and documented by the CQA Monitors and verified that these results met specifications. Seaming logs are summarized in Appendix D.2 – Geosynthetics – Panel Seaming/Repairs.

#### 4.4.2.2 Geomembrane Repair

A repair patch was installed at each tee joint, cross joint, and defect observed during the HDPE geomembrane liner installation. A unique repair identification number was assigned by the CQA Monitors to each of these repairs in accordance with the specifications.

In accordance with the specifications, small creases and holes were repaired by applying a bead of extrudate over the defect. Defects larger than ¼-inch in size were patched. The patches were oval in shape and extended a minimum of 6 inches beyond the intersection or defect. Defective seams, or seams that could not be nondestructively tested, were capped with a patch. Surfaces of the geomembrane receiving repair work were abraded and cleaned prior to the installation of the repair.

#### 4.4.2.3 Non-Destructive Seam Continuity Testing

All double track fusion welded seams received an air pressure test. For this test, the air channel between the tracks of the two fusion welds were sealed off and an inflation needle and pressure gauge were inserted into the air channel. An air compressor then pressurized the channel to a minimum air

pressure of 30 psi for a minimum of 5 minutes. A passing test was achieved if the seam held the pressure or lost no more than 3 psi during the time period. Following a passed pressure test, the seal on the opposite end of the seam was removed to allow release of the air. The pressure gauge had to return to zero to verify that there was no blockage(s) within the seam.

All patches, repairs or extrusion welds were vacuum tested utilizing a vacuum box. For this test, a soapy water solution was applied to the seam. A clear rigid wall box with a plastic plexiglass top and neoprene gasket around the bottom was placed over the seam and a vacuum of at least 3 psi was applied to the box creating a seal between the box and the HDPE geomembrane liner. A passing test occurred if no soap bubbles were observed during a ten second interval. A failing test occurred with the appearance of soap bubbles which were indicative of pinholes, porosity, or non-bonded areas in the repair.

If a seam failed non-destructive testing, then retesting would be performed to isolate the leak. The seam would then be repaired a minimum of 6 inches on either side of the leak and retested until all of the seam length passed. If the CQA monitor felt the seam was questionable during any phase of the HDPE geomembrane liner installation, then the seam would be destructively tested (refer to the Destructive Sample Test Results for details). The results of non-destructive tests performed indicated the seams were in conformance with the specifications. Geomembrane Non-Destructive Logs are located in Appendix D.2 – Geosynthetics – Non-Destruct.

#### 4.4.2.4 Destructive Testing

The CQA personnel selected destructive test locations based on observations made during seaming or selected at random. A destructive sample (DS) was obtained at a minimum of 1 sample per 500 linear feet of seam. There was 22,711 linear feet of liner fusion seam installed at the FGD-A Pond. Based on a minimum requirement of 1 test per 500 linear feet of seam, 46 destructive tests were required and 51 destructive tests were performed.

The average seam length tested was 445 linear feet.

An additional 8 destructive tests (DX 1-8) were taken for the extrusion welding that took place to complete repairs.

Each destructive sample measured 48 inches in length and 6 inches in width. This sample was divided into three sections approximately 16 inches in length. One section was tested in the field. The second was sent to TRI Environmental, Inc. for independent laboratory testing. The third section was kept for archival records.

Ten samples (bones) were taken from each section for testing. Five bones were tested for sheer strength and five bones were tested for peel strength according to specifications. Each destructive test sample was considered to have passed when 4 out of 5 bones met both the strength requirements and exhibited film tear bond (FTB). SCS confirmed that the results of all 59 destructive tests performed indicated all 59 of the tests passed the requirements detailed in the specifications. A summary of destructive sample results can be found in Appendix D.2 – Geosynthetics – Destruct.

# 5.0 CONCRETE REVETMENT

Following the completion of GCL and HDPE geomembrane liner installation, a concrete erosion control lining (revetment) was installed on top of the 60-mil textured HDPE geomembrane liner along the upper sideslopes of FGD-A Pond. The concrete revetment was installed throughout the pond from the anchor trench at the top of the sideslope downward to elevation 434.0 feet mean sea level (msl). Along the sideslope areas that did not have the peninsula ramp above elevation 434.0 feet msl., the installed concrete revetment was approximately 55 feet long from the top crest of the sideslope to elevation 434.0 feet msl. Along the sideslope areas that did have the peninsula ramp above elevation 434.0 feet msl, the concrete revetment was approximately 70 feet long from the top crest of the sideslope across the 12 foot wide peninsula access road to elevation 434.0 feet msl.

The concrete revetment consisted of a HYDROTEX Uniform Section fabric form that is then filled with a pumpable fine aggregate concrete. The HYDROTEX fabric forms were manufactured by Synthetex, LLC. located in Peachtree Corners, Georgia. A 7,100 psi fine aggregate concrete was pumped into the fabric forms providing an erosion resistant concrete lining. Additional information on the fabric form and the aggregate concrete have been included in Appendix C.4 – Preconstruction – Concrete Revetment Product Data.

MR Geo began deploying fabric forms on January 14, 2022. Fine aggregate concrete was pumped into the fabric forms. MR Geo concluded revetment installation on March 12, 2022.

# 6.0 AS BUILT SURVEY

Davis was the record surveyor for this project. They performed survey operations throughout the project and their time on site is documented in the DFRs in Appendix A.4 – Daily Field Reports. Davis provided as-built survey drawings to SCS and the data from these surveys was used to create the final figures and as-built drawings. The Subgrade As-Built and Geomembrane Panel Layout As-Built are located in Appendix F – Record Drawings. Davis completed onsite surveying for the FGD-A Pond retrofit project on March 7, 2022.

# 7.0 PROFESSIONAL ENGINEER'S CERTIFICATION

"As evidenced by the project documentation and testing program results, the new FGD-A Pond liner was constructed in accordance with 40 C.F.R. § 257.72 and the January 6, 2021 "FGD-A Pond Retrofit," project drawings, and specifications.

I certify to the best of my professional judgement that the FGD-A Pond Retrofit at the Oak Grove Steam Electric Station was constructed in substantial accordance with the facility's registration, specifications, and construction drawings. This certification is contingent on the fact that all information supplied to the signatory authority, at the time of this certification is unquestionably accurate and was provided in good faith."

07/14/2022

James Roy Murray III, P.E., Texas Professional Engineer No. 73860 Certification Date

"As evidenced by the project documentation and testing program results, the new FGD-A Pond liner was constructed in accordance with 40 C.F.R. § 257.72 and the January 6, 2021 "FGD-A Pond Retrofit," project drawings, and specifications.

I certify to the best of my professional judgement that the FGD-A Pond Retrofit at the Oak Grove Steam Electric Station was constructed in substantial accordance with the facility's registration, specifications, and construction drawings. This certification is contingent on the fact that all information supplied to the signatory authority, at the time of this certification is unquestionably accurate and was provided in good faith."

07-14-22

Samuel A. Franco, P.E., Texas Professional Engineer No. 137046 — Certification Date

# APPENDIX – A

## Pertinent Information

# OAK GROVE STEAM ELECTRIC STATION
# FGD-A POND RETROFIT
# ROBERTSON COUNTY, TEXAS

GENERAL LOCATION MAP

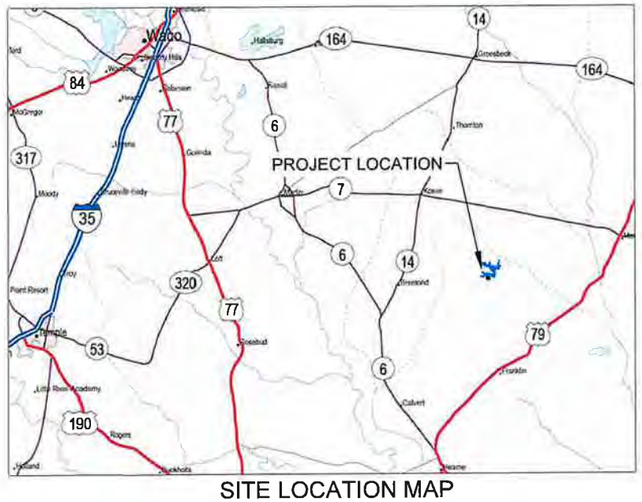
| DRAWING LIST | | | |
|---|---|---|---|
| LUMINANT DRAWING NO. | SHEET NO. | SHEET TITLE | REVISION |
| | 1 | TITLE SHEET | 0 |
| | 2 | GENERAL NOTES | 0 |
| | 3 | SITE OVERVIEW | 0 |
| | 4 | EXISTING PIPING CONDITIONS | 0 |
| | 5 | AS-CONSTRUCTED CLAY PLAN | 0 |
| | 6 | TOP OF EXCAVATED CLAY GRADING PLAN | 0 |
| | 7 | TOP OF RECOMPACTED CLAY GRADING PLAN | 0 |
| | 8 | TOP OF PROTECTIVE COVER GRADING PLAN | 1 |
| | 9 | PROFILES | 1 |
| | 10 | GRADING DETAILS | 0 |
| | 11 | FGD-A POND TO PUMPS INTAKE | 0 |
| | 12 | FGD-A POND TO FGD-B POND CROSSOVER PIPELINE PLAN AND PROFILE | 0 |
| | 13 | FGD-A POND TO FGD-B POND CROSSOVER PIPELINE DETAILS | 0 |
| | 14 | FGD-A POND INLET DETAILS | 0 |
| | 15 | FGD-B POND TO PUMPS SUCTION PIPELINE PLAN AND PROFILE | 0 |
| | 16 | FGD-B POND TO PUMPS SUCTION PIPELINE INTAKE | 0 |
| | 17 | PUMP STRUCTURE PROPOSED PIPING | 0 |
| | 18 | PIPING DETAILS - I OF II | 0 |
| | 19 | PIPING DETAILS - II OF II | 0 |
| | 20 | AS-CONSTRUCTED CLAY POINT TABLE | 0 |
| | 21 | TOP OF EXCAVATED CLAY POINT TABLE | 0 |
| | 22 | TOP OF RECOMPACTED CLAY POINT TABLE | 0 |

PREPARED FOR:

Luminant

PREPARED BY:

GOLDER ASSOCIATES INC.
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS USA 77032




SITE LOCATION MAP

ISSUED FOR CONSTRUCTION

| REV | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 1 | 2021-11-05 | REVISED PENINSULA EXTENSION | JBF | AJD | JBF | JBF |
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

~~APPENDIX E Revision 1 November 21, 2022~~

SEAL

11/24/21
JEFFREY B. FASSETT
85675
REGISTERED
PROFESSIONAL
ENGINEER

GOLDER ASSOCIATES INC
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT

GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TITLE SHEET**

| PROJECT NO | LUMINANT DRAWING NO | REV | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 1 | 1 of 22 | 1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS DESIRED, THE SHEET HAS BEEN RESIZED FROM ANSI D

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Path: \\latnvwa\acad\VISTA\GOSES\%_vdproj\s19129521_jjpk\acad\projstyle\1_plangraph\temp\%02_production\DWG\dn projects | File Name: 19129621-001-TITLE SHEET.dwg | Last Edited By: rsalazar | Date: 2021-09-17 Time: 9:55:47 AM | Plotted By: RSalazar

## GENERAL NOTES

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK. LUMINANT PROCEDURES SHALL BE USED FOR ALL EXCAVATIONS, HOT WORK, AND LOCK-OUT/TAG-OUT.
2. FOR THIS WORK, LUMINANT IS THE OWNER AND GOLDER ASSOCIATES INC. IS THE ENGINEER. THE COMPANY BIDDING THE WORK IS THE CONTRACTOR.
3. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES. ALL EXISTING UNDERGROUND UTILITIES SHOULD BE FIELD VERIFIED AND LOCATED BY POTHOLING PER LUMINANT REQUIREMENTS.
4. WORKERS SHALL BE AWARE OF ACTIVE EQUIPMENT IN THE VICINITY OF THE WORK AREA AND SHALL TAKE PRECAUTIONS NOT TO DISTURB OPERATING EQUIPMENT.
5. CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS PRIOR TO STARTING WORK, AND SHALL NOTIFY THE OWNER'S REPRESENTATIVE IF CONFLICTS EXIST ON THE DRAWINGS.
6. LOCATIONS AND DIMENSIONS OF EXISTING UTILITIES AND STRUCTURES ARE BASED ON DRAWINGS AND PARTIAL GROUND SURVEY PROVIDED BY LUMINANT AND SHOULD BE FIELD-VERIFIED.
7. CONTRACTOR SHALL PERFORM HOUSEKEEPING DUTIES ON A DAILY BASIS TO KEEP WORK AREAS CLEAN. HOUSEKEEPING SHALL BE PERFORMED AT THE COMPLETION OF THE WORK TO THE SATISFACTION OF THE OWNER.
8. CONTRACTOR SHALL STAGE EQUIPMENT AND MATERIALS ONLY IN AREAS APPROVED BY THE OWNER.
9. CONTRACTOR IS RESPONSIBLE FOR SURVEY CONTROL.
10. SPECIAL TOOLS AND OTHER REQUIRED INSTALLATION EQUIPMENT SUCH AS SLINGS, LEVER TOOLS, RATCHET JACKS, PULLING CABLES, ETC., FOR MAKEUP OF JOINTS SHALL BE FURNISHED BY THE CONTRACTOR.
11. TEST PLUGS, HYDROTEST PUMPS, GAUGES, RELIEF VALVES, AND ALL TESTING EQUIPMENT SHALL BE FURNISHED BY THE CONTRACTOR.
12. PIPING CROSSING UNDER ROADWAYS IS DESIGNED FOR AASHTO HS-20 LOADINGS. ALL PIPES SHALL HAVE A MINIMUM COVER DEPTH OF 2'-0" AS MEASURED FROM THE TOP OF THE PIPE UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
13. WHERE VERTICAL OR HORIZONTAL ALIGNMENT REQUIRES DEFLECTION FROM STRAIGHT LINE OR GRADE, SUCH DEFLECTION SHALL NOT EXCEED MAXIMUM DEFLECTION RECOMMEND BY THE PIPE MANUFACTURER. IF ALIGNMENT REQUIRES DEFLECTION EXCEEDING RECOMMENDED LIMITS, FURNISH SPECIAL BENDS TO PROVIDE ANGULAR DEFLECTIONS WITHIN THE ALLOWABLE LIMITS.
14. PIPE SHALL BE CUT NEATLY AND WITHOUT DAMAGE TO THE PIPE. UNLESS OTHERWISE RECOMMENDED BY THE PIPE MANUFACTURER, CUT PIPE WITH MECHANICAL CUTTER ONLY. CUT PLASTIC PIPE SQUARE, USING HAND SAW, AND REMOVE ALL BURRS.
15. APPROPRIATE PROVISIONS SHALL BE MADE TO PREVENT PIPE FLOTATION AND PREVENT FOREIGN MATERIAL FROM ENTERING PIPE OPENINGS. TEMPORARY BLINDS SHALL BE PLACED ON ALL PIPE ENDS AND STUB-UPS DURING INSTALLATION. BLINDS ARE NOT TO BE REMOVED UNTIL PERMANENT CONNECTIONS ARE MADE.
16. VALVE BODIES USED ON THE PROPOSED DRAIN LINES FROM FGD-A POND AND FGD-B POND SHALL BE SET ON A CONCRETE SUPPORT FOOTING AS APPROVED BY THE OWNER'S REPRESENTATIVE.
17. NEW WAFER KNIFE GATE VALVE WITHIN THE PUMP STRUCTURE WILL BE SUPPORTED BY EXISTING ADJACENT PIPING SUPPORTS.
18. IF DISTURBED DURING CONSTRUCTION, THE EXISTING GATE VALVE ON THE FGD-A TO FGD-B CROSSOVER PIPELINE SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL APPROVED BY THE OWNER'S REPRESENTATIVE AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE VALVE BODY. THE MATERIAL DIRECTLY ABOVE THE PIPE IN THE EMBEDMENT ZONE SHALL BE ONLY LIGHTLY COMPACTED TO AVOID DISTORTING THE PIPE.
19. CONFIGURATIONS AND DIMENSIONS SHOWN ARE BASED ON TYPICAL DIMENSIONS FOR FITTINGS AND VALVES. ACTUAL DIMENSIONS MAY VARY BY MANUFACTURER AND WILL REQUIRE FIELD ADJUSTMENTS.

## UNDERGROUND PIPE INSTALLATION

1. CONTRACTOR SHALL SUBMIT A TRENCHING SAFETY PLAN FOR REVIEW AND APPROVAL BY THE OWNER BEFORE ANY TRENCHING ACTIVITIES CAN BEGIN. THE PLAN SHALL INDICATE THE SYSTEMS, METHODS, AND TECHNIQUES TO BE USED TO ENSURE THAT ALL TRENCH SIDEWALLS WILL BE STABLE AND/OR GUARDED FOR THE PROTECTION OF PERSONNEL AND FACILITIES IN THE VICINITY OF THE WORK.
2. AS REQUIRED, CONTRACTOR SHALL PREPARE AND IMPLEMENT AN OWNER APPROVED PLAN TO CONTROL GROUNDWATER IN ALL DEVELOPED EXCAVATIONS (INCLUDING GROUNDWATER AND SURFACE WATER).
3. UNDERGROUND PIPE SHALL BE LOWERED INTO TRENCH BY MEANS OF DERRICK, ROPES, BELT SLINGS, OR OTHER EQUIPMENT RECOMMENDED BY THE PIPE SUPPLIER. TAKE SPECIAL CARE IN HANDLING PREFABRICATED SECTIONS OF HDPE PIPE - THE FUSED FITTINGS MAY NOT BE CAPABLE OF CARRYING THE WEIGHT OF ADJACENT PIPING. DO NOT DUMP OR DROP ANY MATERIALS INTO THE TRENCH.
4. FOR UNDERGROUND AND ON-GRADE HDPE PIPE, REST THE FULL LENGTH OF EACH SECTION OF THE PIPE SOLIDLY ON THE PIPE BED. DO NOT LAY PIPE IN WATER, OR WHEN FOUNDATION CONDITIONS ARE UNSUITABLE FOR THE WORK.
5. UNDERGROUND PIPING SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL APPROVED BY THE OWNER'S REPRESENTATIVE AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE MATERIAL DIRECTLY ABOVE THE PIPE IN THE EMBEDMENT ZONE SHALL BE ONLY LIGHTLY COMPACTED TO AVOID DISTORTING THE PIPE.
6. EMBANKMENT FILL (MORE THAN 12 INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING TEN (10) INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY.
7. FOR ALL UNDERGROUND PIPING, MARKING TAPE ENABLING DETECTION BY METAL DETECTOR (AS INDICATED IN THE SPECIFICATIONS) SHALL BE LOCATED ABOVE THE PIPE AT A DEPTH OF 1 TO 2 FEET BELOW THE FINISHED GRADE.

## HDPE PIPE INSTALLATION

1. FUSION MACHINE FOR BUTT FUSION OF HDPE PIPING SHALL BE FURNISHED BY THE CONTRACTOR.
2. ABOVE GRADE HDPE TO BE INSTALLED WITH AN EARTHEN BERM ANCHORAGE APPROXIMATELY EVERY 400 FEET WITH THE HDPE SNAKED BETWEEN ANCHORAGE POINTS APPROXIMATELY 20 FEET OFF A STRAIGHT LINE ALIGNMENT WITH 20 FEET HORIZONTAL CLEARANCE TO ALLOW THE HDPE PIPES TO EXPAND OR CONTRACT.
3. SECTIONS OF POLYETHYLENE PIPE SHOULD BE JOINED INTO CONTINUOUS LENGTHS ON THE JOBSITE ABOVE GROUND. THE JOINING METHOD SHALL BE THE BUTT FUSION METHOD AND SHALL BE PERFORMED IN STRICT ACCORDANCE WITH THE PIPE MANUFACTURER'S RECOMMENDATIONS BY CRAFT WORKERS CERTIFIED FOR THE FUSION MACHINE AND PIPING MATERIALS BEING UTILIZED. THE BUTT FUSION JOINING WILL PRODUCE A JOINT WITH WELD STRENGTH EQUAL TO OR GREATER THAN THE TENSILE STRENGTH OF THE PIPE ITSELF. ALL FIELD WELDS SHALL BE MADE WITH FUSION EQUIPMENT EQUIPPED WITH A DATA LOGGER. TEMPERATURE, FUSION PRESSURE AND A GRAPHIC REPRESENTATION OF THE FUSION CYCLE SHALL BE PART OF THE QUALITY CONTROL RECORDS.
4. MECHANICAL JOINING OF HDPE PIPE TO OTHER MATERIALS SHALL BE ACCOMPLISHED USING AN HDPE FLANGE ADAPTER WITH A DUCTILE IRON BACK-UP RING.
5. SOCKET FUSION, HOT GAS FUSION, THREADING, SOLVENTS, AND EPOXIES WILL NOT BE USED TO JOIN HDPE PIPE.
6. PRESSURE PIPING SYSTEMS CONSTRUCTED FROM HDPE MATERIAL SHALL BE LEAKAGE TESTED USING THE METHODOLOGY OUTLINED IN ASTM F2164, AND PER THE MANUFACTURER'S RECOMMENDATIONS AND THE PROJECT SPECIFICATIONS.

## STEEL PIPE INSTALLATION

1. COATING/PAINTING SHALL BE APPLIED AND TOUCHED UP AS DIRECTED BY THE OWNER.
2. ALL NEW PIPING WITHIN THE EXISTING PUMP STRUCTURE NEAR FGD-A POND SHALL BE SUPPORTED WITH MEMBERS CONSISTENT WITH THE EXISTING PIPE SUPPORTS IN THE STRUCTURE.
3. ALL WELDING SHALL BE COMPLETED BY QUALIFIED WELDERS.
4. ALL VALVES AND STEEL PIPING SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS

## SPECIFICATIONS

1. ALL MATERIALS AND INSTALLATION TO BE IN ACCORDANCE WITH THE SPECIFICATIONS OR OWNER APPROVED ALTERNATIVE SPECIFICATIONS.
2. CLAY LINER, GEOSYNTHETIC CLAY LINER (GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED IN ACCORDANCE WITH THE LINER QUALITY CONTROL PLAN.

## MATERIALS

1. CONTRACTOR IS RESPONSIBLE FOR PROCURING ADDITIONAL NEEDED QUANTITIES TO MAKE UP FOR SHORTAGES DUE TO LOSS, FIELD REVISIONS, WASTE, ETC.
2. CONTRACTOR TO FURNISH PLASTIC MARKING TAPE FOR NON-METALLIC UNDERGROUND PIPING IN ACCORDANCE WITH THE SPECIFICATION REQUIREMENTS.
3. ALL NEW SOLID WALL HDPE PIPING AND FITTINGS SHALL BE COMPOSED OF PE4710 RESIN CONSTRUCTED TO ASTM F714, OR ALTERNATE AS APPROVED BY THE OWNER'S REPRESENTATIVE.
4. ALL HDPE PIPING, FITTINGS, AND FLANGES SHALL HAVE IRON PIPE SIZING (IPS).
5. ALL NEW PERFORATED HDPE PIPING SHALL BE ADS N-12 PIPE.
6. ALL NEW STEEL PIPING AND FITTINGS SHALL BE ERW A53 STD SCHEDULE CARBON STEEL CONFORMING TO ASME 31.1 POWER PIPING.
7. ALL FLANGES SHALL CONFORM TO ASME B16.5 CLASS 150.
8. ALL PIPE, FITTINGS, FLANGES, AND VALVES FOR FGD-A TO PUMPS SUCTION LINE, FGD-B TO PUMPS SUCTION LINE, AND FGD-A TO FGD-B CROSSOVER LINE TO BE RATED FOR A 100 PSI DESIGN PRESSURE.
9. ALL THREADED FITTINGS SHALL HAVE NATIONAL PIPE THREAD (NPT) THREADS.
10. CONCRETE SHALL CONFORM TO ACI 318 AND ACI 301 AS APPLICABLE. THE CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE UTILIZED WITHIN THE FGD-A POND AND FGD-B POND SHALL BE SULFATE RESISTANT CONCRETE.
11. PIPE BEDDING AND EMBEDMENT SHALL CONSIST OF ON-SITE OR IMPORTED EARTHEN MATERIAL CLASSIFYING UNDER ASTM D2487 AS WELL-GRADED SAND (SW OR SW-SM) OR WELL-GRADED GRAVEL (GW OR GW-GM) OR AS OTHERWISE APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE. PIPE BEDDING SHALL CONTAIN NO PARTICLES LARGER THAN ½ INCH, AND FREE FROM ROOTS, DEBRIS, OR ANY OTHER SUBSTANCE THAT WOULD HARM THE PIPE OR MIGHT IMPAIR THE PERFORMANCE OF THE MATERIALS AS BEDDING OR EMBEDMENT FOR THE PIPE. FINAL MATERIAL SELECTION SHALL BE APPROVED BY THE OWNER'S REPRESENTATIVE.
12. CRUSHED STONE FOR ROADWAY SURFACING SHALL BE APPROVED BY OWNER'S REPRESENTATIVE.
13. WASHED GRAVEL FOR DRAIN LINE EMBEDMENT IN THE FGD-A POND AND FGD-B POND SHALL BE APPROVED BY OWNER'S REPRESENTATIVE.

## REFERENCES

1. SITE LOCATION: J. HENSLEY SURVEY, ABSTRACT NO. 395174, ROBERTSON COUNTY, TEXAS.
2. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020, AND FEBRUARY 17, 2020.
3. COORDINATES ARE BASED ON OAK GROVE STEAM ELECTRIC STATION PLANT GRID SYSTEM.
4. ELEVATIONS ARE BASED ON MEAN SEA LEVEL DATUM.
5. EXISTING PLANT DRAINS PIPELINE LOCATIONS ARE TAKEN FROM A GROUND SURVEY PERFORMED BY SAM, INC. ON OCTOBER 23, 2014. EXACT LOCATIONS OF EXISTING PIPES TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
6. EXISTING PUMP STRUCTURE DETAILS FROM DRAWING A2YF00-0-CD-1-YD.00.PL-08 REVISION 3 DATED AUGUST 28, 2008.
7. EXISTING PIPING DETAILS IN VICINITY OF THE PUMP STRUCTURE FROM PIPING ISOMETRIC DRAWINGS:
   a. A2YF0-IS-5-WR.0015-01 DATED JANUARY 11, 2008
   b. A2YF0-IS-5-WR.0020-01 DATED DECEMBER 16, 2008
   c. A2YF0-IS-5-WR.0020-02 DATED DECEMBER 16, 2008
   d. A2YF0-IS-5-WR.0030-01 DATED DECEMBER 16, 2008
   e. A2YF0-IS-5-WR.0030-02 DATED DECEMBER 16, 2008
   f. A2YF0-IS-5-WR.0040-01 DATED DECEMBER 16, 2008
   g. A2YF0-IS-5-WR.0050-01 DATED DECEMBER 16, 2008
   h. A2YF0-IS-5-WR.0050-02 DATED DECEMBER 16, 2008
   i. A2YF0-IS-5-WR.0050-03 DATED DECEMBER 16, 2008
   j. A2YF0-IS-5-WR.0060-01 DATED DECEMBER 16, 2008
   k. A2YF0-IS-5-WR.0060-02 DATED FEBRUARY 14, 2008
   l. A2YF0-IS-5-WR.0060-03 DATED FEBRUARY 29, 2008
   m. A2YF0-IS-5-WR.0065-01 DATED APRIL 9, 2008

## EXISTING PIPELINE SCHEDULE

| LINE CALLOUT | SOURCE | LINE ID | EXISTING LINE |
|---|---|---|---|
| PLANT DRAIN LINE #1 | 400 SUMP WEST AREA 2 BASIN PUMP #63 | 0-PD-0400-PE01-14"-N | 14 in HDPE DR-11 |
| PLANT DRAIN LINE #2 | 100 SUMP BOILER AREA SUMP #8 | 0-PD-0100-PE01-24"-N | 24 in HDPE DR-11 |
| PLANT DRAIN LINE #3 | 200 SUMP TURBINE AREA HOLDING BASIN PUMPS #62 | 0-PD-0200-PE01-14"-N | 14 in HDPE DR-11 |
| PLANT DRAIN LINE #4 | FLY ASH BASIN | 0 DGN-001-6"-71-N | 6 in HDPE DR-17 |
| PLANT DRAIN LINE #5 | 300 SUMP FR WEST BASIN PUMPS | 0-PD-0300-PE01-14"-N | 14 in HDPE DR-11 |
| PLANT DRAIN LINE #6 | REAGENT PREPARATION AREA SUMP PUMP | 0-PD-0501-PE01-4"-N | 4 in HDPE DR-11 |
| PLANT DRAIN LINE #7 | DEWATERING AREA SUMP | 0-PD-0502-PE01-4"-N | 4 in HDPE DR-11 |
| PLANT DRAIN LINE #8 | FGD BLOWDOWN | 0-PD-0360-PE01-3"-N | 3 in HDPE DR-11 |
| PLANT DRAIN LINE #9 | COMMON DEWATERING (RECLAIM) AREA SUMP | 4"-OFC-HDPE-150 | 4 in HDPE DR-9 |
| PLANT DRAIN LINE #10 | LIGNITE SETTLING POND | 14"- | 14 in HDPE DR-11 |
| PLANT DRAIN LINE #11 | HEAVY EQUIPMENT MAINTENANCE LINE | 4"- | 4 in HDPE DR-17 |
| PLANT DRAIN LINE #12 | LANDFILL LINE | 14"- | 14 in HDPE DR-17 |

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

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HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, SUITE 280
HOUSTON, TEXAS 77032
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www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**GENERAL NOTES**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | 2 of 22 | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | | 2 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSI D

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LEGEND

- LIMIT OF REGISTERED LANDFILL
- SOIL STOCKPILE AREA

ISSUED FOR CONSTRUCTION

0 300 600
1" = 600' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT

GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**SITE OVERVIEW**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 3 of 22 | 3 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B
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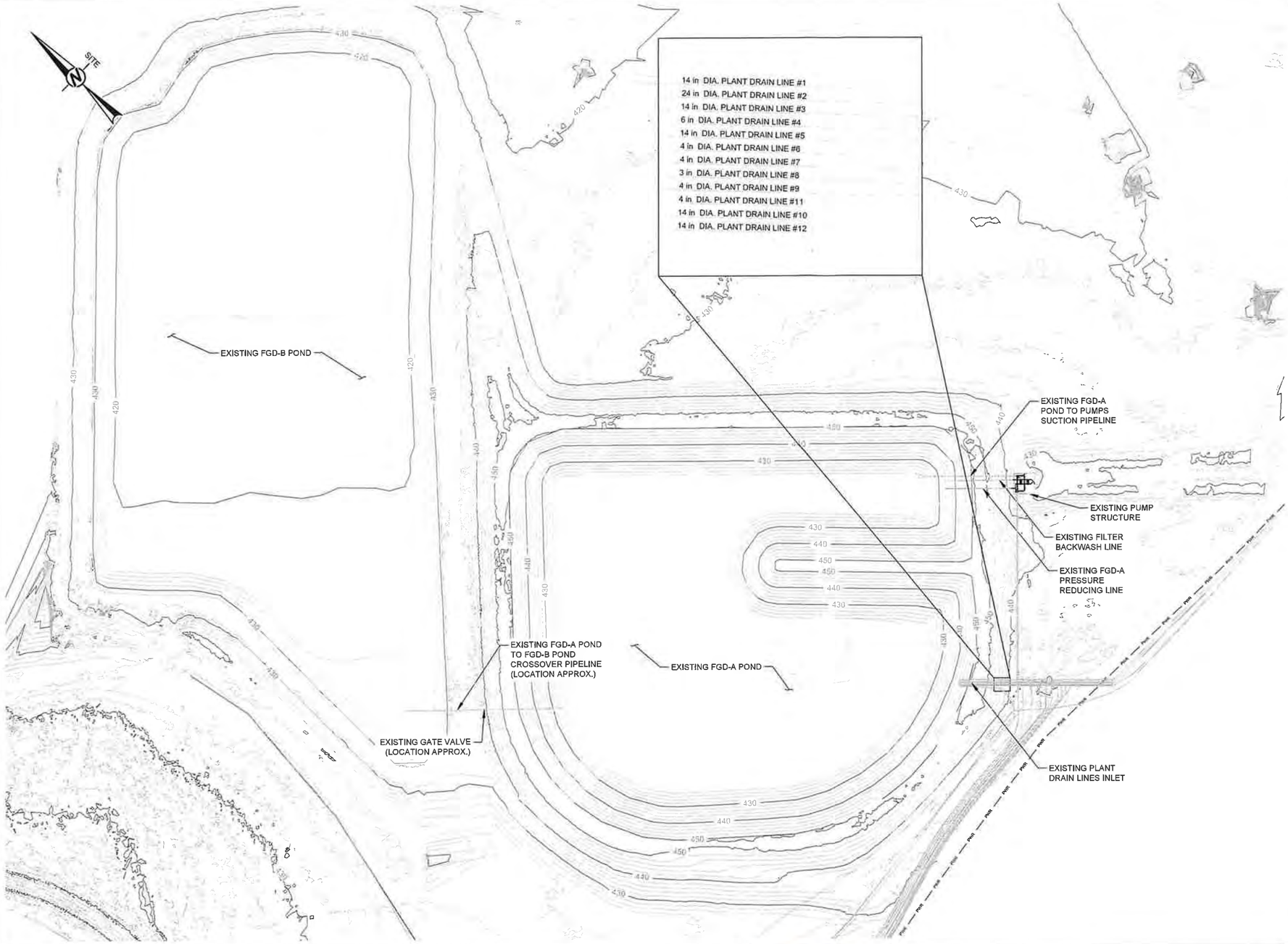


**LEGEND**

- 430 — EXISTING GRADES (REFERENCE 1 AND 2)
- PWR — PWR — EXISTING OVERHEAD POWER LINES
- EXISTING STEEL PIPING
- EXISTING HDPE PIPING

**NOTE(S)**

1. PLANT DRAINS PIPELINE ARRANGEMENT AND LABELING BASED ON DRAWING AYF00-0-PY-5-MS.00.00-01 DATED NOVEMBER 7, 2012.
2. EXISTING PLANT DRAINS PIPELINE LOCATIONS ARE TAKEN FROM A GROUND SURVEY PERFORMED BY SAM, INC. ON OCTOBER 23, 2014. EXACT LOCATIONS OF EXISTING PIPES TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 80 160
1" = 80' FEET

| REV | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

SEAL

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CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**EXISTING PIPING CONDITIONS**

| PROJECT NO | LUMINANT DRAWING NO. | REV | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 4 of 22 | 4 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN INCORRECTLY PRINTED OR SCALED

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LEGEND

- AS-CONSTRUCTED TOP OF CLAY 10-FT MAJOR CONTOUR
- AS-CONSTRUCTED TOP OF CLAY 2-FT MINOR CONTOUR
- EXISTING GROUND 25-FT MAJOR CONTOUR
- EXISTING GROUND 5-FT MINOR CONTOUR

POINT GROUPS

- 1000 CERTIFIED TOP OF CLAY

NOTES

1. CERTIFIED TOP OF CLAY CONTROL POINTS CORRESPOND TO SUBGRADE CERTIFICATION POINTS SURVEYED BY SAM, INC. DURING THE CONSTRUCTION OF THE CLAY LINER IN 2008.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 50 100
1" = 100' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT

GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**AS-CONSTRUCTED CLAY PLAN**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | 5 of 22 | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | | 5 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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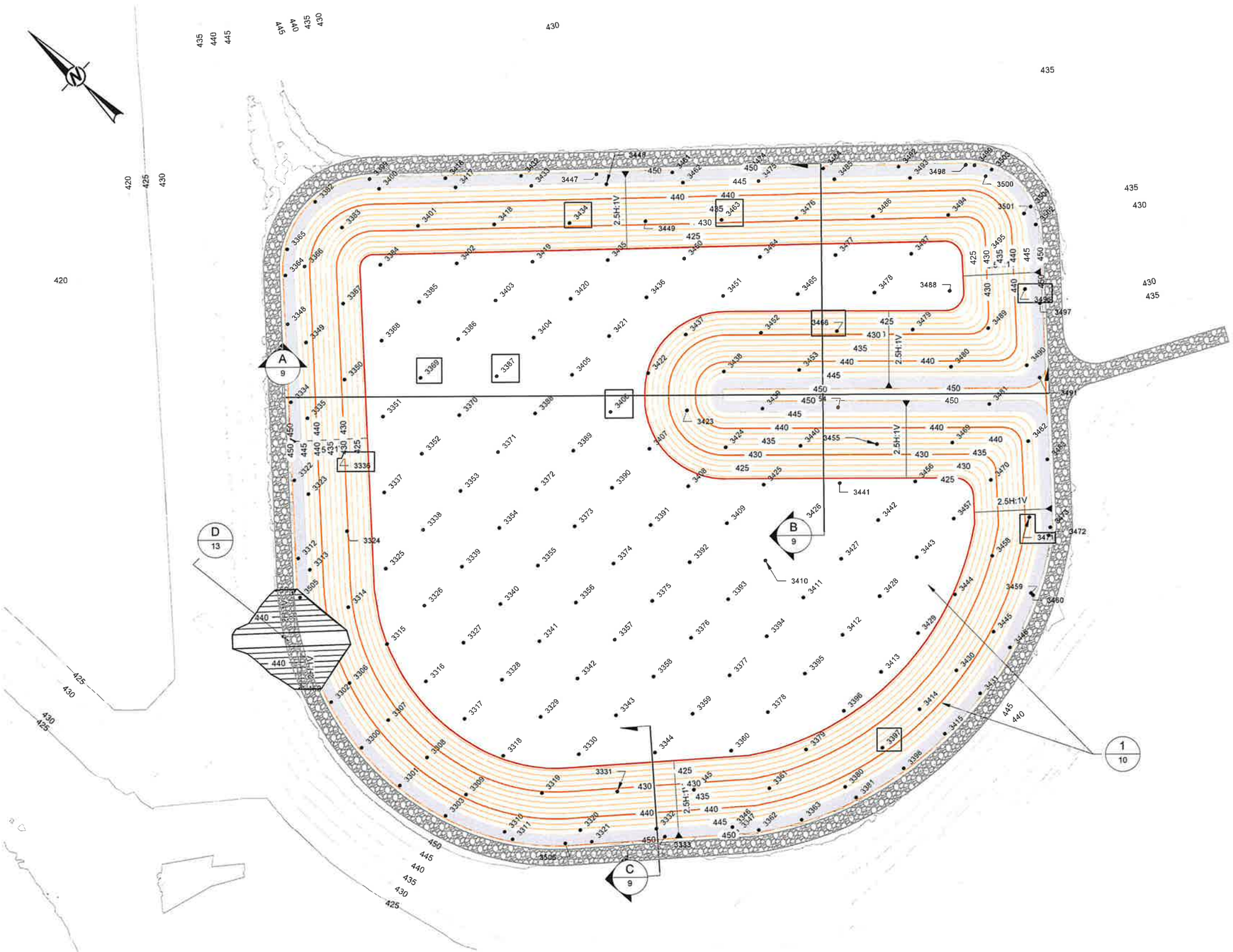



**LEGEND**

- PROPOSED TOP OF EXCAVATED CLAY BREAKLINE
- PROPOSED TOP OF EXCAVATED CLAY 10-FT MAJOR CONTOUR
- PROPOSED TOP OF EXCAVATED CLAY 2-FT MINOR CONTOUR
- EXISTING GROUND 25-FT MAJOR CONTOUR
- EXISTING GROUND 5-FT MINOR CONTOUR
- SEE NOTE 3

**POINT GROUPS**

- 3000 TOP OF EXCAVATED CLAY
- 3387 SEE NOTE 4

**NOTES**

1. CONTROL POINTS ARE SET TO GENERALLY PROVIDE A MINIMUM 2.2-FT THICK CLAY FOLLOWING EXCAVATION. A 0.2-FT BUFFER IS INCLUDED TO ACCOUNT FOR POTENTIAL CLAY LAYER THICKNESS REDUCTION DURING RECOMPACTION.
2. THE FLOOR SHALL BE EXCAVATED TO A UNIFORM ELEVATION OF 421.20 FT
3. THE UPPER PORTION OF THE EXISTING CLAY LINER HAS BEEN ERODED. SEE DRAWING 10.
4. ATTENTION IS DRAWN TO POINTS SHOWN INSIDE A BORDER. BASED ON AS-BUILT INFORMATION, THESE POINTS MAY HAVE LESS THAN A 0.2-FT OF BUFFER.
5. EXCAVATIONS THROUGH FGD-A POND EMBANKMENT SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT REQUIREMENTS.
6. PIPE INSTALLATION THROUGH THE FGD-A POND EMBANKMENT SHALL BE COMPLETED DURING THE LINER RETROFIT WORK. EMBANKMENT FILL (MORE THAN 12-INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING 10-INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY.
7. CLAY LINER (OR GENERAL FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED ON THE INSIDE FACE OF THE EMBANKMENT DURING THE LINER RETROFIT WORK IN ACCORDANCE WITH THE LINER QUALITY CONTROL PLAN.

**REFERENCES**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 50 100
1" = 100' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

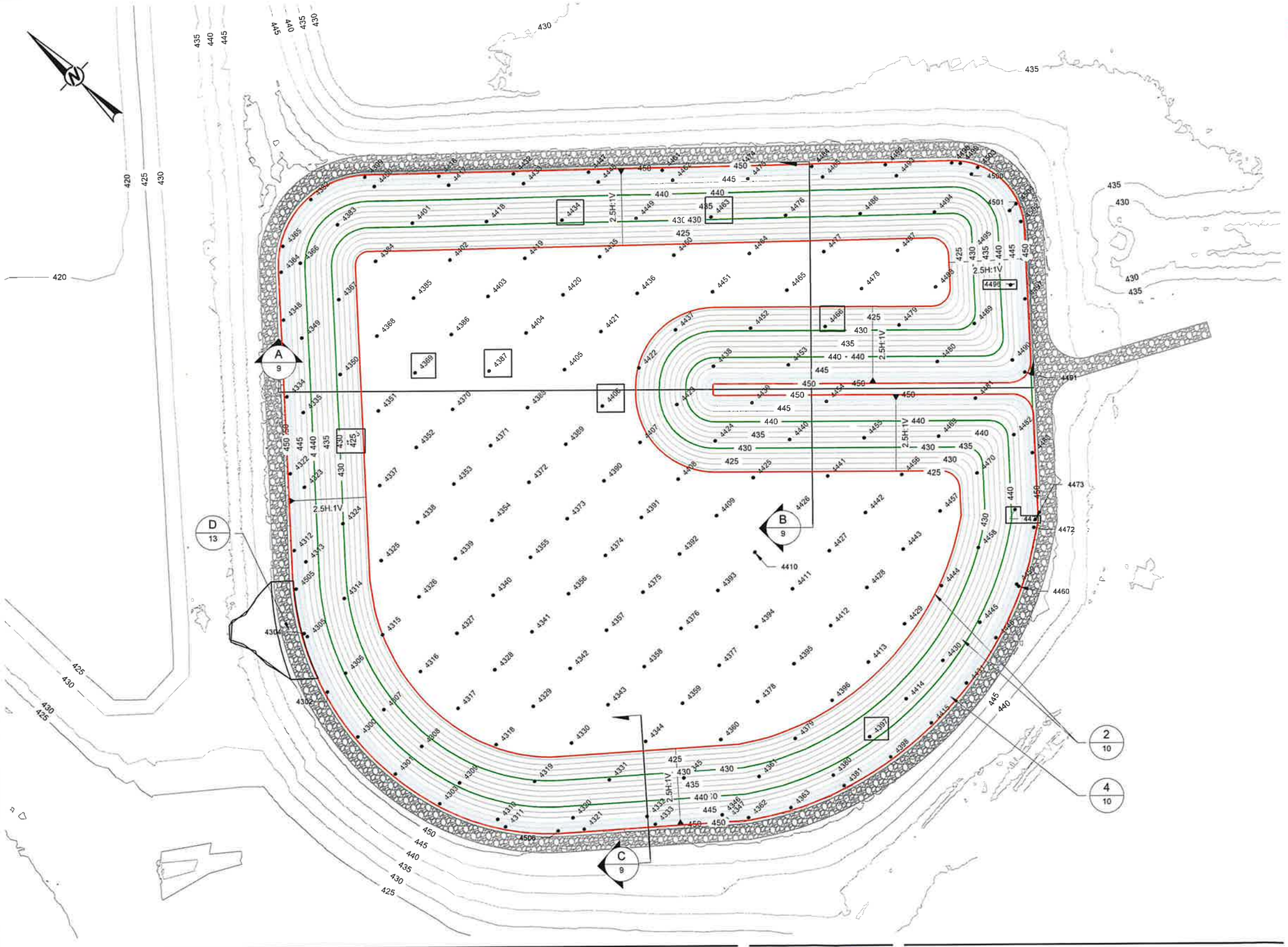
PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TOP OF EXCAVATED CLAY GRADING PLAN**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | 6 of 22 | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | | 6 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

Plotted By: Taylor.Jones@golder.com | Plot Date/Time: 2021-09-16 Time 2:26:09 PM | Printed By: RSJazar Date: 2021-09-17 Time 9:11:32 AM | Last Edited By: rsalazar Date: 2021-09-16 Time 2:26:09 PM | File Name: 19129621-023.dwg | Layout: C:\USERS\RSALAZAR\GOLDER\WSP_FINDAS\19129621_TopMOD_PRE\DRAWINGS\




LEGEND

- PROPOSED TOP OF RECOMPACTED CLAY BREAKLINE
- PROPOSED TOP OF RECOMPACTED CLAY 10-FT MAJOR CONTOUR
- PROPOSED TOP OF RECOMPACTED CLAY 2-FT MINOR CONTOUR
- EXISTING GROUND 25-FT MAJOR CONTOUR
- EXISTING GROUND 5-FT MINOR CONTOUR
- SEE NOTE 3

POINT GROUPS

- 4000 TOP OF RECOMPACTED CLAY
- 4466 SEE NOTE 4

NOTES

1. CONTROL POINTS ARE SET TO PROVIDE A MINIMUM 2.0-FT THICK CLAY LAYER.
2. THE FLOOR ELEVATION IS SET AT A UNIFORM ELEVATION OF 421.0 FT.
3. THE UPPER PORTION OF THE EXISTING CLAY LINER HAS BEEN ERODED. SEE DRAWING 10.
4. ATTENTION IS DRAWN TO POINTS SHOWN INSIDE A BORDER, BASED ON AS-BUILT INFORMATION, THESE POINTS MAY HAVE LESS THAN A 0.2-FT OF BUFFER.
5. PIPE INSTALLATION THROUGH THE FGD-A POND EMBANKMENT SHALL BE COMPLETED DURING THE LINER RETROFIT WORK.
6. CLAY LINER (OR GENERAL FILL OVERLAID BY EQUIVALEMTN OWNER-APPROVED GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED ON THE INSIDE FACE OF THE RECOMPACTED EMBANKMENT EXCAVATED FOR PIPE INSTALLATION.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 50 100
1" = 100' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

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TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TOP OF RECOMPACTED CLAY GRADING PLAN**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 7 of 22 | 7 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI D

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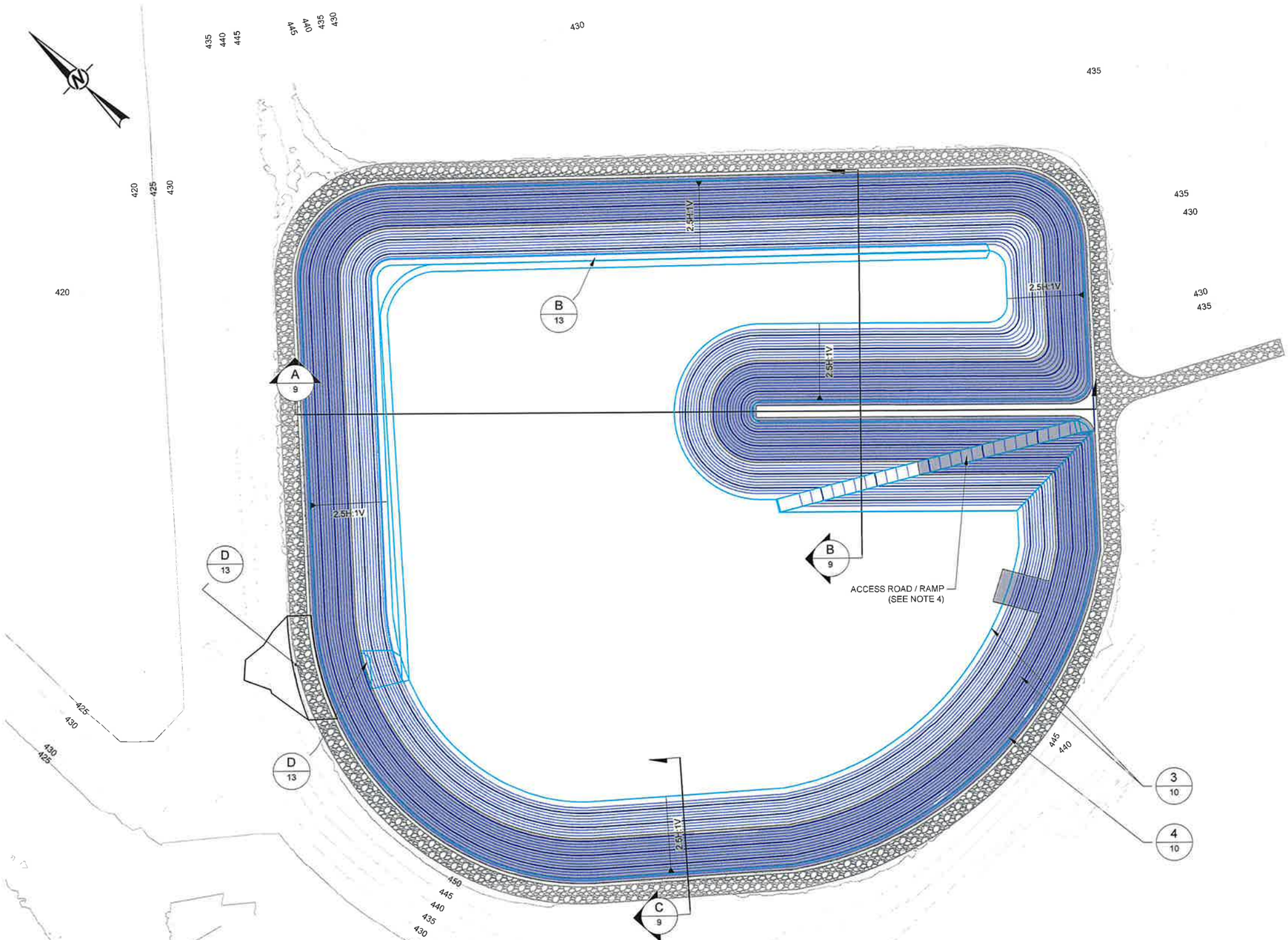


LEGEND

- PROPOSED TOP OF PROTECTIVE COVER BREAKLINE
- PROPOSED TOP OF PROTECTIVE COVER 5-FT MAJOR CONTOUR
- PROPOSED TOP OF PROTECTIVE COVER 1-FT MINOR CONTOUR
- EXISTING GROUND 25-FT MAJOR CONTOUR
- EXISTING GROUND 5-FT MINOR CONTOUR
- GROUT MATTRESS
- AGGREGATE SURFACE ROAD (SEE NOTE 8)

NOTES

1. THE FLOOR ELEVATION IS SET AT A UNIFORM ELEVATION OF 422.5 FT.
2. PROTECTIVE COVER TO BE PLACED 1.5-FT THICK OVER GEOMEMBRANE LINER ON THE FLOOR AS SHOWN ON DRAWING 10. PROTECTIVE COVER MATERIAL TO BE APPROVED BY OWNER'S REPRESENTATIVE.
3. ACCESS ROAD/RAMP SHALL BE 12-FT WIDE AND PROGRESS FROM THE CREST TO THE FLOOR AT A 10% MAXIMUM SLOPE. ACCESS ROAD / RAMP SHALL BE CONSTRUCTED USING SOIL OR CCR AS APPROVED BY OWNER'S REPRESENTATIVE. COMPACTED FILL OR CCR SHALL BE COVERED WITH PROTECTIVE COVER.
4. SEE LINER QUALITY CONTROL PLAN FOR REQUIREMENTS OF CCR PLACEMENT IN THE ACCESS RAMP AND AS PROTECTIVE COVER.
5. GROUT MATTRESS SHALL CONSIST OF HYDROTEX US600 WITH $\frac{1}{4}$ IN. DIA. CABLE IN LONGITUDINAL DIRECTION AT 3 FT. CENTERS.
6. THE GROUT MATTRESS SHALL EXTEND FROM ELEV. 434.0 THROUGH THE ANCHOR TRENCH.
7. THE AGGREGATE IN THE SURFACE ROAD SHALL CONFORM TO TXDOT ITEM 247, TYPE A, GRADE 1-2.

REFERENCES

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

0 50 100
1" = 100' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 1 | 2021-11-05 | REVISED PENINSULA EXTENSION | JBF | AJD | JBF | JBF |
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

~~APPENDIX E-Revision 1 November 21, 2022~~

SEAL

11/23/21
JEFFREY B. FASSETT
85675
LICENSED
PROFESSIONAL
ENGINEER

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TOP OF PROTECTIVE COVER GRADING PLAN**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 1 | 8 of 22 | 8 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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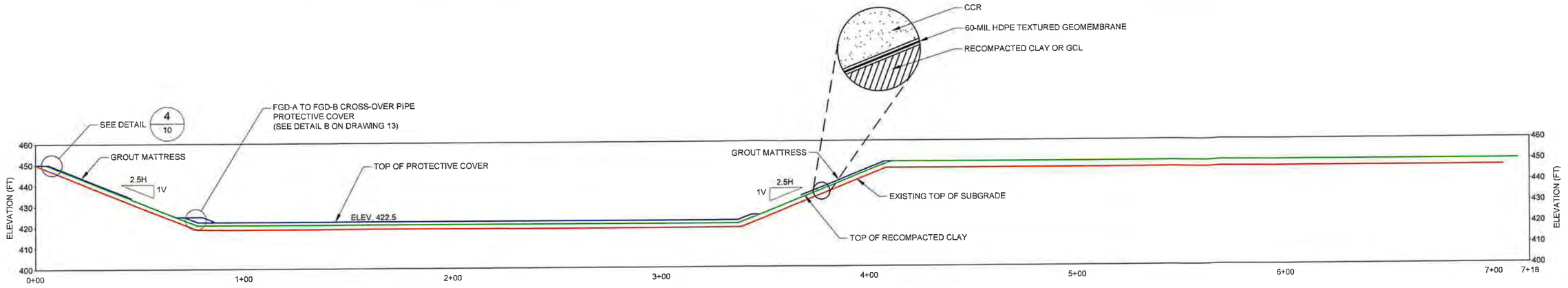
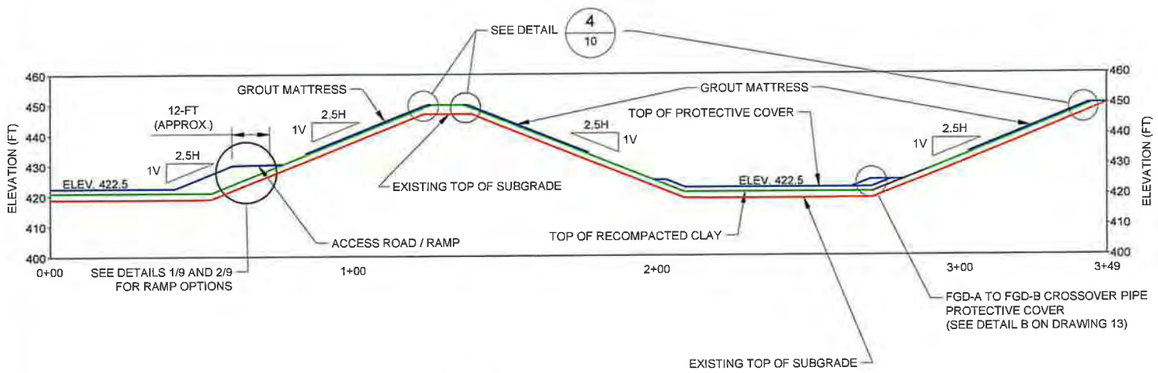



SCALE 1" = 50' A 9 PENINSULA - VERTICAL CROSS-SECTION

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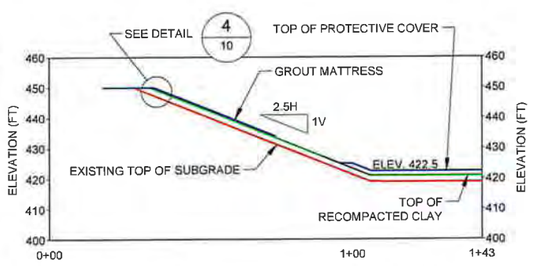


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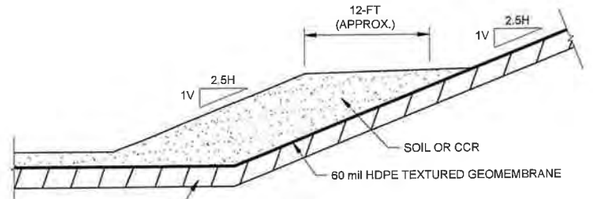


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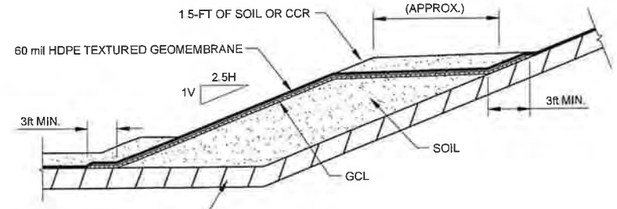


SCALE: NTS 2 9 OPTION B

LEGEND

- PROPOSED TOP OF PROTECTIVE COVER
- PROPOSED TOP OF RECOMPACTED CLAY
- EXISTING TOP OF SUBGRADE

4/10 SEE LINER DETAIL IV

NOTES

1. ACCESS ROAD / RAMP SHALL BE 12 FT WIDE AND PROGRESS FROM THE CREST TO THE FLOOR AT A 10% MAXIMUM SLOPE. ACCESS ROAD / RAMP SHALL BE CONSTRUCTED USING SOIL OR CCR (BOTTOM ASH) FOR OPTION A AND SOIL FOR OPTION B AS APPROVED BY OWNER'S REPRESENTATIVE.
2. SEE LINER QUALITY CONTROL PLAN FOR REQUIREMENTS OF SOIL OR CCR PLACEMENT IN THE ACCESS RAMP AND AS PROTECTIVE COVER.
3. THE EXISTING CLAY LINER DIRECTLY BELOW THE ACCESS RAMP FOR OPTION B DOES NOT REQUIRE RECOMPACTION.

0 25 50
1" = 50' FEET

| REV | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 1 | 2021-11-05 | REVISED PENINSULA EXTENSION | JBF | AJD | JBF | JBF |
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

~~APPENDIX E-Revision 1 November 21, 2022~~

SEAL

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TEXAS REGISTRATION F-2578

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CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**PROFILES**

| PROJECT NO | LUMINANT DRAWING NO | REV | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 1 | 9 of 22 | 9 |

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File Name: 19129621-004.dwg | Last Edited By: ajdamond Date: 2021-11-05 Time: 10:04 PM
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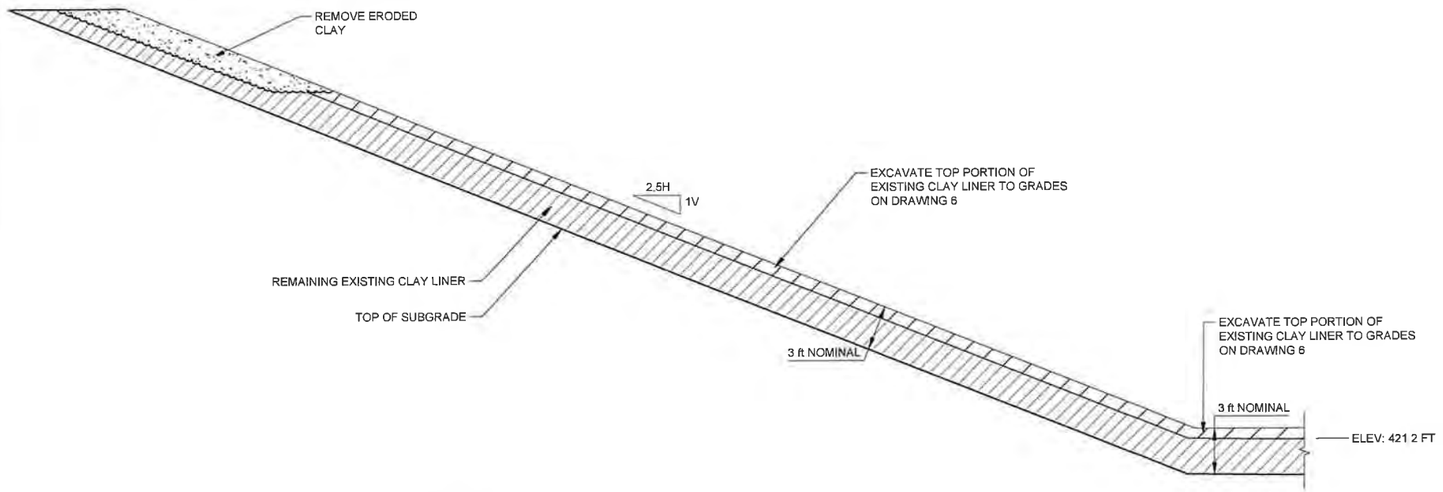
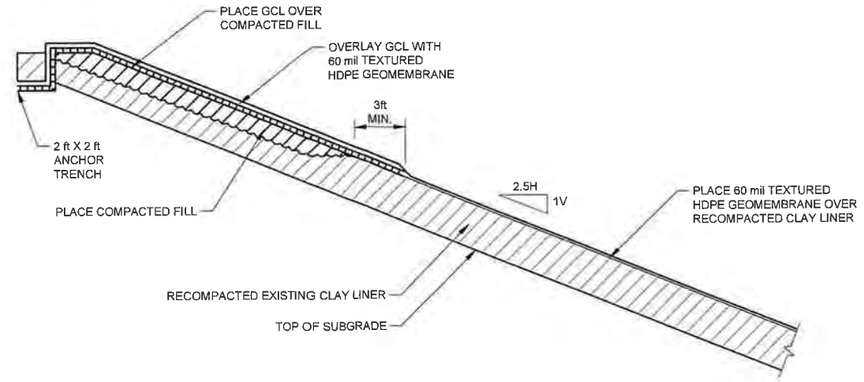



SCALE NTS 1/10 LINER DETAIL I

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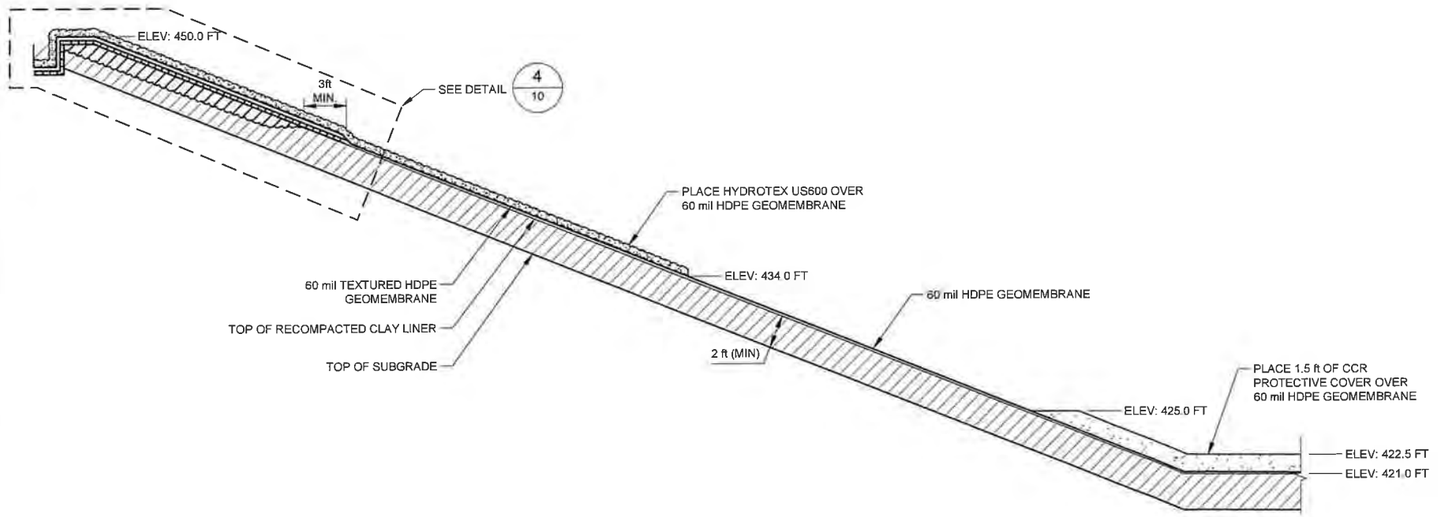


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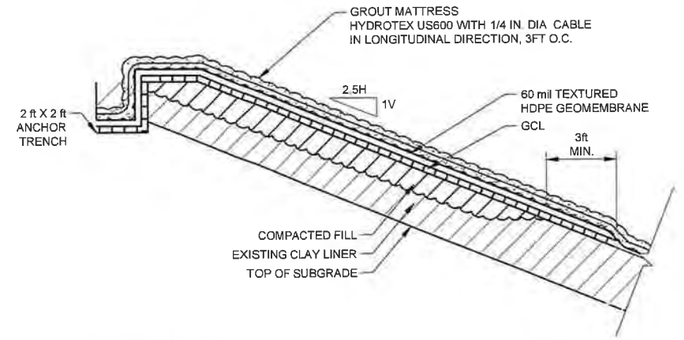


SCALE NTS 4/10 LINER DETAIL IV

ISSUED FOR CONSTRUCTION

| REV | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |
| | | ~~APPENDIX E-Revision 1 November 21, 2022~~ | | | | |

SEAL

GOLDER ASSOCIATES INC
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

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HOUSTON, TEXAS 77032
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[+1] (281) 821-6868
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PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**GRADING DETAILS**

| PROJECT NO | LUMINANT DRAWING NO | REV | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 10 of 22 | 10 |

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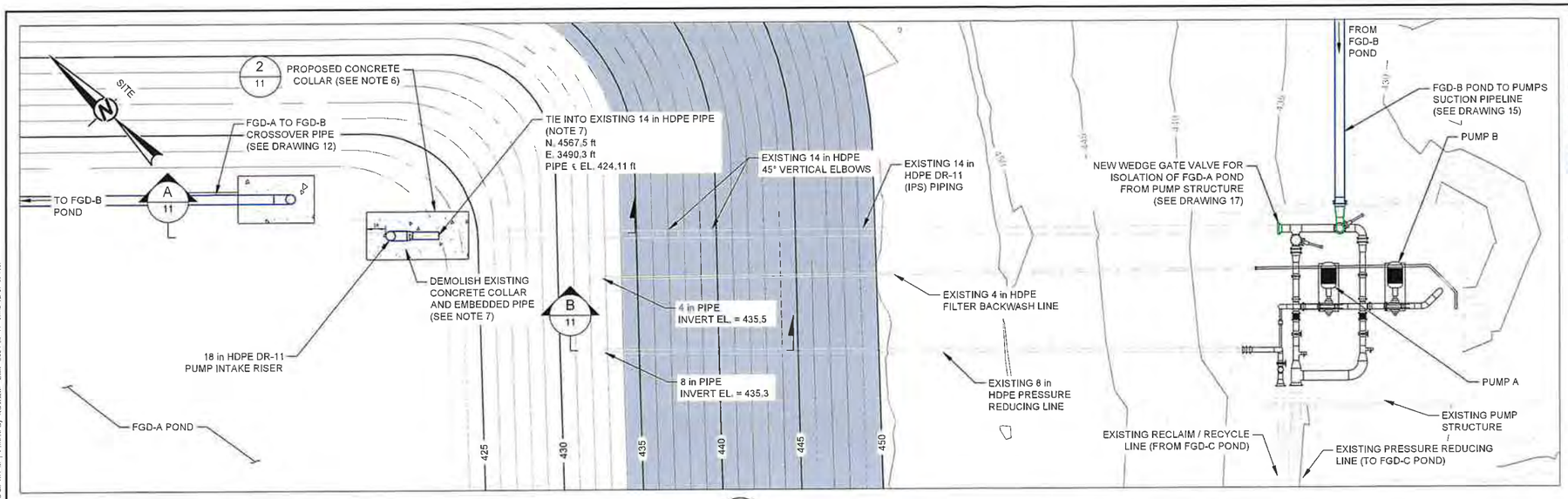
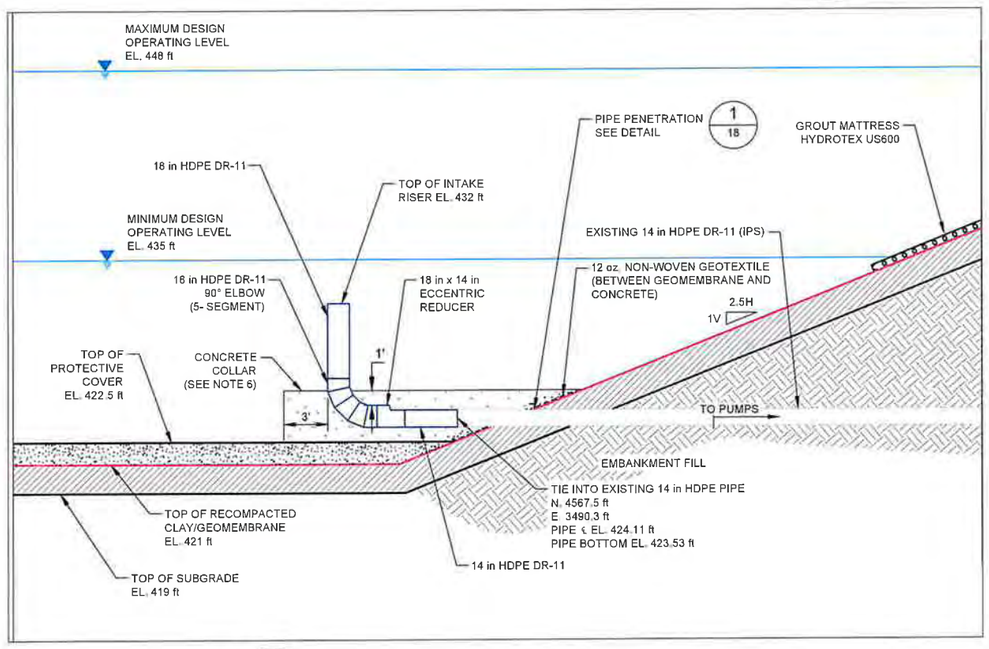
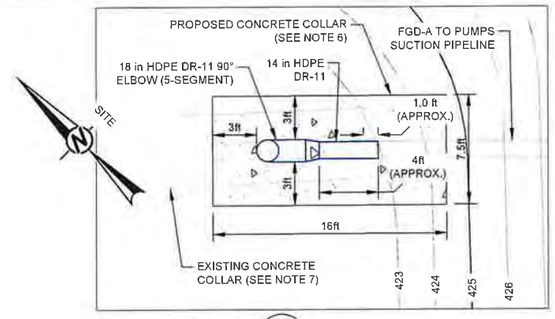


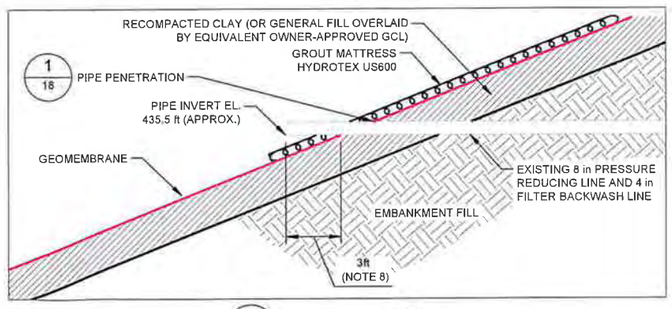

SCALE 1" = 10' 1/11 FGD-A POND TO PUMP SUCTION PIPELINE PLAN




SCALE N.T.S. A/11 FGD-A POND TO PUMP SUCTION PIPELINE PROFILE VIEW




SCALE 1" = 5' 2/11 CONCRETE COLLAR




SCALE N.T.S. B/11 EXISTING 8 in PIPE PENETRATION

**LEGEND**

- 436 — EXISTING GRADES (REFERENCE 1)
- 430 — PROPOSED TOP OF PROTECTIVE COVER GRADES
- EXISTING STEEL PIPING
- EXISTING HDPE PIPING
- PROPOSED STEEL PIPING
- PROPOSED HDPE PIPING
- GROUT MATTRESS (HYDROTEX US600)

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) DR-11 (IRON PIPE SIZING) SOLID WALL UNLESS OTHERWISE INDICATED.
4. UNDERGROUND PIPING SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE PROTECTIVE COVER, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.
5. NO PIPING OR CONCRETE SHOULD BE IN DIRECT CONTACT WITH THE GEOMEMBRANE. A 12-OZ NON-WOVEN GEOTEXTILE SHALL BE PLACED BETWEEN THE CONCRETE AND THE GEOMEMBRANE. A 60 mil HDPE GEOMEMBRANE RUB-SHEET SHALL BE TACK WELDED TO THE LINER IN AREAS WHERE PIPING IS RESTING ON THE LINER.
6. A SULFATE RESISTANT CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE COLLAR TO EXTEND APPROXIMATELY THREE (3) FEET AROUND THE RISER PIPE AND TO HAVE A MINIMUM OF 12 INCHES OF COVER ABOVE AND BELOW THE PIPE.
7. EXISTING 14 in HDPE PIPELINE SHALL BE CUT SQUARE APPROXIMATELY ONE (1) FOOT DOWNSTREAM OF THE EXISTING CONCRETE COLLAR. CONCRETE COLLAR AND EMBEDDED PIPING TO BE DEMOLISHED AND REMOVED. PROPOSED HDPE PIPING TO BE FUSION WELDED TO EXISTING PIPE
8. PIPE LENGTH FOR THE EXISTING 8 in HDPE PRESSURE REDUCING LINE AND THE 4 in HDPE FILTER BACKWASH LINE TO BE FIELD FIT AS REQUIRED TO ACHIEVE THE SPECIFIED PIPE PENETRATION INTO THE FGD-A POND.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 10 20
1" = 10' FEET

0 5 10
1" = 5' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

SEAL

GOLDER ASSOCIATES INC
TEXAS REGISTRATION F-2578

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CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-A POND TO PUMPS INTAKE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 11 of 22 | 11 |

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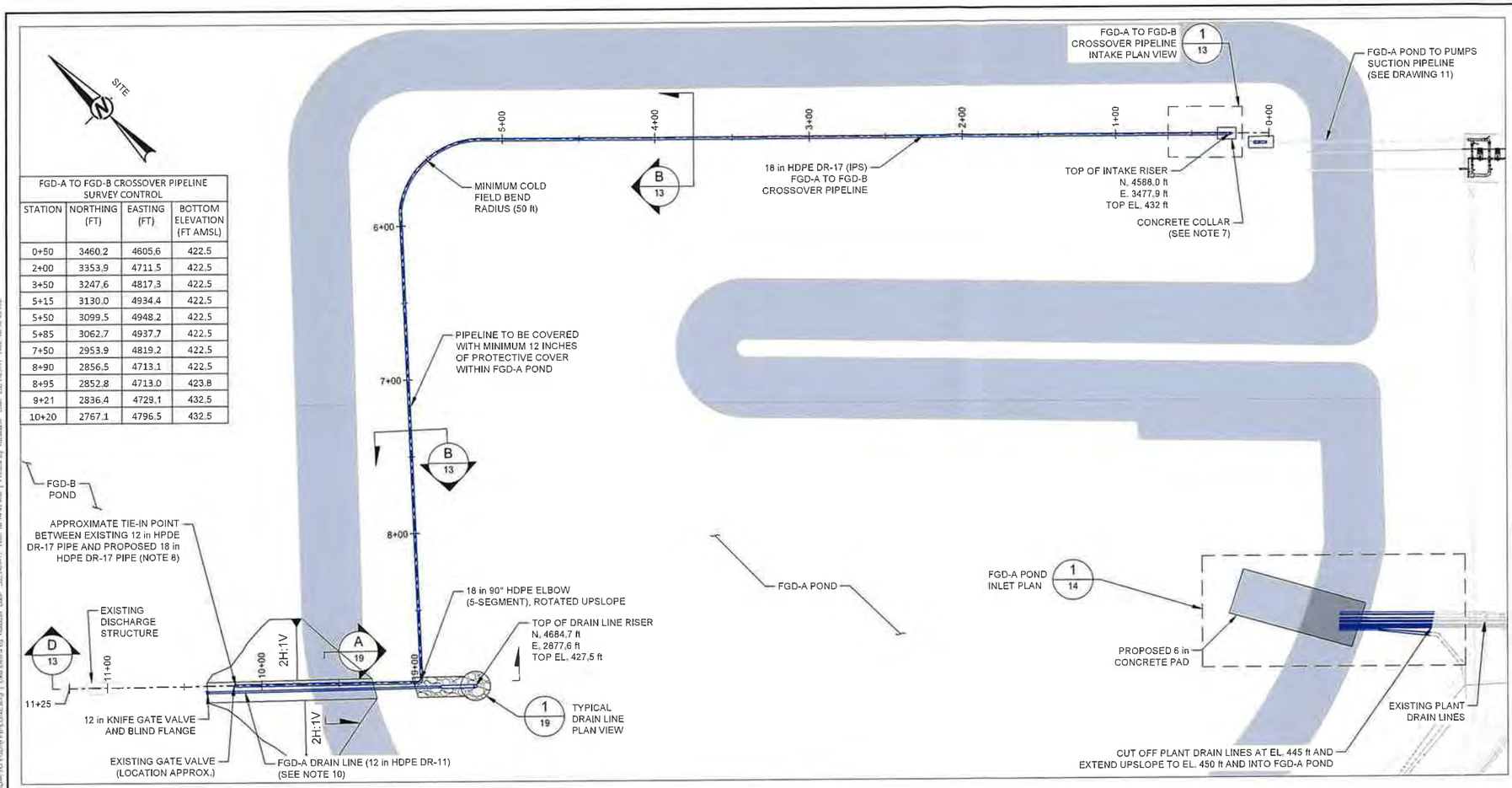
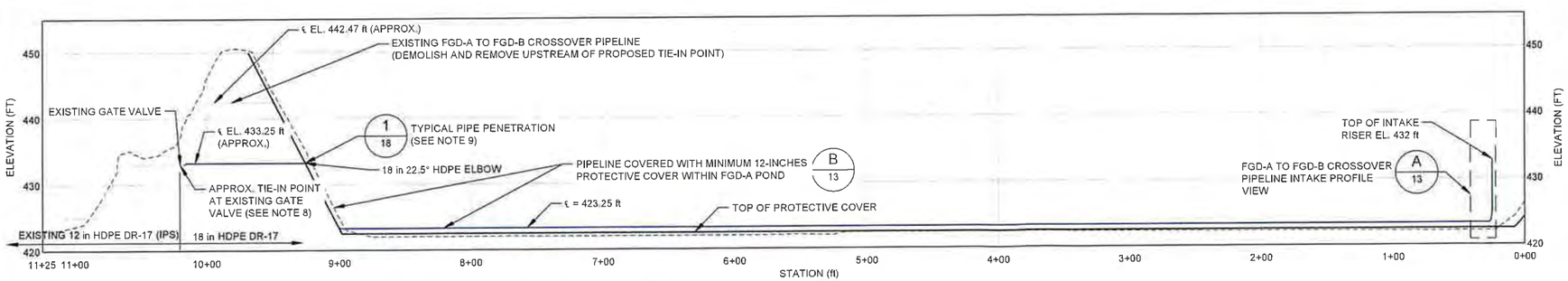



| FGD-A TO FGD-B CROSSOVER PIPELINE SURVEY CONTROL | | | |
|---|---|---|---|
| STATION | NORTHING (FT) | EASTING (FT) | BOTTOM ELEVATION (FT AMSL) |
| 0+50 | 3460.2 | 4605.6 | 422.5 |
| 2+00 | 3353.9 | 4711.5 | 422.5 |
| 3+50 | 3247.6 | 4817.3 | 422.5 |
| 5+15 | 3130.0 | 4934.4 | 422.5 |
| 5+50 | 3099.5 | 4948.2 | 422.5 |
| 5+85 | 3062.7 | 4937.7 | 422.5 |
| 7+50 | 2953.9 | 4819.2 | 422.5 |
| 8+90 | 2856.5 | 4713.1 | 422.5 |
| 8+95 | 2852.8 | 4713.0 | 423.8 |
| 9+21 | 2836.4 | 4729.1 | 432.5 |
| 10+20 | 2767.1 | 4796.5 | 432.5 |




0 50 100
1" = 50' FEET

SCALE 1" = 50' 5x VERTICAL EXAGGERATION

A 12 FGD-A TO FGD-B PIPELINE

0 40 80
1" = 40' FEET

**LEGEND**

- 439 — EXISTING GRADES (REFERENCE 1)
- 430 — PROPOSED TOP OF PROTECTIVE COVER GRADES
- EXISTING STEEL PIPING
- EXISTING HDPE PIPING
- PROPOSED STEEL PIPING
- PROPOSED HDPE PIPING
- GROUT MATTRESS (HYDROTEX US600)

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) DR-11 (IRON PIPE SIZING) SOLID WALL UNLESS OTHERWISE INDICATED.
4. EXCAVATION THROUGH THE FGD-A POND EMBANKMENT SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT REQUIREMENTS.
5. UNDERGROUND PIPING (THROUGH THE FGD-A POND EMBANKMENT) SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE PROTECTIVE COVER, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.
6. NO PIPING OR CONCRETE SHOULD BE IN DIRECT CONTACT WITH THE GEOMEMBRANE. A 12-OZ NON-WOVEN GEOTEXTILE SHALL BE PLACED BETWEEN THE CONCRETE AND THE GEOMEMBRANE. A 60 mil HDPE GEOMEMBRANE RUB-SHEET SHALL BE TACK WELDED TO THE LINER IN AREAS WHERE PIPING IS RESTING ON THE LINER.
7. A SULFATE RESISTANT CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE COLLAR TO EXTEND APPROXIMATELY THREE (3) FEET AROUND THE RISER PIPE AND TO HAVE A MINIMUM OF 12 INCHES OF COVER ABOVE THE PIPE.
8. CONTRACTOR TO FIELD IDENTIFY TIE-IN LOCATION AND INDICATE ANY PROPOSED CHANGES TO TIE-IN FOR OWNER'S APPROVAL.
9. PIPE INSTALLATION THROUGH THE FGD-A POND EMBANKMENT SHALL BE COMPLETED DURING THE LINER RETROFIT WORK. CLAY LINER (OR GENERAL FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED ON THE INSIDE FACE OF THE EMBANKMENT DURING THE LINER RETROFIT WORK IN ACCORDANCE WITH THE LINER QUALITY CONTROL PLAN. PIPING WITHIN FGD-A POND SHALL BE COMPLETED AFTER PROTECTIVE COVER PLACEMENT.
10. THE PROPOSED FGD-A POND DRAIN LINE TO FOLLOW THE SAME PROFILE AS THE PROPOSED FGD-A POND TO FGD-B POND CROSSOVER PIPELINE THROUGH THE EMBANKMENT WHICH SEPARATES THE TWO PONDS. THE FGD-A POND DRAIN LINE SHALL BE DAYLIGHTED NEAR THE EXISTING KNIFE GATE VALVE ON THE FGD-A POND TO FGD-B POND CROSSOVER PIPELINE AND TERMINATED WITH A KNIFE GATE VALVE AND BLIND FLANGE.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. AS-CONSTRUCTED SURVEY OF FGD-B POND PERFORMED BY SAM, INC. ON DECEMBER 7, 2011.
3. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

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LUMINANT POWER

CONSULTANT
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MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-A POND TO FGD-B POND CROSSOVER PIPELINE PLAN AND PROFILE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | 12 of 22 | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | | 12 |

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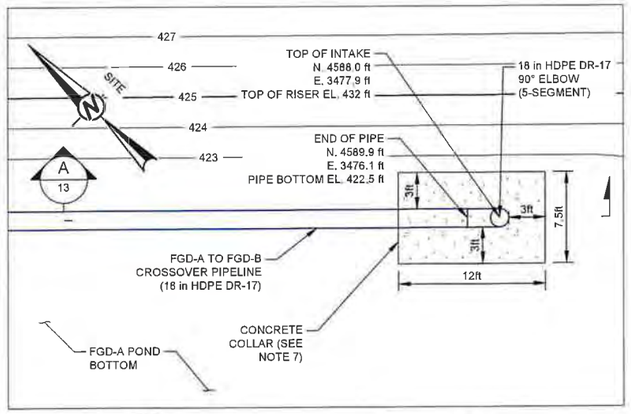
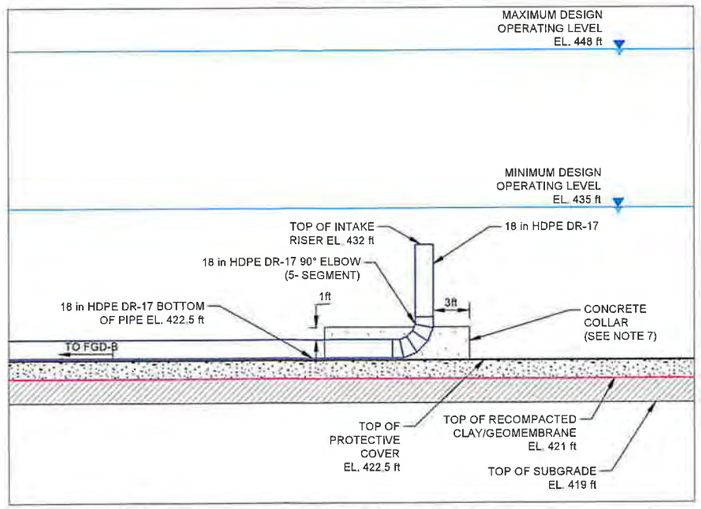
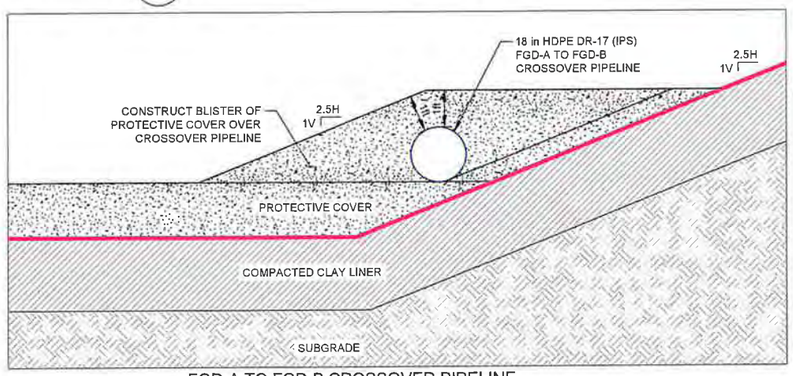


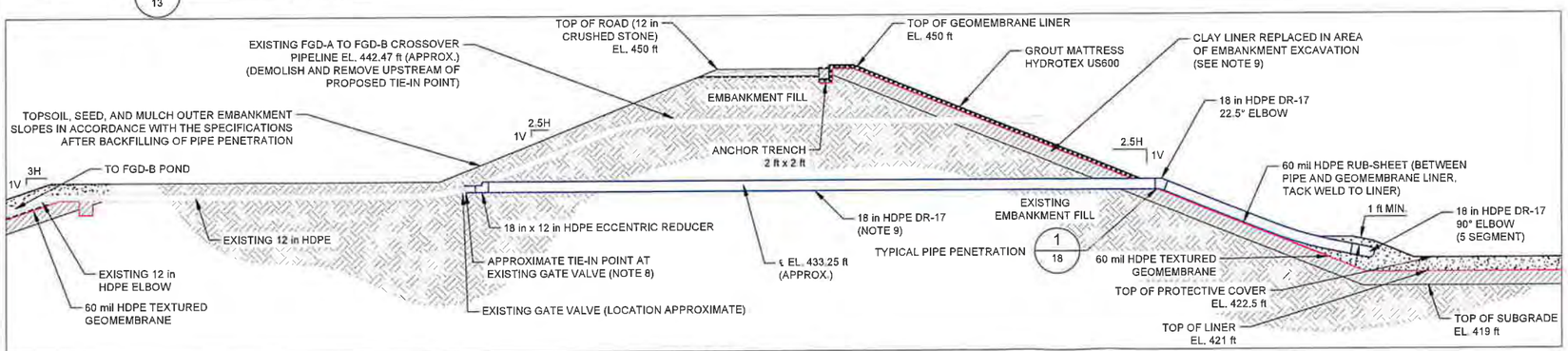

SCALE 1" = 6' 1/13 FGD-A TO FGD-B CROSSOVER PIPELINE INTAKE PLAN VIEW




SCALE 1" = 6' A/13 FGD-A TO FGD-B CROSSOVER PIPELINE INTAKE PROFILE VIEW




SCALE N.T.S. B/13 FGD-A TO FGD-B CROSSOVER PIPELINE PROTECTIVE COVER BLISTER




SCALE 1" = 10' D/13 FGD-A TO FGD-B CROSSOVER PIPELINE EMBANKMENT CUT PROFILE

**LEGEND**

430 PROPOSED TOP OF PROTECTIVE COVER GRADES

EXISTING HDPE PIPING

PROPOSED HDPE PIPING

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) DR-11 (IRON PIPE SIZING) SOLID WALL UNLESS OTHERWISE INDICATED.
4. EXCAVATIONS THROUGH FGD-A POND EMBANKMENT SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT REQUIREMENTS.
5. UNDERGROUND PIPING (THROUGH THE FGD-A POND EMBANKMENT) SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE PROTECTIVE COVER, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.
6. NO PIPING OR CONCRETE SHOULD BE IN DIRECT CONTACT WITH THE GEOMEMBRANE. A 12-OZ NON-WOVEN GEOTEXTILE SHALL BE PLACED BETWEEN THE CONCRETE AND THE GEOMEMBRANE. A 60 mil HDPE GEOMEMBRANE RUB-SHEET SHALL BE TACK WELDED TO THE LINER IN AREAS WHERE PIPING IS RESTING ON THE LINER.
7. A SULFATE RESISTANT CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE COLLAR TO EXTEND APPROXIMATELY THREE (3) FEET AROUND THE RISER PIPE AND TO HAVE A MINIMUM OF 12 INCHES OF COVER ABOVE THE PIPE.
8. CONTRACTOR TO FIELD IDENTIFY TIE-IN LOCATION AND INDICATE ANY PROPOSED CHANGES TO TIE-IN FOR OWNER'S APPROVAL.
9. PIPE INSTALLATION THROUGH THE FGD-A POND EMBANKMENT SHALL BE COMPLETED DURING THE LINER RETROFIT WORK. EMBANKMENT FILL (MORE THAN 12 INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING TEN (10) INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. CLAY LINER (OR GENERAL FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED ON THE INSIDE FACE OF THE EMBANKMENT DURING THE LINER RETROFIT WORK IN ACCORDANCE WITH THE LINER QUALITY CONTROL PLAN.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 6 12
1" = 6' FEET

0 10 20
1" = 10' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

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[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-A POND TO FGD-B POND CROSSOVER PIPELINE DETAILS**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | 13 of 22 | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | | 13 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI D

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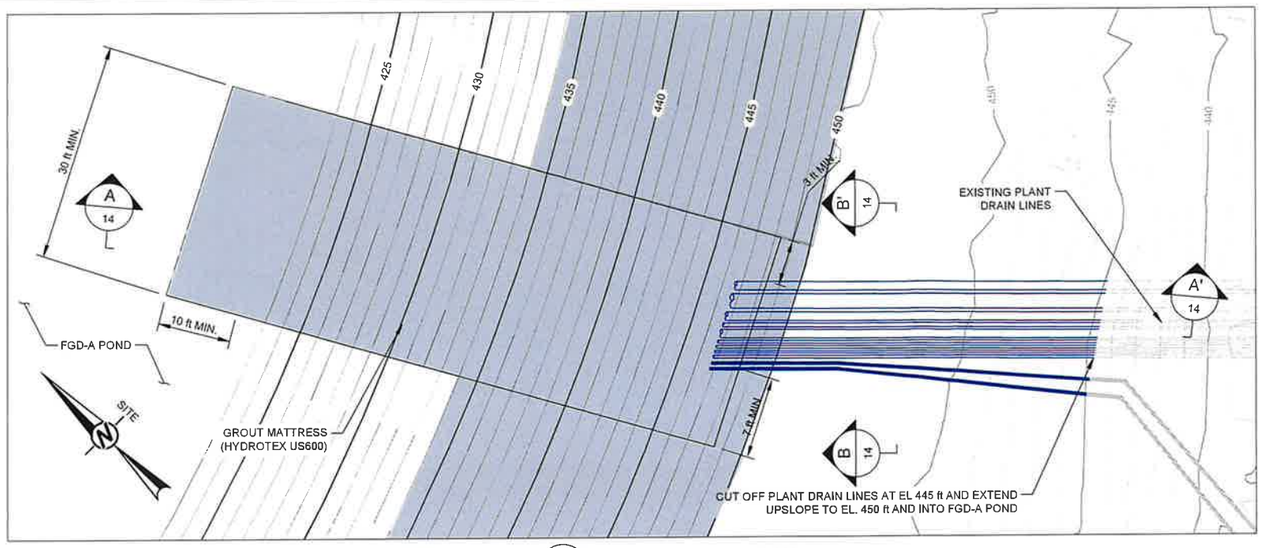
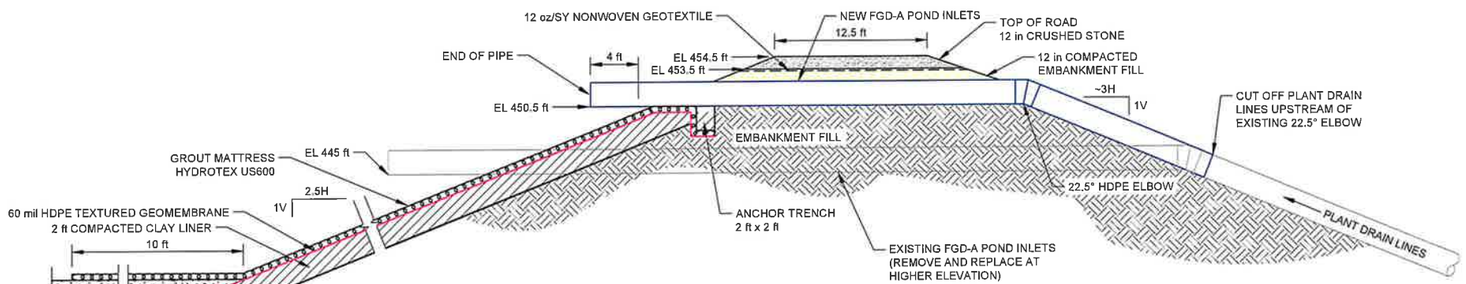
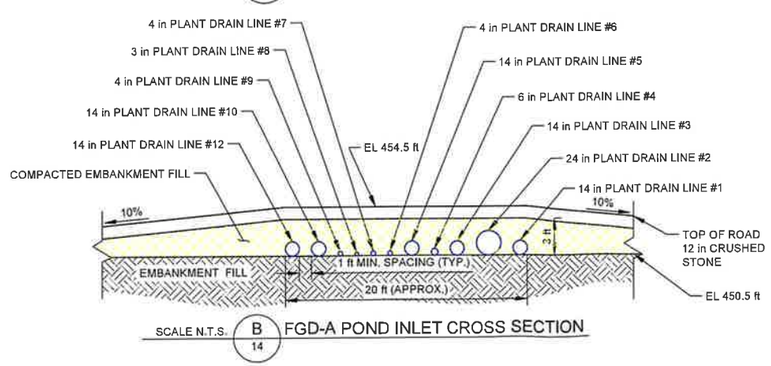



SCALE 1" = 10' 1/14 FGD-A POND INLET PLAN




SCALE N.T.S. A 14 FGD-A POND INLET PROFILE VIEW




SCALE N.T.S. B 14 FGD-A POND INLET CROSS SECTION

**LEGEND**

- 430 — EXISTING GRADES (REFERENCE 1)
- 430 — PROPOSED TOP OF PROTECTIVE COVER GRADES
- EXISTING HDPE PIPING
- PROPOSED HDPE PIPING
- GROUT MATTRESS (HYDROTEX US600)

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) AND SHALL MATCH THE EXISTING INLET LINES (SEE TABLE ON DRAWING 2).
4. EXCAVATIONS SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT STANDARDS.
5. UNDERGROUND PIPING (THROUGH THE FGD-A POND EMBANKMENT) SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE GROUT MATTRESS, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 10 20
1" = 10' FEET

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PROJECT
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FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-A POND INLET DETAILS**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 14 of 22 | 14 |

IF THIS DRAWING DOES NOT MEASURE 1 in BY 1 in THEN DRAWING HAS BEEN SCALED FROM ORIGINAL

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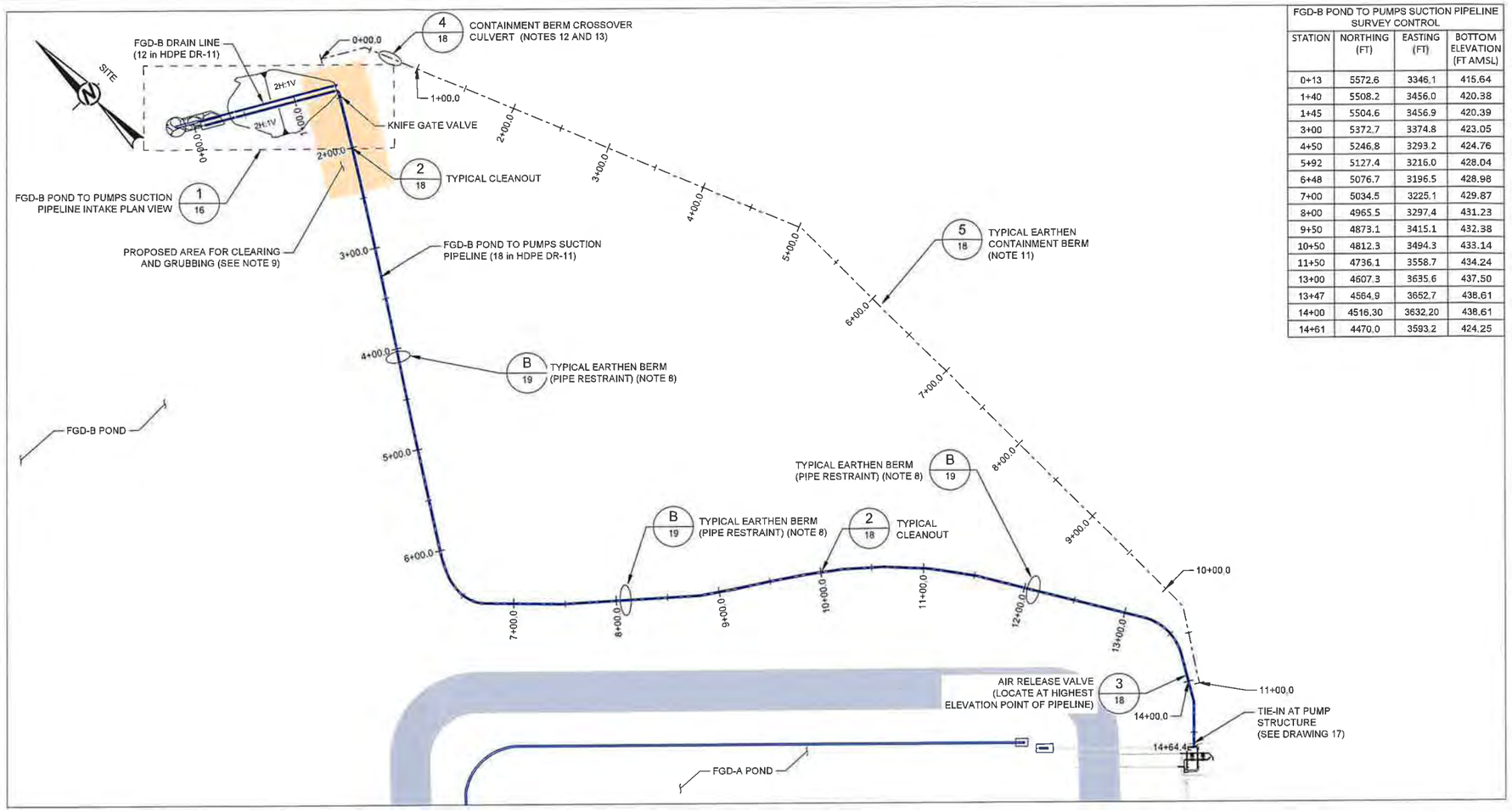



| FGD-B POND TO PUMPS SUCTION PIPELINE SURVEY CONTROL | | | |
|---|---|---|---|
| STATION | NORTHING (FT) | EASTING (FT) | BOTTOM ELEVATION (FT AMSL) |
| 0+13 | 5572.6 | 3346.1 | 415.64 |
| 1+40 | 5508.2 | 3456.0 | 420.38 |
| 1+45 | 5504.6 | 3456.9 | 420.39 |
| 3+00 | 5372.7 | 3374.8 | 423.05 |
| 4+50 | 5246.8 | 3293.2 | 424.76 |
| 5+92 | 5127.4 | 3216.0 | 428.04 |
| 6+48 | 5076.7 | 3196.5 | 428.98 |
| 7+00 | 5034.5 | 3225.1 | 429.87 |
| 8+00 | 4965.5 | 3297.4 | 431.23 |
| 9+50 | 4873.1 | 3415.1 | 432.38 |
| 10+50 | 4812.3 | 3494.3 | 433.14 |
| 11+50 | 4736.1 | 3558.7 | 434.24 |
| 13+00 | 4607.3 | 3635.6 | 437.50 |
| 13+47 | 4564.9 | 3652.7 | 438.61 |
| 14+00 | 4516.30 | 3632.20 | 438.61 |
| 14+61 | 4470.0 | 3593.2 | 424.25 |

**LEGEND**

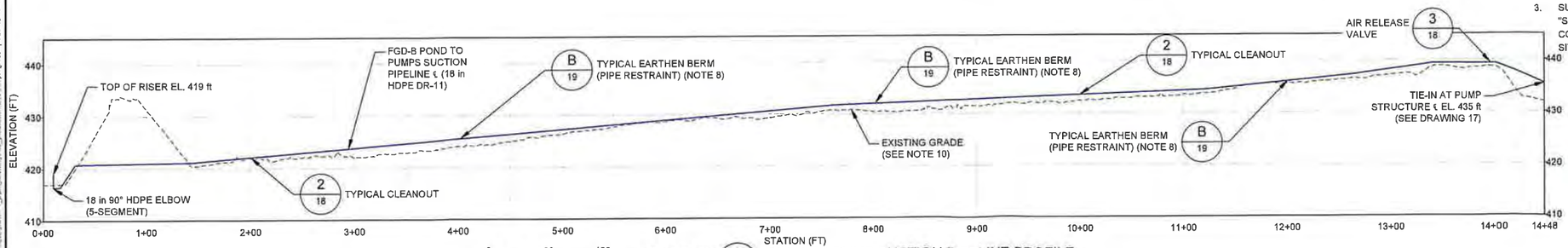
- 430 — EXISTING GRADES (REFERENCE 1 AND 2)
- 430 — PROPOSED TOP OF PROTECTIVE COVER GRADES
- EXISTING STEEL PIPING
- EXISTING HDPE PIPING
- PROPOSED HDPE PIPING

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) DR-11 (IRON PIPE SIZING) SOLID WALL UNLESS OTHERWISE INDICATED.
4. EXCAVATIONS THROUGH FGD-B POND EMBANKMENT SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT REQUIREMENTS. THE EXISTING GEOMEMBRANE LINER SHALL BE CLEANLY CUT AND GENTLY PEELED AWAY FROM THE PROPOSED EXCAVATION. FOLLOWING COMPLETION OF THE PIPELINE, EMBANKMENT FILL, AND CLAY LINER (OR EMBANKMENT FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL) CONSTRUCTION, THE GEOMEMBRANE SHALL BE LAID BACK AND WELDED USING GEOMEMBRANE CAPSTRIPS AS APPROPRIATE.
5. UNDERGROUND PIPING (THROUGH THE FGD-B POND EMBANKMENT) SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE PROTECTIVE COVER, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.
6. NO PIPING OR CONCRETE SHOULD BE IN DIRECT CONTACT WITH THE GEOMEMBRANE. A 12-OZ NON-WOVEN GEOTEXTILE SHALL BE PLACED BETWEEN THE CONCRETE AND THE GEOMEMBRANE. A 60 mil HDPE GEOMEMBRANE RUB-SHEET SHALL BE TACK WELDED TO THE LINER IN AREAS WHERE PIPING IS RESTING ON THE LINER.
7. A SULFATE RESISTANT CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE COLLAR TO EXTEND APPROXIMATELY THREE (3) FEET AROUND THE RISER PIPE AND TO HAVE A MINIMUM OF 12 INCHES OF COVER ABOVE THE PIPE.
8. EARTHEN BERM ANCHORAGES WILL BE PROVIDED AT APPROXIMATELY 400-FOOT INTERVALS ALONG THE FGD-B TO PUMPS SUCTION PIPELINE. PIPING BETWEEN THE EARTHEN BERMS SHALL BE SNAKED APPROXIMATELY 20 FEET OFF OF A STRAIGHT LINE ALIGNMENT WITH 20 FEET HORIZONTAL CLEARANCE TO ALLOW THE HDPE PIPES TO EXPAND OR CONTRACT.
9. CLEARING AND GRUBBING PLAN TO BE APPROVED BY OWNER.
10. LOCAL GRADING TO BE DONE ALONG THE ALIGNMENT TO MINIMIZE LOCALIZED HIGH AND LOW SPOTS.
11. EARTHEN CONTAINMENT BERM TO BE 4-FEET (MIN.) ABOVE EXISTING GRADES BETWEEN ALIGNMENT STATIONS 0+00 AND 2+50, AND TRANSITION TO BE 2-FEET (MIN.) ABOVE EXISTING GRADES BETWEEN ALIGNMENT STATIONS 2+50 AND 11+00.
12. CULVERT PIPING SHALL BE ADS N-12 ST IB HDPE PIPE OR EQUIVALENT APPROVED BY THE OWNER'S REPRESENTATIVE.
13. CULVERT THROUGH CONTAINMENT BERM SHALL BE SITUATED AT THE LOWEST ELEVATION ON THE UPSTREAM SIDE OF THE CONTAINMENT BERM AND SHALL BE ORIENTED TO ALLOW FOR DRAINAGE DURING PRECIPITATION EVENTS.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. AS-CONSTRUCTED SURVEY OF FGD-B POND PERFORMED BY SAM, INC. ON DECEMBER 7, 2011.
3. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.




0 60 120
1" = 60' FEET

SCALE 1" = 60'
5x VERTICAL EXAGGERATION

A / 15 FGD-B TO PUMP SUCTION PIPELINE PROFILE

ISSUED FOR BIDDING PURPOSES ONLY

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-01-06 | ISSUED FOR BIDDING PURPOSES | BJP | KWG | AMS | TJS |

SEAL

BRENT J. PASSE 85675 LICENSED PROFESSIONAL ENGINEER

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-B POND TO PUMPS SUCTION PIPELINE PLAN AND PROFILE**

| PROJECT NO | LUMINANT DRAWING NO | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 15 of 22 | 15 |

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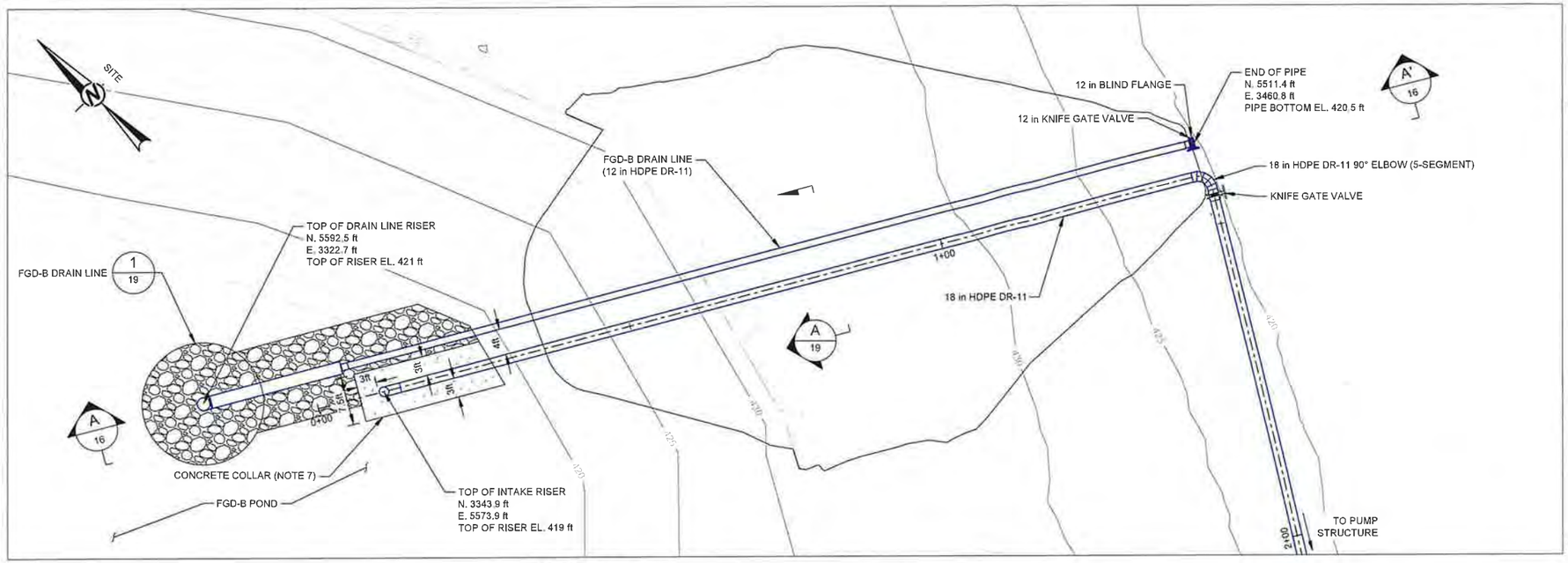
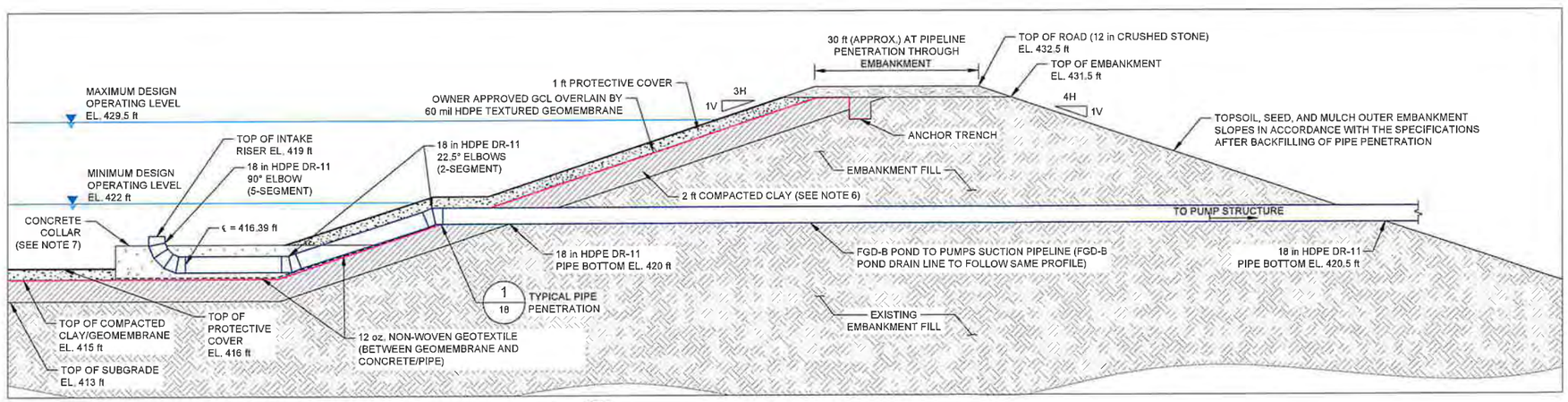



SCALE 1" = 10' 1/16 FGD-B POND TO PUMPS SUCTION PIPELINE INTAKE PLAN VIEW




SCALE 1" = 6' A/16 FGD-B POND TO PUMPS SUCTION PIPELINE INTAKE PROFILE VIEW

LEGEND

430 EXISTING GRADES (REFERENCE 1 AND 2)

PROPOSED HDPE PIPING

NOTE(S)

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) DR-11 (IRON PIPE SIZING) SOLID WALL UNLESS OTHERWISE INDICATED.
4. EXCAVATIONS THROUGH FGD-B POND EMBANKMENT SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT REQUIREMENTS. THE EXISTING GEOMEMBRANE LINER SHALL BE CLEANLY CUT AND GENTLY PEELED AWAY FROM THE PROPOSED EXCAVATION. FOLLOWING COMPLETION OF THE PIPELINE, EMBANKMENT FILL, AND CLAY LINER (OR EMBANKMENT FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL) CONSTRUCTION, THE GEOMEMBRANE SHALL BE LAID BACK AND WELDED USING GEOMEMBRANE CAPSTRIPS AS APPROPRIATE.
5. UNDERGROUND PIPING (THROUGH THE FGD-B EMBANKMENT) SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE PROTECTIVE COVER, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.
6. NO PIPING OR CONCRETE SHOULD BE IN DIRECT CONTACT WITH THE GEOMEMBRANE. A 12-OZ NON-WOVEN GEOTEXTILE SHALL BE PLACED BETWEEN THE CONCRETE AND THE GEOMEMBRANE.
7. A SULFATE RESISTANT CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE COLLAR TO EXTEND APPROXIMATELY THREE (3) FEET AROUND THE RISER PIPE AND TO HAVE A MINIMUM OF 12 INCHES OF COVER ABOVE THE PIPE.
8. EMBANKMENT FILL (MORE THAN 12 INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING TEN (10) INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. CLAY LINER (OR GENERAL FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED ON THE INSIDE FACE OF THE EMBANKMENT IN ACCORDANCE WITH THE LINER QUALITY CONTROL PLAN AFTER CONSTRUCTING THE PIPELINES THROUGH THE EMBANKMENT.

REFERENCE(S)

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. AS-CONSTRUCTED SURVEY OF FGD-B POND PERFORMED BY SAM, INC. ON DECEMBER 7, 2011.
3. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 10 20
1" = 10' FEET

0 6 12
1" = 6' FEET

| REV | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-B POND TO PUMPS SUCTION PIPELINE INTAKE**

| PROJECT NO | LUMINANT DRAWING NO | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 16 of 22 | 16 |

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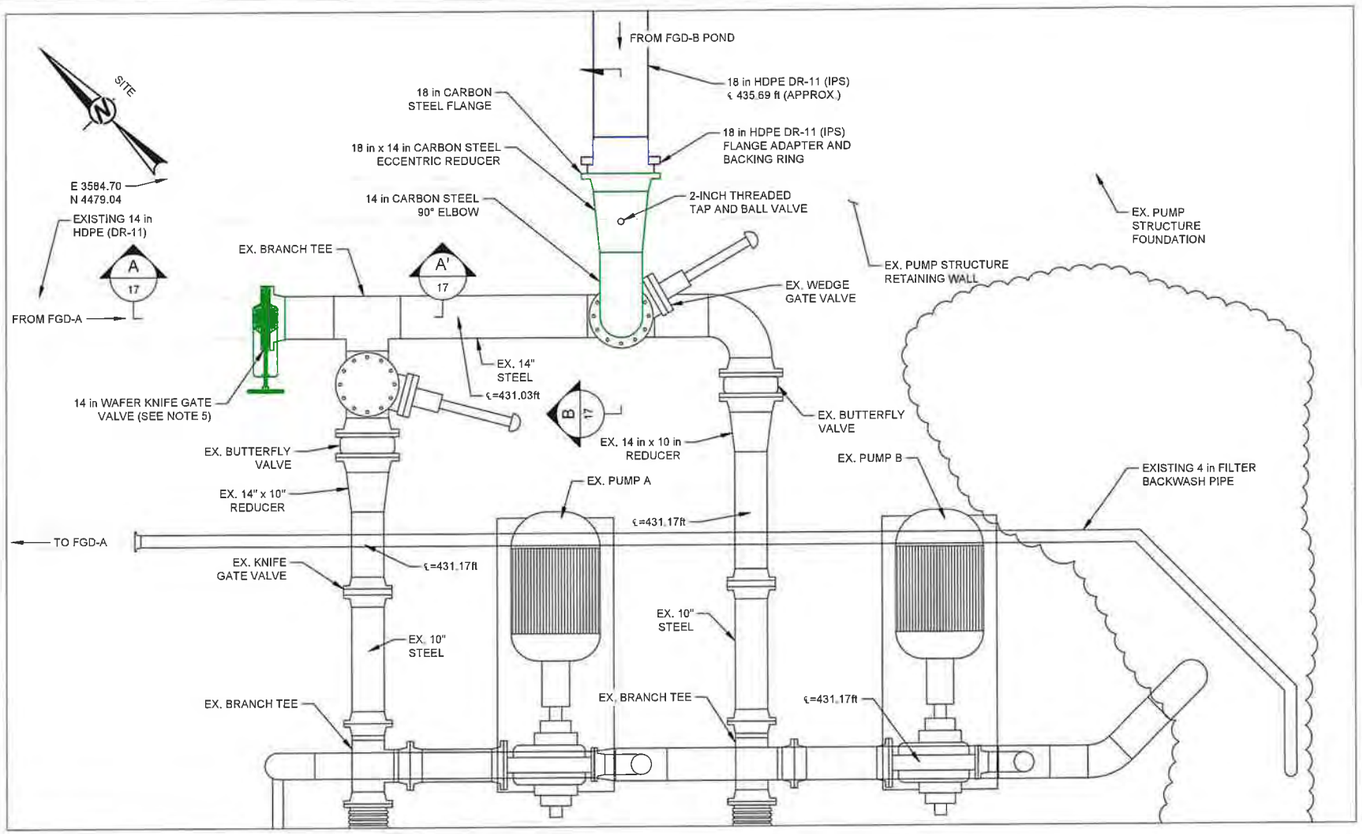
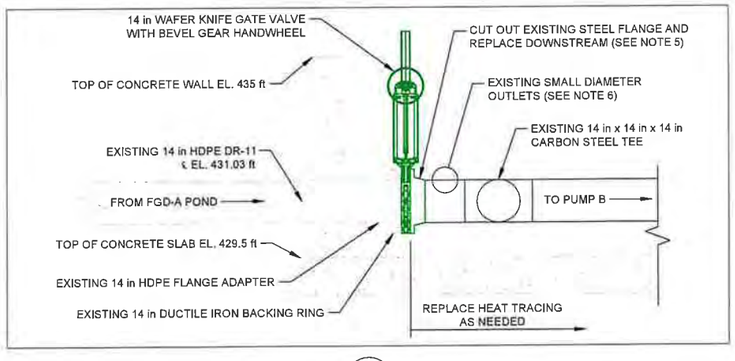
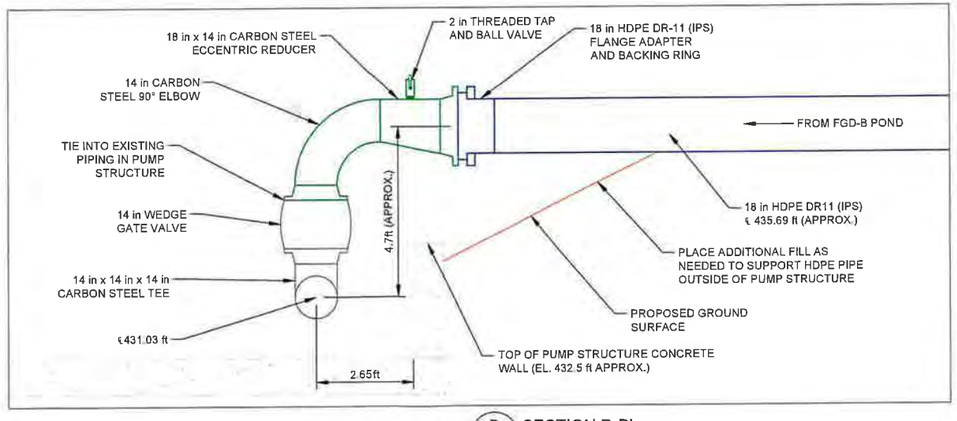



PUMP STRUCTURE PIPING PLAN VIEW
SCALE N.T.S.




SCALE SCALE A 17 SECTION A-A'




SCALE N.T.S. B 17 SECTION B-B'

**LEGEND**

- EXISTING STEEL PIPING
- EXISTING HDPE PIPING
- PROPOSED STEEL PIPING
- PROPOSED HDPE PIPING

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING WITHIN THE EXISTING PUMP STRUCTURE SHALL BE STD SCHEDULE ERW A53 CARBON STEEL.
4. TIE-IN CONFIGURATIONS AND DIMENSIONS SHOWN ARE BASED ON TYPICAL DIMENSIONS FOR FITTINGS AND VALVES. ACTUAL DIMENSIONS MAY VARY BY MANUFACTURER AND WILL REQUIRE FIELD ADJUSTMENTS.
5. CONTRACTOR SHALL CUT OUT EXISTING 14 in CARBON STEEL FLANGE AND APPROXIMATELY THREE (3) INCHES OF CARBON STEEL PIPE (LENGTH TO BE VERIFIED BY CONTRACTOR BASED ON ACTUAL 14 in WAFER KNIFE GATE VALVE PROCURED). A NEW 14 in CARBON STEEL FLANGE SHALL BE WELDED TO THE EXISTING PIPE TO ACCOMMODATE THE PROPOSED VALVE.
6. THE TWO (2) EXISTING SMALL DIAMETER (APPROXIMATELY 1-1/4 in) HEAT-TRACED OUTLETS EQUIPPED WITH BALL VALVES SHALL BE RELOCATED DOWNSTREAM APPROXIMATELY SIX (6) INCHES TO ALLOW THE EXISTING CARBON STEEL FLANGE TO BE MOVED DOWNSTREAM FOR THE PROPOSED 14 in WAFER KNIFE GATE VALVE. LOCATION OF THE RELOCATED OUTLETS TO BE APPROVED BY OWNER. OUTLETS SHALL BE HEAT-TRACED.

**REFERENCE(S)**

1. EXISTING PUMP STRUCTURE DETAILS FROM DRAWING A2YF00-0-CD-1-YD.00.PL-08 REVISION 3 DATED AUGUST 28, 1998.
2. EXISTING PIPING DETAILS FROM PIPING ISOMETRIC DRAWINGS:
   - 2.1. A2YF0-IS-5-WR.0015-01 DATED JANUARY 11, 2008
   - 2.2. A2YF0-IS-5-WR.0020-01 DATED DECEMBER 16, 2008
   - 2.3. A2YF0-IS-5-WR.0020-02 DATED DECEMBER 16, 2008
   - 2.4. A2YF0-IS-5-WR.0030-01 DATED DECEMBER 16, 2008
   - 2.5. A2YF0-IS-5-WR.0030-02 DATED DECEMBER 16, 2008
   - 2.6. A2YF0-IS-5-WR.0040-01 DATED DECEMBER 16, 2008
   - 2.7. A2YF0-IS-5-WR.0050-01 DATED DECEMBER 16, 2008
   - 2.8. A2YF0-IS-5-WR.0050-02 DATED DECEMBER 16, 2008
   - 2.9. A2YF0-IS-5-WR.0050-03 DATED DECEMBER 16, 2008
   - 2.10. A2YF0-IS-5-WR.0060-01 DATED DECEMBER 16, 2008
   - 2.11. A2YF0-IS-5-WR.0060-02 DATED FEBRUARY 14, 2008
   - 2.12. A2YF0-IS-5-WR.0060-03 DATED FEBRUARY 29, 2008
   - 2.13. A2YF0-IS-5-WR.0065-01 DATED APRIL 9, 2008

ISSUED FOR CONSTRUCTION

| REV | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT

GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**PUMP STRUCTURE PROPOSED PIPING**

| PROJECT NO | LUMINANT DRAWING NO | REV | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 17 of 22 | 17 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN REDUCED OR ENLARGED FROM ORIGINAL SIZE

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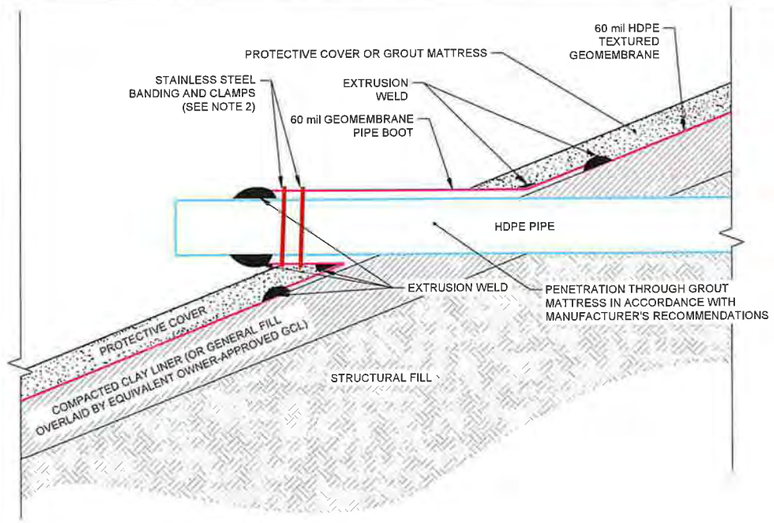
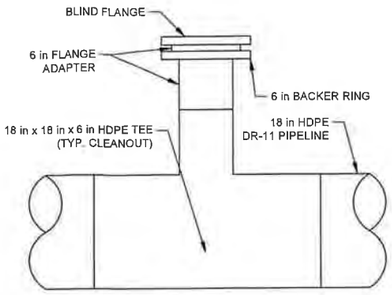



SCALE N.T.S. 1/18 TYPICAL PIPE PENETRATION

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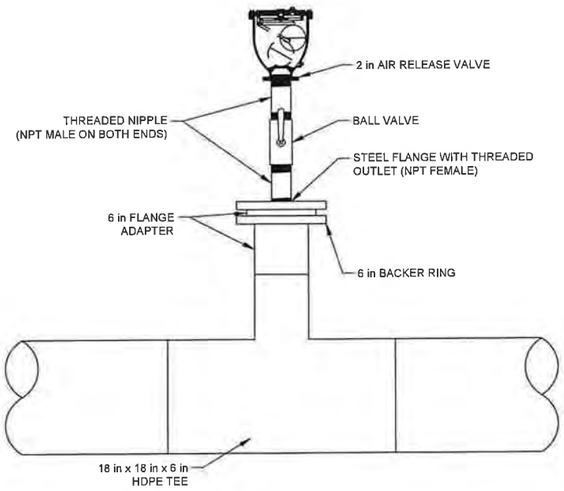


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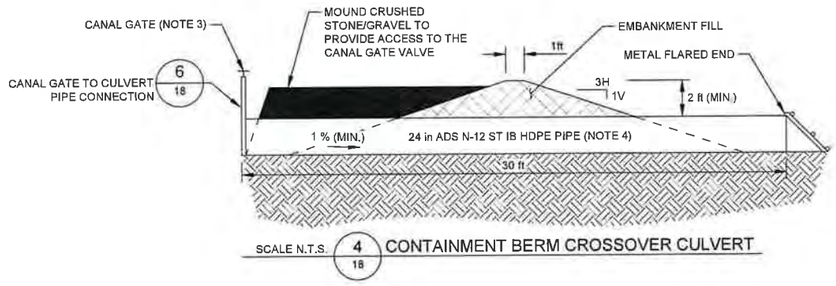


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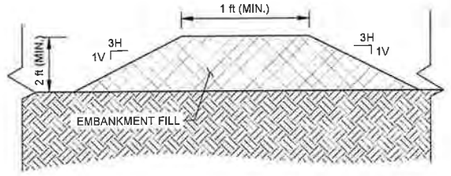
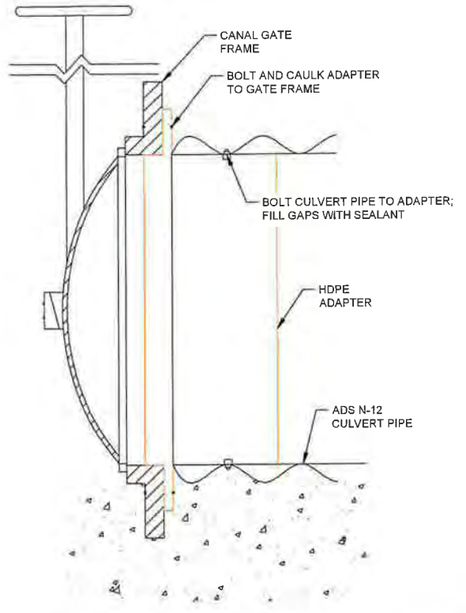



SCALE N.T.S. 5/18 TYPICAL EARTHEN CONTAINMENT BERM




SCALE N.T.S. 6/18 CANAL GATE TO CULVERT PIPE CONNECTION

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTINUOUS ONE-HALF-INCH STAINLESS STEEL CLAMPS WITH A GASKET BETWEEN THE HDPE PIPE AND HDPE LINER BELOW THE STEEL CLAMPS, AND A CONTINUOUS STRIP OF NEOPRENE RUBBER CUSHION BETWEEN THE STAINLESS STEEL CLAMPS AND THE HDPE LINER.
3. THE CULVERT CANAL GATE VALVE SHALL BE A WATERMAN C-10 CANAL GATE WITH HDPE ADAPTER, TUBE SEAL, AND BACK FRAME ATTACHMENTS OR AN EQUIVALENT APPROVED BY THE OWNER'S REPRESENTATIVE. CANAL GATE VALVES AND FITTINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS
4. CULVERT PIPING SHALL BE ADS N-12 ST IB HDPE PIPE OR EQUIVALENT APPROVED BY THE OWNER'S REPRESENTATIVE.
5. CULVERT FITTINGS (METAL FLARED END SECTIONS, ETC.) SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS
6. CULVERT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
7. CONTRACTOR SHALL USE CARE WHEN COMPACTING EMBANKMENT FILL AROUND THE CULVERT AND SHALL USE HAND AND/OR REMOTE COMPACTION EQUIPMENT UNTIL THE PIPE HAS APPROXIMATELY 2-FEET OF COVER

ISSUED FOR CONSTRUCTION

| REV | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

SEAL

GOLDER ASSOCIATES INC
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

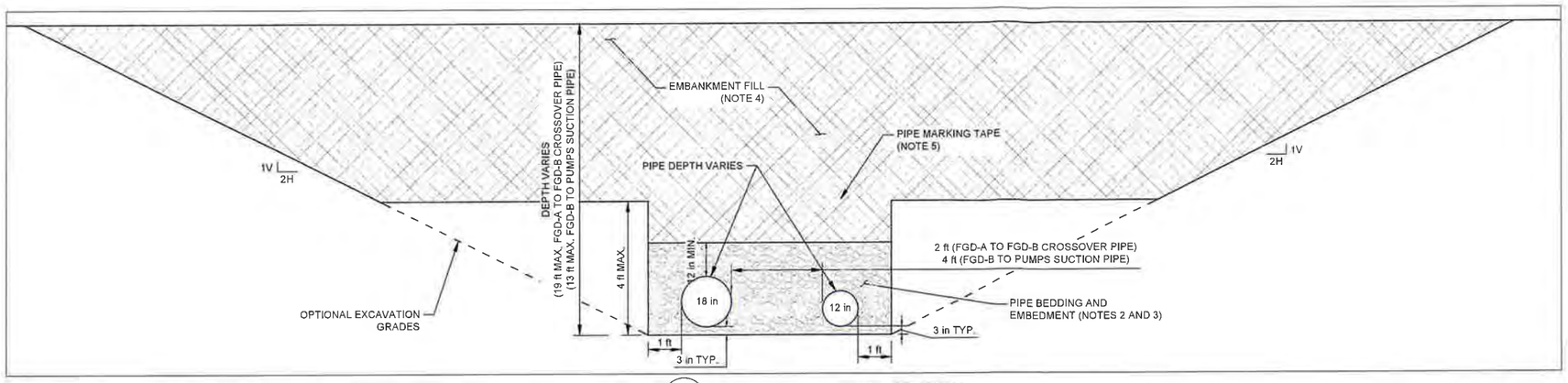
PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**PIPING DETAILS - I OF II**

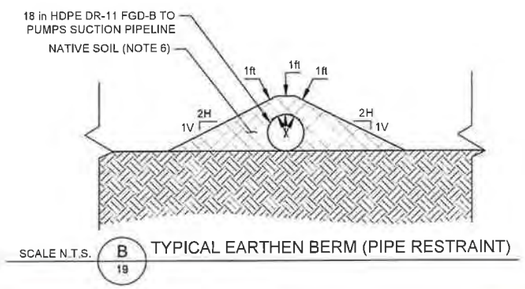
| PROJECT NO. | LUMINANT DRAWING NO | REV | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 18 of 22 | 18 |

Path: c:\dm\cad\acad\VISTRA.GOLDER\19_projects\19129621_fgd-pond-retrofit\drawings\sheets\1_plan\plan\drawings\02_production\DWG\xx.pwg<+++> | File Name: H:\WIRED\TAR\1\HIDIST\CIVIL\Sheets | Last Edited By: rsalazar Date: 2021-09-17 Time: 10:04:31 AM | Printed By: RSalazar Date: 2021-09-17 Time: 10:04:31 AM

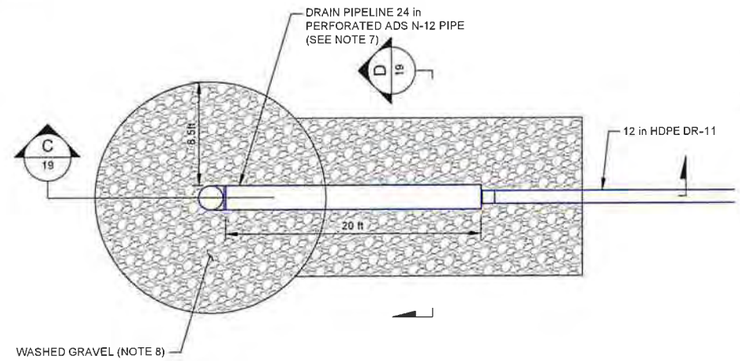
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN ALTERED FROM ANSI D



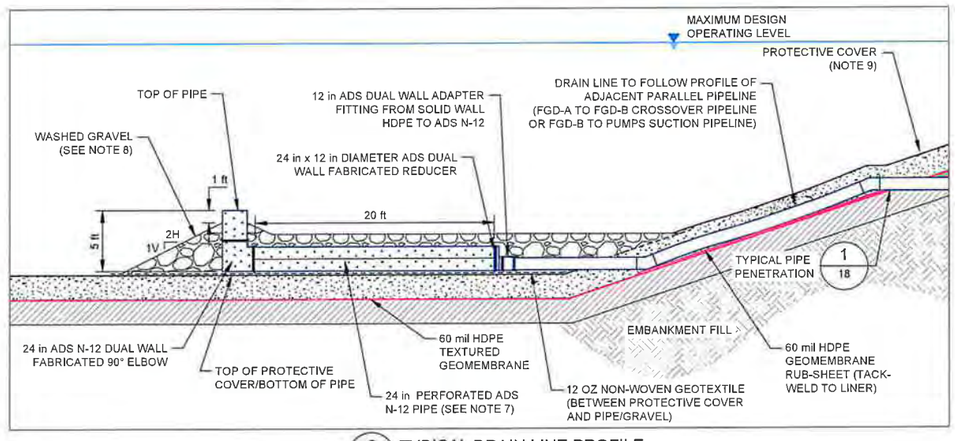

SCALE N.T.S. A 19 TYPICAL PIPE BACKFILL SECTION



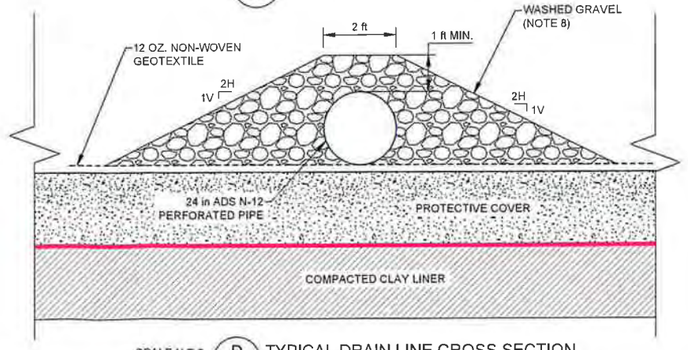

SCALE N.T.S. B 19 TYPICAL EARTHEN BERM (PIPE RESTRAINT)




SCALE N.T.S. 1 19 TYPICAL DRAIN LINE PLAN VIEW




SCALE N.T.S. C 19 TYPICAL DRAIN LINE PROFILE




SCALE N.T.S. D 19 TYPICAL DRAIN LINE CROSS SECTION

NOTE(S)

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. PIPE BEDDING AND EMBEDMENT SHALL CONSIST OF ON-SITE OR IMPORTED EARTHEN MATERIAL CLASSIFYING UNDER ASTM D2487 AS WELL-GRADED SAND (SW OR SW-SM) OR WELL-GRADED GRAVEL (GW OR GW-GM) OR AS OTHERWISE APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE. PIPE BEDDING SHALL CONTAIN NO PARTICLES LARGER THAN 0.5-INCH, AND FREE FROM ROOTS, DEBRIS, OR ANY OTHER SUBSTANCE THAT WOULD HARM THE PIPE OR MIGHT IMPAIR THE PERFORMANCE OF THE MATERIAL AS BEDDING FOR THE PIPE. FINAL MATERIAL SELECTION SHALL BE APPROVED BY THE OWNER'S REPRESENTATIVE.
3. UNDERGROUND PIPING SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE MATERIAL DIRECTLY ABOVE THE PIPE IN THE EMBEDMENT ZONE SHALL BE ONLY LIGHTLY COMPACTED TO AVOID DISTORTING THE PIPE.
4. EMBANKMENT FILL (MORE THAN 12 INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING TEN (10) INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY.
5. FOR ALL UNDERGROUND PIPING, MARKING TAPE ENABLING DETECTION BY METAL DETECTOR (AS INDICATED IN THE SPECIFICATIONS) SHALL BE LOCATED ABOVE THE PIPE AT A DEPTH OF 1 TO 2 FEET BELOW THE FINISHED GRADE.
6. MATERIAL FOR EARTHEN BERM USED TO ANCHOR HDPE PIPE TO BE SPECIFIED BY OWNER. EARTHEN BERM TO EXTEND 6 FEET ALONG LENGTH OF PIPE.
7. DRAIN LINE PIPING WITHIN BOTH PONDS TO BE PERFORATED 24 inch ADS N-12 ST IB (SOIL TIGHT) PIPE AND FITTINGS. ADS PIPE TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
8. PERFORATED DRAIN LINE PIPING WITHIN THE POND TO BE SURROUNDED WITH WASHED GRAVEL (GRAVEL TO BE APPROVED BY OWNER) AS SHOWN ON THE DRAWINGS (I.E. MINIMUM 12 INCHES AROUND THE DRAIN PIPE).
9. EXTEND PROTECTIVE COVER TO EMBANKMENT CREST IN FGD-B POND, PROTECTIVE COVER ENDS AT ELEV. 425.5 FT IN FGD-A POND

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

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14950 HEATHROW FOREST PKWY, SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**PIPING DETAILS - II OF II**

| PROJECT NO. | LUMINANT DRAWING NO. | REV | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 19 of 22 | 19 |

THE MEASUREMENT DOES NOT SHOW WHAT IS SHOWN ON THE SHEET HAS BEEN BORROWED FROM ARCHIVE

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1300 | 4650.17 | 2764.40 | 450.0 |
| 1301 | 4599.87 | 2763.50 | 450.1 |
| 1302 | 4699.77 | 2775.42 | 450.1 |
| 1303 | 4550.07 | 2772.72 | 450.0 |
| 1304 | 4754.20 | 2800.00 | 450.1 |
| 1305 | 4750.14 | 2800.03 | 449.2 |
| 1306 | 4700.13 | 2800.05 | 440.6 |
| 1307 | 4650.11 | 2799.95 | 435.9 |
| 1308 | 4600.03 | 2800.07 | 435.6 |
| 1309 | 4550.20 | 2799.98 | 439.7 |
| 1310 | 4499.82 | 2799.80 | 447.9 |
| 1311 | 4490.14 | 2800.07 | 450.0 |
| 1312 | 4815.57 | 2850.04 | 450.0 |
| 1313 | 4799.98 | 2849.73 | 445.7 |
| 1314 | 4749.98 | 2849.97 | 432.6 |
| 1315 | 4699.95 | 2850.07 | 422.2 |
| 1316 | 4649.91 | 2850.00 | 422.0 |
| 1317 | 4600.10 | 2850.01 | 422.1 |
| 1318 | 4549.91 | 2850.01 | 422.1 |
| 1319 | 4499.96 | 2849.96 | 431.5 |
| 1320 | 4449.95 | 2849.86 | 445.6 |
| 1321 | 4434.75 | 2849.91 | 450.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1322 | 4868.56 | 2900.00 | 450.1 |
| 1323 | 4850.00 | 2899.87 | 445.0 |
| 1324 | 4800.20 | 2900.11 | 431.3 |
| 1325 | 4749.94 | 2899.92 | 422.1 |
| 1326 | 4700.03 | 2899.99 | 422.1 |
| 1327 | 4649.97 | 2900.08 | 422.1 |
| 1328 | 4600.07 | 2900.00 | 422.0 |
| 1329 | 4550.21 | 2900.09 | 422.0 |
| 1330 | 4499.98 | 2900.08 | 422.1 |
| 1331 | 4449.90 | 2899.80 | 432.1 |
| 1332 | 4399.76 | 2900.26 | 447.0 |
| 1333 | 4389.22 | 2899.91 | 450.0 |
| 1334 | 4921.29 | 2949.98 | 450.0 |
| 1335 | 4900.11 | 2949.92 | 444.3 |
| 1336 | 4849.87 | 2949.86 | 430.4 |
| 1337 | 4799.99 | 2949.93 | 422.2 |
| 1338 | 4750.26 | 2949.96 | 422.1 |
| 1339 | 4699.99 | 2950.07 | 422.1 |
| 1340 | 4650.13 | 2950.09 | 422.1 |
| 1341 | 4600.03 | 2950.03 | 422.2 |
| 1342 | 4549.85 | 2949.92 | 422.1 |
| 1343 | 4499.95 | 2950.14 | 422.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1344 | 4450.05 | 2950.23 | 422.1 |
| 1345 | 4400.14 | 2949.99 | 433.4 |
| 1346 | 4349.82 | 2950.28 | 448.3 |
| 1347 | 4344.00 | 2950.08 | 450.1 |
| 1348 | 4974.17 | 3000.13 | 450.0 |
| 1349 | 4949.93 | 3000.02 | 443.5 |
| 1350 | 4900.18 | 2999.97 | 429.7 |
| 1351 | 4849.97 | 3000.13 | 422.1 |
| 1352 | 4800.05 | 2999.96 | 422.0 |
| 1353 | 4750.05 | 2999.91 | 422.1 |
| 1354 | 4700.05 | 2999.90 | 422.1 |
| 1355 | 4649.97 | 2999.99 | 422.0 |
| 1356 | 4599.94 | 3000.00 | 422.0 |
| 1357 | 4550.02 | 3000.14 | 422.0 |
| 1358 | 4500.13 | 2999.94 | 422.0 |
| 1359 | 4450.12 | 2999.99 | 422.1 |
| 1360 | 4400.07 | 2999.94 | 422.1 |
| 1361 | 4350.06 | 2999.95 | 435.6 |
| 1362 | 4330.05 | 2965.21 | 450.1 |
| 1363 | 4307.59 | 2999.88 | 450.0 |
| 1364 | 5007.18 | 3031.31 | 450.1 |
| 1365 | 5022.71 | 3050.00 | 450.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1366 | 5000.08 | 3049.94 | 442.8 |
| 1367 | 4949.98 | 3050.16 | 428.9 |
| 1368 | 4900.10 | 3050.17 | 422.1 |
| 1369 | 4850.14 | 3050.27 | 422.0 |
| 1370 | 4800.14 | 3049.86 | 422.0 |
| 1371 | 4749.91 | 3049.98 | 422.1 |
| 1372 | 4700.07 | 3050.19 | 422.0 |
| 1373 | 4650.04 | 3050.09 | 422.0 |
| 1374 | 4599.85 | 3050.16 | 422.1 |
| 1375 | 4549.78 | 3050.08 | 422.0 |
| 1376 | 4500.01 | 3050.00 | 422.0 |
| 1377 | 4450.08 | 3049.92 | 422.1 |
| 1378 | 4399.82 | 3049.99 | 422.1 |
| 1379 | 4350.12 | 3050.06 | 426.0 |
| 1380 | 4299.95 | 3050.19 | 444.6 |
| 1381 | 4285.70 | 3049.94 | 449.9 |
| 1382 | 5035.04 | 3099.88 | 450.0 |
| 1383 | 5000.20 | 3099.84 | 436.1 |
| 1384 | 4949.95 | 3099.98 | 422.1 |
| 1385 | 4899.91 | 3100.10 | 422.1 |
| 1386 | 4849.94 | 3099.95 | 422.0 |
| 1387 | 4800.11 | 3099.95 | 422.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1388 | 4750.00 | 3099.93 | 422.0 |
| 1389 | 4699.99 | 3100.11 | 422.1 |
| 1390 | 4650.01 | 3099.95 | 422.1 |
| 1391 | 4599.80 | 3100.10 | 422.1 |
| 1392 | 4549.94 | 3099.90 | 422.0 |
| 1393 | 4500.08 | 3100.00 | 422.1 |
| 1394 | 4450.21 | 3099.91 | 422.1 |
| 1395 | 4399.86 | 3099.92 | 422.1 |
| 1396 | 4349.88 | 3099.92 | 422.1 |
| 1397 | 4300.15 | 3099.88 | 439.2 |
| 1398 | 4272.67 | 3099.86 | 450.0 |
| 1399 | 5012.69 | 3150.19 | 450.1 |
| 1400 | 5000.03 | 3149.86 | 446.5 |
| 1401 | 4949.91 | 3150.08 | 432.3 |
| 1402 | 4900.08 | 3150.00 | 422.1 |
| 1403 | 4849.97 | 3150.04 | 422.1 |
| 1404 | 4799.96 | 3149.87 | 422.1 |
| 1405 | 4749.94 | 3149.97 | 422.1 |
| 1406 | 4699.89 | 3149.98 | 422.1 |
| 1407 | 4650.25 | 3150.18 | 422.2 |
| 1408 | 4600.10 | 3150.23 | 422.2 |
| 1409 | 4549.82 | 3149.90 | 422.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1410 | 4499.87 | 3149.94 | 422.1 |
| 1411 | 4450.03 | 3149.98 | 422.0 |
| 1412 | 4400.13 | 3150.16 | 422.0 |
| 1413 | 4349.65 | 3149.80 | 422.1 |
| 1414 | 4299.98 | 3150.21 | 436.8 |
| 1415 | 4266.85 | 3149.88 | 450.0 |
| 1416 | 4962.89 | 3199.97 | 450.1 |
| 1417 | 4949.95 | 3199.98 | 446.5 |
| 1418 | 4899.96 | 3200.03 | 432.2 |
| 1419 | 4850.02 | 3199.95 | 422.2 |
| 1420 | 4799.94 | 3200.01 | 422.0 |
| 1421 | 4750.12 | 3200.09 | 422.1 |
| 1422 | 4699.93 | 3200.02 | 422.3 |
| 1423 | 4650.12 | 3200.18 | 436.9 |
| 1424 | 4599.99 | 3200.00 | 433.7 |
| 1425 | 4549.96 | 3200.14 | 422.1 |
| 1426 | 4499.99 | 3200.02 | 422.1 |
| 1427 | 4449.99 | 3199.87 | 422.0 |
| 1428 | 4400.15 | 3199.88 | 422.0 |
| 1429 | 4350.05 | 3200.03 | 422.1 |
| 1430 | 4299.90 | 3200.20 | 437.8 |
| 1431 | 4269.07 | 3199.96 | 450.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1432 | 4913.14 | 3250.10 | 450.1 |
| 1433 | 4899.98 | 3249.85 | 446.3 |
| 1434 | 4850.06 | 3249.87 | 432.2 |
| 1435 | 4799.90 | 3249.95 | 422.1 |
| 1436 | 4750.09 | 3249.94 | 422.1 |
| 1437 | 4699.99 | 3250.13 | 425.9 |
| 1438 | 4649.99 | 3250.25 | 444.6 |
| 1439 | 4600.18 | 3250.06 | 448.1 |
| 1440 | 4550.06 | 3249.90 | 434.2 |
| 1441 | 4499.72 | 3250.10 | 422.0 |
| 1442 | 4449.97 | 3249.99 | 422.1 |
| 1443 | 4400.03 | 3250.01 | 422.1 |
| 1444 | 4349.99 | 3249.98 | 422.8 |
| 1445 | 4300.15 | 3249.95 | 441.9 |
| 1446 | 4278.95 | 3250.10 | 450.0 |
| 1447 | 4863.36 | 3299.92 | 450.0 |
| 1448 | 4849.93 | 3299.88 | 446.2 |
| 1449 | 4800.06 | 3300.17 | 432.1 |
| 1450 | 4749.89 | 3299.96 | 422.1 |
| 1451 | 4700.00 | 3300.08 | 422.0 |
| 1452 | 4650.18 | 3299.94 | 430.2 |
| 1453 | 4599.88 | 3299.95 | 444.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1454 | 4549.94 | 3300.05 | 448.6 |
| 1455 | 4499.96 | 3299.93 | 434.7 |
| 1456 | 4449.92 | 3300.11 | 422.0 |
| 1457 | 4400.26 | 3299.83 | 422.0 |
| 1458 | 4350.02 | 3300.08 | 431.0 |
| 1459 | 4299.91 | 3300.04 | 448.9 |
| 1460 | 4296.92 | 3299.90 | 450.0 |
| 1461 | 4813.80 | 3350.04 | 450.1 |
| 1462 | 4800.05 | 3350.08 | 446.1 |
| 1463 | 4749.84 | 3350.06 | 432.1 |
| 1464 | 4699.95 | 3350.17 | 422.0 |
| 1465 | 4649.96 | 3350.21 | 422.1 |
| 1466 | 4600.17 | 3350.01 | 429.6 |
| 1467 | 4550.05 | 3350.05 | 443.6 |
| 1468 | 4500.12 | 3350.13 | 449.0 |
| 1469 | 4449.97 | 3349.88 | 435.1 |
| 1470 | 4400.03 | 3349.86 | 428.7 |
| 1471 | 4350.07 | 3350.02 | 442.6 |
| 1472 | 4325.28 | 3349.95 | 449.9 |
| 1473 | 4329.35 | 3356.34 | 450.0 |
| 1474 | 4764.24 | 3399.84 | 450.1 |
| 1475 | 4750.01 | 3400.01 | 446.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1476 | 4700.00 | 3399.71 | 431.8 |
| 1477 | 4650.04 | 3400.03 | 422.1 |
| 1478 | 4600.09 | 3400.10 | 422.2 |
| 1479 | 4550.14 | 3400.09 | 429.2 |
| 1480 | 4499.87 | 3400.10 | 443.2 |
| 1481 | 4450.09 | 3399.92 | 449.4 |
| 1482 | 4400.02 | 3399.94 | 443.3 |
| 1483 | 4375.39 | 3399.89 | 450.1 |
| 1484 | 4714.51 | 3449.91 | 450.0 |
| 1485 | 4700.06 | 3449.89 | 446.0 |
| 1486 | 4650.07 | 3450.02 | 431.8 |
| 1487 | 4600.03 | 3449.95 | 422.1 |
| 1488 | 4550.05 | 3450.13 | 422.0 |
| 1489 | 4499.96 | 3450.10 | 431.7 |
| 1490 | 4450.18 | 3450.08 | 445.6 |
| 1491 | 4433.76 | 3450.07 | 450.0 |
| 1492 | 4664.92 | 3499.94 | 450.2 |
| 1493 | 4649.88 | 3499.98 | 445.9 |
| 1494 | 4600.16 | 3499.92 | 431.7 |
| 1495 | 4550.19 | 3500.09 | 431.3 |
| 1496 | 4499.89 | 3500.02 | 445.0 |
| 1497 | 4481.43 | 3499.95 | 450.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1498 | 4620.47 | 3544.63 | 450.1 |
| 1499 | 4614.43 | 3550.05 | 450.0 |
| 1500 | 4599.92 | 3550.00 | 446.9 |
| 1501 | 4550.16 | 3550.21 | 446.8 |
| 1502 | 4534.98 | 3550.17 | 450.0 |
| 1503 | 4600.17 | 3558.36 | 450.0 |
| 1504 | 4549.98 | 3558.82 | 450.0 |
| 1505 | 4788.76 | 2825.11 | 450.1 |
| 1506 | 4451.48 | 2831.62 | 450.0 |

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
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USA
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www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**AS-CONSTRUCTED CLAY POINT TABLE**

| PROJECT NO | LUMINANT DRAWING NO | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 20 of 22 | 20 |

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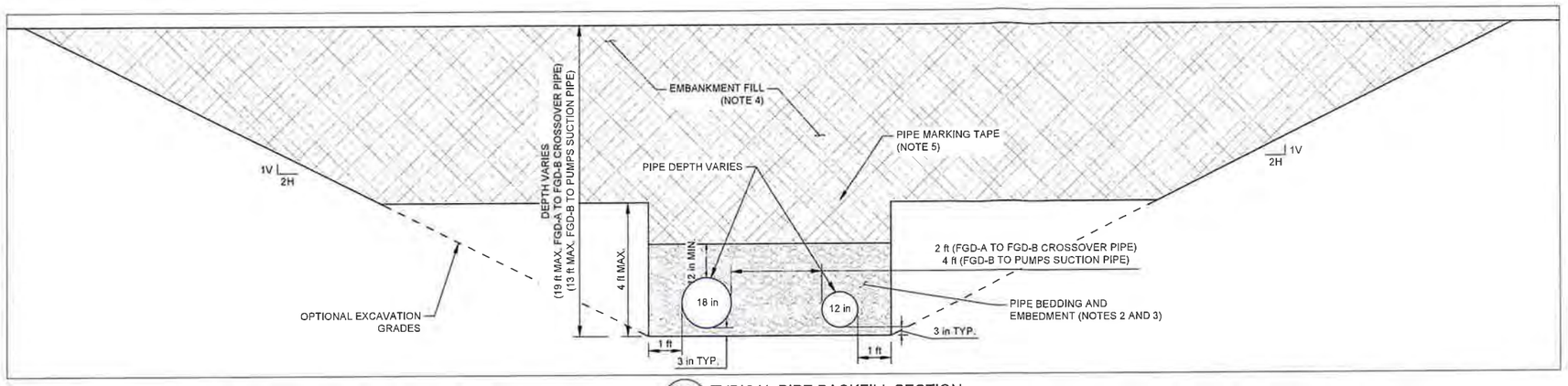
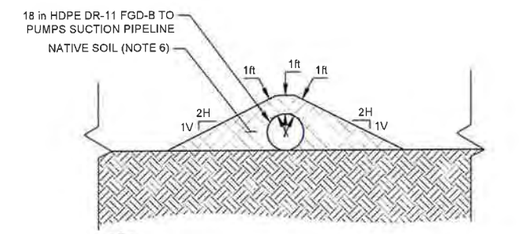
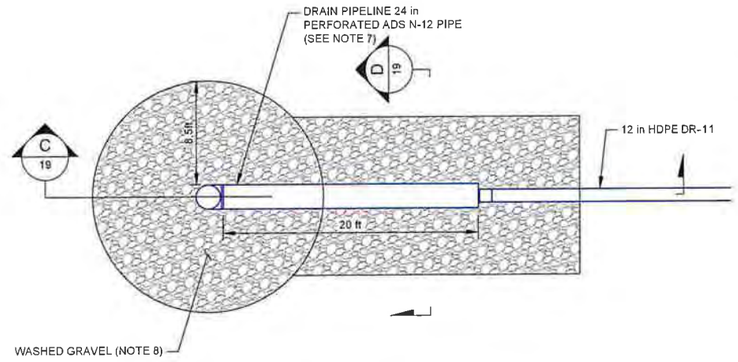
THIS DRAWING MUST BE PRINTED ON ANSI D (22" x 34") MEDIA. IF NOT, THE SCALE BAR WILL BE INCORRECT.



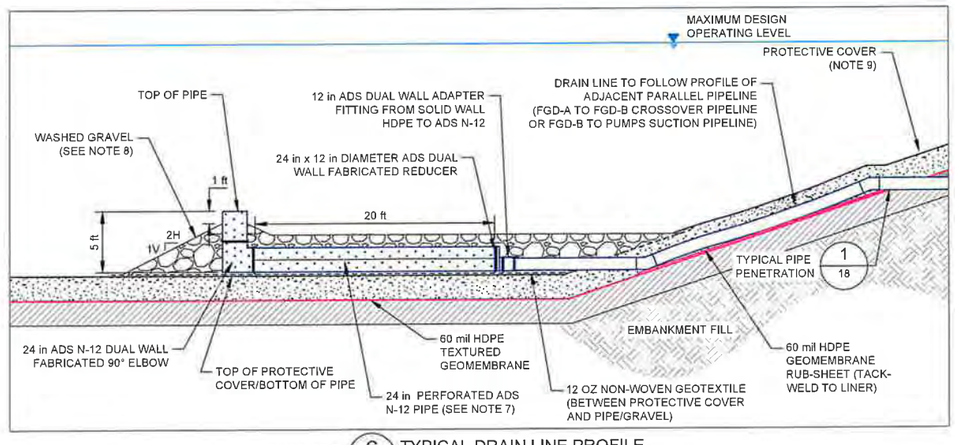

SCALE N.T.S. A 19 TYPICAL PIPE BACKFILL SECTION



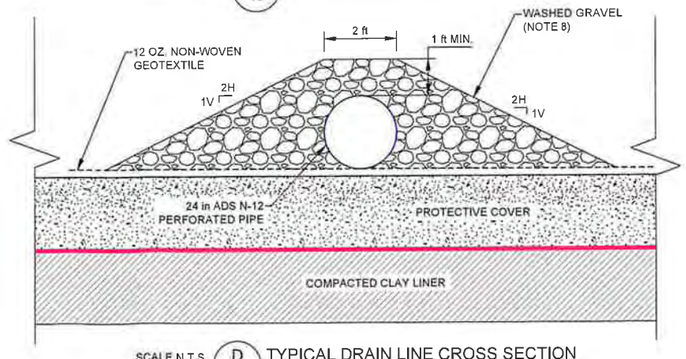

SCALE N.T.S. B 19 TYPICAL EARTHEN BERM (PIPE RESTRAINT)




SCALE N.T.S. 1 19 TYPICAL DRAIN LINE PLAN VIEW




SCALE N.T.S. C 19 TYPICAL DRAIN LINE PROFILE




SCALE N.T.S. D 19 TYPICAL DRAIN LINE CROSS SECTION

NOTE(S)

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. PIPE BEDDING AND EMBEDMENT SHALL CONSIST OF ON-SITE OR IMPORTED EARTHEN MATERIAL CLASSIFYING UNDER ASTM D2487 AS WELL-GRADED SAND (SW OR SW-SM) OR WELL-GRADED GRAVEL (GW OR GW-GM) OR AS OTHERWISE APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE. PIPE BEDDING SHALL CONTAIN NO PARTICLES LARGER THAN 0.5-INCH, AND FREE FROM ROOTS, DEBRIS, OR ANY OTHER SUBSTANCE THAT WOULD HARM THE PIPE OR MIGHT IMPAIR THE PERFORMANCE OF THE MATERIAL AS BEDDING FOR THE PIPE. FINAL MATERIAL SELECTION SHALL BE APPROVED BY THE OWNER'S REPRESENTATIVE.
3. UNDERGROUND PIPING SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE MATERIAL DIRECTLY ABOVE THE PIPE IN THE EMBEDMENT ZONE SHALL BE ONLY LIGHTLY COMPACTED TO AVOID DISTORTING THE PIPE.
4. EMBANKMENT FILL (MORE THAN 12 INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING TEN (10) INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY.
5. FOR ALL UNDERGROUND PIPING, MARKING TAPE ENABLING DETECTION BY METAL DETECTOR (AS INDICATED IN THE SPECIFICATIONS) SHALL BE LOCATED ABOVE THE PIPE AT A DEPTH OF 1 TO 2 FEET BELOW THE FINISHED GRADE.
6. MATERIAL FOR EARTHEN BERM USED TO ANCHOR HDPE PIPE TO BE SPECIFIED BY OWNER. EARTHEN BERM TO EXTEND 6 FEET ALONG LENGTH OF PIPE.
7. DRAIN LINE PIPING WITHIN BOTH PONDS TO BE PERFORATED 24 inch ADS N-12 ST IB (SOIL TIGHT) PIPE AND FITTINGS. ADS PIPE TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
8. PERFORATED DRAIN LINE PIPING WITHIN THE POND TO BE SURROUNDED WITH WASHED GRAVEL (GRAVEL TO BE APPROVED BY OWNER) AS SHOWN ON THE DRAWINGS (I.E. MINIMUM 12 INCHES AROUND THE DRAIN PIPE).
9. EXTEND PROTECTIVE COVER TO EMBANKMENT CREST IN FGD-B POND. PROTECTIVE COVER ENDS AT ELEV. 425.5 FT IN FGD-A POND.

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

SEAL

GOLDER ASSOCIATES INC
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**PIPING DETAILS - II OF II**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 19 of 22 | 19 |

THIS DRAWING/DOCUMENT DOES NOT CONTAIN WHAT IS SHOWN THIS SHEET WAS REVISED/SIGNED ON ITS OWN

Path: \\golder.gds.golder.com\gis\GISDATA\GISDATA\Projects\Active\19129621_Oak_Grove_Luminant\19129621_0g\cad\projects\active\1_projects\oakgrove_40_production DWGs in project | File Name: 19129621-041-D-DWG-0019.dwg | Last Edited By: rashton Date: 2021-09-17 Time: 10:26:00.611 | Printed By: RSalazar Date: 2021-09-17 Time: 10:41:46 AM

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1300 | 4650.17 | 2764.40 | 450.0 |
| 1301 | 4599.87 | 2763.50 | 450.1 |
| 1302 | 4699.77 | 2775.42 | 450.1 |
| 1303 | 4550.07 | 2772.72 | 450.0 |
| 1304 | 4754.20 | 2800.00 | 450.1 |
| 1305 | 4750.14 | 2800.03 | 449.2 |
| 1306 | 4700.13 | 2800.05 | 440.6 |
| 1307 | 4650.11 | 2799.95 | 435.9 |
| 1308 | 4600.03 | 2800.07 | 435.6 |
| 1309 | 4550.20 | 2799.98 | 439.7 |
| 1310 | 4499.82 | 2799.80 | 447.9 |
| 1311 | 4490.14 | 2800.07 | 450.0 |
| 1312 | 4815.57 | 2850.04 | 450.0 |
| 1313 | 4799.98 | 2849.73 | 445.7 |
| 1314 | 4749.98 | 2849.97 | 432.6 |
| 1315 | 4699.95 | 2850.07 | 422.2 |
| 1316 | 4649.91 | 2850.00 | 422.0 |
| 1317 | 4600.10 | 2850.01 | 422.1 |
| 1318 | 4549.91 | 2850.01 | 422.1 |
| 1319 | 4499.96 | 2849.96 | 431.5 |
| 1320 | 4449.95 | 2849.86 | 445.6 |
| 1321 | 4434.75 | 2849.91 | 450.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1344 | 4450.05 | 2950.23 | 422.1 |
| 1345 | 4400.14 | 2949.99 | 433.4 |
| 1346 | 4349.82 | 2950.28 | 448.3 |
| 1347 | 4344.00 | 2950.08 | 450.1 |
| 1348 | 4974.17 | 3000.13 | 450.0 |
| 1349 | 4949.93 | 3000.02 | 443.5 |
| 1350 | 4900.18 | 2999.97 | 429.7 |
| 1351 | 4849.97 | 3000.13 | 422.1 |
| 1352 | 4800.05 | 2999.96 | 422.0 |
| 1353 | 4750.05 | 2999.91 | 422.1 |
| 1354 | 4700.05 | 2999.90 | 422.1 |
| 1355 | 4649.97 | 2999.99 | 422.0 |
| 1356 | 4599.94 | 3000.00 | 422.0 |
| 1357 | 4550.02 | 3000.14 | 422.0 |
| 1358 | 4500.13 | 2999.94 | 422.0 |
| 1359 | 4450.12 | 2999.99 | 422.1 |
| 1360 | 4400.07 | 2999.94 | 422.1 |
| 1361 | 4350.06 | 2999.95 | 435.6 |
| 1362 | 4330.05 | 2965.21 | 450.1 |
| 1363 | 4307.59 | 2999.88 | 450.0 |
| 1364 | 5007.18 | 3031.31 | 450.1 |
| 1365 | 5022.71 | 3050.00 | 450.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1388 | 4750.00 | 3099.93 | 422.0 |
| 1389 | 4699.99 | 3100.11 | 422.1 |
| 1390 | 4650.01 | 3099.95 | 422.1 |
| 1391 | 4599.80 | 3100.10 | 422.1 |
| 1392 | 4549.94 | 3099.90 | 422.0 |
| 1393 | 4500.08 | 3100.00 | 422.1 |
| 1394 | 4450.21 | 3099.91 | 422.1 |
| 1395 | 4399.86 | 3099.92 | 422.1 |
| 1396 | 4349.88 | 3099.92 | 422.1 |
| 1397 | 4300.15 | 3099.88 | 439.2 |
| 1398 | 4272.67 | 3099.86 | 450.0 |
| 1399 | 5012.69 | 3150.19 | 450.1 |
| 1400 | 5000.03 | 3149.86 | 446.5 |
| 1401 | 4949.91 | 3150.08 | 432.3 |
| 1402 | 4900.08 | 3150.00 | 422.1 |
| 1403 | 4849.97 | 3150.04 | 422.1 |
| 1404 | 4799.96 | 3149.87 | 422.1 |
| 1405 | 4749.94 | 3149.97 | 422.1 |
| 1406 | 4699.89 | 3149.98 | 422.1 |
| 1407 | 4650.25 | 3150.18 | 422.2 |
| 1408 | 4600.10 | 3150.23 | 422.2 |
| 1409 | 4549.82 | 3149.90 | 422.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1432 | 4913.14 | 3250.10 | 450.1 |
| 1433 | 4899.98 | 3249.85 | 446.3 |
| 1434 | 4850.06 | 3249.87 | 432.2 |
| 1435 | 4799.90 | 3249.95 | 422.1 |
| 1436 | 4750.09 | 3249.94 | 422.1 |
| 1437 | 4699.99 | 3250.13 | 425.9 |
| 1438 | 4649.99 | 3250.25 | 444.6 |
| 1439 | 4600.18 | 3250.06 | 448.1 |
| 1440 | 4550.06 | 3249.90 | 434.2 |
| 1441 | 4499.72 | 3250.10 | 422.0 |
| 1442 | 4449.97 | 3249.99 | 422.1 |
| 1443 | 4400.03 | 3250.01 | 422.1 |
| 1444 | 4349.99 | 3249.98 | 422.8 |
| 1445 | 4300.15 | 3249.95 | 441.9 |
| 1446 | 4278.95 | 3250.10 | 450.0 |
| 1447 | 4863.36 | 3299.92 | 450.0 |
| 1448 | 4849.93 | 3299.88 | 446.2 |
| 1449 | 4800.06 | 3300.17 | 432.1 |
| 1450 | 4749.89 | 3299.96 | 422.1 |
| 1451 | 4700.00 | 3300.08 | 422.0 |
| 1452 | 4650.18 | 3299.94 | 430.2 |
| 1453 | 4599.88 | 3299.95 | 444.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1476 | 4700.00 | 3399.71 | 431.8 |
| 1477 | 4650.04 | 3400.03 | 422.1 |
| 1478 | 4600.09 | 3400.10 | 422.2 |
| 1479 | 4550.14 | 3400.09 | 429.2 |
| 1480 | 4499.87 | 3400.10 | 443.2 |
| 1481 | 4450.09 | 3399.92 | 449.4 |
| 1482 | 4400.02 | 3399.94 | 443.3 |
| 1483 | 4375.39 | 3399.89 | 450.1 |
| 1484 | 4714.51 | 3449.91 | 450.0 |
| 1485 | 4700.06 | 3449.89 | 446.0 |
| 1486 | 4650.07 | 3450.02 | 431.8 |
| 1487 | 4600.03 | 3449.95 | 422.1 |
| 1488 | 4550.05 | 3450.13 | 422.0 |
| 1489 | 4499.96 | 3450.10 | 431.7 |
| 1490 | 4450.18 | 3450.08 | 445.6 |
| 1491 | 4433.76 | 3450.07 | 450.0 |
| 1492 | 4664.92 | 3499.94 | 450.2 |
| 1493 | 4649.88 | 3499.98 | 445.9 |
| 1494 | 4600.16 | 3499.92 | 431.7 |
| 1495 | 4550.19 | 3500.09 | 431.3 |
| 1496 | 4499.89 | 3500.02 | 445.0 |
| 1497 | 4481.43 | 3499.95 | 450.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1322 | 4868.56 | 2900.00 | 450.1 |
| 1323 | 4850.00 | 2899.87 | 445.0 |
| 1324 | 4800.20 | 2900.11 | 431.3 |
| 1325 | 4749.94 | 2899.92 | 422.1 |
| 1326 | 4700.03 | 2899.99 | 422.1 |
| 1327 | 4649.97 | 2900.08 | 422.1 |
| 1328 | 4600.07 | 2900.00 | 422.0 |
| 1329 | 4550.21 | 2900.09 | 422.0 |
| 1330 | 4499.98 | 2900.08 | 422.1 |
| 1331 | 4449.90 | 2899.80 | 432.1 |
| 1332 | 4399.76 | 2900.26 | 447.0 |
| 1333 | 4389.22 | 2899.91 | 450.0 |
| 1334 | 4921.29 | 2949.98 | 450.0 |
| 1335 | 4900.11 | 2949.92 | 444.3 |
| 1336 | 4849.87 | 2949.86 | 430.4 |
| 1337 | 4799.99 | 2949.93 | 422.2 |
| 1338 | 4750.26 | 2949.96 | 422.1 |
| 1339 | 4699.99 | 2950.07 | 422.1 |
| 1340 | 4650.13 | 2950.09 | 422.1 |
| 1341 | 4600.03 | 2950.03 | 422.2 |
| 1342 | 4549.85 | 2949.92 | 422.1 |
| 1343 | 4499.95 | 2950.14 | 422.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1366 | 5000.08 | 3049.94 | 442.8 |
| 1367 | 4949.98 | 3050.16 | 428.9 |
| 1368 | 4900.10 | 3050.17 | 422.1 |
| 1369 | 4850.14 | 3050.27 | 422.0 |
| 1370 | 4800.14 | 3049.86 | 422.0 |
| 1371 | 4749.91 | 3049.98 | 422.1 |
| 1372 | 4700.07 | 3050.19 | 422.0 |
| 1373 | 4650.04 | 3050.09 | 422.0 |
| 1374 | 4599.85 | 3050.16 | 422.1 |
| 1375 | 4549.78 | 3050.08 | 422.0 |
| 1376 | 4500.01 | 3050.00 | 422.0 |
| 1377 | 4450.08 | 3049.92 | 422.1 |
| 1378 | 4399.82 | 3049.99 | 422.1 |
| 1379 | 4350.12 | 3050.06 | 426.0 |
| 1380 | 4299.95 | 3050.19 | 444.6 |
| 1381 | 4285.70 | 3049.94 | 449.9 |
| 1382 | 5035.04 | 3099.88 | 450.0 |
| 1383 | 5000.20 | 3099.84 | 436.1 |
| 1384 | 4949.95 | 3099.98 | 422.1 |
| 1385 | 4899.91 | 3100.10 | 422.1 |
| 1386 | 4849.94 | 3099.95 | 422.0 |
| 1387 | 4800.11 | 3099.95 | 422.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1410 | 4499.87 | 3149.94 | 422.1 |
| 1411 | 4450.03 | 3149.98 | 422.0 |
| 1412 | 4400.13 | 3150.16 | 422.0 |
| 1413 | 4349.65 | 3149.80 | 422.1 |
| 1414 | 4299.98 | 3150.21 | 436.8 |
| 1415 | 4266.85 | 3149.88 | 450.0 |
| 1416 | 4962.89 | 3199.97 | 450.1 |
| 1417 | 4949.95 | 3199.98 | 446.5 |
| 1418 | 4899.96 | 3200.03 | 432.2 |
| 1419 | 4850.02 | 3199.95 | 422.2 |
| 1420 | 4799.94 | 3200.01 | 422.0 |
| 1421 | 4750.12 | 3200.09 | 422.1 |
| 1422 | 4699.93 | 3200.02 | 422.3 |
| 1423 | 4650.12 | 3200.18 | 436.9 |
| 1424 | 4599.99 | 3200.00 | 433.7 |
| 1425 | 4549.96 | 3200.14 | 422.1 |
| 1426 | 4499.99 | 3200.02 | 422.1 |
| 1427 | 4449.99 | 3199.87 | 422.0 |
| 1428 | 4400.15 | 3199.88 | 422.0 |
| 1429 | 4350.05 | 3200.03 | 422.1 |
| 1430 | 4299.90 | 3200.20 | 437.8 |
| 1431 | 4269.07 | 3199.96 | 450.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1454 | 4549.94 | 3300.05 | 448.6 |
| 1455 | 4499.96 | 3299.93 | 434.7 |
| 1456 | 4449.92 | 3300.11 | 422.0 |
| 1457 | 4400.26 | 3299.83 | 422.0 |
| 1458 | 4350.02 | 3300.08 | 431.0 |
| 1459 | 4299.91 | 3300.04 | 448.9 |
| 1460 | 4296.92 | 3299.90 | 450.0 |
| 1461 | 4813.80 | 3350.04 | 450.1 |
| 1462 | 4800.05 | 3350.08 | 446.1 |
| 1463 | 4749.84 | 3350.06 | 432.1 |
| 1464 | 4699.95 | 3350.17 | 422.0 |
| 1465 | 4649.96 | 3350.21 | 422.1 |
| 1466 | 4600.17 | 3350.01 | 429.6 |
| 1467 | 4550.05 | 3350.05 | 443.6 |
| 1468 | 4500.12 | 3350.13 | 449.0 |
| 1469 | 4449.97 | 3349.88 | 435.1 |
| 1470 | 4400.03 | 3349.86 | 428.7 |
| 1471 | 4350.07 | 3350.02 | 442.6 |
| 1472 | 4325.28 | 3349.95 | 449.9 |
| 1473 | 4329.35 | 3356.34 | 450.0 |
| 1474 | 4764.24 | 3399.84 | 450.1 |
| 1475 | 4750.01 | 3400.01 | 446.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1498 | 4620.47 | 3544.63 | 450.1 |
| 1499 | 4614.43 | 3550.05 | 450.0 |
| 1500 | 4599.92 | 3550.00 | 446.9 |
| 1501 | 4550.16 | 3550.21 | 446.8 |
| 1502 | 4534.98 | 3550.17 | 450.0 |
| 1503 | 4600.17 | 3558.36 | 450.0 |
| 1504 | 4549.98 | 3558.82 | 450.0 |
| 1505 | 4788.76 | 2825.11 | 450.1 |
| 1506 | 4451.48 | 2831.62 | 450.0 |

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**AS-CONSTRUCTED CLAY POINT TABLE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 20 of 22 | 20 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSI B

Path: I:\gis\cad\as-built\drawings\active\GIS_Luminant\GDSESRS\0_PROJ\19129621_fgdA\02_PRODUCTION | File Name: 19129621-003.dwg | Last Edited By: rsalazar Date: 2021-09-17 Time: 9:21:25 AM
Date: 2021-09-16 Time: 2:47:39 PM | Printed By: RSalazar

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3300 | 4649.98 | 2764.49 | 449.2 |
| 3301 | 4599.99 | 2763.63 | 449.2 |
| 3302 | 4700.09 | 2775.23 | 449.2 |
| 3303 | 4550.03 | 2772.71 | 449.2 |
| ~~3304~~ | ~~4754.21~~ | ~~2799.96~~ | ~~449.2~~ |
| ~~3305~~ | ~~4749.97~~ | ~~2800.01~~ | ~~448.3~~ |
| 3306 | 4700.06 | 2799.95 | 439.8 |
| 3307 | 4650.00 | 2800.03 | 435.1 |
| 3308 | 4600.03 | 2799.91 | 434.7 |
| 3309 | 4549.99 | 2800.05 | 438.7 |
| 3310 | 4500.06 | 2799.98 | 447.1 |
| 3311 | 4489.87 | 2800.05 | 449.2 |
| 3312 | 4815.30 | 2850.13 | 449.1 |
| 3313 | 4800.09 | 2850.04 | 444.9 |
| 3314 | 4749.95 | 2849.98 | 431.7 |
| 3315 | 4700.13 | 2850.15 | 421.3 |
| 3316 | 4649.95 | 2850.08 | 421.2 |
| 3317 | 4599.96 | 2849.86 | 421.2 |
| 3318 | 4550.08 | 2849.91 | 421.2 |
| 3319 | 4499.94 | 2850.00 | 430.6 |
| 3320 | 4450.05 | 2850.10 | 444.6 |
| 3321 | 4434.82 | 2849.80 | 449.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3322 | 4868.44 | 2899.84 | 449.3 |
| 3323 | 4850.02 | 2899.83 | 444.2 |
| 3324 | 4800.01 | 2900.05 | 430.4 |
| 3325 | 4749.78 | 2899.94 | 421.2 |
| 3326 | 4700.02 | 2899.99 | 421.2 |
| 3327 | 4649.94 | 2900.13 | 421.2 |
| 3328 | 4600.15 | 2900.02 | 421.2 |
| 3329 | 4550.01 | 2900.15 | 421.2 |
| 3330 | 4500.03 | 2900.01 | 421.2 |
| 3331 | 4449.97 | 2899.91 | 431.2 |
| 3332 | 4399.89 | 2900.01 | 446.0 |
| 3333 | 4389.16 | 2900.02 | 449.2 |
| 3334 | 4921.29 | 2950.05 | 449.2 |
| 3335 | 4899.93 | 2949.95 | 443.4 |
| 3336 | 4850.03 | 2949.92 | 429.6 |
| 3337 | 4800.05 | 2950.07 | 421.2 |
| 3338 | 4749.90 | 2949.86 | 421.2 |
| 3339 | 4700.03 | 2950.05 | 421.2 |
| 3340 | 4650.14 | 2949.85 | 421.2 |
| 3341 | 4599.76 | 2950.10 | 421.2 |
| 3342 | 4549.90 | 2949.96 | 421.2 |
| 3343 | 4500.06 | 2950.10 | 421.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3344 | 4450.11 | 2950.03 | 421.2 |
| 3345 | 4400.08 | 2950.08 | 432.5 |
| 3346 | 4349.99 | 2949.97 | 447.4 |
| 3347 | 4343.90 | 2950.01 | 449.2 |
| 3348 | 4974.04 | 3000.18 | 449.1 |
| 3349 | 4949.87 | 2999.80 | 442.6 |
| 3350 | 4899.93 | 2999.98 | 428.8 |
| 3351 | 4850.01 | 2999.98 | 421.2 |
| 3352 | 4800.00 | 2999.95 | 421.2 |
| 3353 | 4749.99 | 2999.95 | 421.2 |
| 3354 | 4700.12 | 3000.05 | 421.2 |
| 3355 | 4649.75 | 2999.91 | 421.2 |
| 3356 | 4600.02 | 2999.78 | 421.2 |
| 3357 | 4549.97 | 2999.95 | 421.2 |
| 3358 | 4500.08 | 3000.16 | 421.2 |
| 3359 | 4449.98 | 3000.13 | 421.2 |
| 3360 | 4400.19 | 3000.28 | 421.2 |
| 3361 | 4350.01 | 3000.00 | 434.7 |
| 3362 | 4330.13 | 2965.15 | 449.2 |
| 3363 | 4307.50 | 3000.08 | 449.2 |
| 3364 | 5007.10 | 3031.27 | 449.2 |
| 3365 | 5022.88 | 3049.99 | 449.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3366 | 5000.02 | 3049.82 | 442.0 |
| 3367 | 4950.03 | 3050.04 | 428.0 |
| 3368 | 4900.06 | 3050.04 | 421.2 |
| 3369 | 4849.94 | 3049.97 | 421.2 |
| 3370 | 4799.94 | 3049.96 | 421.2 |
| 3371 | 4750.14 | 3050.06 | 421.2 |
| 3372 | 4700.05 | 3050.02 | 421.2 |
| 3373 | 4650.14 | 3050.11 | 421.2 |
| 3374 | 4599.86 | 3050.26 | 421.2 |
| 3375 | 4549.83 | 3050.00 | 421.2 |
| 3376 | 4500.11 | 3050.10 | 421.2 |
| 3377 | 4449.94 | 3049.83 | 421.2 |
| 3378 | 4400.20 | 3050.12 | 421.2 |
| 3379 | 4350.00 | 3049.94 | 425.1 |
| 3380 | 4299.92 | 3049.95 | 443.7 |
| 3381 | 4285.57 | 3049.92 | 449.2 |
| 3382 | 5034.77 | 3100.02 | 449.1 |
| 3383 | 5000.01 | 3100.13 | 435.3 |
| 3384 | 4950.02 | 3100.05 | 421.2 |
| 3385 | 4900.10 | 3100.09 | 421.2 |
| 3386 | 4849.98 | 3100.03 | 421.2 |
| 3387 | 4800.10 | 3099.98 | 421.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3388 | 4749.95 | 3099.96 | 421.2 |
| 3389 | 4700.03 | 3099.98 | 421.2 |
| 3390 | 4649.91 | 3100.08 | 421.2 |
| 3391 | 4599.96 | 3099.81 | 421.2 |
| 3392 | 4549.96 | 3099.93 | 421.2 |
| 3393 | 4500.04 | 3100.03 | 421.2 |
| 3394 | 4449.97 | 3100.23 | 421.2 |
| 3395 | 4399.85 | 3100.03 | 421.2 |
| 3396 | 4349.86 | 3100.03 | 421.2 |
| 3397 | 4300.11 | 3100.06 | 438.3 |
| 3398 | 4272.46 | 3100.10 | 449.1 |
| 3399 | 5012.69 | 3150.30 | 449.2 |
| 3400 | 4999.99 | 3150.05 | 445.6 |
| 3401 | 4950.11 | 3150.20 | 431.5 |
| 3402 | 4899.87 | 3149.96 | 421.2 |
| 3403 | 4849.90 | 3150.03 | 421.2 |
| 3404 | 4800.03 | 3149.92 | 421.2 |
| 3405 | 4749.90 | 3149.97 | 421.2 |
| 3406 | 4700.06 | 3150.04 | 421.2 |
| 3407 | 4650.12 | 3150.17 | 421.2 |
| 3408 | 4600.02 | 3150.01 | 421.2 |
| 3409 | 4550.02 | 3150.04 | 421.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3410 | 4499.97 | 3150.05 | 421.2 |
| 3411 | 4450.05 | 3150.08 | 421.2 |
| 3412 | 4399.88 | 3149.97 | 421.2 |
| 3413 | 4349.99 | 3150.03 | 421.2 |
| 3414 | 4299.79 | 3149.95 | 436.1 |
| 3415 | 4266.81 | 3150.03 | 449.3 |
| 3416 | 4962.61 | 3199.66 | 449.0 |
| 3417 | 4949.98 | 3200.11 | 445.6 |
| 3418 | 4900.10 | 3200.07 | 431.4 |
| 3419 | 4849.92 | 3199.93 | 421.2 |
| 3420 | 4800.05 | 3200.02 | 421.2 |
| 3421 | 4749.98 | 3199.84 | 421.2 |
| 3422 | 4700.00 | 3200.07 | 421.5 |
| 3423 | 4649.93 | 3199.94 | 436.1 |
| 3424 | 4600.00 | 3200.15 | 432.9 |
| 3425 | 4550.07 | 3199.89 | 421.2 |
| 3426 | 4500.11 | 3199.99 | 421.2 |
| 3427 | 4449.95 | 3200.02 | 421.2 |
| 3428 | 4399.93 | 3199.87 | 421.2 |
| 3429 | 4350.02 | 3200.01 | 421.2 |
| 3430 | 4299.96 | 3200.05 | 436.9 |
| 3431 | 4269.09 | 3200.06 | 449.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3432 | 4913.31 | 3249.92 | 449.2 |
| 3433 | 4899.87 | 3249.96 | 445.4 |
| 3434 | 4849.79 | 3249.97 | 431.2 |
| 3435 | 4800.06 | 3249.94 | 421.2 |
| 3436 | 4750.07 | 3249.82 | 421.2 |
| 3437 | 4699.85 | 3249.95 | 425.1 |
| 3438 | 4650.22 | 3249.88 | 443.6 |
| 3439 | 4600.03 | 3250.12 | 447.3 |
| 3440 | 4549.99 | 3249.93 | 433.3 |
| 3441 | 4500.06 | 3249.89 | 421.2 |
| 3442 | 4450.07 | 3249.98 | 421.2 |
| 3443 | 4400.05 | 3250.03 | 421.2 |
| 3444 | 4349.96 | 3250.03 | 422.0 |
| 3445 | 4300.02 | 3250.08 | 441.0 |
| 3446 | 4278.82 | 3250.03 | 449.2 |
| 3447 | 4863.33 | 3300.08 | 449.2 |
| 3448 | 4850.07 | 3299.94 | 445.4 |
| 3449 | 4800.01 | 3300.12 | 431.2 |
| 3450 | 4750.09 | 3299.88 | 421.2 |
| 3451 | 4699.74 | 3300.06 | 421.2 |
| 3452 | 4650.10 | 3299.89 | 429.3 |
| 3453 | 4599.94 | 3299.98 | 443.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3454 | 4549.94 | 3299.92 | 447.7 |
| 3455 | 4500.11 | 3300.07 | 433.8 |
| 3456 | 4450.05 | 3299.92 | 421.2 |
| 3457 | 4399.89 | 3300.08 | 421.2 |
| 3458 | 4350.00 | 3300.06 | 430.2 |
| 3459 | 4299.89 | 3300.04 | 448.1 |
| 3460 | 4296.96 | 3299.97 | 449.1 |
| 3461 | 4813.76 | 3350.05 | 449.2 |
| 3462 | 4800.05 | 3350.06 | 445.3 |
| 3463 | 4749.84 | 3349.96 | 431.0 |
| 3464 | 4699.89 | 3350.05 | 421.2 |
| 3465 | 4650.01 | 3349.83 | 421.2 |
| 3466 | 4600.05 | 3350.02 | 428.8 |
| 3469 | 4450.05 | 3350.07 | 434.3 |
| 3470 | 4399.90 | 3349.95 | 427.9 |
| 3471 | 4350.05 | 3349.92 | 441.6 |
| 3472 | 4325.46 | 3350.10 | 449.1 |
| 3473 | 4329.49 | 3356.46 | 449.1 |
| 3474 | 4764.16 | 3400.09 | 449.2 |
| 3475 | 4749.97 | 3399.91 | 445.1 |
| 3476 | 4699.92 | 3399.99 | 430.9 |
| 3477 | 4650.10 | 3400.08 | 421.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3478 | 4599.76 | 3400.02 | 421.2 |
| 3479 | 4550.03 | 3400.07 | 428.3 |
| 3480 | 4500.04 | 3400.07 | 442.2 |
| 3481 | 4450.06 | 3399.93 | 448.6 |
| 3482 | 4399.93 | 3400.08 | 442.5 |
| 3483 | 4375.40 | 3400.07 | 449.2 |
| 3484 | 4714.37 | 3449.93 | 449.1 |
| 3485 | 4699.82 | 3449.99 | 445.0 |
| 3486 | 4649.98 | 3450.12 | 430.9 |
| 3487 | 4600.03 | 3449.92 | 421.2 |
| 3488 | 4550.17 | 3449.88 | 421.2 |
| 3489 | 4499.88 | 3450.11 | 430.9 |
| 3490 | 4450.02 | 3450.04 | 444.7 |
| 3491 | 4433.56 | 3449.95 | 449.2 |
| 3492 | 4664.93 | 3500.04 | 449.2 |
| 3493 | 4649.94 | 3500.02 | 445.0 |
| 3494 | 4600.07 | 3499.95 | 430.8 |
| 3495 | 4549.97 | 3499.88 | 430.4 |
| 3496 | 4500.56 | 3500.01 | 444.0 |
| 3497 | 4481.43 | 3500.05 | 449.2 |
| 3498 | 4620.63 | 3544.75 | 449.3 |
| 3499 | 4614.54 | 3550.07 | 449.3 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3500 | 4599.96 | 3549.94 | 446.1 |
| 3501 | 4549.99 | 3549.99 | 446.0 |
| 3502 | 4535.15 | 3550.06 | 449.2 |
| 3503 | 4600.09 | 3558.45 | 449.2 |
| 3504 | 4550.00 | 3558.84 | 449.2 |
| 3505 | 4788.77 | 2825.15 | 449.2 |
| 3506 | 4451.50 | 2831.59 | 449.2 |

NOTE:

1. CONTROL POINTS 3304 AND 3305 ARE WITHIN THE EXTENT OF FGD-A POND EMBANKMENT WHICH WILL BE REMOVED TO ACCOMODATE PIPE INSTALLATION.

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |
| | ~~APPENDIX E Revision 1 November 21, 2022~~ | | | | | |

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT

GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TOP OF EXCAVATED CLAY POINT TABLE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 21 of 22 | 21 |

Path: \\golder.gds\corp\usa\staff\ulle\chouvlen - ivan\fil_luminant\fgd\fgd_pond\19129621_taskfol_2\fig\19129621-003.dwg | Last Edited By: rsalazar Date: 2021-09-16 Time: 2:47:19 PM | Printed By: RSalazar Date: 2021-09-17 Time: 9:21:45 AM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN ALTERED FROM ANSI B

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 4300 | 4649.98 | 2764.49 | 449.0 |
| 4301 | 4599.99 | 2763.63 | 449.0 |
| 4302 | 4700.09 | 2775.23 | 449.0 |
| 4303 | 4550.03 | 2772.71 | 449.0 |
| 4304 | 4754.21 | 2799.96 | 449.0 |
| 4305 | 4749.97 | 2800.01 | 448.1 |
| 4306 | 4700.06 | 2799.95 | 439.6 |
| 4307 | 4650.00 | 2800.03 | 434.9 |
| 4308 | 4600.03 | 2799.91 | 434.5 |
| 4309 | 4549.99 | 2800.05 | 438.5 |
| 4310 | 4500.06 | 2799.98 | 446.9 |
| 4311 | 4489.87 | 2800.05 | 449.0 |
| 4312 | 4815.30 | 2850.13 | 449.0 |
| 4313 | 4800.09 | 2850.04 | 444.8 |
| 4314 | 4749.95 | 2849.98 | 431.5 |
| 4315 | 4700.13 | 2850.15 | 421.1 |
| 4316 | 4649.95 | 2850.08 | 421.0 |
| 4317 | 4599.96 | 2849.86 | 421.0 |
| 4318 | 4550.08 | 2849.91 | 421.0 |
| 4319 | 4499.94 | 2850.00 | 430.4 |
| 4320 | 4450.05 | 2850.10 | 444.4 |
| 4321 | 4434.82 | 2849.80 | 449.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 4322 | 4868.44 | 2899.84 | 449.1 |
| 4323 | 4850.02 | 2899.83 | 444.0 |
| 4324 | 4800.01 | 2900.05 | 430.2 |
| 4325 | 4749.78 | 2899.94 | 421.0 |
| 4326 | 4700.02 | 2899.99 | 421.0 |
| 4327 | 4649.94 | 2900.13 | 421.0 |
| 4328 | 4600.15 | 2900.02 | 421.0 |
| 4329 | 4550.01 | 2900.15 | 421.0 |
| 4330 | 4500.03 | 2900.01 | 421.0 |
| 4331 | 4449.97 | 2899.91 | 431.0 |
| 4332 | 4399.89 | 2900.01 | 445.8 |
| 4333 | 4389.16 | 2900.02 | 449.0 |
| 4334 | 4921.29 | 2950.05 | 449.0 |
| 4335 | 4899.93 | 2949.95 | 443.2 |
| 4336 | 4850.03 | 2949.92 | 429.5 |
| 4337 | 4800.05 | 2950.07 | 421.0 |
| 4338 | 4749.90 | 2949.86 | 421.0 |
| 4339 | 4700.03 | 2950.05 | 421.0 |
| 4340 | 4650.14 | 2949.85 | 421.0 |
| 4341 | 4599.76 | 2950.10 | 421.0 |
| 4342 | 4549.90 | 2949.96 | 421.0 |
| 4343 | 4500.06 | 2950.10 | 421.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 4344 | 4450.11 | 2950.03 | 421.0 |
| 4345 | 4400.08 | 2950.08 | 432.3 |
| 4346 | 4349.99 | 2949.97 | 447.2 |
| 4347 | 4343.90 | 2950.01 | 449.0 |
| 4348 | 4974.04 | 3000.18 | 448.9 |
| 4349 | 4949.87 | 2999.80 | 442.4 |
| 4350 | 4899.93 | 2999.98 | 428.6 |
| 4351 | 4850.01 | 2999.98 | 421.0 |
| 4352 | 4800.00 | 2999.95 | 421.0 |
| 4353 | 4749.99 | 2999.95 | 421.0 |
| 4354 | 4700.12 | 3000.05 | 421.0 |
| 4355 | 4649.75 | 2999.91 | 421.0 |
| 4356 | 4600.02 | 2999.78 | 421.0 |
| 4357 | 4549.97 | 2999.95 | 421.0 |
| 4358 | 4500.08 | 3000.16 | 421.0 |
| 4359 | 4449.98 | 3000.13 | 421.0 |
| 4360 | 4400.19 | 3000.28 | 421.0 |
| 4361 | 4350.01 | 3000.00 | 434.5 |
| 4362 | 4330.13 | 2965.15 | 449.0 |
| 4363 | 4307.50 | 3000.08 | 449.0 |
| 4364 | 5007.10 | 3031.27 | 449.0 |
| 4365 | 5022.88 | 3049.99 | 449.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 4366 | 5000.02 | 3049.82 | 441.8 |
| 4367 | 4950.03 | 3050.04 | 427.8 |
| 4368 | 4900.06 | 3050.04 | 421.0 |
| 4369 | 4849.94 | 3049.97 | 421.0 |
| 4370 | 4799.94 | 3049.96 | 421.0 |
| 4371 | 4750.14 | 3050.06 | 421.0 |
| 4372 | 4700.05 | 3050.02 | 421.0 |
| 4373 | 4650.14 | 3050.11 | 421.0 |
| 4374 | 4599.86 | 3050.26 | 421.0 |
| 4375 | 4549.83 | 3050.00 | 421.0 |
| 4376 | 4500.11 | 3050.10 | 421.0 |
| 4377 | 4449.94 | 3049.83 | 421.0 |
| 4378 | 4400.20 | 3050.12 | 421.0 |
| 4379 | 4350.00 | 3049.94 | 424.9 |
| 4380 | 4299.92 | 3049.95 | 443.5 |
| 4381 | 4285.57 | 3049.92 | 449.0 |
| 4382 | 5034.77 | 3100.02 | 448.9 |
| 4383 | 5000.01 | 3100.13 | 435.1 |
| 4384 | 4950.02 | 3100.05 | 421.0 |
| 4385 | 4900.10 | 3100.09 | 421.0 |
| 4386 | 4849.98 | 3100.03 | 421.0 |
| 4387 | 4800.10 | 3099.98 | 421.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 4388 | 4749.95 | 3099.96 | 421.0 |
| 4389 | 4700.03 | 3099.98 | 421.0 |
| 4390 | 4649.91 | 3100.08 | 421.0 |
| 4391 | 4599.96 | 3099.81 | 421.0 |
| 4392 | 4549.96 | 3099.93 | 421.0 |
| 4393 | 4500.04 | 3100.03 | 421.0 |
| 4394 | 4449.97 | 3100.23 | 421.0 |
| 4395 | 4399.85 | 3100.03 | 421.0 |
| 4396 | 4349.86 | 3100.03 | 421.0 |
| 4397 | 4300.11 | 3100.06 | 438.1 |
| 4398 | 4272.46 | 3100.10 | 448.9 |
| 4399 | 5012.69 | 3150.30 | 449.0 |
| 4400 | 4999.99 | 3150.05 | 445.4 |
| 4401 | 4950.11 | 3150.20 | 431.3 |
| 4402 | 4899.87 | 3149.96 | 421.0 |
| 4403 | 4849.90 | 3150.03 | 421.0 |
| 4404 | 4800.03 | 3149.92 | 421.0 |
| 4405 | 4749.90 | 3149.97 | 421.0 |
| 4406 | 4700.06 | 3150.04 | 421.0 |
| 4407 | 4650.12 | 3150.17 | 421.0 |
| 4408 | 4600.02 | 3150.01 | 421.0 |
| 4409 | 4550.02 | 3150.04 | 421.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 4410 | 4499.97 | 3150.05 | 421.0 |
| 4411 | 4450.05 | 3150.08 | 421.0 |
| 4412 | 4399.88 | 3149.97 | 421.0 |
| 4413 | 4349.99 | 3150.03 | 421.0 |
| 4414 | 4299.79 | 3149.95 | 435.9 |
| 4415 | 4266.81 | 3150.03 | 449.1 |
| 4416 | 4962.61 | 3199.66 | 448.9 |
| 4417 | 4949.98 | 3200.11 | 445.5 |
| 4418 | 4900.10 | 3200.07 | 431.2 |
| 4419 | 4849.92 | 3199.93 | 421.0 |
| 4420 | 4800.05 | 3200.02 | 421.0 |
| 4421 | 4749.98 | 3199.84 | 421.0 |
| 4422 | 4700.00 | 3200.07 | 421.3 |
| 4423 | 4649.93 | 3199.94 | 435.9 |
| 4424 | 4600.00 | 3200.15 | 432.7 |
| 4425 | 4550.07 | 3199.89 | 421.0 |
| 4426 | 4500.11 | 3199.99 | 421.0 |
| 4427 | 4449.95 | 3200.02 | 421.0 |
| 4428 | 4399.93 | 3199.87 | 421.0 |
| 4429 | 4350.02 | 3200.01 | 421.0 |
| 4430 | 4299.96 | 3200.05 | 436.7 |
| 4431 | 4269.09 | 3200.06 | 449.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 4432 | 4913.31 | 3249.92 | 449.0 |
| 4433 | 4899.87 | 3249.96 | 445.2 |
| 4434 | 4849.79 | 3249.97 | 431.0 |
| 4435 | 4800.06 | 3249.94 | 421.0 |
| 4436 | 4750.07 | 3249.82 | 421.0 |
| 4437 | 4699.85 | 3249.95 | 424.9 |
| 4438 | 4650.22 | 3249.88 | 443.4 |
| 4439 | 4600.03 | 3250.12 | 447.1 |
| 4440 | 4549.99 | 3249.93 | 433.1 |
| 4441 | 4500.06 | 3249.89 | 421.0 |
| 4442 | 4450.07 | 3249.98 | 421.0 |
| 4443 | 4400.05 | 3250.03 | 421.0 |
| 4444 | 4349.96 | 3250.03 | 421.8 |
| 4445 | 4300.02 | 3250.08 | 440.8 |
| 4446 | 4278.82 | 3250.03 | 449.0 |
| 4447 | 4863.33 | 3300.08 | 449.0 |
| 4448 | 4850.07 | 3299.94 | 445.2 |
| 4449 | 4800.01 | 3300.12 | 431.0 |
| 4450 | 4750.09 | 3299.88 | 421.0 |
| 4451 | 4699.74 | 3300.06 | 421.0 |
| 4452 | 4650.10 | 3299.89 | 429.1 |
| 4453 | 4599.94 | 3299.98 | 443.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 4454 | 4549.94 | 3299.92 | 447.5 |
| 4455 | 4500.11 | 3300.07 | 433.6 |
| 4456 | 4450.05 | 3299.92 | 421.0 |
| 4457 | 4399.89 | 3300.08 | 421.0 |
| 4458 | 4350.00 | 3300.06 | 430.0 |
| 4459 | 4299.89 | 3300.04 | 447.9 |
| 4460 | 4296.96 | 3299.97 | 448.9 |
| 4461 | 4813.76 | 3350.05 | 449.0 |
| 4462 | 4800.05 | 3350.06 | 445.1 |
| 4463 | 4749.84 | 3349.96 | 430.8 |
| 4464 | 4699.89 | 3350.05 | 421.0 |
| 4465 | 4650.01 | 3349.83 | 421.0 |
| 4466 | 4600.05 | 3350.02 | 428.6 |
| 4469 | 4450.05 | 3350.07 | 434.1 |
| 4470 | 4399.90 | 3349.95 | 427.7 |
| 4471 | 4350.05 | 3349.92 | 441.4 |
| 4472 | 4325.46 | 3350.10 | 448.9 |
| 4473 | 4329.49 | 3356.46 | 448.9 |
| 4474 | 4764.16 | 3400.09 | 449.0 |
| 4475 | 4749.97 | 3399.91 | 444.9 |
| 4476 | 4699.92 | 3399.99 | 430.7 |
| 4477 | 4650.10 | 3400.08 | 421.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 4478 | 4599.76 | 3400.02 | 421.0 |
| 4479 | 4550.03 | 3400.07 | 428.1 |
| 4480 | 4500.04 | 3400.07 | 442.0 |
| 4481 | 4450.06 | 3399.93 | 448.4 |
| 4482 | 4399.93 | 3400.08 | 442.3 |
| 4483 | 4375.40 | 3400.07 | 449.0 |
| 4484 | 4714.37 | 3449.93 | 449.0 |
| 4485 | 4699.82 | 3449.99 | 444.8 |
| 4486 | 4649.98 | 3450.12 | 430.7 |
| 4487 | 4600.03 | 3449.92 | 421.0 |
| 4488 | 4550.17 | 3449.88 | 421.0 |
| 4489 | 4499.88 | 3450.11 | 430.7 |
| 4490 | 4450.02 | 3450.04 | 444.5 |
| 4491 | 4433.56 | 3449.95 | 449.0 |
| 4492 | 4664.93 | 3500.04 | 449.0 |
| 4493 | 4649.94 | 3500.02 | 444.8 |
| 4494 | 4600.07 | 3499.95 | 430.6 |
| 4495 | 4549.97 | 3499.88 | 430.2 |
| 4496 | 4500.56 | 3500.01 | 443.9 |
| 4497 | 4481.43 | 3500.05 | 449.0 |
| 4498 | 4620.63 | 3544.75 | 449.1 |
| 4499 | 4614.54 | 3550.07 | 449.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 4500 | 4599.96 | 3549.94 | 445.9 |
| 4501 | 4549.99 | 3549.99 | 445.8 |
| 4502 | 4535.15 | 3550.06 | 449.0 |
| 4503 | 4600.09 | 3558.45 | 449.0 |
| 4504 | 4550.00 | 3558.84 | 449.0 |
| 4505 | 4788.77 | 2825.15 | 449.0 |
| 4506 | 4451.50 | 2831.59 | 449.0 |

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |
| | APPENDIX E-Revision 1 November 21, 2022 | | | | | |

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TOP OF RECOMPACTED CLAY POINT TABLE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 22 of 22 | 22 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI D

Plotted By: rgoller gis\central\autolisp\ecn\autolisp_ecn\plt_Luminant\DOSES\90_PRO\19129621_tpl\t02_PRODUCTION4 | File Name: 19129621-003.dwg | Last Edited By: rsalazar Date: 2021-09-16 Time: 2:21:06 PM | Printed By: RSalazar Date: 2021-09-17 Time: 9:23:06 AM

GOLDER

# Technical Specifications

*FGD-A Pond Retrofit*

Submitted to:

**Oak Grove Management Company LLC**

Submitted by:

**Golder Associates Inc.**

14950 Heathrow Forest Parkway, Suite 280, Houston, Texas, USA 77032

+1 281 821-6868

19129621

January 2021

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**DIVISION 01**

# General

# SECTION 01 11 00
# SUMMARY OF WORK

## 1.0 GENERAL

### 1.1 Description

A. Provide all labor, materials, and equipment to complete Project as depicted on the Construction Drawings entitled "Oak Grove Steam Electric Station, FGD-A Pond Retrofit, Robertson County, Texas", dated November 2020, and as described in the Technical Specifications.

### 1.2 Description of Work

A. The Project consists of retrofitting FGD-A Pond with a liner system meeting the requirements of the Environmental Protection Agency CCR regulations (40 Code of Federal Regulations Part 257, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule", part §257.72).

B. The FGD-A Pond is a surface impoundment constructed in 2008.

C. The FGD-A Work generally consists of:

1. Removal of any remaining CCR and roughly the upper 1 foot of the existing 3-foot thick clay liner.
2. Installation of a cross-over intake riser and pipeline connecting FGD-A Pond and FGD-B Pond.
3. Installation of a drain pipeline through the FGD-A Pond embankment.
4. Scarification and recompaction of the upper 6 inches of the exposed clay liner.
5. Placement of general fill in areas where the clay liner has eroded on the sideslopes.
6. Repair of areas of clay liner not meeting the hydraulic conductivity criterion ($\leq 1 \times 10^{-7}$ cm/s) (if any), by:
   a. Placement of GCL over area; or
   b. Removal and recompaction of clay in 6-inch lifts to form a 2-foot thick clay liner.
7. Installation of a geomembrane over the clay liner/GCL.
8. Access ramp construction
9. Extension of the "peninsula" by 120 feet.
10. Placement of revetment on the upper portions of the lined interior sideslopes.
11. Placement of protective cover on the liner floor.
12. Demolition of existing Reclaim/Recycle pump intake riser in FGD-A Pond and installation of new intake riser.
13. Raise/extend FGD-A Pond inlet pipes from the plant drain lines.
14. Extend or shorten FGD-A Pond inlet return pipes from the Reclaim/Recycle pump structure.

D. FGD-B Pond will also be upgraded, as follows:

1. Installation of an intake riser and pipeline through FGD-B Pond embankment and run on-grade to connect to the suction side of the Reclaim/Recycle pumps.
2. Installation of a drain pipeline through the FGD-B Pond embankment.

3. Construction of earthen containment berm along the length of the FGD-B Pond to Pumps pipeline.
4. Installation of valved drainage culvert at low point in the earthen containment berm.

## 1.3 Use of Premises

A. The Contractor shall have full use of the premises, as approved by the Owner, for construction operations, including use of the Project Site, during the construction period. The Contractor's use of premises is limited only by the Owner's right to perform work or to retain other Contractors on portions of work related to this project.

B. Project Site is an active and operating power generation plant (the Plant). As such, the Contractor's use of premises shall not impede the continuing operation and activity of the Plant.

C. The Contractor shall furnish all labor, tools, materials, equipment, and supervision as may be required to complete the Work.

D. All excavations and shoring shall comply with the requirements of applicable federal and state excavation safety standards.

E. The Work shall be done in strict accordance with these Specifications and as indicated in the Bid documents and on the Drawings.

# 2.0 PRODUCTS

## 2.1 Submittals

A. Submittals for all products/materials used on the project shall be provided by the Contractor to the Owner's Representative for review. The submittals shall include, but not be limited to, geosynthetics, slope revetment, soils, aggregates, piping and appurtenances, pipe coating/painting, heat tracing plan, concrete, revegetation plans, stormwater pumps, etc.

B. Submittals shall also be produced by the Contractor for the Owner's review for documents including, but not limited to, Health and Safety Plan, equipment extraction plan, trenching safety plan, groundwater/surface water control plan, locations of temporary stockpiles and staging areas, Spill Prevention Control and Countermeasure Plan, Stormwater Pollution Prevention Plan, and Dust Control Plan. These items shall be submitted prior to the contractor coming on site.

# 3.0 EXECUTION

## 3.1 General Responsibilities of the Contractor

A. The Contractor shall execute all construction work stated in this Section and in the manner specified or illustrated in the Contract Documents and Construction Drawings. Any omission in these Technical Specifications does not release the Contractor from the responsibility to complete the Work or any part of the Work to the satisfaction of the Owner or his/her representative.

B. The Contractor shall develop, and submit to the Owner, a Spill Prevention Control and Countermeasure (SPCC) Plan for the fuels and oils stored and used on site during the project. The SPCC plan must cover storage tanks, tank trucks, and equipment used on site during the project. The SPCC plan shall be certified by a Professional Engineer licensed in the State of Texas.

C. The Contractor shall prepare a written Health and Safety Plan and submit to the Owner. The Contractor is solely responsible for the safety of their employees and subcontractors.

D. The Contractor shall provide field stake-out surveying as necessary to comply with the Construction Drawings. All project materials, labor, and equipment necessary to comply with all conditions identified in the project documents and incidental to the project shall be included in the Contractor's lump sum and/or unit prices contained on the Contractor's Bid Form.

## 3.2 General Responsibilities of the Owner

A. The Owner will supply available water for dust control and soil compaction, which can be drawn from on-site ponds or as designated by the Owner, subject to approval by the Owner. Note that Contractor is to provide Dust Control Plan, which is subject to approval by the Owner.

B. The Owner will supply third-party Construction Quality Assurance (CQA) to confirm that the Work performed by the Contractor(s) is in compliance with the approved Construction Drawings and Technical Specifications.

C. The Owner will supply surveying for construction certification, payment verification, and construction quality assurance (CQA) only.

## 3.3 Meetings

A. Weekly progress meetings shall be held to facilitate communications with the Owner. At a minimum, these meetings should be attended by the Owner's Representative and Contractor. The purpose of these meetings will be to:

1. Review the previous week's activities.
2. Review activities planned for the upcoming week.
3. Identify Contractor's equipment and personnel assignments for the week.
4. Provide review and updates regarding the material test results performed by the Owner's Representative.
5. Discuss any problems or potential problems, including safety issues.
6. Review test data.
7. Provide updates to the Construction Schedule

***END OF SECTION***

**SECTION 01 22 00**
**MEASUREMENT AND PAYMENT**

# 1.0 GENERAL

## 1.1 Description

A. This Section includes administrative and procedural requirements for measurement and payment of each bid item.

B. Payment to be received after work is installed. Payment for material on hand can only be paid for if allowed by the Agreement, the General and/or Special Conditions.

C. All invoices should be sent as a draft for review to the Luminant/Vistra Project Manager. Once reviewed and approved, invoices may be uploaded to the Luminant/Vistra Payment Services.

## 1.2 RELATED DOCUMENTS:

A. The Drawings, the Specifications, and general provisions of the Contract, including General and Supplementary Conditions, are related to this Section.

B. The items listed in this section refer to and are the same as the pay items listed on the Bid Form.

## 1.3 DEFINITIONS:

A. Compensation for all such services and materials shall be included in the prices stipulated for the lump sum and unit price pay items listed herein. Items of Work not specifically included in this Section for measurement and payment as described herein will not be measured for payment, but will be considered incidental to the Contract with the associated costs borne solely by the Contractor. Lump sum is an amount proposed by bidders, stated on the Bid Form, as a price for payment for defined items required by the Contract Documents.

## 1.4 Procedures:

A. Items include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead and profit.

B. Estimated neat-line material quantities are provided on the Bid Form for reference only. The Contractor is responsible for verifying material quantities as part of the bidding process. The Contractor shall notify the Owner of any discrepancy as soon as it is discovered so that the Owner can clarify the requirements prior to bid submittal.

# 2.0 EXECUTION

## 2.1 GENERAL COSTS

A. Item 1 - Mobilization/Demobilization:

1. Measurement for Mobilization/Demobilization shall be by lump sum. Payment for Mobilization/Demobilization shall include, but not be limited to, all costs to mobilize and demobilize all labor, equipment, supplies, tools, parts trailers, portable shop facilities, fuel tanks, and all other incidentals required to perform the Work and complete cleanup of the work areas, including waste disposal, to the satisfaction of the Owner's Representative.

2. The lump sum payment for Mobilization/Demobilization shall be payment in full on the basis of satisfactory evidence of mobilization of sufficient labor, equipment, and material to adequately advance the work. Fifty (50) percent of the lump sum price will be paid with the first payment request following satisfactory evidence of additional mobilization of sufficient labor, equipment, and material to adequately progress the work of this contract. Fifty (50) percent of the Lump Sum price bid will be paid with the Final Payment request.

B. Item 2 – Miscellaneous Site Work & Materials:

1. Measurement for Miscellaneous Site Work & Materials shall be by lump sum. Payment for Miscellaneous Site Work & Materials shall include, but not be limited to, all costs necessary to provide horizontal and vertical survey control, site trailer, sanitary and other temporary facilities, erosion control, dewatering, and all necessary permits.

2. The lump sum payment for Miscellaneous Site Work & Materials shall be payment in full on the basis of satisfactory evidence of mobilization of sufficient labor, equipment, and material to adequately advance the work. Fifty (50) percent of the lump sum price will be paid with the first payment request following satisfactory evidence of establishment of sufficient labor, equipment, and material to adequately progress the work of this contract. Fifty (50) percent of the Lump Sum price bid will be paid with the Final Payment request.

## 2.2 Liner Retrofit costs

C. Item 3 – Remove Coal Combustion Residuals (CCR) and Unsuitable Clay Liner:

1. Measurement for Remove CCR and Unsuitable Clay Liner shall be by contract unit price per cubic yard. Payment for Remove CCR and Unsuitable Clay Liner shall include, but not be limited to, all costs associated with the excavation, loading, hauling, and placement of remaining CCR and upper layer of the existing clay liner soil from FGD-A Pond to Ash Landfill 1 and providing all labor, materials, quality control, equipment, and incidentals to Remove CCR and Unsuitable Clay Liner in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Rainwater removal will not be measured and paid for separately but shall be included in the Work.

2. The volume of CCR and Unsuitable Clay Liner removed to achieve grade shown on the Drawings shall be calculated by 3-Dimensional Model based on the pre-construction topography and topography after excavation of CCR and unsuitable clay within the limits as shown on the Drawings.

D. Item 4 – Scarify/Recompact Upper 6 Inches of Clay Liner

1. Measurement for Scarify/Recompact Upper 6 Inches of Clay Liner shall be by contract unit price per square yard. Payment for Scarify/Recompact Upper 6 Inches of Clay Liner shall include, but not be limited to, all costs associated with the scarifying, processing, moisture conditioning, compacting, and preparing the surface of the clay liner and providing all labor, materials, quality control, equipment, and incidentals to Scarify/Recompact Upper 6 Inches of Clay Liner in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Rainwater removal will not be measured and paid for separately but shall be included in the Work.

2. The area of Scarify/Recompact Upper 6 Inches of Clay Liner shall be based on the surveyed area of the scarified/recompacted clay liner. The Owner shall estimate the actual area as shown by the 3-Dimensional Model and shall produce Record Drawings of the ground surface after recompaction.

E. Item 5 – Remove and Recompact Lower 24 inches of Clay Liner (if necessary)

1. Measurement for Remove/Recompact Lower 24 inches of Clay Liner shall be by contract unit price per cubic yard. Payment for Remove/Recompact Lower 24 Inches of Clay Liner shall include, but not be limited to, all costs associated with the removal of existing clay liner in failing area as identified by the Owner's Representative, processing, moisture conditioning, placing, compacting, and preparing the surface of the clay liner and providing all labor, materials, quality control, equipment, and incidentals to Remove/Recompact Lower 24 Inches of Clay Liner in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Rainwater removal will not be measured and paid for separately but shall be included in the Work.
2. The volume of Remove/Recompact Lower 24 Inches of Clay Liner shall be shall be calculated based on the surveyed area multiplied by 24 inches. The Owner shall estimate the actual area as shown by the 3-Dimensional Model and shall produce Record Drawings of the ground surface after replacement of the clay liner.

F. Item 6 - Place and Compact General Fill

1. Measurement for Place and Compact General Fill shall be by contract unit price per cubic yard. Payment for Place and Compact General Fill shall include, but not be limited to, all costs associated with the subgrade preparation, excavation, loading, hauling, double or multiple handling, stockpiling, placement, spreading, moisture conditioning, compaction, and trimming of soil materials and providing all labor, materials, quality control, equipment, and incidentals to achieve the lines and elevations indicated on the Drawings and in accordance with the Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.
2. The volume of General Fill needed to achieve subgrade shown on the Drawings shall be calculated by 3-Dimensional Model based on the topography of ground surface before and after grading within the limits as shown on the Drawings. No additional allowances shall be permitted for shrinkage, swelling, creep or unauthorized over-excavations beyond the approved depth or limits of excavation. The Owner shall estimate the actual volume of general fill as shown by the 3-Dimensional Model and shall produce Record Drawings of the ground surface before and after grading.

G. Item 7 – Supply GCL

1. Measurement for Supply GCL shall be by contract unit price per square foot. Payment for Supply GCL shall include, but not be limited to, all costs associated with manufacturing, manufacturer's testing, pre-delivery testing, and transporting the GCL meeting these Specifications and in accordance with the Liner Quality Control Plan.
2. The quantity of GCL will be based on the actual amount of approved GCL delivered to the Facility.

H. Item 8 – Install GCL

1. Measurement for Install GCL shall be by contract unit price per square foot. Payment for Install GCL shall include, but not be limited to, all costs associated with unloading, handling, storing, protecting, installing, seaming, testing, constructing the anchor trench, as well as all labor, materials, quality control, equipment, and incidentals, including accessory granular bentonite, to complete the work as indicated on the Drawings and in accordance with the Specifications and to the satisfaction of the Owner's Representative.
2. The quantity of GCL installed shall be the surveyed area. Allowance will be made for GCL in anchor trench; however, no allowance will be made for waste, overlap, repairs, materials used for convenience of the Contractor, replacing hydrated GCL, or material not meeting the Specifications. No additional allowance shall be permitted for unauthorized GCL installed beyond the limits as set forth by Owner's Representative following field

verification. The Owner shall estimate the actual area and shall show the locations and dimensions on Record Drawings.

I. Item 9 - Supply and Install Geomembrane

1. Measurement for Supply and Install Geomembrane shall be by contract unit price per square foot. Payment for Supply and Install Geomembrane shall include, but not be limited to, all costs associated with manufacturing, manufacturer's testing, pre-delivery testing, transporting, unloading, handling, storing, installing, seaming, testing, constructing anchor trench, as well as all labor, materials, quality control, equipment, and incidentals to complete the work as indicated on the Drawings in accordance with the Specifications and to the satisfaction of the Owner's Representative.

2. The quantity of Geomembrane shall be the surveyed area. Allowance will be made for Geomembrane in anchor trench; however, no allowance will be made for waste, overlap, repairs, or materials used for convenience of the Contractor. No additional allowance shall be permitted for unauthorized Geomembrane installed beyond the limits as set forth by Owner's Representative following field verification. The Owner shall estimate the actual area and shall show the locations and dimensions on Record Drawings.

J. Item 10 - Place Protective Cover

1. Measurement for Place Protective Cover shall be by contract unit price per cubic yard. The Protective Cover will consist of bottom ash supplied by the Owner. Payment for Place Protective Cover shall include, but not be limited to, all costs associated with the loading, hauling, double or multiple handling, stockpiling, placing, spreading, and grading and providing all labor, materials, quality control, equipment, and incidentals to Place Protective Cover to the lines and grades indicated on the Drawings in accordance with the Liner Quality Control Plan and to the satisfaction of the Owner's Representative. Water removal will not be measured and paid for separately but shall be included in the Work.

2. The volume of Protective Cover needed to achieve the minimum 1.5-foot thickness shall be calculated by multiplying the surveyed area of Protective Cover placement (minus the area of the ramp and peninsula)by 1.5 feet. No additional allowances shall be permitted for unauthorized amounts of Protective Cover in excess of the 1.5-foot thickness. The Owner shall estimate the actual area and shall show the locations and dimensions on Record Drawings.

K. Item 11 - Construct Ramp and Peninsula Extension Over Geosynthetics

1. Measurement for Construct Ramp and Peninsula Extension Over Geosynthetics shall be by contract unit price per cubic yard. The Ramp and Peninsula Extension will consist of bottom ash supplied by the Owner. Payment for Construct Ramp and Peninsula Extension shall include, but not be limited to, all costs associated with the loading, hauling, double or multiple handling, stockpiling, placing, spreading, moisture conditioning, grading, and providing all labor, materials, quality control, equipment, and incidentals to Construct Ramp and Peninsula Extension Over Geosynthetics to the lines and grades indicated on the Drawings in accordance with the Liner Quality Control Plan and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

2. The volume of Construct Ramp and Peninsula Extension Over Geosynthetics to achieve grades shown on the Drawings shall be calculated by 3-Dimensional Model based on the 3-dimensional model of the As-Constructed Clay Plan and topography after grading within the limits as shown on the Drawings.

L. Item 12 - Procure and Install Erosion Control Lining System

1. Measurement for Procure and Install Erosion Control Lining System shall be by contract unit price per square foot. Payment for Procure and Install Erosion Control Lining System shall include, but not be limited to, all costs associated with manufacturing, manufacturer's testing, pre-delivery testing, transporting, unloading, handling, storing, installing, seaming, testing, constructing anchor trench, as well as all labor, materials, quality control, equipment, and incidentals to complete the work as indicated on the Drawings in accordance with the Specifications and to the satisfaction of the Owner's Representative.
2. The quantity of Procure and Install Erosion Control Lining System shall be the surveyed area. Allowance will be made for Procure and Install Erosion Control Lining System in anchor trench; however, no allowance will be made for waste, overlap, repairs, or materials used for convenience of the Contractor. No additional allowance shall be permitted for unauthorized Erosion Control Lining System installed beyond the limits as set forth by Owner's Representative following field verification. The Owner shall estimate the actual area and shall show the locations and dimensions on Record Drawings.

## 2.3 Piping Modifications costs

M. Item 13 – FGD-A to FGD-B Crossover Pipeline Through Embankment (two pipes):

1. Measurement for FGD-A to FGD-B Crossover Pipeline Through Embankment shall be by lump sum. Payment for FGD-A to FGD-B Crossover Pipeline Through Embankment shall include, but not be limited to, all costs necessary to furnish and install 18-inch HDPE crossover piping, 12-inch HDPE drain piping, valves, fittings, and appurtenances, including providing horizontal and vertical control for 18-inch HDPE piping and 12-inch HDPE piping; clearing and grubbing, stripping and stockpiling topsoil, excavating and stockpiling clay liner, and excavating and stockpiling embankment fill material as required to install 18-inch HDPE crossover piping and 12-inch HDPE drain piping; cutting, demolishing, removing, and disposing of existing 12-inch crossover pipeline upstream of the existing 12-inch gate valve; excavating, stockpiling, and filling as required to install 18-inch HDPE crossover piping and 12-inch HDPE drain piping to the lines and elevations shown on the Drawings; furnishing, loading, hauling, stockpiling, and placing bedding and embedment materials (provided by the contractor) for 18-inch HDPE crossover piping and 12-inch HDPE drain piping; laying and joining 18-inch HDPE crossover piping, 12-inch HDPE drain piping, and fittings, including boots/penetrations, as indicated in the Drawings and Specifications; furnishing, fitting, and installing 12-inch knife gate valve; connecting new 18-inch HDPE crossover pipeline to existing 12-inch crossover pipeline and gate valve; furnishing, loading, hauling, stockpiling, placing, moisture conditioning, and compacting backfill materials for 18-inch HDPE crossover piping and 12-inch HDPE drain piping; furnishing, loading, hauling, stockpiling, placing, moisture conditioning, and compacting excavated clay (or general fill and installing geosynthetic clay liner as approved by Owner's Representative) on the upstream embankment slope; replacing stripped topsoil, revegetating, and placing erosion control mat on the downstream embankment slope; furnishing, loading, hauling stockpiling, placing, moisture conditioning, and compacting crushed stone roadway material; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to install 18-inch HDPE crossover piping and 12-inch HDPE drain piping in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

N. Item 14 – FGD-A to Pump Intake:

1. Measurement for FGD-A to Pump Intake shall be by lump sum. Payment for FGD-A to Pump Intake shall include, but not be limited to, all costs necessary to furnish and install 18-inch and 14-inch HDPE intake riser, fittings, boots/penetrations, and appurtenances, including providing horizontal and vertical control for 18-inch and 14-inch HDPE intake

riser; demolishing, loading, hauling, stockpiling, and disposing of existing concrete collar and intake pipe; furnishing, laying, and joining 18-inch and 14-inch HDPE intake riser to the lines and elevations shown on the Drawings; preparing subgrade; procuring, delivering, unloading, storing, transporting, deploying, and installing geotextile between geomembrane liner and concrete; furnishing, erecting, and stripping concrete forms; furnishing, placing, finishing, and curing concrete as indicated in the Drawings; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to install 18-inch and 14-inch HDPE intake riser and concrete collar in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

O. Item 15 – FGD-A to FGD-B Crossover Pipeline in FGD-A Pond (Run of Pipe):

1. Measurement for FGD-A to FGD-B Crossover Pipeline in FGD-A Pond (Run of Pipe) shall be by lump sum. Payment for FGD-A to FGD-B Crossover Pipeline in FGD-A Pond (Run of Pipe) shall include, but not be limited to, all costs necessary to furnish and install 18-inch HDPE crossover piping, intake vertical riser, concrete collar, fittings, and appurtenances, including providing horizontal and vertical control for 18-inch HDPE piping; filling and grading as required to install 18-inch HDPE crossover piping; furnishing, laying, and joining 18-inch HDPE crossover piping and intake riser to the lines and elevations shown in the Drawings; loading, hauling, double or multiple handling, stockpiling, placing, spreading, and grading and providing all labor, materials, quality control, equipment, and incidentals to Place Protective Cover over the 18-inch HDPE crossover piping to the lines and grades indicated on the Drawings; procuring, delivering, unloading, storing, transporting, deploying, and installing geomembrane rub-sheet; furnishing, erecting, and stripping concrete forms; furnishing, placing, finishing, and curing concrete as indicated in the Drawings; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to install 18-inch HDPE crossover piping, intake riser, and concrete collar in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

P. Item 16 – FGD-A Drain Line

1. Measurement for FGD-A Drain Line shall be by lump sum. Payment for FGD-A Drain Line shall include, but not be limited to, all costs necessary to furnish and install 24-inch perforated HDPE piping, 12-inch HDPE piping, fittings, and appurtenances, including providing horizontal and vertical control for 24-inch perforated HDPE piping and riser and 12-inch HDPE piping; filling and grading as required to install 24-inch perforated HDPE piping and riser and 12-inch HDPE piping; furnishing, laying, and joining 24-inch perforated HDPE piping and riser and 12-inch HDPE piping to the lines and elevations shown in the Drawings; procuring, delivering, unloading, storing, transporting, deploying, and installing geotextile and geomembrane rub-sheet; furnishing, loading, hauling, stockpiling, and placing washed gravel embedment; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to install 24-inch perforated HDPE piping and riser and 12-inch HDPE piping in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

Q. Item 17 – Extend FGD-A Pond Inlets (Return from Pumps)

1. Measurement for Extend FGD-A Pond Inlets (Return from Pumps) shall be by lump sum. Payment for Extend FGD-A Pond Inlets (Return from Pumps) shall include, but not be limited to, all costs necessary to extend or cut existing 4-inch HDPE inlet piping and 8-inch HDPE inlet piping to the lines and elevations shown in the Drawings, including providing horizontal and vertical control for 4-inch and 8-inch HDPE inlet piping; procuring, laying, and joining 4-inch and 8-inch HDPE inlet pipe extensions; cutting, removing, and disposing of excess 4-inch and 8-inch HDPE inlet piping; furnishing and installing pipe boot/penetrations; disposing of

waste; and providing all labor, materials, quality control, equipment, and incidentals to extend or cut 4-inch and 8-inch HDPE inlet piping in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative.

R. Item 18 – Extend FGD-A Pond Inlets (From Plant)

1. Measurement for Extend FGD-A Pond Inlets (From Plant) shall be by lump sum. Payment for Extend FGD-A Pond Inlets (From Plant) shall include, but not be limited to, all costs necessary to demolish the eleven existing HDPE inlet pipelines and replace with eleven new HDPE inlet pipelines at a higher elevation into the FGD-A Pond as shown in the Drawings, including providing horizontal and vertical control for HDPE inlet piping; excavating and stockpiling existing embankment material; cutting, removing, and disposing of eleven existing HDPE inlets (piping extending through the embankment); loading, hauling, stockpiling, placing, moisture conditioning, and compacting embankment fill to establish inlet piping subgrade; furnishing, loading, hauling, stockpiling, and placing bedding and embedment materials (provided by the contractor) for the HDPE inlet piping; furnishing, loading, hauling storing, laying, and joining HDPE inlet piping extensions; furnishing, loading, hauling, stockpiling, placing, moisture conditioning, and compacting embankment fill materials; furnishing, loading, hauling, stockpiling, placing, moisture conditioning, and compacting crushed stone roadway material; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to install HDPE inlet piping extensions in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

S. Item 19 – FGD-B to Pumps Pipeline Through Embankment (two pipes):

1. Measurement for FGD-B to Pumps Pipeline Through Embankment shall be by lump sum. Payment for FGD-B to Pumps Pipeline Through Embankment shall include, but not be limited to, all costs necessary to furnish and install 18-inch HDPE piping 12-inch HDPE drain piping, valves, fittings, and appurtenances, including providing horizontal and vertical control for 18-inch HDPE piping and 12-inch HDPE piping; clearing and grubbing, stripping and stockpiling topsoil, excavating and stockpiling protective cover, cutting and temporarily removing existing HDPE geomembrane liner, excavating and stockpiling clay liner, and excavating and stockpiling embankment fill material as required to install 18-inch HDPE piping and 12-inch HDPE drain piping; excavating, stockpiling, and filling as required to install 18-inch HDPE piping and 12-inch HDPE drain piping to the lines and elevations shown on the Drawings; furnishing, loading, hauling, stockpiling, and placing bedding and embedment materials (provided by the contractor) for 18-inch HDPE piping and 12-inch HDPE drain piping; laying and joining 18-inch HDPE piping, 12-inch HDPE drain piping, valves, and fittings, including boots/penetrations, as indicated in the Drawings and Specifications; furnishing, fitting, and installing 12-inch and 18-inch knife gate valves; furnishing, loading, hauling, stockpiling, placing, moisture conditioning, and compacting backfill materials for 18-inch HDPE piping and 12-inch HDPE drain piping; furnishing, loading, hauling, stockpiling, placing, moisture conditioning, and compacting excavated clay (or general fill and installing geosynthetic clay liner as approved by Owner's Representative) on the upstream embankment slope; deploying, repairing, and seaming geomembrane liner; loading, hauling, placing, moisture conditioning, and compacting protective cover material stockpiled during excavation; replacing stripped topsoil, revegetating, and placing erosion control mat on the downstream embankment slope; furnishing, loading, hauling, stockpiling, placing, moisture conditioning, and compacting crushed stone roadway material; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to install 18-inch HDPE crossover piping and 12-inch HDPE drain piping in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

T. Item 20 – FGD-B to Pump Intake:

1. Measurement for FGD-B to Pump Intake shall be by lump sum. Payment for FGD-B to Pump Intake shall include, but not be limited to, all costs necessary to furnish and install 18-inch HDPE intake riser, fittings, boots/penetrations, and appurtenances, including providing horizontal and vertical control for 18-inch HDPE intake riser; procuring, delivering, unloading, storing, transporting, deploying, and installing geotextile; furnishing, laying, and joining 18-inch HDPE intake riser to the lines and elevations shown on the Drawings; loading, hauling, and placing protective cover to the lines and elevations shown on the Drawings; preparing subgrade; furnishing, erecting, and stripping concrete forms; furnishing, placing, finishing, and curing concrete as indicated in the Drawings; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to install 18-inch HDPE intake riser and concrete collar in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

U. Item 21 – FGD-B Drain Line

1. Measurement for FGD-B Drain Line shall be by lump sum. Payment for FGD-B Drain Line shall include, but not be limited to, all costs necessary to furnish and install 24-inch perforated HDPE piping, 12-inch HDPE piping, fittings, and appurtenances, including providing horizontal and vertical control for 24-inch perforated HDPE piping and riser and 12-inch HDPE piping; filling and grading as required to install 24-inch perforated HDPE piping and riser and 12-inch HDPE piping; furnishing, laying, and joining 24-inch perforated HDPE piping and riser and 12-inch HDPE piping to the lines and elevations shown in the Drawings; procuring, delivering, unloading, storing, transporting, deploying, and installing geotextile and geomembrane rub-sheet; furnishing, loading, hauling, stockpiling, and placing washed gravel embedment; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to install 24-inch perforated HDPE piping and riser and 12-inch HDPE piping in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

V. Item 22 –FGD-B to Pump Pipeline (Run of Pipe):

1. Measurement for FGD-B to Pump Pipeline (Run of Pipe) shall be by lump sum. Payment for FGD-B to Pump Pipeline (Run of Pipe) shall include, but not be limited to, all costs necessary to furnish and install 18-inch HDPE piping, fittings, valves and appurtenances, including providing horizontal and vertical control for 18-inch HDPE piping; clearing and grubbing; filling and grading as required to remove localized high and low spots before installing 18-inch HDPE piping; furnishing, laying, and joining 18-inch HDPE piping to the lines and elevations shown in the Drawings; constructing earthen berm pipe restraints; furnishing, laying, and installing cleanouts and air release valve; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to install 18-inch HDPE piping in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

W. Item 23 –Earthen Containment Berm (FGD-B to Pump Pipeline):

1. Measurement for Earthen Containment Berm (FGD-B to Pump Pipeline) shall be by lump sum. Payment for Earthen Containment Berm (FGD-B to Pump Pipeline) shall include, but not be limited to, all costs necessary to construct the approximately 1,100-foot-long earthen containment berm and furnish and install 24-inch HDPE culvert, canal gate valve, fittings, and appurtenances, including providing horizontal and vertical control for earthen berm and 24-inch HDPE culvert to the lines and grades shown in the Drawings; clearing and grubbing; stripping and stockpiling topsoil; furnishing, loading, hauling stockpiling, and placing bedding and embedment materials for 24-inch HDPE culvert; furnishing, laying, and joining 24-inch HDPE culvert; furnishing and installing canal gate valve and metal flared end; furnishing,

loading, hauling, stockpiling, placing, moisture conditioning, and compacting embankment materials; furnishing, loading, hauling, stockpiling, placing, moisture conditioning, and compacting crushed rock fill; loading, hauling, and placing stripped topsoil; revegetating; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to construct earthen containment berm and install 24-inch HDPE culvert in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative. Water will not be measured and paid for separately but shall be included in the Work.

X. Item 24 – Reclaim/Recycle Pump Structure Piping Modifications

1. Measurement for Reclaim/Recycle Pump Structure Piping Modifications shall be by lump sum. Payment for Reclaim/Recycle Pump Structure Piping Modifications shall include, but not be limited to, all costs necessary to furnish and install 14-inch knife gate valve, carbon steel pipe, small diameter valves, fittings, flanges, heat tracing, and appurtenances, including providing horizontal and vertical control for Reclaim/Recycle Pump Structure Piping Modifications; cutting and removing steel flange and small diameter outlets from the FGD-A to Pump Pipeline; furnishing, fitting, and installing 14-inch carbon steel flange and 14-inch knife gate valve; furnishing, fitting, and installing replacement small diameter outlets; furnishing, fitting, and installing carbon steel flanges, 90-degree elbow, reducer, and miscellaneous piping to connect the FGD-B to Pump Pipeline into the Reclaim/Recycle Pump Structure to the lines and elevations shown in the Drawings; disposing of waste; and providing all labor, materials, quality control, equipment, and incidentals to complete Reclaim/Recycle Pump Structure Piping Modifications in accordance with the Drawings and Specifications and to the satisfaction of the Owner's Representative.

*** END OF SECTION ***

**DIVISION 31**

# Earthwork

# SECTION 31 23 00
# EARTHWORK

## 1.0 GENERAL

### 1.1 Description

A. This Section describes the requirements for site preparation, excavation, selective stockpiling of soils, placement, and compaction of earthen materials, including related work such as trenching and shoring, and other items incidental to the Work wherever such are requested by the Owner's Representative.

B. The Contractor shall furnish all labor, tools, materials, equipment, and supervision as may be required to complete the Work.

C. All excavations and shoring shall comply with the requirements of applicable federal and state excavation safety standards.

D. The Work shall be done in strict accordance with these Specifications and as indicated in the Bid documents and on the Drawings.

### 1.2 Related Sections

A. Section 33 05 33 – Polyethylene Pipe and Culverts

### 1.3 References

A. ASTM International (ASTM) (latest version):

1. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft$^3$ (600 kN-m/m$^3$)).
2. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
3. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
4. ASTM D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
5. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

### 1.4 Submittals

A. The Contractor shall submit an earthworks operation plan and schedule. The submittal shall include a description of the equipment and quality control procedures to be used, including lift thickness control. This plan shall be approved by the Owner's Representative prior to Contractor mobilization.

B. The Contractor shall submit material data for imported earthen materials for review by the Owner's Representative prior to delivery.

C. The Contractor shall submit copies of all quality control test results to the Owner's Representative daily, including field and laboratory test results.

### 1.5 Tolerances

A. Grading limits and the design surface are defined by the lines and elevations shown on the Drawings or as determined by the Owner's Representative.

B. The Contractor shall maintain uniform gradients between adjacent elevations shown on the Drawings.

C. The tolerances for construction, unless otherwise approved by the Owner's Representative, shall be as required for proper functioning of the constructed Work, and as follows:

1. Slopes:

   Line:± 0.2 feet

   Grade:± 0.1 feet

2. Floors:

   Line:± 0.2 feet

D. Grade:± 0.1 feet

## 1.6 Quality Assurance

A. All Work shall be constructed, monitored, and tested in accordance with the requirements set forth in the Drawings and Specifications and as set forth by the Owner's Representative. The quality of the Work shall be controlled through the use of the Contractor's quality control procedures.

B. The Contractor shall be aware of all testing activities and shall account for these activities in the construction schedule.

C. All quality control testing required by the Contractor's quality control procedures (both field and laboratory testing) will be the responsibility of the Contractor. Quality assurance testing will be conducted by the Owner's Representative. The Contractor shall be responsible for cooperating with the Owner's Representative during all sampling and testing activities. The Contractor shall provide equipment and labor to perform sampling and shall also provide access to all areas that require sampling or testing.

D. All excavation, backfill, and grading operations shall be made available to the observation and testing of the Owner's Representative.

E. Any Work found to be unsatisfactory or any Work disturbed by subsequent operations before acceptance is granted shall be corrected by the Contractor as directed by the Owner's Representative at no additional cost to the Owner.

## 1.7 Protection

A. Shoring shall be furnished and installed as necessary to protect workers, banks, structures, and utilities during construction of foundations, structures, culverts, piping, and manholes. Shoring and bracing shall be removed as excavations are stabilized to the final configuration. Shoring shall be in conformance with all applicable federal, state, and local regulations.

B. The Contractor shall provide and maintain silt fences or other means to prevent sediment generated in excavations, fills, and cleared areas from entering downstream waters. Stockpiling of materials within downstream drainages is not allowed. Silt Fences should be inspected daily and repaired at Contractor's expense if damaged.

C. The Contractor shall call the "one-call" utility location service prior to excavation and shall coordinate directly with the Owner and local utility companies to provide protection and/or relocation of all utilities as required to complete the Work.

D. The Contractor is responsible for locating and protecting existing underground and overhead utilities. Existing underground utilities shall be located by vacuum excavation or another method approved in writing by the Owner in a sufficient number of locations to field verify the routing of underground utilities within the limits of excavation.

## 2.0 PRODUCTS

### 2.1 Materials

A. Materials used in conjunction with this Work shall be furnished and installed by the Contractor unless noted otherwise. Materials shall be free of organics and other deleterious materials. Use of crushed concrete is not permitted.

B. General Fill shall consist of soils obtained from an existing stockpile located SW of the FGD-C Pond as shown on the Drawings.

C. Embankment Fill shall consist of soils excavated as part of the work as approved by the Owner's Representative. If excavated soils are deemed unsuitable (i.e., contain organics or contaminants) or not of sufficient quantity, embankment fill shall consist of material obtained from the existing stockpile located SW of the FGD-C pond or imported earthen materials approved by the Owner's Representative.

D. Topsoil – material stripped within the working area and deemed suitable for use as topsoil by the Owner's Representative.

E. Pipe Bedding and Embedment shall consist of on-site or imported earthen material classifying under ASTM D2487 as well-graded sand (SW or SW-SM) or well-graded gravel (GW or GW-GM) or as otherwise approved in writing by the Owner's Representative. Pipe Bedding shall contain no particles larger than 0.5 inches, and be free from roots, debris, or any other substance that would harm the pipe or might impair the performance of the materials as bedding or embedment for the pipe. Final material selection shall be approved by the Owner's Representative.

F. Selection and placement of earthen materials shall be the responsibility of the Contractor. The Contractor shall be familiar with the materials classified in these Specifications and shall obtain aggregate materials meeting all pertinent requirements unless otherwise approved in writing by the Owner's Representative. The Owner's Representative reserves the right to approve all material selection and stockpiling.

## 3.0 EXECUTION

### 3.1 Clearing and Grubbing

A. If required, clearing shall be done within the footprint of the limits of the construction area, as delineated on the Drawings, or as otherwise described in the Specifications. Clearing shall extend a maximum of fifteen (15) feet and a minimum of ten (10) feet outside of the construction limits or as directed by the Owner's Representative.

B. No clearing shall be performed until written permission is given by the Owner's Representative and until Contractor has provided construction staking for the proposed Work.

C. Contractor shall strip all vegetative matter, rubbish, roots in excess of one (1) inch in diameter and other deleterious materials from the designated areas. In no case shall unsuitable deleterious materials, as determined by the Owner's Representative, be incorporated in the fill materials within limits of the Work.

D. In areas designated to be stripped of unsuitable or objectionable materials, said materials shall be stripped to the full depth of organic or other unsuitable material as determined by the Owner's Representative.

E. Stripped and grubbed vegetation shall be removed and uniformly spread in an area designated by Owner's Representative in accordance with permits obtained from the appropriate local, state, and federal regulatory agencies. All areas shown as part of the Work shall be cleared and grubbed, unless otherwise directed by Owner's Representative.

## 3.2 Strip and Stockpile Topsoil

A. Stripping of topsoil shall be done on the embankment slopes to be excavated where topsoil is present, or as directed by Owner's Representative.

B. Topsoil shall be excavated and removed in a manner that will minimize contact with other soil horizons. Such measures as are necessary shall be taken to ensure that the removal of topsoil does not result in erosion or excessive sedimentation.

C. If required, removed topsoil shall be stockpiled at locations designated by Owner's Representative. Stored topsoil shall not be disturbed by construction or on-site activities, and shall be protected from wind and water erosion, unnecessary compaction and contamination that would lessen the capability of the material to support vegetation when redistributed.

D. Topsoil stockpiles shall be graded to minimize erosion and prevent ponding of precipitation in the stockpile areas.

E. Stockpiled topsoil shall not be moved until required for redistribution on a regraded area.

## 3.3 Excavation

A. Excavation shall be performed to the lines and grades indicated in the Drawings or as otherwise approved by the Owner's Representative. No excavation shall begin until the Contractor's Surveyor has provided construction staking for the Work. During excavation, grades shall be maintained to provide drainage of any surface waters that may impact the Work. The final excavated surface shall be free of loose materials, clods, rock, and other debris, including grade stakes and hubs. The upper twelve (12) inches of subgrade shall be compacted to achieve a firm and unyielding surface to the satisfaction of the Owner's Representative.

B. Excavated soil materials may be used as fill material if they can be demonstrated to meet the requirements of these Specifications, as determined by the Owner's Representative based on material data furnished by the Contractor, or are otherwise approved for such use by the Owner's Representative. The Owner's Representative will visually observe out-of-specification excavated materials and designate them for stockpiling or disposal. The Contractor shall place excavated materials designated for stockpiling in an on-site stockpile at a location determined by the Owner. The Contractor shall dispose excavated soils designated for disposal legally off site.

C. Excavations shall be graded and properly maintained to provide adequate drainage at all times. The Work shall be suspended by the Contractor when, in the opinion of the Owner's Representative, the site is overly wet or muddy or otherwise unsuitable for proper maintenance until directed otherwise by the Owner's Representative.

D. Where the required lines, levels, and grades are not otherwise defined, the Contractor shall excavate as necessary to accommodate the items that are to be placed in the excavations and as necessary to provide working space to install and inspect those items. In such cases, the Contractor shall excavate to establish safe side slopes or sheet, brace, and shore the sides of the excavations as needed.

E. All necessary precautions shall be taken to preserve the material below and beyond the lines of excavation in the soundest possible condition. Where required to complete the Work, all excess excavation or over-excavation shall be backfilled with acceptable materials that have been placed and

compacted in accordance with the Specifications and to the satisfaction of the Owner's Representative.

F. Safe temporary construction slopes shall be the responsibility of the Contractor. The Contractor shall inspect all temporary and permanent open-cut excavations on a regular basis for signs of instability. Should signs of instability be noted, the Contractor shall immediately undertake remedial measures and shall notify the Owner's Representative immediately. Permanent cut slopes shall be left in a smooth, safe, and stable condition at the end of each workday.

## 3.4 Stockpile Construction

A. Stockpiles may be constructed as approved by the Owner's Representative in areas designated by the Owner.

B. Watering shall be performed during stockpiling to control dust to the satisfaction of the Owner's Representative.

## 3.5 Prepared Subgrade

A. Subgrade shall be prepared to the lines and grades shown on the Drawings and shall be compacted using equipment approved by the Owner's Representative.

B. The subgrade shall not contain saturated or other deleterious materials as determined by the Owner's Representative.

C. The Contractor shall protect prepared subgrade from disturbance due to weather, construction equipment, and other factors. Subgrade surfaces, including previously approved subgrade, that become softened or otherwise unsuitable shall be repaired to conform to these Specifications and to the satisfaction of the Owner's Representative. Subgrade found to exhibit swelling, heaving, or other similar conditions shall be replaced or reworked by the Contractor to remove such defects at no additional cost to the Owner.

## 3.6 Fill and Compaction

A. The following general guidelines shall be adhered to for all types of fill except as noted elsewhere in this section.

B. Fill shall be placed to achieve the lines and grades shown on the Drawings.

C. No fill materials shall be placed until the subgrade preparations, pipe bedding placement, and pipe installation have been completed and approved by the Owner's Representative.

D. Prior to placement of a lift of fill, the Contractor must have received positive results of field quality assurance testing or observation for the previous lift to verify compliance with these Specifications. The Contractor shall not place a new lift of fill over a preceding lift until approval is given by the Owner's Representative. If the Contractor fails to comply with this requirement, the Contractor may be required to remove and replace Work that has not been approved at the Contractor's expense.

E. The suitability of all materials intended for use in the fill shall be subject to approval by the Owner's Representative. No brush, roots, sod, ice, snow, frozen soil, or other deleterious or unsuitable materials shall be incorporated in the fills. Fill placement shall be temporarily stopped by the Contractor in unsuitable weather conditions that could cause materials or installation to fail to meet the Specifications, in the opinion of the Owner's Representative. The distribution of materials shall be such that the fill is free from voids, lenses, pockets, streaks, and layers of materials differing substantially in texture or gradation from the surrounding material.

F. If the surface of the prepared subgrade or the surface of any layer of the fill is too dry or too smooth to bond properly with the layer of material to be placed thereon, it shall be moisture conditioned and/or worked with a harrow, scarifier, disk, or other suitable equipment to provide a satisfactory bonding surface before fill material is placed thereon. If the surface of the prepared subgrade or rolled surface of any layer is excessively wet for fill materials to be placed thereon, the surficial material shall be removed and allowed to dry or worked with a harrow, scarifier, disk, or other suitable equipment to reduce the moisture content to an acceptable level, as determined by the Owner's Representative. It shall then be compacted in accordance with these Specifications before the next layer of fill material is placed. Determination of such wet or dry conditions shall be made by the Owner's Representative. Subgrade surfaces, including previously approved subgrade, that become softened or otherwise unsuitable shall be repaired to the satisfaction of the Owner's Representative.

G. Earthen fill materials shall be compacted at moisture contents such that the required degree of compaction and strength can be achieved. If the moisture content of the fill is outside of the acceptable range, the soil shall be wetted or dried back as appropriate. Wetting shall be accomplished using a water truck and spray nozzle unless the Owner's Representative approves an alternative method. During wetting or drying, the soil shall be regularly disked or otherwise mixed so that uniform moisture conditions are achieved.

H. The Contractor may moisture condition backfill either in the stockpile area or in the fill area, or both. Any delays in progress shall be the responsibility of the Contractor.

I. Each lift of fill placed against a sloping earth surface shall be keyed into the slope by excavating a bench into the slope. The width of the bench shall be greater than or equal to the height of the lift. Keying of lifts is not required against rock slopes.

J. Compaction shall be accomplished with equipment and by methods approved by the Owner's Representative. If such equipment or methods are found unsatisfactory for the intended use, the Contractor shall replace the unsatisfactory equipment with other types or adjust methods until proper compaction can be achieved. After each layer of fill material has been placed, spread, and moisture conditioned, the layer shall be compacted by passing compaction equipment over the entire surface of the layer a sufficient number of times to obtain the required density, as specified herein.

K. If testing by the Contractor or the Owner's Representative indicates that the Work does not meet the requirements of these Specifications, the Owner's Representative will establish the extent of the non-conforming area. The non-conforming area will be reworked by the Contractor until acceptable test results are achieved.

L. A method specification for compaction may be implemented with the approval of the Owner's Representative for specific material type(s). The method specification will be dependent upon the material characteristics, the Contractor's equipment, and the field conditions. At a minimum, the method specification will be to uniformly compact the soil with a minimum of two passes per lift with compaction equipment approved by the Owner's Representative.

M. The Contractor shall not place frozen fill, nor shall fill be placed on frozen ground.

N. The Contractor shall remove and replace or recompact natural subgrade or previously placed fill that has been softened by frost, flooding, or other weather effects. Fill shall not be placed over such corrected areas until the required surface preparation has been completed and approved by the Owner's Representative.

O. General Fill

1. General Fill shall be obtained from a soil stockpile located near the SW of FGD-C
2. General Fill shall be placed in loose lifts not exceeding ten (10) inches in thickness. Subgrade materials shall be re-worked and compacted to the requirements as outlined in the Specifications.

3. General Fill material shall be moisture conditioned as required to achieve a moisture content of -1 to +3 percent relative to the standard Proctor (ASTM D698) optimum moisture content. General Fill material shall be compacted to a minimum of 95% of the maximum dry density as determined by the standard Proctor compaction test. Final lines shall be approved by Owner's Representative.

P. Embankment Fill

1. Embankment Fill shall be placed in horizontal loose lifts not exceeding ten (10) inches in thickness. Subgrade materials shall be re-worked and compacted to the requirements as outlined in the Specifications.
2. Embankment Fill material shall be approved by Owner's Representative.
3. Embankment Fill material shall be moisture conditioned as required to achieve a moisture content of -1 to +3 percent relative to the standard Proctor (ASTM D698) optimum moisture content. Embankment Fill material shall be compacted to a minimum of 95% of the maximum dry density as determined by the standard Proctor compaction test. Final lines shall be approved by OWNER'S REPRESENTATIVE.

Q. Topsoil

1. Topsoil shall be placed in horizontal loose lifts not exceeding six (6) inches in thickness.
2. Topsoil material shall be placed to the final lines and grades and shall be approved by the Owner's Representative.
3. Topsoil material shall be material that was stripped and stockpiled by the CONTRACTOR, or as otherwise directed by Owner's Representative.

R. Pipe Bedding and Embedment

1. Pipe Bedding/Embedment shall be granular material approved by the OWNER'S REPRESENTATIVE.
2. Pipe Bedding shall be placed in a horizontal loose lift with a minimum thickness of three (3) inches, or as approved by OWNER'S REPRESENTATIVE. Pipe Embedment shall be placed around the pipe.
3. Pipe embedment shall be placed in uniform horizontal loose lifts not to exceed six (6) inches in thickness to a minimum of 12 inches above the top of the pipe(s) being backfilled, or as approved by OWNER'S REPRESENTATIVE. Pipe Embedment shall be placed around the pipe.
4. Pipe embedment shall be placed in uniform horizontal loose lifts not to exceed 6 inches in thickness to a minimum of 12 inches above the top of the pipe(s) being backfilled
5. Pipe Bedding/Embedment shall be moisture conditioned as approved by OWNER'S REPRESENTATIVE and placed loosely to provide adequate pipe support. Compaction of Pipe Embedment may be accomplished using hand and/or remote compaction equipment as approved by OWNER'S REPRESENTATIVE.
6. Heavy compaction equipment shall not be used over the top of the pipe unless at least eighteen (18) inches of fill material has been placed over the top of the pipeline and as approved by the OWNER'S REPRESENTATIVE.

## 3.7 Field Quality Control and Quality Assurance

A. The Contractor is responsible for quality control during all phases of earthworks construction, including verification of quantities.

B. The Owner's Representative will conduct quality assurance testing to verify that the Contractor is performing the Work in accordance with the Specifications and Drawings. The Contractor shall allow the Owner's Representative access to all phases of the Work to carry out the required testing and observations. The Contractor shall coordinate with the Owner's Representative on testing logistics, locations, and timing. The Owner's Representative may require temporary suspension of an earthworks operation in order to collect samples and/or conduct testing. In addition, the Contractor shall provide assistance in sampling or testing, including use of the Contractor's equipment, upon request from the Owner's Representative

1. The Owner's Representative will perform moisture content and density testing and monitoring of lift thickness in the field in accordance with the requirements set forth in the Specifications.
2. If testing by the Contractor or the Owner's Representative indicates that the Work does not meet the requirements of these Specifications, the Owner's Representative will establish the extent of the non-conforming area. The non-conforming area will be reworked by the Contractor at no additional cost to the Owner until acceptable test results are obtained.
3. The Contractor shall be aware of all field quality assurance testing activities, as these may affect the schedule, and shall comply with the requirements of the Specifications.
4. General Fill and Embankment Fill material testing will be conducted by the Owner's Representative in accordance with Table 310000-1.

**Table 310000-1: General Fill & Embankment Fill Testing Requirements**

| Material | Parameter | Test Method | QA Test Frequency |
|---|---|---|---|
| General Fill and Embankment Fill | In-situ Density/Moisture Nuclear Gauge | ASTM D6938 or equivalent | 1 per material type or 1 per 500 cy or |
| | Standard Proctor Curve | ASTM D698 | 1 per material type or 1 per 5,000 cy |
| | Sieve Analysis | ASTM D6913 or equivalent | 1 per material type or 1 per 5,000 cy |
| | Atterberg Limits | ASTM D4318 | 1 per material type or 1 per 5,000 cy |

## 3.8 Protection of Work

A. The Contractor shall use all means necessary to protect materials and partially completed and completed Work.

B. In the event of damage, the Owner's Representative will identify areas requiring repair and the Contractor shall make all repairs and replacements necessary to the approval of the Owner's Representative at no additional cost to the Owner.

C. At the end of each workday, the Contractor shall verify that the entire Work area was left in a state that promotes surface drainage off of and away from the area and from finished Work.

## 3.9 Seeding and Vegetation

A. The Contractor shall revegetate all areas disturbed by operations. All areas disturbed or not having sufficient vegetation shall be revegetated to prevent erosion.

B. The Contractor shall select the seeding mixture, application rate and mulching requirements.

C. Contractor shall provide 2-year warranty on all permanent seeding. If after 2-year period a mature stand of grass vegetation is not established to the satisfaction of the Owner, the Contractor shall be responsible for placement of additional topsoil, fertilizing, seeding, and mulching as necessary. The Contractor shall provide a 1-year warranty on all repaired vegetation areas.

## 3.10 Survey Control

A. The Contractor is responsible for construction surveying and survey control.

***END OF SECTION***

# SECTION 31 35 26A
# COMPACTED CLAY LINER

## 1.0 GENERAL

### 1.1 Description

A. This Section describes the requirements for site preparation, excavation, disposal, scarification and recompaction of the clay liner, including other items incidental to the Work wherever such are requested by the Owner's Representative.

B. The work consists of removing the approximately 1 foot of clay from the existing liner system in FGD-A Pond and scarifying and recompacting the upper 6 inches of the remaining Clay Liner. As required, the work may also include placement of Clay Liner to meet the thickness requirement, and/or removal and recompaction of existing Clay Liner to meet the hydraulic conductivity specification.

C. The Contractor shall furnish all labor, tools, materials, equipment, and supervision as may be required to complete the Work.

D. The Work shall be done in strict accordance with these Specifications and as indicated in the Bid documents and on the Drawings.

### 1.2 Related Sections

A. Section 31 23000A – Earthwork

B. Section 31 05 19.16 -- Textured HDPE Geomembrane Liner

C. Section 31 05 19.23 -- Geosynthetic Clay Liner

### 1.3 References

A. Liner Quality Control Plan

B. ASTM International (ASTM) (latest version):

1. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1140, Standard Test Method for Amount of Material in Soils Finer than the No. 200 (75-mm) Sieve
3. ASTM D1587, Standard Practice for Thin-Walled Tube Sampling of Soils.
4. ASTM D2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock
5. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
6. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
7. ASTM D5084, Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

8. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

## 1.4 Submittals

A. The Contractor shall submit an operations plan and schedule. The submittal shall include a description of the equipment and quality control procedures to be used, including lift thickness control. This plan shall be approved by the Owner's Representative prior to Contractor mobilization.

B. The Contractor shall submit copies of all quality control test results to the Owner's Representative daily, including field and laboratory test results.

## 1.5 Tolerances

A. Grading limits and the design surface are defined by the lines and elevations shown on the Drawings or as determined by the Owner's Representative.

B. A minimum 2.0-foot layer of Clay Liner must be in place. The thickness of the Clay Liner will be based on comparing the subgrade elevations shown on the Drawings to the surveyed elevation of the top of the recompacted Clay Liner surface.

C. The tolerances for construction, unless otherwise approved by the Owner's Representative, shall be as required for proper functioning of the constructed Work, and as follows:

1. Slopes:

   Line:= 0.2 feet

   Grade:+ 0.1 feet

2. Floors:

   Line:± 0.2 feet

   Grade:+ 0.1 feet

## 1.6 Quality Assurance

A. All Work shall be constructed, monitored, and tested in accordance with the requirements set forth in the Liner Quality Control Plan, Drawings and Specifications and as set forth by the Owner's Representative. The quality of the Work shall be controlled through the use of the Contractor's quality control procedures.

B. The Contractor shall be aware of all testing activities and shall account for these activities in the construction schedule.

1. The proposed minimum testing frequencies for Construction Quality Assurance (CQA) are presented in Tables 313526A-1. Actual test frequencies may vary. CQA testing, or lack thereof, does not relieve the Contractor from its responsibility to complete the Work in accordance with the Specifications.

2. Sampling locations shall be selected by the Owner's Representative. If necessary, the location of routine in-place moisture content and dry unit weight tests shall be determined using a non-biased sampling plan.

3. Undisturbed recompacted clay material samples for laboratory hydraulic conductivity testing shall be taken in accordance with ASTM D1587 with the assistance of the Contractor such that the sample tube is inserted vertically into the compacted clay with a continuous smooth stroke from the construction equipment used to advance the sampler.

4. Additional testing may be performed at the Owner's Representative's discretion.

C. All quality control testing required by the Contractor's quality control procedures (both field and laboratory testing) will be the responsibility of the Contractor. Quality assurance testing will be conducted by the Owner's Representative. The Contractor shall be responsible for cooperating with the Owner's Representative during all sampling and testing activities. The Contractor shall provide equipment and labor to perform sampling and shall also provide access to all areas that require sampling or testing.

D. All excavation, backfill, and grading operations shall be made available to the observation and testing of the Owner's Representative.

E. If a defective area is discovered in the Compacted Clay, the Owner's Representative shall determine the extent and nature of the defect. If the defect is indicated by an unsatisfactory test result, the Owner's Representative shall determine the extent of the defective area by additional tests, observations, a review of records, or other means that the Owner's Representative deems appropriate.

F. After determining the extent and nature of a defect, the Owner's Representative shall notify the Contractor and schedule appropriate retests when the defective work has been corrected.

G. The Contractor shall correct defective work to the satisfaction of the Owner's Representative. The cost of corrective actions shall be borne by the Contractor.

H. All retests recommended by the Owner's Representative must verify that the defect has been corrected before any additional work is performed by the Contractor in the area of the deficiency.

## 2.0 PRODUCTS

### 2.1 Material

A. The Clay Liner shall consist of material currently in place as part of an existing nominal 3-foot thick clay liner or other on-site material as approved by the Owner. Pre-construction testing data are included in the Liner Quality Control Plan.

## 3.0 EXECUTION

### 3.1 Familiarization

A. Prior to implementing any work of this Section, the Contractor shall become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this Section and the Liner Quality Control Plan (LQCP).

B. Inspection:

1. Prior to implementing any work of this Section, the Contractor shall carefully inspect the installed work of all other Sections and verify that all such work is complete to the point where the installation of this Section may properly commence without adverse impact.

2. If the Contractor has any concerns regarding the installed work of other Sections or the site, the Contractor shall notify the Owner's Representative in writing within 48 hours of the site visit. Failure to notify the Owner's Representative prior to installation of the Compacted Clay will be construed as Contractor's acceptance of the related work of all other Sections.

3. The Contractor shall verify that the as-built subgrade has been surveyed to sufficient accuracy and with sufficient frequency as required by the LQCP prior to placement of any Compacted Clay liner material.

## 3.2 Excavation of Existing Compacted Clay Liner

A. Following removal of CCR, the Contractor shall survey the Clay Liner surface and compare it to the As-Constructed Clay Plan in the Drawings.

B. The Contractor shall remove the existing Clay Liner to the elevations shown on the Top of Excavated Clay Grading Plan in the Drawings.

C. Excavated Clay Liner will be hauled to Ash Landfill 1 for disposal. The exact location of the material placement will be verified by the Owner during the pre-bid meeting.

D. Care shall be taken to prevent damage to the lower portion of the existing Clay Liner.

E. The Owner's Representative will collect thin-walled tube samples of the lower 1.5 feet of the existing Clay Liner for hydraulic conductivity testing at the frequency indicated in Table 313526A-1.

F. In the event a sample collected from the lower 1.5 feet of existing Clay Liner fails to meet the hydraulic conductivity specification, the backup sample will be tested. If the backup sample does not meet the project specification, the failing area will be delineated and the existing Clay Liner in the failing area shall either be removed and replaced in accordance with the specifications or covered with an approved geosynthetic clay liner (GCL). GCL to be installed in accordance with the specifications.

G. The upper 6 inches of the remaining Clay Liner will be scarified and moisture conditioned (if necessary).

H. The scarified Clay Liner shall be thoroughly remolded and compacted using a padfoot roller to the required minimum dry unit weight, (not less than 95 percent of the maximum dry density (ASTM D698)), within the acceptable range of water contents (not less than 0 percent nor greater than 6 percent above optimum (ASTM D698)), as approved by the Owner's Representative.

I. Compaction will be performed with an appropriately heavy, properly ballasted, penetrating-foot compactor (such as a CAT 815 or equivalent) subject to approval from the Owner's Representative. A minimum of 4 passes will be required on each area of each lift to remold the clay regardless of whether the lift meets compaction specifications. A pass being defined as two applications of the compacting roller (i.e., for a 1 roller compactor, a pass is a trip forward and back; for a 2 roller compactor, a pass is a trip forward). A pass, for a CAT 815, is one trip across the liner.

J. The daily work area will extend a distance no greater than necessary to maintain moist soil conditions and continuous operations. Desiccation and crusting of the lift surface will be avoided as much as possible.

K. If desiccation and crusting of the lift surface occurs before placement of the geomembrane, this area will be sprinkled with water and then scarified and tested for water content to ensure uniform moisture before placing the geomembrane.

L. Hand compaction at the proper moisture content shall be used in all locations around penetrations, corners, appurtenances, etc., to achieve the specified dry unit weight and moisture content. A tamping-foot type compactor having a foot pressure of at least 250 pounds per square inch (psi) shall be used. Care shall be taken to protect piping, geomembranes and other structures. Damage to any materials or work shall be repaired by the Contractor at no additional cost to the Owner.

M. Additional thin-walled tube samples will be collected of the upper 6 inches of recompacted Clay Liner by the Owner's Representative for hydraulic conductivity testing at the frequency indicated in Table 313526A-1.

N. The same material and compaction methods as outlined in this Section shall be used to replace unacceptable zones detected by the Owner's Representative.

O. The Compacted Clay Liner surface shall be made smooth and free from ruts or indentations at the end of every working day when precipitation is forecast and/or at the completion of the compaction operations in that area.

P. The Contractor shall finish each day's work with a smooth roller to create a smooth surface which will promote surface-water runoff and minimize moisture penetration.

Q. The entire area shall be left in a manner to promote runoff at the end of each day.

R. After completion of a segment of Compacted Clay Liner, but before installation of the geomembrane liner, the top of the clay will be surveyed to ensure that: (i) the specified thickness of the Compacted Clay Liner has been achieved; (ii) the top of the Compacted Clay Liner slopes across the cell at the grades specified on the Drawings.

S. Any holes in the Compacted Clay Liner resulting from soil testing, sample procurement, grade stakes, or other activities shall be backfilled with bentonite or a bentonite-rich soil material. This backfill will be tamped in the hole to remove pockets of air or loose soil, and to assure a tight compact seal.

T. Ponded water on constructed Compacted Clay Liner should be removed in a timely manner.

U. For Compacted Clay Liner which will be overlain with a geomembrane, the Compacted Clay Liner shall be smooth-drum rolled in preparation for geomembrane placement.

V. Compacted Clay Liner construction will be conducted in a systematic and timely fashion.

W. In the event of a non-conforming or failing test the Contractor shall follow procedures described in the LQCP.

## 3.3 Product Protection

A. The Contractor shall use all means necessary to protect all prior work, including all materials and completed work of other Sections.

B. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary for the approval of the Owner's Representative and at no additional cost to Owner.

C. Compacted Clay Liner shall be maintained at or slightly above optimum moisture content until placement of the geomembrane liner. After density and moisture tests indicate Compacted Clay Liner meets specifications, the Compacted Clay Liner shall be smooth-drum rolled and watered as directed by the POR to prevent desiccation cracking.

## 3.4 Field Quality Control and Quality Assurance

A. The Contractor is responsible for quality control during all phases of Compacted Clay Liner construction.

B. The Owner's Representative will conduct quality assurance testing to verify that the Contractor is performing the Work in accordance with the LQCP, Specifications and Drawings. The Contractor shall allow the Owner's Representative access to all phases of the Work to carry out the required testing and observations. The Contractor shall coordinate with the Owner's Representative on testing logistics, locations, and timing. The Owner's Representative may require temporary suspension of operations in order to collect samples and/or conduct testing. In addition, the Contractor shall provide assistance in sampling or testing, including use of the Contractor's equipment, upon request from the Owner's Representative.

1. The Owner's Representative will collect thin-walled tube samples of the existing Compacted Clay Liner (lower 1.5 foot of Clay Liner) prior to scarification of the upper portion of the Compacted Clay Liner.
2. The Owner's Representative will perform moisture content and density testing in the field in accordance with the requirements set forth in the LQCP and Specifications.

3. The Owner's Representative will collect thin-walled tube samples of the recompacted Clay Liner (upper 6-inch layer of Clay Liner).
4. If testing by the Contractor or the Owner's Representative indicates that the Work does not meet the requirements of these Specifications, the Owner's Representative will establish the extent of the non-conforming area. The non-conforming area will be reworked by the Contractor at no additional cost to the Owner until acceptable test results are obtained.
5. The Contractor shall be aware of all field quality assurance testing activities, as these may affect the schedule, and shall comply with the requirements of the Specifications. Areas of Clay Liner cannot be approved for geomembrane installation until passing hydraulic conductivity results are received for the area. Hydraulic conductivity testing of thin-walled samples may take up to 5 days to complete.
6. Compacted Clay Liner testing will be conducted by the Owner's Representative in accordance with Table 313526A-1.

**Table 313526A-1 Clay Liner Testing Requirements**

| Material | Parameter | Test Method | QA Test Frequency |
|---|---|---|---|
| Clay Liner | In-situ Density/Moisture Nuclear Gauge | ASTM D6938, D2937, or D1556 | 1 per 8,000 ft²/upper 6 inches |
| | Sieve Analysis | ASTM D1140 or equivalent | 1 per 40,000 ft²/ upper 6 inches |
| | Atterberg Limits | ASTM D4318 | 1 per 100,000 ft² / lower 1.5 feet |
| | Hydraulic Conductivity | ASTM D5084 | |

A. When sampling for permeability tests, two Shelby tubes/drive cylinders should be retrieved. One tube/cylinder shall serve as the primary test sample. The second tube/cylinder shall serve as the backup sample in case of damage or sample disturbance in the first tube, or in case of a non-conforming permeability test.

B. Care will be taken to reference field density tests to the correct Proctor curve for the material being used in construction.

C. Throughout construction of the Compacted Clay Liner, test results will be reviewed.

D. In the event of a failing permeability test within the lower 1.5 feet of the clay liner, the Owner's Representative will establish the extent of the non-conforming area and the area will be repaired either by removing/recompacting clay or covering the area with a geosynthetic clay liner.

## 3.5 Survey Control

A. The Owner will supply surveying for payment verification, construction certification and CQA only.

B. Thickness verification will be performed by survey methods. At a minimum, the points listed in the Drawings are required. Additional points shall be obtained to define grade breaks, penetration, etc.

***END OF SECTION***

# SECTION 31 35 26B
# TEXTURED HDPE GEOMEMBRANE

## 1.0 GENERAL

### 1.1 Work Included

A. The Work set forth in this section includes the specifications and guidelines for the manufacture, installation, and testing of textured high density polyethylene (HDPE) geomembrane.

### 1.2 Related Work

A. Carefully examine all of the Contract Documents for requirements that affect the Work of this section.

B. Section 31 23 00 – Earthworks

C. Section 31 35 26A – Compacted Clay Liner

D. Section 31 35 26C – Geosynthetic Clay Liner

### 1.3 References

A. Liner Quality Control Plan

B. Latest Version of American Society for Testing and Materials (ASTM) standards:

1. D792 Specific Gravity (Relative Density) and Density of Plastics by Displacement
2. D1004 Test Method for Initial Tear Resistance of Plastics Film and Sheeting
3. D1238 Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
4. D1505 Test Method for Density of Plastics by Density-Gradient Technique
5. D3895 Test Method for Oxidative Inductive Time of Polyolefins by Thermal Analysis
6. D4218 Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
7. D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
8. D5199 Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
9. D5397 Procedure to Perform a Single Point Notched Constant Tensile Load – (SP-NCTL) Test: Appendix
10. D5596 Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
11. D5617 Test Method for Multi-Axial Tension Test for Geosynthetics
12. D5721 Practice for Air-Oven Aging of Polyolefin Geomembranes
13. D5885 Test method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry
14. D5994 Test Method for Measuring the Core Thickness of Textured Geomembranes

15. D6693 Test Method for Determining Tensile Properties of Non-reinforced Polyethylene and Non-reinforced Flexible Polypropylene Geomembranes
16. D7466 Test Method for Measuring the Asperity Height of Textured Geomembranes

C. Geosynthetic Research Institute (GRI) Standard Specifications and Test Methods:

1. GRI GM-9 Cold Weather Seaming of Geomembranes
2. GM10 Specification for the Stress Crack Resistance of Geomembrane Sheet
3. GRI GM-11 Accelerated Weathering of Geomembranes Using a Fluorescent UVA-Condensation Exposure Device
4. GRI GM-12 Measurement of the Asperity Height of Textured Geomembranes Using a Depth Gauge
5. GRI GM-13 Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
6. GRI GM-19 Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes

## 1.4 Submittals

A. Prior to Material Delivery

1. No material shall be delivered to the Site until the material and performance documentation and certifications have been received and reviewed by the Owner or Owner's Representative. Documentation shall include quality control (QC) test results on the manufactured geomembrane sheet and certification stating the geomembrane roll numbers, base resin type, and lot from which it was produced. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. The quality control tests shall be performed in the manufacturing plant using the test methods and frequencies listed in the most recent version of the Geosynthetic Research Institute (GRI) test method GM13, "Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes,"
2. Resumes of the installer's supervisor(s) or Master Seamer(s) shall be obtained to verify that adequate seaming experience will be utilized on the project. The installer's supervisor or Master Seamer shall have had experience totaling a minimum of 2,000,000 square feet of geomembrane installation.
3. Upon delivery of geomembrane, storage and handling procedures shall also be documented. Rolls of geomembrane shall be handled and stored in such a way as not to damage the material.

B. During Installation

1. Quality control documentation shall be recorded during installation.
2. Subgrade surface acceptance certificates signed by Liner Installer for each area that will be covered directly by geomembrane.

# 2.0 PRODUCTS

## 2.1 Geomembrane

A. Polyethylene Resin

1. The polyethylene resin from which the geomembrane is made will generally be in the density range of 0.932 g/ml or higher, and have a melt index value per ASTM D1238 of less than 1.0 g/10 min.

2. The resin shall be virgin material with no more than 10% rework. If rework is used, it must be a similar polyethylene as the parent material.
3. No post-consumer resin (PCR) of any type shall be added to the formulation.

B. Textured High Density Polyethylene (HDPE) Geomembrane Properties

**Table 313526B-1 Textured HDPE Geomembrane Requirements**

| Testing Properties | Testing Method | Test Value | Testing Frequency |
|---|---|---|---|
| Thickness (min ave.)<br>• Lowest individual for 8 of 10 values<br>• Lowest individual for any value | ASTM D5994 | 57 mil<br>54 mil<br>51 mil | Per roll |
| Density g/cc | ASTM D792 | 0.940 mil | 200,000 lb |
| Asperity Height (min ave.) (1) | ASTM D7466 | 16 mil | Every 2nd roll |
| Tensile Properties (min. ave.) (2)<br>• Yield strength – lb/in<br>• Break strength – lb/in<br>• Yield elongation - %<br>Break elongation - % | ASTM D6693 | <br>126<br>90<br>12<br><br>100 | 20,000 lb |
| Tear Resistance – lb (min. ave.) | ASTM D1004 | 42 | 45,000 lb |
| Puncture Resistance – lb (min. ave.) | ASTM D4833 | 90 | 45,000 lb |
| Stress Crack Resistance (3) | ASTM D5397 | 500 hr | Per GRI GM10 |
| Carbon Black Content - % | ASTM D1603(4) | 2.0 to 3.0 | 20,000 lb |
| Carbon Black Dispersion | ASTM D5596 | Note (5) | 45,000 lb |
| Oxidative Induction Time (OIT) (min ave.) (6)<br>• Standard OIT; or<br>• High Pressure OIT | <br>ASTM D3895<br>ASTM D5885 | <br>100 min<br>400 min | 200,000 lb |
| Oven Aging at 85°C (6)(7)<br>• Std. OIT (min. ave.), % retained after 90 days<br>• High Pressure OIT (min. ave.), % retained after 90 days | ASTM D5885<br>ASTM D5721<br><br>ASTM D3895 | <br>55<br><br>80 | Per each formulation |
| UV Resistance (8) | | | |

| | | | |
|---|---|---|---|
| High Pressure OIT (min ave.) % retained after 1600 hrs | ASTM D5885 | 50 | Per each formulation |

(1) Alternate the measurement side for double sided textured sheet
(2) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 inches
(3) SP-NCTL per ASTM D5397 Appendix, is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from
the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
(4) Other methods such as D1603 (tube furnace) or D6370 (TGA) are acceptable if an appropriate correlation to D4218 (muffle furnace) can be established.
(5) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3
(6) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(7) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(8) The condition of the test should be 20 hr. UV cycle at 75□C followed by 4 hr. condensation at 60°C.
(9) UV resistance is based on percent retained value regardless of the original HP-OIT value.

C. Geomembrane pre-construction QA samples shall be taken by the Owner's Representative from pre-shipped material at the factory or from shipped material on site.

D. The extrudate rod and/or bead shall be made from same type of resin as the geomembrane. Additives shall be thoroughly dispersed, and the material shall be free of contamination by moisture or foreign matter.

## 2.2 Seaming and Testing Equipment

A. Welding

1. Use fusion-welding apparatus that are self-propelled devices equipped with following:
   a. Gauge indicating temperature of heating element.
   b. Gauge indicating the speed of travel
2. Use extrusion welding apparatus equipped with gauges giving temperature of extrudate at nozzle of apparatus or utilize hand-held gauges to measure extrudate temperatures.
3. Place electric generator on smooth base such that no damage occurs to geomembrane.

B. Air Pressure Testing Equipment

1. Air pump (manual or motor driven), equipped with a pressure gauge, capable of generating, sustaining, and measuring pressure between 20 and 35 psi, and mounted on cushion to protect geomembrane.
2. Rubber hose with fittings and connections.
3. Sharp hollow needle, or other approved pressure feed device.
4. Air pressure monitoring device.

C. Vacuum Testing Equipment

1. Vacuum box assembly consisting of: rigid housing, transparent viewing window, soft neoprene gasket attached to bottom of housing, porthole or valve assembly, and vacuum gauge.
2. Pump assembly equipped with pressure controller and pipe connections.
3. Pressure/vacuum rubber hose with fittings and connections.
4. Soapy solution to wet test area.

5. Means of applying soapy solution.

D. Tensiometer Testing Equipment

1. Tensiometer shall be capable of maintaining constant jaw separation rate of 2 inches per minute, and shall be calibrated, with certificate of calibration less than 1 year old kept with tensiometer.

## 3.0 EXECUTION

### 3.1 Preparation

A. Surface Preparation

1. Contractor is responsible for preparing supporting surface for geomembrane placement.
2. After prepared surface has been accepted in accordance with the Liner Quality Control Plan, report to Owner any change in supporting surface condition that may require repair work. Maintain prepared surface.
3. Do not place geomembrane onto an area that has become softened by precipitation or cracked due to desiccation. Observe and report surface condition daily to evaluate degree of softening and desiccation cracking.
4. Repair damage to prepared surface caused by installation activities at Installer's expense.

B. Panel Nomenclature

1. Field panel is defined as a roll or portion of roll cut and seamed in field, excluding patches and cap strips.
2. Identify each field panel with identification code (number or letter-number) consistent with Installer's layout plan. This identification code shall be agreed upon by Owner, Installer, and Owner's Representative.
3. Writing on liner with colored markers shall be as agreed upon in the Pre-Construction Meeting. Only authorized personnel shall be permitted to write on liner.

C. Protection

1. Do not use equipment that damages geomembrane.
2. Ensure prepared surface underlying geomembrane has not deteriorated since previous acceptance and remains acceptable immediately prior to geomembrane deployment.
3. Do not permit personnel to smoke or wear shoes that can damage geomembrane while working on geomembrane. Personnel shall not bring glass bottles on geomembrane.
4. Unroll panels in manner that does not cause excessive scratches or crimps in geomembrane and does not damage supporting soil.
5. Place panels in manner that minimizes wrinkles (especially differential wrinkles between adjacent panels).
6. Prevent wind uplift by providing adequate temporary loading and/or anchoring (e.g., sandbags) that shall not damage geomembrane. In case of high winds, continuous loading is recommended along panel edges.
7. Protect geomembrane in areas where excessive traffic is expected with geotextiles, extra geomembrane, or other suitable materials.

D. Panel Deployment

1. Replace seriously damaged (torn, twisted, or crimped) field panels, or portions thereof, at no cost to Owner. Repair less serious damage as specified herein. Owner's Representative shall determine if material shall be repaired or replaced.
2. Remove damaged panels or portions of damaged panels that have been rejected from work area.
3. Do not proceed with deployment at ambient temperature below 32°F or above 104°F unless otherwise authorized, in writing, by Owner.
4. Do not deploy during precipitation, in presence of excessive moisture, (fog, dew), in areas of ponded water or in presence of excessive winds.
5. Do not undertake deployment in weather conditions that will preclude material seaming on same day as deployment.
6. Do not deploy more geomembrane field panels in one day than can be seamed during that day.

E. Seam Layout

1. When possible, orient seams parallel to line of maximum slope, i.e., oriented along, not across, slope.
2. No horizontal seam shall be less than 5 ft from the top of or toe of slope.
3. In general, maximize lengths of field panels and minimize number of field seams.
4. Panels should be overlapped, as recommended by the manufacturer, as appropriate for the type of seam welding to be performed; however, overlapping shall be no less than 2 inches.
5. only low ground pressure rubber-tired support equipment approved by the Owner's Representative may be allowed on the geomembrane. If the Owner's Representative observes any potential damage done to the liner by the support equipment, use of the equipment will cease and the damage will be repaired.
6. Personnel working on the geomembrane shall not smoke, wear damaging shoes, or engage in any other activity likely to damage the geomembrane.

F. Seaming Methods

1. Approved processes for field seaming are extrusion fillet welding and fusion welding. Proposed alternate processes shall be documented and submitted to Owner for approval. Alternate procedures shall be used only after being approved in writing by Owner.
2. Seams shall meet requirements in Table 313526B-2:

**Table 313526B-2 Minimum Seam Properties**

| Property | Method | 60-mil HDPE |
|---|---|---|
| Peel Strength (fusion) | ASTM D6392 | 91 ppi |
| Peel Strength (extrusion) | ASTM D6392 | 78 ppi |
| Shear Strength (fusion and extrusion) | ASTM D6392 | 120 ppi |

(1) The strength of four of five specimens shall meet or exceed the value shown in this table. The fifth must meet or exceed 80% of the given value in order to be considered a passing test.
(2) Unacceptable break codes are:
   a. Fusion: AD and AD-Brk>25%
   b. Extrusion: AD1,AD2, AD-WLD (unless strength is achieved)

3. Use fusion welding as primary method of seaming adjacent field panels.

a. Cross seam tees, associated with fusion welding or extrusion welding, shall be patched to a minimum distance of 6-in. on each side of tee.

b. Place welder on protective pad to prevent geomembrane damage between seaming.

c. When subgrade conditions dictate, use movable protective layer (e.g. extra piece of geomembrane) directly below each overlap of geomembrane that is to be seamed to prevent buildup of moisture between sheets and prevent debris from collecting around pressure rollers.

2. Use extrusion fillet welding as secondary method for seaming between adjacent panels and as primary method of welding for detail and repair work.

a. Purge heat-degraded extrudate from barrel of extruder under the following conditions:

i. Prior to beginning seam.

ii. Whenever extruder has been inactive.

b. Place a smooth insulating plate or fabric beneath the hot welding apparatus after usage.

c. Use clean and dry welding rod or extrudate pellets.

d. Complete grinding process without damaging geomembrane and within 1 hour of seaming operation.

e. Minimize exposed grinding marks adjacent to extrusion weld. Do not allow exposed grinding marks to extend more than 1/4 in. outside finished seam area and grind perpendicular to seam.

G. Seaming Procedures

1. Seaming shall not proceed when ambient air temperature or adverse weather conditions jeopardize the integrity of the liner installation. The Installer shall demonstrate that acceptable seaming can be achieved by completing acceptable trial welds.

2. General Seaming Procedures: (Ambient temperature between 32°F and 104°F).

a. Do not field seam without master seamer being present.

b. Dry conditions - no precipitation or other excessive moisture, such as fog or dew.

c. No excessive winds.

d. If required, provide firm substrate by using extra piece of geomembrane, or similar hard surface directly under seam overlap to achieve proper support for seaming apparatus.

e. Align seams with fewest possible number of wrinkles and fishmouths.

f. Extend seams to outside edge of panels placed in anchor trench.

g. Prior to seaming, ensure that seam area is clean and free of moisture, dust, dirt, debris, or foreign material.

h. Fishmouths or wrinkles at seam overlaps shall be cut along ridge of wrinkle in order to achieve flat overlap. Cut fishmouths or wrinkles shall be seamed and any portion where overlap is inadequate shall be patched with an oval or round patch of same geomembrane extending minimum of 6-in. beyond cut in each direction.

H. Repair Procedures

1. Repair portions of geomembrane exhibiting flaws or failing destructive or nondestructive tests.

2. The final decision as to repair procedure shall be agreed upon between Owner, Installer, and Owner's Representative.

3. Acceptable repair procedures include the following:

a. Patching: Piece of same geomembrane material extrusion welded into place. Use to repair large holes, tears, nondispersed raw materials, and contamination by foreign matter. All panel intersections shall be patched.

b. Spot welding or seaming: Bead of molten extrudate placed on flaw. Use to repair small tears, pinholes, or other minor, localized flaws.

c. Capping: Strip of same geomembrane material extrusion welded into place over inadequate seam. Use to repair large lengths of failed seams.

d. Removal and replacement: Remove bad seam and replace with strip of same geomembrane material welded into place. Use to repair large lengths of failed seams.

e. Extrusion welding flap: Repairs of this type shall not be used unless approved by Owner's Representative and shall not exceed 100 feet in length.

4. For each repair method:

a. Ensure surfaces are clean, dry, and prepared in accordance with specified seaming process.

b. Ensure seaming equipment used in repairing procedures meet requirements of this Specification.

c. Extend patches or caps at least 6 in. beyond edge of defect. Round corners of patches with radius of approximately 6 in.

5. Do not place overlying layers over locations which have been repaired until appropriate acceptable nondestructive and destructive (laboratory) test results are obtained.

I. Pipe Boots

1. The pipe boot or sleeve shall be constructed or manufactured with High Density Polyethylene (HDPE) to match other installed geomembrane.

2. The pipe boot or sleeve shall be installed in areas where the geomembrane liner must be penetrated as shown on the Contract drawings.

3. Prior to constructing the boot or sleeve, the Contractor shall assure that the material in the area of the penetration is properly compacted and that the area is clean. The Contractor shall take extreme care in work to assure the geomembrane liner is not damaged.

4. The size of the boot or sleeve shall be adequate to provide 6 inches overlap of the geomembrane liner.

5. Extrusion welding shall be as shown on the Contract drawings.

6. When tightening the stainless-steel adjustment bands, the Installer shall be careful not to over tighten the bands, thereby causing damage to the boot or sleeve.

J. Anchor Trench

1. Contractor shall excavate anchor trenches, unless otherwise specified, to lines and grades shown on design Construction Drawings prior to geomembrane placement. Anchor trench shall be drained to prevent ponding or softening of adjacent soils while trench is open.

2. Slightly rounded corners shall be provided in the anchor trench to avoid sharp bends in geomembrane.

3. If the anchor trench is excavated in clay material susceptible to desiccation, the amount of trench open at any time should be minimized.

4. Remove construction-related debris from anchor trench.

5. Contractor shall backfill and compact anchor trench as soon as practical after geomembrane installation is completed. Take care when backfilling trenches to prevent damage to geosynthetics.

## 3.2 Field Quality Control

A. Visual Inspection

1. Owner's Representative will examine seam and non-seam areas of geomembrane for identification of defects, holes, blisters, nondispersed raw materials, and any sign of contamination by foreign matter.
2. Clean and wash geomembrane surface if Owner's Representative determines that amount of dust or mud inhibits examination.
3. Do not seam any geomembrane panels that have not been examined for flaws by Owner's Representative.
4. Nondestructively test seams and any non-seam areas identified by Owner's Representative.

B. Trial Seams

1. Make trial seams on fragment pieces of geomembrane liner to verify that conditions are adequate for production seaming.
2. Trial seams shall be made at the beginning of each seaming period and shift (generally, at least twice each day) for each combination of production seaming machine and operator to be used that day.
3. Make trial seams under same conditions as actual seams.
4. Make trial seams only under observation of Owner's Representative.
5. Seam overlap shall be as indicated for finished seam.
6. Trial seam sample shall be at least 3 feet long by 1 foot wide (after seaming) with seam centered lengthwise.
7. Cut 4 specimens from sample with 1 inch wide die. These specimen locations shall be selected randomly along trial seam sample by Owner's Representative. Test 2 specimens in inside peel, 2 specimens in outside peel, and 2 specimens in shear using field tensiometer. Samples shall fail in sheet or exceed the specified peel and shear criteria stated in this Specification.
8. If specimen fails, entire trial seam operation shall be repeated. If additional specimen fails, do not use seaming apparatus and seamer until deficiencies are corrected and two (2) consecutive successful trial welds are achieved.

C. Nondestructive Seam Testing

1. General
   a. Purpose of nondestructive tests is to check continuity of seams. It will not provide quantitative information on seam strength.
   b. Nondestructively test field seams over their full length using vacuum test for extrusion seams, air pressure for double-fusion seams, or other Owner approved method. Document results.
   c. Perform nondestructive testing as seaming work progresses.
2. Air Pressure Testing for double-fusion seam:
   a. Seal both ends of seam to be tested.
   b. Insert needle or other approved pressure feed device into air channel created by fusion weld.

c. Insert protective cushion between air pump and geomembrane.

d. Pressurize air channel to 30 psi. Close valve and allow pressure to stabilize for approximately 2 minutes.

e. Observe air pressure 5 minutes after initial 2-minute stabilization period ends. If pressure loss exceeds 3 psi or pressure does not stabilize, locate faulty area and repair.

f. Cut opposite end of tested seam area once testing is completed to verify continuity of air channel. If air does not escape, locate blockage and retest unpressurized area. Repair cut end of air channel.

g. Remove needle or other approved pressure feed device and repair hole in geomembrane.

3. Vacuum Testing for extrusion seam:

a. Energize vacuum pump and reduce tank pressure to approximately 4 to 8 psi gauge pressure.

b. Wet strip of geomembrane approximately 12 in. by 48 in. with soapy solution.

c. Place box over wetted area.

d. Close bleed valve and open vacuum valve.

e. Ensure that leak-tight seal is created.

f. For minimum of 10 seconds, apply vacuum and examine geomembrane through viewing window for presence of soap bubbles.

g. If no bubbles appear within 10 seconds, close vacuum valve and open bleed valve, move box over to next adjoining area with minimum 3 inches overlap and repeat process.

h. Mark and repair areas where soap bubbles appear.

4. Inaccessible Seams:

a. Cap-strip seams that cannot be nondestructively tested.

b. Cap-strip material shall be composed of same type and thickness geomembrane as geomembrane to be capped.

c. Examine cap-stripping operations with Owner's Representative for uniformity and completeness. Document observations.

D. Destructive Seam Testing

1. General

a. Purpose of destructive seam testing to evaluate seam strength.

b. Perform destructive seam test as seaming progresses.

c. The destructive seam sample shall fail if the grips of testing machine cannot be closed on sample test flap (available flap is 1/2 in. long or less) due to excessive temporary welding.

2. Location and frequency:

a. Test at minimum frequency of one test location per 500 feet of welding length performed by each welding machine.

b. Both primary longitudinal and cross seams, cap strips, and repairs 20 square feet or larger shall be counted in the seam length.

c. Test locations shall be determined during seaming at Owner's Representative's discretion.

d. Installer will not be informed in advance of locations where seam samples will be taken.

e. Owner reserves right to increase frequency of testing in accordance with performance results of samples previously tested.

3. Sampling Procedures:
   a. Cut samples at locations chosen by Owner's Representative.
   b. Owner's Representative shall number each sample and record sample number and location in panel layout drawing.
4. Sample Dimensions: Take two 1-inch wide samples for field testing prior to cutting full laboratory sample.
   a. Field Testing: Cut 1 inch wide samples, 6 inches long with seam centered parallel to width. Distance between these 2 samples shall be 42 inches. Test both samples on field tensiometer in peel. If both samples pass field test, take sample for laboratory testing.
   b. Laboratory Testing: Take laboratory test sample from between samples taken for field testing. Cut sample for laboratory testing 12 inches wide by a minimum 42 inches long with seam centered lengthwise. Cut this sample into three parts. Owner's Representative shall distribute parts as follows:
      i. One part to Installer for optional laboratory testing, a minimum 12 inches by 12 inches.
      ii. One part to Geosynthetic Quality Assurance Laboratory for testing, a minimum 12 inches by 18 inches.
      iii. One part to Owner for archive storage, a minimum 12 inches by 12 inches.
   c. Final determination of sample sizes shall be agreed upon at pre-construction meeting.
   d. Submit laboratory sample for quantitative testing
5. Destructive Test Failure Procedures:
   a. When a sample fails destructive testing, whether test is conducted by the Geosynthetic QAL or by field tensiometer, Contractor has following options:
   b. Repair seam between any 2 passing destructive test locations.
   c. Trace welding path to intermediate point (10 feet minimum from point of failed test in each direction) and take small sample with 1 inch wide die for an additional field test at each location. If these additional samples pass test, then take full laboratory samples. If the laboratory samples pass tests, repair seam between these locations. If either sample fails, repeat process to establish zone in which seam should be repaired.
   d. Acceptable repaired seams shall be bound by 2 locations from which samples passing laboratory destructive tests have been taken. In cases exceeding 150 feet of repaired seam, Owner's Representative may have Installer destructively test repair seam.
   e. When the sample fails, Owner may require additional testing of seams that were welded by same welder and/or welding apparatus during same time shift.

E. Repair Verification
   1. Owner's Representative shall observe number and log each repair.
   2. Nondestructively test each repair.
   3. Nondestructive test results that pass shall indicate adequate repair.
   4. Repairs more than 150 feet long require destructive test sampling.
   5. Failed destructive or nondestructive tests indicate that repair shall be redone and retested until passing test results.

F. Large Wrinkles: Wrinkle is considered to be large when geomembrane can be folded over onto itself.

1. When seaming of geomembrane is completed, and prior to placing overlying materials, Owner's Representative shall identify all excessive geomembrane wrinkles, which should be cut and reseamed.
2. Cut and reseam all wrinkles identified by Owner's Representative. Seams produced while repairing wrinkles shall be nondestructively tested.
3. Repair wrinkles identified by Owner's Representative. Repair during coldest part of installation period.

***END OF SECTION***

# SECTION 31 35 26C
# GEOSYNTHETIC CLAY LINER

## 1.0 GENERAL

### 1.1 Description

A. This Section describes the requirements for the manufacture, supply, installation, and quality control of geosynthetic clay liner (GCL).

B. The Work shall be done in accordance with these Specifications and as shown on the Drawings.

C. The Work includes furnishing all labor, tools, materials, equipment, and supervision as may be required to construct the Work.

D. GCL will be placed over compacted General Fill along the upper portions of the pond sideslopes.

E. Additional GCL may be placed over areas where the existing clay liner does not meet the CCR rule requirements.

### 1.2 Related Sections

A. Liner Quality Control Plan

B. ASTM International (ASTM) (latest version):

1. ASTM D4873 – Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
2. ASTM D5887 – Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter
3. ASTM D5888 – Standard Guide for Storage and Handling of Geosynthetic Clay Liners
4. ASTM D5889 – Standard Practice for Quality Control of Geosynthetic Clay Liners
5. ASTM D5890 – Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners
6. ASTM D5891 – Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners
7. ASTM D5993 – Standard Test Method for Measuring Mass per Unit of Geosynthetic Clay Liners
8. ASTM D6102 – Standard Guide for Installation of Geosynthetic Clay Liners
9. ASTM D6496 – Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners
10. ASTM D6768 – Standard Test Method for Tensile Strength of Geosynthetic Clay Liners

### 1.3 Qualifications

A. Installation of geosynthetic clay liner shall be performed by a Geosynthetics Installer that can demonstrate a minimum of 1,000,000 square feet of successfully completed multi-component composite liner installation experience or provide satisfactory evidence of installation experience and competence with other geosynthetics, as determined by the Owner's Representative.

## 1.4 Submittals

A. The Contractor shall submit to the Owner's Representative the information listed in this section from the Geosynthetics Manufacturer relating to geosynthetic clay liner.

1. Quality control (QC) certificates issued by the raw material supplier, including the production dates of the raw materials used to manufacture geosynthetic clay liner for the project.
2. The QC Manual followed during the manufacturing process, including those for the polymer materials and for detecting foreign objects in the finished goods, and a description of the QC laboratory facilities, including the name and telephone number of the quality control manager.
3. Certificates for test results at the sampling frequency indicated by the QC Manual.
    a. Certificates for each shift's production shall be signed by responsible parties employed by the Geosynthetics Manufacturer.
    b. The certificates shall include roll numbers and identification, sampling procedures, and results of the QC tests verifying conformance for each of the properties listed in Table 313526C-1. Certificates shall be submitted at the frequency indicated in the QC Manual for geosynthetic clay liner that is continuously produced and supplied to the project and at a frequency of at least one per lot. The certificates shall indicate that geosynthetic clay liner produced for the project meets or exceeds the requirements of these Specifications.

## 1.5 Quality Control and Quality Assurance

A. All Work shall be constructed, monitored, and tested in accordance with the Specifications. The Contractor, the Geosynthetics Installer, and the Geosynthetics Manufacturer shall participate and comply with all items in the Specifications.

B. The Geosynthetics Installer and the Contractor shall be aware of all activities outlined in the Specifications and shall account for these activities in the construction schedule.

C. The Manufacturer's quality control shall be in accordance with ASTM D5889, unless otherwise approved by the Owner's Representative.

D. The Geosynthetics Manufacturer shall assure that the geosynthetic clay liner is delivered to the site at least seven (7) calendar days prior to installation.

E. Samples of geosynthetic clay liner shall be collected at the factory as directed by the Owner's Representative for possible laboratory testing to verify compliance with the Specifications. If such testing is performed, passing results must be confirmed by the Owner's Representative prior to shipment of geosynthetic clay liner to the site.

F. Geosynthetic clay liner rolls that do not meet the requirements of the Specifications in the determination of the Owner's Representative shall be rejected. The Geosynthetics Manufacturer shall be required to replace the rejected material with new material that complies with the Specifications at no cost to the Owner.

## 1.6 Delivery, Storage, And Handling

A. Offloading and storage of geosynthetic clay liner is the responsibility of the Contractor. Handling and care of geosynthetic clay liner after acceptance by the Owner's Representative, prior to and following installation, is the responsibility of the Contractor, until final acceptance of the liner system by the Owner's Representative. Handling and storage of geosynthetic clay liner shall be in accordance with ASTM D5888.

B. Rolls shall be stored on a flat, dry surface. If necessary, the Contractor shall store the material off of the ground on pallets or use equivalent means to keep the material from contacting the ground. Tarping the stored materials is suggested to avoid unnecessary stress on the packaging. Geosynthetic clay

liner shall be protected from ultraviolet light exposure, moisture, puncture, cutting, and other damaging or deleterious conditions. Any additional storage procedures required by the Geosynthetics Manufacturer shall be the responsibility of the Contractor.

C. All rolls of geosynthetic clay liner shall be identified at the factory with the following:

1. Name of the Geosynthetics Manufacturer
2. Product identification
3. Lot number
4. Roll number
5. Roll dimensions

D. Geosynthetic clay liner rolls and offloading straps shall be shipped and stored by the Geosynthetics Manufacturer in relatively opaque and watertight wrappings.

E. Rolls shall be handled using a solid steel bar inserted through the core bar and slings or chains attached to the ends of the bar. The core bar shall be suspended from a spreader bar so that the edges of the geosynthetic clay liner are not damaged by the suspending straps or chains.

F. Rolls shall be stored following all recommendations of the Geosynthetics Manufacturer and the requirements of ASTM D4873.

G. Acceptance at the site shall include the activities described in this section.

1. The Owner's Representative shall take inventory and perform surface inspection for defects and damage of geosynthetic clay liner rolls upon delivery.
2. The Contractor shall unroll and inspect any geosynthetic clay liner roll that may be damaged below the surface layers.
3. The Geosynthetics Installer shall repair damage resulting from handling and transport of geosynthetic clay liner to the site. If the damage is irreparable, in the opinion of the Owner's Representative, damaged materials shall be replaced at no cost to the Owner.

H. The Contractor shall preserve the integrity and readability of geosynthetic clay liner roll labels and store the rolls such that the Owner's Representative shall have access to the package slips or roll labels for each roll to verify roll acceptance.

## 2.0 PRODUCTS

### 2.1 Material:

A. The geosynthetic clay liner shall be "Resistex U40" as manufactured by CETCO Lining Technologies; "BentoLiner CAR Plus" as manufactured by Solmax; or Engineer-approved equivalent. The geosynthetic clay liner for the project shall meet or exceed the requirements shown in Table 313526C-1:

**Table 313526C-1: Geosynthetic Clay Liner Properties**

| Geosynthetic Clay Liner Property | Test Method | Requirement |
|---|---|---|
| Bentonite Mass Per Unit Area | ASTM D5993 | 0.75 pounds per square foot (minimum) |
| Peel Strength | ASTM D6496 | 5.0 pounds per inch (minimum) |
| Grab Tensile Strength | ASTM D6768 | 45 pounds per inch (minimum) |
| Hydraulic Conductivity | ASTM D5887 | $3 \times 10^{-9}$ centimeters per second (maximum) |
| Bentonite Swell Index | ASTM D5890 | 24 milliliters per 2 grams (minimum) |
| Bentonite Fluid Loss | ASTM D5891 | 18 milliliters (maximum) |
| GCL Moisture Content | ASTM D5993 | 35 percent (maximum) |

B. The supplier of any proposed alternate GCL will provide data showing compatibility of their GCL with liquids with chemistry similar to Table 313526C-2.

**Table 313526C-2: Site-Specific Liquid Chemistry Data**

| Parameter | Value | Unit |
|---|---|---|
| pH | 6.52 | |
| Alkalinity | 68.0 | ppm |
| Sb | 0.00155 | ppm |
| As | <0.002 | ppm |
| Ba | 0.0835 | ppm |
| Be | <0.0003 | ppm |
| B | 73.3 | ppm |
| Cd | 0.000348 | ppm |
| Ca | 487 | ppm |
| Cl | 1510 | ppm |
| Cr | 0.00427 | ppm |
| Co | <0.003 | ppm |
| Fe(3) | <0.05 | ppm |
| Fe(2) | <0.05 | ppm |
| F | 17.5 | ppm |
| Pb | <0.0003 | ppm |
| Li | 0.172 | ppm |
| Mg | 809 | ppm |
| Hg | 0.00134 | ppm |
| Mo | 0.241 | ppm |
| N(5) | 3.24 | ppm |
| P | <0.03 | ppm |
| K | 86.9 | ppm |
| Se | 1.3 | ppm |
| Na | 287 | ppm |
| S04(6) | 3260 | ppm |
| Tl | 0.00144 | ppm |

C. Needled geosynthetic clay liners are those that, by a process that employs a needling board, have fibers of a non-woven geotextile pushed through a bentonite layer and integrated into a woven or non-woven geotextile on the opposite side of the bentonite layer from the first geotextile without the use of any chemical binders or adhesives.

D. The geosynthetic clay liner shall be manufactured using the mechanical bonding of the needle-punching process to enhance the frictional characteristics of the product and to maintain the integrity of the geosynthetic clay liner under hydration. No glues or adhesives shall be used in lieu of the needle-punching process so as to retain these characteristics.

E. No disassociation of geotextile components from the bentonite shall occur. A sample of the bentonite and geotextile components placed in tap water at 70 degrees Fahrenheit for one (1) hour shall not show evidence of delamination.

F. The geosynthetic clay liner shall be manufactured utilizing a minimum of 0.75 pound per square foot of polymer-enhance, high-swelling sodium bentonite.

G. Rolls shall be manufactured at least 12 feet wide.

H. All rolls shall be labeled and bagged in packaging that is resistant to photodegradation by ultraviolet light.

I. Accessory bentonite used for sealing seams, penetrations, and repairs shall be the same granular bentonite as used in the production of the geosynthetic clay liner.

## 3.0 EXECUTION

### 3.1 Installation

A. Installation shall be in accordance with ASTM D6102, unless otherwise indicated in these Specifications or on the Drawings.

B. The Geosynthetics Installer shall install the GCL over eroded areas on the sideslopes in accordance with the procedures listed in this section.

1. Repair rough areas and any damage to the subgrade by placing and densifying general fill approved by the Owner's Representative in any ruts caused by equipment prior to GCL deployment. Surfaces to be lined shall be smooth and free of any debris, vegetation, roots, sticks, sharp rocks, protrusions larger than 0.5 inches, soil particles larger than one (1) inch in the longest dimension, and any other deleterious materials, as well as free of any voids, large cracks, standing water, and ice.
2. Install the geosynthetic clay liner so that panel seams are parallel to the dip of the slope.
3. Pull geosynthetic clay liner panels from a roll suspended at the crest of the slope.

C. The Geosynthetics Installer shall install the geosynthetic clay liner over isolated areas not meeting the CCR regulations in accordance with the procedures listed in this section.

1. Repair rough areas and any damage to the subgrade by scarifying and compacting the existing clay liner prior to GCL deployment. Surfaces to be lined shall be smooth and free of any debris, vegetation, roots, sticks, sharp rocks, protrusions larger than 0.5 inches, soil particles larger than one (1) inch in the longest dimension, and any other deleterious materials, as well as free of any voids, large cracks, standing water, and ice.
2. Extend the geosynthetic clay liner a minimum of 24 inches beyond the failing clay liner as determined by the Owner's representative. Cut a small notch measuring approximately three (3) inches wide and eight (8) inches deep in the subgrade approximately 6 inches from the edge of the GCL. The Geosynthetics Installer shall compact a mixture of one (1) part bentonite to four (4) parts soil by volume, blended dry, into the bottom half of the notch. The geosynthetic clay liner

shall then be inserted into the notch. The Geosynthetics Installer shall then fill the remaining notch volume with bentonite or compact the mixture of one (1) part bentonite to four (4) parts soil by volume, blended dry, into the remaining notch volume

D. The Geosynthetic Installer shall install all geosynthetic clay liner in accordance with the following procedures.

3. Do not install geosynthetic clay liner over saturated subgrade, in standing water, or during precipitation events.
4. Overlap geosynthetic clay liner panels in accordance with the recommendations of the Geosynthetics Manufacturer. At a minimum, the overlap shall be six (6) inches along the length of the geosynthetic clay liner panel and 24 inches along the width of the geosynthetic clay liner panel. Contacting surfaces shall be clean and free from dirt or native soil with all edges pulled tight to maximize contact and to smooth out wrinkles and creases. Heat tack the seams with a brief application of a flame torch followed by light pressure or with a hot-air device, also known as a Leister.
5. Augment seams with granular bentonite if recommended by the Geosynthetics Manufacturer to ensure seam integrity. Accessory bentonite shall be of the same type as the bentonite within the geosynthetic clay liner.
6. Place only as much geosynthetic clay liner each day as can be covered on the same day. The geosynthetic clay liner shall be covered before the end of each working day. Exposed edges shall be covered by a temporary tarp or other such water-resistant sheeting until the next working day.
7. Do not drag geosynthetic clay liner or textured geomembrane over previously installed geosynthetic clay liner. Use a smooth rub sheet if needed to prevent damage.
8. Do not allow geosynthetic clay liner to become wetted, except by the subgrade, prior to placement of the overlying geomembrane. All hydrated geosynthetic clay liner shall be removed and replaced by the Geosynthetics Installer at no cost to the Owner.
9. For any penetrations or structures the geosynthetic clay liner will contact, cut a small notch measuring approximately three (3) inches wide and eight (8) inches deep in the subgrade along the edge of the area. The geosynthetic clay liner shall be brought up to the appurtenance and trimmed to fit into the notch. The Geosynthetics Installer shall compact a mixture of one (1) part bentonite to four (4) parts soil by volume, blended dry, into the bottom half of the notch. The geosynthetic clay liner shall then be inserted into the notch. The Geosynthetics Installer shall then fill the remaining notch volume with bentonite or compact the mixture of one (1) part bentonite to four (4) parts soil by volume, blended dry, into the remaining notch volume.

## 3.2 Repair

A. The Geosynthetics Installer shall repair cuts, tears, and holes in the geosynthetic clay liner by covering them with a geosynthetic clay liner patch per the recommendations of the Geosynthetics Manufacturer. The patch shall overlap the edges of the cut, hole, or tear by a minimum of two (2) feet in all directions. Accessory bentonite shall be placed between the patch and the repaired material at a rate of at least one-quarter (1/4) pound per lineal foot of edge.

B. The Geosynthetics Installer shall attach patches to panels using either non-hazardous, non-toxic adhesive as recommended by the Geosynthetics Manufacturer or by spot welding with a hot-air apparatus, also known as a Leister. The attachment method shall be approved by the Owner's Representative prior to use.

C. All repairs shall be made at no additional cost to the Owner.

## 3.3 Conformance Testing

A. The GCL material shall be made available to the Owner's Representative for sampling and conformance testing at a minimum frequency of one (1) sample per lot.

B. If a test result is out of conformance with the Specifications, all material from the lot represented by the failed test is subject to rejection. The amount of rejected material may be reduced by bounding the non-conforming material with passing tests. Additional testing and replaced material will be provided at no additional cost to the Owner. If conformance testing is performed, no material shall be shipped until confirmation has been received from the Owner's Representative that the samples have passed conformance testing.

## 3.4 Field Quality Control

A. The Contractor shall not permit traffic directly over any geosynthetic materials.

B. The Contractor shall place overlying materials in such a manner as to ensure that:

1. The geosynthetic clay liner and underlying materials are not damaged.
2. Excess tensile stresses are not developed in the geosynthetic clay liner by earth moving equipment making sudden starts, stops or turns.
3. Minimal movement and wrinkling or folding of geosynthetic layers occurs.
4. The geosynthetic clay liner is fully covered at the end of each working day to prevent potential damage by moisture and wildlife.

C. Care shall be taken to prevent damage to geosynthetic materials. At no time shall construction equipment come into direct contact with geosynthetic materials. If damage occurs, it shall be repaired by the Contractor at no cost to the Owner.

## 3.5 Survey Control

A. The Owner's Surveyor will perform a survey of geosynthetic clay liner placement areas.

*** END OF SECTION ***

**DIVISION 33**

# Utilities

# SECTION 33 05 33
# POLYETHYLENE PIPE

## 1.0 GENERAL

### 1.1 Summary

A. This Section describes the requirements for polyethylene pipe and fittings.

B. The Work shall be done in strict accordance with these Specifications and as shown on the Drawings.

C. The Contractor shall furnish all labor, tools, materials, equipment, and supervision as may be required to complete the Work.

### 1.2 Related Project Specs

A. Section 31 23 00 – Earthwork

### 1.3 References

A. ASTM International (ASTM) (latest version):

1. ASTM D2321 – Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
2. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
3. ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
4. ASTM F2620 – Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.
5. ASTM F2164 – Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure

B. Handbook of Polyethylene Pipe, 2nd Edition – Plastic Pipe Institute, 2008

### 1.4 Submittals

A. The Contractor shall submit manufactured materials information for piping components of the Work including, but not limited to, the Manufacturer's product data to the Owner's Representative for approval at least 10 working days prior to delivery.

### 1.5 Tolerances

A. Fill areas are defined by the lines and grades shown on the Drawings.

B. Installation shall achieve uniform gradients without sags or humps and maintain grades and slopes shown on the Drawings to provide positive drainage control at all times.

C. The tolerances for construction, unless otherwise approved by the Owner's Representative, shall be as follows:

1. For pipe invert, the horizontal and vertical construction tolerances are as follows:
   a. Line:± 0.2 feet
   b. Grade:± 0.1 feet

D. Correction of over excavation or locating portions of the Work outside the tolerances shall be completed by the Contractor at no expense to the Owner.

## 1.6 Quality Control/Quality Assurance

A. All Work shall be constructed, monitored, and tested in accordance with the requirements set forth by the Owner's Representative.

B. The Contractor shall be aware of all testing activities and shall account for these activities in the construction schedule.

C. All excavation, backfill, and grading operations shall be carried out under the observation of the Owner's Representative.

D. Any Work found unsatisfactory or any Work disturbed by subsequent operations before acceptance is granted shall be corrected by the Contractor as directed by the Owner's Representative at no additional cost to the Owner.

## 1.7 Protection of Existing Services and Utilities

A. The Contractor shall locate existing utilities, pipes, culverts, and structures, above and below ground, before any excavation starts and shall coordinate the Work with local utility companies and the Owner's Representative. The Contractor shall protect, maintain in service, and prevent damage to utilities not designated for removal.

B. The Contractor shall be responsible for locating all underground utilities and shall exercise care to avoid disturbing or damaging any existing wells, sumps, electrical poles and lines, permanent below-ground utilities, permanent drainage structures, temporary utilities and structures, and other items. If the Contractor encounters any unexpected underground utilities during the course of the Work, the Contractor shall immediately inform the Owner's Representative. When the Work requires the Contractor to be near or cross known utilities, the Contractor shall carefully uncover, support, and protect these utilities and shall not cut, damage, or otherwise disturb them without prior authorization from the Owner's Representative. Unless noted otherwise on the Drawings, utilities damaged by the Contractor shall be immediately repaired by the Contractor to the satisfaction of the Owner's Representative at no additional cost to the Owner. Any required shutdowns of active utilities or site operations shall be coordinated with the Owner.

# 2.0 PRODUCTS

## 2.1 Earthen Materials

A. Bedding and backfill materials used in conjunction with this Work shall be furnished by the Contractor.

B. Pipe bedding materials shall be free of organics and other deleterious materials and shall meet the requirements for Pipe Bedding described in Section 31 00 00 – Earthwork, unless otherwise approved by the Owner's Representative.

C. Pipe embedment materials shall be free of organics and other deleterious materials and shall meet the requirements for Pipe Bedding described in Section 31 00 00 – Earthwork, unless otherwise approved by the Owner's Representative.

D. Backfill materials shall be free of organics and other deleterious materials and shall meet the requirements for Embankment Fill described in Section 31 00 00 – Earthwork, unless otherwise approved by the Owner's Representative.

## 2.2 Piping and Fittings

A. Piping and fittings used in conjunction with this Work shall be furnished by the Contractor.

B. All materials and equipment shall be new and undamaged and shall be approved by the Owner's Representative prior to delivery.

C. Piping shall be solid-wall high-density polyethylene pipe of the diameter and diameter ratio (DR) shown on the Drawings. Piping shall meet the requirements of ASTM D3350 and ASTM F714 (Iron Pipe Size). Joints shall be butt fusion-welded joints, unless otherwise shown on the Drawings or approved by the Owner's Representative

D. Polyethylene piping shall be PE Resin 4710 or alternate as approved by the Owner's Representative.

## 2.3 Plastic Marking Tape

A. Plastic marking tape used in conjunction with this Work shall be furnished by the Contractor.

B. Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6-inches side with minimum thickness of 0.004 inches. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provide with other means to protect it from corrosion.

C. Plastic marking tape shall be approved by the Owner's Representative prior to delivery.

# 3.0 EXECUTION

## 3.1 Pipe Bedding and Backfill

A. Pipe Bedding shall be placed as follows:

1. The base of pipe excavations shall be constructed to provide a firm and unyielding surface meeting the requirements of prepared subgrade under Section 31 00 00 – Earthwork or as approved by the Owner's Representative.
2. Loose Pipe Bedding material shall have a minimum thickness of 3 inches.
3. The entire barrel of the pipe shall be fully supported for its entire length.
4. The pipe surface shall be kept clean. The Contractor shall exercise care to keep dirt and other material from entering the pipe during placement in the trench and shall close the ends of in-place pipe at the end of the work period to prevent entry of animals and foreign material.

B. Pipe Embedment shall be placed as follows:

1. Pipe embedment shall be placed in uniform horizontal loose lifts not to exceed 6 inches in thickness to a minimum of 12 inches above the top of the pipe(s) being backfilled.
2. Place compact Pipe Bedding under the sides of the pipe to the pipe spring line (haunching area), taking care during placement and compaction of this material to ensure continuous support is developed under the pipe haunches while avoiding either vertical or lateral displacement of the pipe from its intended position. Compact pipe bedding in the haunching area using manual or mechanical tamping techniques.
3. Place and compact Pipe Bedding from the spring line of the pipe to a minimum of 12 inches above the top of the pipe in uniform horizontal lifts. Bring up the level of Pipe Bedding uniformly on both sides of the pipe along the full length of each pipe section taking care not to damage the pipe.
4. Pay special attention to proper compaction of the materials in the pipe haunching area and sides to ensure adequate side support is developed. The material directly above the pipe in the pipe embedment zone shall be only lightly compacted to avoid distorting the pipe. Compacted density requirements do not apply to materials in this area directly over flexible pipe.

C. Pipe Backfill shall be placed as follows:

1. Embankment Fill shall be placed and compacted to the meet the requirements of Section 31 00 00 – Earthwork.
2. The Contractor shall install plastic marking tape (as specified) above the pipe at a depth of 1 to 2 feet below the finished grade.
3. Pipe backfill shall be placed to the grades shown on the Drawings.

## 3.2 Unloading and Storage of Pipe and Fittings

A. The unloading and loading of pipe, fittings, and related accessories shall be performed with care so as to avoid damage to these materials. Upon arrival at the site, the pipe should be inspected for quantity and shipping damage. Unloading can be performed by hand or with equipment using lifting tongs or nylon slings.

B. Materials shall not be stored directly on the ground but shall be placed on pallets or other suitable supports to prevent the entry of mud and debris into the pipe. The Contractor shall also endeavor to store materials in accordance with any special practices that may be recommended by the Manufacturer.

C. Maximum stacking height of HDPE pipe shall be in accordance with the Manufacturer's Manual or equivalent for storage requirements, based on pipe size and wall thickness.

D. When storing HDPE pipe, stack the heaviest pipe at the bottom.

## 3.3 Installation of Piping and Fittings

A. The line and grade of all piping shall be established and verified by survey as described on the Drawings.

B. Piping shall be installed in accordance with ASTM D2321 and per the Manufacturer's recommendations

C. Pipe shall be cut neatly and without damage to the pipe. Unless otherwise recommended by the pipe manufacturer, cut pipe with mechanical cutter only. Cut plastic pipe square, using a hand saw, and remove all burrs.

D. Lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other equipment recommended by the pipe supplier. Take special care in handling prefabricated sections of HDPE pipe. Do not dump or drop any of the materials of this specification into the trench.

E. Heat fusion joining of pipe and fittings shall be in accordance with ASTM F2620 and the Manufacturer's recommendations.

F. Butt fused joints shall be made by craft persons certified for the fusion machine and piping materials being utilized. Initial training or a refresher course by a certified instructor is recommended.

G. Securely close open ends of the pipe, fittings, and valves when work is not in progress.

## 3.4 Inspection and Testing of Piping System

A. Visual testing of pipe systems shall be performed to verify the accuracy of the alignment and grade and freedom from major defects, debris, and obstructions.

B. Pressure piping system constructed from HDPE material shall be leakage tested using the methodology outlined in the ASTM F2164 ("Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure") and the manufacturers recommendations. HDPE pipe expands under test pressure, and this method provides and estimated allowance for this expansion consideration.

1. Test pressure should not exceed 1.5 times the design pressure of the pipe or the lowest rated component in the system. Relief valve shall be provided in the test setup to prevent overpressure due to sun exposure or from accidental over-pumping.
2. The pressure test can be conducted before or after the pipe is backfilled. At a minimum, the pipe should be covered at intervals, particularly at curves and changes in direction to hold the pipe in place during the pressure test. Mechanical joints should be left exposed for visual leak inspection, if practical.

## 3.5 Field Quality Control

A. The Contractor is responsible for quality control during all phases of construction.

B. The Owner's Representative will observe pipe installation to verify that the Contractor is complying with the Specifications and Drawings. The Contractor shall allow the Owner's Representative access to all phases of the Work to carry out the required observations and shall assist the Owner's Representative in obtaining samples and conducting tests as necessary.

## 3.6 Protection of Work

A. The Contractor shall use all means necessary to protect materials and partially completed and completed Work.

B. In the event of damage, the Owner's Representative will identify areas requiring repair, and the Contractor shall make repairs and replacements to the satisfaction of the Owner's Representative at no additional cost to the Owner.

***END OF SECTION***

**DIVISION 35**

# Waterway Construction

# SECTION 35 31 19
# EROSION CONTROL LINING

## 1.0 GENERAL

### 1.1 Description

A. The work shall consist of installing an concrete lining by positioning specially woven, double-layer synthetic forms on the geomembrane-lined sideslopes to be protected and filling them with a pumpable fine aggregate concrete (structural grout) in such a manner as to form a stable lining of required thickness, weight and configuration.

B. The Contractor shall furnish all labor, materials, equipment, and incidentals as maybe required and perform all operations in connection with the installation of the fabric formed concrete erosion control lining systems in accordance with the lines, grades, design, and dimensions shown on the Drawings and as specified herein.

C. The fabric forms are constructed of woven, double-layer synthetic fabric. Hydrotex® uniform section linings, or equal, are installed by positioning fabric forms over the areas to be protected and then pumping, high-strength, fine aggregate concrete into the forms. The high-strength, fine aggregate concrete is used in place of conventional concrete because of its pumpability, high-strength, impermeability, and absorption resistance.

### 1.2 References

A. ASTM International (ASTM) (latest version):

1. ASTM C31 -- Standard Practice for Making and Curing Concrete Test Specimens in the Field
2. ASTM C33 -- Standard Specification for Concrete Aggregates
3. ASTM C94 -- Standard Specification for Ready-Mixed Concrete
4. ASTM C109 -- Standard Test Method for Compressive Strength Grout (Using 2-inch Cube Specimens or Grout Prisms)
5. ASTM C150 -- Standard Specification for Portland Cement
6. ASTM C260 -- Standard Specification for Air-Entraining Admixtures for Concrete
7. ASTM C494 -- Standard Specification for Chemical Admixtures for Concrete
8. ASTM C618 -- Standard Specification for Coal Fly Ash and Calcined Natural Pozzolan for Use in Concrete
9. ASTM C685 -- Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
10. ASTM C1019 -- Standard Test Method for Sampling and Testing Grout
11. ASTM C1602 -- Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
12. ASTM C1603 -- Standard Test Method for Measurement of Solids in Water
13. ASTM D2061 -- Standard Test Method of Strength of Zippers
14. ASTM D2256 -- Standard Test Method for Tensile Properties of Yarns by the Single-Strand Method
15. ASTM D4354 -- Practice for Sampling of Geotextiles for Testing

16. ASTM D4491 -- Standard Test Methods for Water Permeability of Geotextiles by Permittivity
17. ASTM D4533 -- Standard Test Method for Trapezoidal Tearing Strength of Geotextiles
18. ASTM D4595Test Method for Tensile Properties of Geotextiles by the Wide Width Strip Method
19. ASTM D4632 -- Test Method for Breaking Load and Elongation of Geotextiles (Grab Method)
20. ASTM D4751 -- Test Method for Determining Apparent Opening Size for a Geotextile
21. ASTM D4759 -- Practice for Determining the Specification Conformance of Geotextiles
22. ASTM D4873 -- Standard Guide for Identification, Storage, and Handling of Geotextiles
23. ASTM D4884 Test Method for Seam Strength of Sewn Geotextiles
24. ASTM D5199 -- Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
25. ASTM D5261 -- Test Method for Measuring Mass per Unit Area of Geotextiles
26. ASTM D6241 -- Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 2-inch [50-mm] Probe
27. ASTM D6449 -- Standard Method for Flow of Fine Aggregate Concrete for Fabric Formed Concrete

## 1.3 Submittals

A. The Contractor/Subcontractor shall submit the following at the time of bid:

1. Project References with contacts of direct installation of fabric formed concrete products installed in similar applications, totaling a minimum of 200,000 square feet.
2. Concrete Mix Design

B. The fabric form manufacturer shall furnish the following required submittals:

1. Certification Letter of Approved Installer. This letter should state the contractor or subcontractor has sufficient experience with the manufacturer's product and that the manufacturer certifies the installer is experienced in all aspects of construction as required by the project conditions.
2. Full-Scale Flume Test Report. Report of such hydraulic testing shall be by an industry accredited laboratory, including the tested maximum shear stress, velocity, and other pertinent hydraulic and geometric data.
3. Materials Property Test Results. These results showing conformance must be performed within 90 days prior to the bid date.
4. Certificate of Compliance. This certificate shall state that the fabric forms meet or exceed all aspects of this Specification and shall be signed by an officer of the company.
5. Manufacturer's name and current address; Full product name;
6. Style and product code number; Form number(s)
7. Manufacturer's Hydraulic Stability Calculation Report. This report shall include calculations of applied shear stress, resisting shear stress, with a corresponding factor of safety for the product, along with requirements, recommendations, and details.
8. Concrete Mix Design Approval.This approval from the fabric form manufacturer shall note manufacturer's mix design number and any other designation noted on the mix design report.
9. Shop Drawings and Layout. Individual panel drawings with dimensions and a panel layout drawing.

10. Recommendations or Notes. If applicable, these items should be specifically related to the project.

C. Alternative fabric formed concrete lining materials shall not be considered that do not meet this Specification. Alternative material packages must be submitted to the Engineer a minimum of fourteen (14) days prior to the bid date. Submittal packages must include, as a minimum, the above noted requirements. Material testing reports prepared by a certified geotextile laboratory attesting to the alternative fabric form material's compliance with this Specification. Material laboratory testing shall have been performed within ninety (90) days of the bid date.

## 2.0 PRODUCTS

### 2.1 Fabric Forms

A. The fabric forms for casting the concrete lining(s) shall be as specified, HYDROTEX® Uniform Section US600 fabric forms, or Engineer approved equal, as manufactured by:,

Synthetex, LLC
5550 Triangle Parkway, Suite 220
Peachtree Corners, Georgia 30092 USA
Tel: 800.253.0561 or 770.399.5051
E-Mail: info@synthetex.com

B. The fabric forms shall be composed of synthetic yarns formed into a woven fabric. Yarns used in the manufacture of the fabric shall be composed of polyester. Forms shall be woven with a minimum of 50% textured yarns (by weight). Partially-oriented (POY), draw-textured, and/or staple yarns shall not be used in the manufacture of the fabric. The fabric shall conform to the physical, mechanical and hydraulic requirements Mean Average Roll Values listed in Table 1.0. The fabric forms shall be free of defects or flaws which significantly affect their physical, mechanical, or hydraulic properties.

**Table 353119-1 PROPERTY REQUIREMENTS – HYDROTEX FABRIC [1, 2]**

| Properties | Testing Method | Units | MARV |
|---|---|---|---|
| Composition of Yarns | - | - | Polyester |
| Mass Per Unit Area (double-layer) | ASTM D5261 | oz/yd$^2$ | 13 |
| Thickness (single-layer) | ASTM D 5199 | mils | 15 |
| Mill Width (Woven) minimum | | inch | 84 |
| Wide-Width Strip Tensile Strength - MD \| TD | ASTM D4595 | lbs/inch | 300 \| 350 |
| Elongation at Break - MD \| TD - Max. | | % | 15 \| 15 |
| Trapezoidal Tear Strength - MD \| TD | ASTM D4533 | lbs | 150 \| 175 |
| CBR Puncture Strength | ASTM D6241 | lbs | 1250 |
| Mullen Burst Strength | ASTM D3786 (Mod.) | psi | 500 |
| Apparent Opening Size (AOS) | ASTM D4751 | U.S. Standard Sieve | 30 - 40 |
| Flow Rate | ASTM D4491 | gal/min/ft$^2$ | 30 - 55 |

(1) Conformance of fabric to specification property requirements shall be based on ASTM D4759.
(2) All numerical values represent minimum average roll values (i.e., average of test results from any sample roll in a lot shall meet or exceed the minimum values). Lots shall be sampled according to ASTM D4354.

C. Fabric forms shall consist of double-layer woven fabric joined together by spaced, interwoven cords of uniform length to form a concrete lining of the specified average thickness. The cords shall be

interwoven between the two layers of fabric, in parallel pairs, so that the two (2) cords together in the top layer and two (2) cords together in the bottom layer cross between layers at drop points. Each cord shall have a minimum breaking strength of 160 pounds when tested in accordance with ASTM D2256.

D. Mill widths of fabric shall be a minimum of 84 inches. Each selvage edge of the top and bottom layers of fabric shall be reinforced for a width of not less than 1.35 inches by adding a minimum of 6 warp yarns to each selvage construction. Mill width rolls shall be cut to the length required, and the double-layer fabric separately joined, bottom layer to bottom layer and top layer to top layer, by means of sewing thread, to form multiple mill width panels with sewn seams.

E. Fabric form panels shall be factory-sewn, by jointing together the layers of fabric, top layer to top layer and bottom layer to bottom layer, into predetermined custom sized panels. Sewn seams shall be downward facing as shown on the Contract Drawings. All sewn seams and zipper attachments shall be made using a double line of U.S. Federal Standard Type 401 stitch. All seams sewn shall be not less than 100 lbf/inch when tested in accordance with ASTM D4884. Both lines of stitches shall be sewn simultaneously and be parallel to each other, spaced between 0.25 inches to 0.75 inches apart. Each row of stitching shall consist of 4 to 7 stitches per inch. Thread used for seaming shall be polyester.

F. Revetment cables shall be installed in the longitudinal directions between the two layers of fabric. Longitudinal cables, on approximately 36-inch centers or as required by the Engineer.

G. Revetment cables shall be constructed of **high-strength polyester. Longitudinal cables shall be nominally 0.25 inches in diameter and their rated breaking strength shall be not less than 3.700 pound-force (Consult manufacturer for cable recommendations for the application).** Cable fittings shall be selected so that the resultant cable splice shall provide a minimum of 80 percent of the rated breaking strength of the cable. All cable splices shall have a minimum cable overlap of 6 inches (15.3 cm) and be made with aluminum compression fittings. Polyester Revetment Cables shall be constructed of high tenacity, low elongation, and continuous filament polyester fibers. Cable shall consist of a core constructed of parallel fibers contained within an outer jacket or cover. The weight of the parallel core shall be between 65% to 70% of the total weight of the cable.

H. Baffles shall be installed at predetermined mill width intervals to regulate the distance of lateral flow of fine aggregate concrete. The baffles shall be designed to maintain a full concrete lining thickness along the full length of the baffle. The baffle material shall be nonwoven filter fabric. The grab tensile strength of the filter fabric shall be not less than 180 lbf/inch when tested in accordance with ASTM D4632.

I. The fabric forms shall be kept dry and wrapped such that they are protected from the elements during shipping and storage. If stored outdoors, they shall be elevated and protected with a waterproof cover that is opaque to ultraviolet light. The fabric forms shall be labeled as per ASTM D4873.

J. If recommended by manufacturer, plastic weep tubes (drains) are pre-installed at designated locations to relieve hydrostatic pressure. The tubes have a flange at one end and a point at the other end of a 7/8-inch diameter barrel. The pointed end has four small holes that allow the passage of water but retain large soil particles. There is a flanged cap that is placed over the pointed end and locks in place. The locations of weep tubes, if required, are clearly marked on the fabric form panel shop drawings. Weep tubes are assembled by forcing the pointed end of the weep tube through both the top and bottom layers of the fabric form and locking the flanged cap over the pointed end. A small square of filter fabric can be placed over the in-place flanged cap and secured with a fastener or the fabric form can be placed over a continuous layer of as-specified filter fabric. In either case the filter fabric should prevent fine soil particles from passing through the weep tube.

## 2.2 Fine Aggregate Concrete

A. Fine aggregate concrete consists of a mixture of Portland cement, fine aggregate (sand) and water, so proportioned and mixed as to provide a pumpable fine aggregate concrete.

B. The water/cement ratio of the fine aggregate concrete shall be determined by the ready-mix manufacturer, but generally should be on the order of 0.65 to 0.70. The pumping of fine aggregate

concrete into the fabric forms causes a reduction in the water content by filtering excess mixing water through the permeable fabric. The reduction of mixing water substantially improves the water/cement ratio of the in-place fine aggregate concrete thereby increasing its strength and durability. The sand/cement ratio should be determined by the ready-mix manufacturer and should be on the order of 2.4:1.

C. The consistency of the fine aggregate concrete delivered to the concrete pump should be proportioned and mixed as to have a flow time of 9-12 seconds when passed through the ¾" (19 mm) orifice of the standard flow cone that is described in ASTM C6449-99. Additional Pozzolan and/or admixtures may be used with the approval of the Engineer. The water/cement ratio varies with the exact granulometry of the fine aggregate (sand) and should be determined by the ready-mix manufacturer using the above referenced flow cone.

D. The Contractor should demonstrate the suitability by placing the proposed fine aggregate concrete mix into three (3) 2-inch concrete cubes or grout prisms. The mix should exhibit a minimum compressive strength of 2,000 psi at 28 days, when made and tested in accordance ASTM C109/C109M-13 and ASTM C1019.

E. With a typical loss of approximately 15% of the total mixing water, 27 cubic feet of pumpable fine aggregate concrete will reduce to approximately 25 cubic feet of hardened concrete. The mixing water reduction will also result in an increase of approximately 8% in the sand and cement per cubic foot of concrete. The range of fine aggregate concrete mix proportions provided in the table below has been developed under a variety of field conditions.

F. Typical Range of Mix Proportion

| **Material** | **Mix Proportions lb/yd$^3$** | **After Placement Mix Proportions lb/yd$^3$** |
|---|---|---|
| Cement | 750-850 | 805-915 |
| Sand | 2120-2030 | 2290-2190 |
| Water | 540-555 | 460-470 |
| Air | As Required | As Required |

## 3.0 CONSTRUCTION AND INSTALLATION REQUIREMENTS

### 3.1 Site Preparation

A. The Erosion Control Lining shall be placed directly over the geomembrane. Care shall be taken to prevent damaging the geomembrane.

### 3.2 Fabric Form Placement

A. Factory assembled fabric form panels shall be placed over the 60-mil textured HDPE Geomembrane within the limits shown on the Contract Drawings. Perimeter termination of the fabric forms shall be accomplished through the use of an anchor trench, as shown on the Drawings. When placing panels an allowance for approximately 10% contraction of the form in each direction which will occur as a result of fine aggregate concrete filling. The contractor shall gather and fold the additional slope direction fabric form in the anchor trench to be secured in such a manner as to be gradually released as fabric forms contract during filling. The contractor shall gather the additional transverse direction fabric form at each baffle for self-release during filling.

B. Adjacent fabric form panels shall be joined in the field by means of sewing or zippering closures. Adjacent panels shall be joined top layer to top layer and bottom layer to bottom layer. All field seams

shall be made using two lines of U.S. Federal Standard Type 101 stitches. All sewn seams shall be downward facing.

C. When conventional joining of fabric forms is impractical or where called for on the Contract Drawings, adjacent forms may be overlapped a minimum of 3 feet to form a lap joint, pending approval by the Engineer. Based on the predominant flow direction, the upstream form shall overlap the downstream form. In no case shall simple butt joints between forms be permitted.

D. Expansion joints shall be provided as shown on the Contract Drawings, or as specified by the Engineer.

E. Immediately prior to filling with fine aggregate concrete, the assembled fabric forms shall be inspected by the Engineer, and no fine aggregate concrete shall be pumped therein until the fabric seams have been approved. At no time shall the unfilled fabric forms be exposed to ultraviolet light (including direct sunlight) for a period exceeding five (5) days.

## 3.3 Fine Aggregate Concrete Placement

A. Following the placement of the fabric forms over the geomembrane, fine aggregate concrete shall be pumped between the top and bottom layers of the fabric form through small slits to be cut in the top layer of the fabric form or manufacturer supplied valves. The slits shall be of the minimum length to allow proper insertion of a filling pipe inserted at the end of a 2-inch I.D. concrete pump hose. Fine aggregate concrete shall be pumped between the top and bottom layers of fabric, filling the forms to the recommended thickness and configuration.

B. Holes in the fabric forms left by the removal of the filling pipe shall be temporarily closed by inserting a piece of fabric. The fabric shall be removed when the concrete is no longer fluid and the concrete surface at the hole shall be cleaned and smoothed by hand.

C. Fine aggregate concrete shall be pumped in such a manner that excessive pressure on the fabric forms is avoided. Consultation with the fabric form manufacturer with regard to the selection of grout/concrete pumps is recommended.

D. Cold joints shall be avoided. A cold joint is defined as one in which the pumping of the fine aggregate concrete into a given section of form is discontinued or interrupted for an interval of forty-five (45) or more minutes.

E. The sequence of fine aggregate concrete shall be such as to ensure complete filling of the fabric formed concrete lining to the thickness specified by the Engineer. The flow of the fine aggregate concrete shall first be directed into the lower edge of the fabric form and working back up the slope, followed by redirecting the flow into the anchor trench.

F. Prior to removing the filling pipe from the current concrete lining section and proceeding to the fine aggregate concrete filling of the adjacent lining section, the thickness of the current lining section shall be measured by inserting a length of stiff wire through the lining at several locations from the crest to the toe of the slope. The average of all thickness measurements shall be not less than the specified average thickness of the concrete lining. Should the measurements not meet the specified average thickness, pumping shall continue until the specified average thickness has been attained.

G. Excessive fine aggregate concrete that has inadvertently spilled on the concrete lining surface shall be removed. The use of a high-pressure water hose to remove spilled fine aggregate concrete from the surface of the freshly pumped concrete lining shall not be permitted.

H. Foot traffic will not be permitted on the freshly pumped concrete lining when such traffic will cause permanent indentations in the lining surface. Walk boards shall be used where necessary.

I. After the fine aggregate concrete has set, all anchor trenches shall be backfilled and compacted flush with the top of the concrete lining. The integrity of the trench backfill must be maintained so as to ensure a surface that is flush with the top surface of the concrete lining for its entire service life. No more than five hundred (500) linear feet of pumped concrete lining with non-completed anchor trench

will be permitted at any time.

***** END OF SECTION *****

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**REPORT**

# LINER QUALITY CONTROL PLAN

*Oak Grove Steam Electric Station*

*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

Submitted by:

**Golder Associates Inc.**

14950 Heathrow Forest Parkway, Suite 280, Houston, Texas, USA 77032

+1 281 821-6868

Rev. 1

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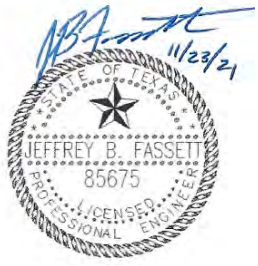


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# 1.0 PURPOSE

## 1.1 Purpose and Scope

This Liner Quality Control Plan (LQCP), is prepared under the direction of a licensed professional engineer, and establishes the procedures for construction, testing, and documentation of the retrofit liner system for FGD-A at the Oak Grove Steam Electric Station (OGSES).

This LQCP was developed to address the construction and quality control testing of components of the liner system in compliance with 40 Code of Federal Regulations (CFR) §257.102(k) in the CCR Rule. Construction and testing of all liner systems components must be according to this LQCP.

The FGD-A retrofit measures will consist of the following.

- Removal of roughly the upper 1 foot of the existing 3-foot thick clay liner
- Retrofit FGD-A with a composite liner system meeting the requirements for new CCR surface impoundments (§257.72)
- Incorporate design improvements

Following removal of all contaminants, FGD-A will be retrofitted by confirming the existing clay liner meets the requirements of §257.70(b) and placement of the following.

- 60-mil textured high density polyethylene (HDPE) geomembrane
- 1.5-foot thick protective cover.

In areas where the existing clay liner does not meet the requirements of §257.70(b) (i.e. is either not at least 2 feet thick or has a hydraulic conductivity exceeding 1 x $10^{-7}$ cm/s), additional clay liner will be placed and compacted to meet the thickness specification, the existing 2-foot clay liner will be removed and recompacted to meet the hydraulic conductivity specifications, or a geosynthetic clay liner (GCL) will be installed as the soil component of the composite liner system. This GCL / geomembrane composite liner will meet the requirements of §257.70(c).

## 1.2 General Responsibilities

OGSES is responsible for fully implementing this LQCP. The site manager (SM) or designated alternate shall be responsible for contracting a qualified Professional of Record (POR) prior to initiating liner and leachate collection system construction.

# 2.0 CLAY LINER EVALUATION

The existing liner system in FGD-A consists of a minimum 3-foot thick compacted clay layer with a maximum hydraulic conductivity of 1 x $10^{-7}$ cm/s. The CCR rules require that the soil component of the composite liner consist of a minimum 2-foot thick clay layer. Therefore, the upper nominal 1 foot of the existing clay liner will be removed. The actual thickness of clay removed will depend on the actual grades of the liner. Care shall be taken to minimize disturbance to the lower 2 feet of the clay liner.

## 2.1 Clay Liner Surface Preparation

The CCR within FGD-A will be removed to within 2 to 3 feet of the top of the existing clay liner prior to retrofit work. The remaining CCR and contaminated soils and sediments will be removed using dozers (or other means) and hauled to Ash Landfill 1 for disposal. The surface of the exposed existing clay liner will be visually inspected to confirm removal of all CCR.

Following removal of the upper portion of the existing clay liner, tube samples will be obtained from the lower 1.5 feet of the existing clay liner for testing in accordance with Table 1. In the event of a failing test, the backup sample will be tested. If the backup sample does not meet the project requirements, the failing area will be delineated by the POR. The failing area shall either be removed and replaced or covered with GCL as described in Section 3.2.5.

The upper 6 inches of the remaining clay liner will be scarified, moisture conditioned (if necessary) and recompacted using a padfoot roller followed by a smooth-drum roller to between 0 to 6% above optimum moisture content and compacted to a minimum of 95% of the maximum dry density as determined by the standard Proctor test (ASTM D698).

The standard Proctor curves from the 2008 clay liner construction are included as Appendix A. The Proctor curve used for determining the compaction criteria shall be selected based on a visual classification of the soil by the POR or his/her representative.

## 2.2 Construction Testing

Construction tests shall be performed in accordance with project-specific testing methods and subject to the minimum testing frequency shown in Table 1.

**Table 1: Clay Liner Construction Testing Requirements**

| Test Parameter | Testing Procedure | Frequency |
|---|---|---|
| In-place Moisture/Density | ASTM D6938, D2937, or D1556 | 1 per 8,000 ft$^2$/upper 6 inches |
| Percent Finer Than No. 200 Sieve | ASTM D1140 or D422 | 1 per 40,000 ft$^2$/ upper 6 inches |
| Atterberg Limits | ASTM D4318 | 1 per 100,000 ft$^2$ / lower 1.5 feet |
| Hydraulic Conductivity(1) | ASTM D5084 | |

Notes:

1. When sampling for hydraulic conductivity tests, two tube samples should be retrieved. One tube shall serve as the primary test sample. The second tube shall serve as the backup sample in case of damage or sample disturbance in the first tube.

## 2.3 Failing Tests

Sections of compacted clay liner that do not pass either the density or moisture requirements in the field shall be reworked and retested until the section in question does pass.

In the event of a failed hydraulic conductivity test, the POR will do following.

1. The test procedures and test sample shall be reviewed for inconsistencies in test procedures or flaws in the test sample. A review of the associated soil characteristic test and field density/moisture content tests shall be performed to confirm that the proper compaction criteria were used.
2. A permeability sample shall be prepared from the backup tube sample and an additional hydraulic conductivity test shall be performed on the backup sample.
3. If the backup sample provides an acceptable result, the results from the first sample will be disregarded. If the backup sample does not provide acceptable results, a review of the required compaction criteria will be performed to determine if the compaction criteria require revision.
4. Additional hydraulic conductivity test samples will be retrieved between the non-conforming location and the surrounding passing test locations. The results from these additional tests will be used to bound the area requiring rework. The area to be reworked will be bounded by passing hydraulic conductivity tests.
5. All reworked areas shall be tested and confirmed to satisfy the hydraulic conductivity criterion. The reporting of retests will clearly indicate the number and location of non-conforming test and subsequent retest.

Alternatively, the clay liner in the failing area will be covered with a GCL meeting the requirements in Section 3.

## 2.4 Clay Liner Perforations

When taking field densities and tube samples, all holes dug or created in the clay liner for density probes or samples must be backfilled with bentonite or a bentonite-rich soil material. This backfill will be tamped in the hole to remove pockets of air or loose soil, and to assure a tight compact seal.

## 2.5 Clay Liner Thickness Verification

The existing clay liner thickness shall be verified by comparing the top of clay liner elevation to the “Subgrade and Clay Liner Elevations” drawing prepared by SAM in 2008.

## 2.6 Care of Clay Liner

The integrity of the clay liner shall be maintained by moistening to prevent the material from desiccating. Conversely, the clay liner shall be kept free of standing water by adequately pumping after rainfall events. Damage caused by rain shall be repaired, and if the lift must be reworked, as determined by the POR, then appropriate retesting (including field moisture-density and permeability tests) shall be performed.

# 3.0 GEOSYNTHETIC CLAY LINER

This section presents general procedures, quality control testing requirements, and installation procedures for geosynthetic clay liner (GCL) construction. The GCL approved for use at the site consists of polymer-enhanced sodium bentonite encapsulated between two geotextile layers, needle-punched or stitched-bonded together. The geosynthetic clay liner shall be “Resistex U40” as manufactured by CETCO Lining Technologies; “BentoLiner CAR Plus” as manufactured by Solmax; or Engineer-approved equivalent

## 3.1 Pre-Installation Material Evaluation

### 3.1.1 Manufacturer’s Quality Control Certificates

Prior to the installation of the GCL, the manufacturer or installer shall provide the POR with quality control certificates signed by a responsible party employed by the manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. The quality control tests shall be performed in accordance with project-specific testing methods and subject to the minimum testing frequency shown in Table 2. OGSES may require more frequent testing at their discretion.

The quality control testing may be performed in the manufacturing plant. The POR shall review the test results prior to accepting the GCL to ensure that the certified minimum properties meet the values presented in Table 2.

### 3.1.2 Compatibility Testing

Prior to installation of the GCL, the manufacturer or installer shall provide the POR with information showing that the material is compatible with liquids with chemistry similar to liquid obtained from an OGSES surface impoundment.

### 3.1.3 Conformance Testing

In addition to the manufacturer’s quality control certificates, samples of rolls of GCL will be obtained for conformance testing. The samples shall be tested by an independent third-party laboratory in accordance with Table 3. The POR shall review the test results to ensure that they meet the values presented in Table 2.

**Table 2: GCL QC Submittal Frequency & Material Specifications**

| **Property** | **Qualifier** | **Unit** | **Value** | **Test Method(1)** | **Frequency** |
|---|---|---|---|---|---|
| Fluid Loss | max. | ml | 18 | ASTM D5891 | 1 per 50 tons or every truck or railcar |
| Free Swell | min. | ml | 24 | ASTM D5890 | |
| **Geotextile** | | | | | |
| **Property** | **Qualifier** | **Unit** | **Value** | **Test Method(1)** | **Frequency** |
| Mass per Unit Area | Nominal | oz/yd$^2$ | 6 | ASTM D5261 | 1 per 200,000 ft$^2$ |
| Tensile Properties: | — | lb | — | ASTM D4632 | |
| **GCL Product** | | | | | |
| **Property** | **Qualifier** | **Unit** | **Value** | **Test Method(1)** | **Frequency** |

| | | | | | |
|---|---|---|---|---|---|
| Bentonite Mass | min. | lb/ft$^2$ | 0.75 | ASTM D5993 | 1 per 40,000 ft$^2$ |
| GCL Moisture Content | max. | % | 35 | ASTM D5993 | |
| Peel Strength | min. | lb/in | 5.0 | ASTM D6496 | |
| Grab Tensile Strength | min. | lb/in | 45 | ASTM D6768 | 1 per 200,000 ft$^2$ |
| Hydraulic Conductivity | max. | cm$^2$/s | 3 x 10$^{-9}$ | ASTM D5887 | 1 per week for each production line(2) |

Notes:
1. Updated test methods may be implemented based on a review by the POR.
2. Report last 20 test values, ending on production date of supplied GCL.
3. For those properties that do not indicate a value, the GCL material must meet the manufacturer's minimum specification.

**Table 3: GCL Conformance Test Schedule**

| Test | Test Method(1) | Frequency |
|---|---|---|
| Bentonite Mass/Unit Area | ASTM D5993 | Not less than 1 test per 100,000 ft$^2$ |
| Hydraulic Conductivity | ASTM D5887 | |

Notes:
1. Updated test methods may be implemented based on a review by the POR.

## 3.2 Installation Procedures

### 3.2.1 GCL Shipping and Storage

In order to prevent premature hydration, the GCL rolls shall be shipped in plastic wrapping that shall remain intact until material installation. Upon delivery of the GCL, storage and handling procedures shall be documented. The rolls will be stacked, stored, and handled in accordance with ASTM D5888 or manufacturer's recommendations.

### 3.2.2 GCL Subgrade Preparation

Surfaces to be lined should be smooth and free of all rocks greater than 0.75-inch diameter (or as recommended by the manufacturer), sharp/angular objects, sticks, roots, or debris of any kind. The surface should provide a firm, unyielding foundation for the GCL with no sudden, sharp, or abrupt changes or break in grade. The subgrade surface shall be prepared by rolling with a smooth-drum roller to minimize the roughness and press down protruding soil or rock particles prior to GCL deployment. Loose rocks and/or dry soil particles that could damage the GCL shall be removed. Excessive voids or dimples shall be filled with soil.

Standing water or excessive moisture on the subgrade will not be allowed. The subgrade shall be maintained in a smooth, uniform, and drained condition.

### 3.2.3 Anchor Trench Construction

The anchor trench shall be constructed according to the project plans, and the excavation and backfilling operations shall be documented. If the anchor trench is excavated in a clay material susceptible to desiccation, the amount of anchor trench open at any time should be minimized. The inside edge of the trench shall be

rounded to avoid stresses from sharp bends in the GCL. The GCL will not be placed into the anchor trench on top of any rocks greater than 0.75-inch diameter, sharp/angular objects, sticks, roots, or debris of any kind. The anchor trench shall be adequately drained to prevent ponding or hydration of the GCL while the trench is open. The anchor trench shall be backfilled and compacted according to the project plans ; however, backfilling shall be performed, at a minimum, with ordinary compaction as deemed suitable by the POR.

### 3.2.4 GCL Deployment

Equipment used to deploy GCL must not cause excessive rutting of the subgrade. Deployed GCL panels should contain no folds or excessive slack. Installation personnel must not smoke or wear damaging shoes on GCL. GCL should not be placed during excessive winds. In general, only low ground pressure rubber-tired support equipment approved by the POR may be allowed on the GCL. If the POR observes any potential damage done to the clay liner by the support equipment, use of the equipment will cease and the damage will be repaired. Generators, gasoline or solvent cans, tools, or supplies must not be stored directly on the GCL.

Panels should be overlapped and seamed, as recommended by the manufacturer. Augment seams with granular bentonite if recommended by the Geosynthetics Manufacturer to ensure seam integrity.

End-to-end seams on sideslopes should be kept to a minimum. If end-to-end seams on sideslopes are necessary (i.e., if the GCL roll lengths are insufficient to cover the entire slope length), a minimum overlap of 5 feet will be required and may be placed only in the lower half of the slope and must be staggered.

GCL deployment shall be limited to the amount that can be covered with the overlying geomembrane liner the same day. GCL deployment shall not be undertaken during precipitation or when there is an impending threat of precipitation.

Following deployment, the CQA monitor shall visually examine the entire surface of the GCL for even bentonite distribution, thin spots, or other panel defects. All defects will be recorded and repaired in accordance with this LQCP. The POR representative shall also verify the following:

- Proper overlap during deployment
- Seams between GCL panels are constructed per manufacturer’s recommendations
- Defects are patched and overlapped properly
- The bentonite has not become excessively hydrated

Excessively hydrated GCL shall be removed and replaced with new material. Geomembrane shall not be placed on hydrated GCL.

GCL panels shall be given an identification code, mapped, and logged to record relevant installation information.

### 3.2.5 GCL Placement Over Isolated Failing Compacted Clay

GCL may be used as an alternate liner over isolated areas where the hydraulic conductivity of the clay liner exceeds 1 x $10^{-7}$ cm/s. The GCL shall be extended a minimum of 24 inches beyond the failing area as determined by the POR. For areas 15-feet by 15-feet or smaller, a small notch measuring approximately 3 inches wide and 8 inches deep will be cut in the subgrade along the edge of the GCL. The GCL shall be trimmed to fit into the notch. The installer shall then compact a mixture consisting of one part bentonite to four parts soil by volume, blended dry, into the bottom half of the notch. The GCL shall then be inserted into the notch. The

installer shall then fill the remaining notch volume with bentonite or compact the mixture bentonite and soil into the remaining notch volume.

### 3.2.6 Penetrations and Placement Over Isolated Failing Compacted Clay

At penetrations or structures, a small notch measuring approximately 3 inches wide and 8 inches deep will be cut in the subgrade along the edge of the area the GCL will contact. The GCL shall be brought up to the appurtenance and trimmed to fit into the notch. The installer shall then compact a mixture of one part bentonite to four parts soil by volume, blended dry, into the bottom half of the notch. The GCL shall then be inserted into the notch. The installer shall then fill the remaining notch volume with bentonite or compact the mixture bentonite and soil into the remaining notch volume.

### 3.2.7 GCL Repairs

Torn or otherwise damaged geosynthetic facing must be patched with the same type of geosynthetic. The geosynthetic patch must extend at least 12 inches beyond the damaged area and must be heat bonded, or otherwise attached to the main GCL to avoid shifting during placement of overlying geosynthetics. If the GCL damage includes loss of bentonite, the patch must consist of full GCL extending at least 12 inches beyond the damaged area. Lapping procedures must be the same as specified for original laps of GCL panels.

### 3.2.8 GCL Protection

The overlying geosynthetics and soil layers shall be deployed in such a manner as to ensure that the GCL is not damaged. Textured geomembranes shall not be dragged across previously installed GCL. A smooth rubsheet shall be placed between the GCL and textured geomembrane to prevent damage. The rubsheet will be removed when the geomembrane is in position. Other methods may be employed at the POR's discretion.

To avoid local bentonite displacement, and the possible impact on the hydraulic performance of a GCL, the protective cover of suitable thickness should be placed over the geomembrane overlying the GCL as soon as practicable following completion of the geomembrane and leachate collection system construction.

# 4.0 GEOMEMBRANE LINER EVALUATION

This section presents general procedures, quality control testing requirements, and construction specifications for geomembrane liner construction.

The geomembrane will be a textured 60-mil high density polyethylene (HDPE) geomembrane.

## 4.1 Pre-installation Material Evaluation

### 4.1.1 Manufacturer's Quality Control Certificates

Prior to the installation of any geomembrane, the manufacturer or installer shall provide the POR with quality control certificates signed by a responsible party employed by the manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. The quality control tests shall be performed in the manufacturing plant using the test methods and frequencies listed in the most recent version of the Geosynthetic Research Institute (GRI) test method GM13, “Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes,” included in Appendix B. . The owner may require more frequent testing at his/her discretion.

The POR shall review the test results prior to accepting the geomembrane to assure that the certified minimum properties meet the minimum values for smooth and textured geomembranes, as determined by the most recent GRI test method GM13, OGSES may require more frequent testing at their discretion.

The rolls delivered to the site shall be inventoried, recording the manufacturer's name and product identification, and the roll thickness, number, and dimensions. Manufacturer's certificates should be cross-referenced to rolls delivered on-site.

Resumes of the installer's supervisor(s) or Master Seamer(s) shall be obtained to verify that adequate seaming experience will be utilized on the project. The installer’s supervisor or Master Seamer shall have had experience totaling a minimum of 2,000,000 square feet of geomembrane installation.

Upon delivery of geosynthetic materials, storage and handling procedures shall also be documented. Rolls of geosynthetic materials shall be handled and stored in such a way as not to damage the material. Generally, rolls of geosynthetic materials should not be stacked more than four rolls high.

In addition to the manufacturer's quality control certificates, samples of the geomembrane will be obtained either at the manufacturing facility or upon delivery to the site for conformance testing. The test samples shall be obtained for conformance testing in accordance with the testing schedule shown in Table 4.

The POR shall review the test results to ensure that they meet the values presented in GRI GM13.

**Table 4: Geomembrane Conformance Test Schedule**

| TEST | METHOD(1) | FREQUENCY |
|---|---|---|
| Thickness (laboratory measurement) | ASTM D5994 (Textured) | Not less than 1 test per 100,000 ft$^2$ with not less than 1 per resin lot |
| Density | ASTM D1505 or D792 | |
| Carbon black content | ASTM D4218 | |

| TEST | METHOD(1) | FREQUENCY |
|---|---|---|
| Carbon black dispersion | ASTM D5596 | |
| Tensile properties | ASTM D6693, Type IV | |

Notes:
1. Updated ASTM or GRI methods may be implemented based on a review by the POR.

## 4.2 Installation Procedures

### 4.2.1 Geomembrane Liner Subgrade Preparation and Acceptance

Prior to geomembrane installation, the top of the clay liner shall be checked for irregularities, protrusions, sharp stones, stones larger than 3/8 inch in size, loose soil, and abrupt changes in grade. The clay liner surface shall be prepared by rolling with a smooth-drum roller to minimize the roughness and to press down protruding soil or rock particles prior to geomembrane deployment. Loose rocks and/or dry soil particles that could damage the geomembrane shall be removed. Excessive voids or dimples shall be filled in with a soil-bentonite mixture. The surface shall not exhibit excessive desiccation prior to geomembrane deployment. The geomembrane subgrade acceptance shall be documented.

### 4.2.2 Anchor Trench Construction

The anchor trench shall be constructed according to the project plans, and the excavation and backfilling operations shall be documented. If the anchor trench is excavated in a clay material susceptible to desiccation, the amount of anchor trench open at any time should be minimized. The inside edge of the trench shall be rounded to avoid stresses from sharp bends in the geomembrane. Excessive amounts of loose soil shall not be allowed underneath the geomembrane in the anchor trench, and the anchor trench shall be adequately drained to prevent ponding or softening of adjacent soils while the trench is open. The anchor trench shall be backfilled and compacted according to the project plans; however, backfilling shall be performed, at a minimum, with ordinary compaction as deemed suitable by the POR.

### 4.2.3 Geomembrane Deployment

The geomembrane shall be installed in direct and uniform contact with the compacted soil liner or GCL. The geomembrane shall not be placed during inclement weather, such as high winds or rain.

Geomembrane seaming should generally not take place when ambient temperatures are below 32 degrees Fahrenheit (°F), unless preheating is used. For extrusion welding, preheating will be required if the temperature is below 32°F. For fusion welding, preheating may be waived if the installer demonstrates that quality welds may be obtained without preheating. Seaming shall not be permitted at ambient temperatures above 104°F, unless the installer can demonstrate that seam quality is not compromised.

In general, only low ground pressure rubber-tired support equipment approved by the POR may be allowed on the geomembrane. If the POR observes any potential damage done to the liner by the support equipment, use of the equipment will cease and the damage will be repaired. Personnel working on the geomembrane shall not smoke, wear damaging shoes, or engage in any other activity likely to damage the geomembrane. Only those sections that are to be placed and seamed in one day should be unrolled. Panels left unseamed should be anchored with sandbags or other suitable weights. In general, seams should be oriented parallel to the line of maximum slope

(i.e., oriented up and down, not across the slope). In corners and odd-shaped geometric locations, the number of field seams should be minimized.

Panels should be overlapped, as recommended by the manufacturer, as appropriate for the type of seam welding to be performed; however, overlapping shall be no less than 2 inches. Field seaming shall only be performed by the method(s) approved by the manufacturer, either by extrusion welding or double-tracked fusion welding. No seaming shall take place without the installer's supervisor or Master Seamer and CQA monitor being present. Fishmouths, or wrinkles at the seam overlap, shall be cut along the ridge of the wrinkle to achieve a flat overlap. The cut shall be seamed and/or patched. Seams shall extend to the outside edge of panels placed in the anchor trench.

Panel layout and field seams shall be given an identification code, mapped, and logged to record relevant installation information. Inspection and testing records shall be logged as well as repair and retest data.

## 4.3 Installation Monitoring and Testing

### 4.3.1 Trial Seams

Each day prior to commencing field seaming, trial seams shall be made on pieces of geomembrane material to verify that conditions are adequate for production seaming. Trial seams shall be made at the beginning of each seaming period and shift (generally, at least twice each day) for each combination of production seaming machine and operator to be used that day. The trial test seam shall be at least 3 feet long by 1 foot wide (after seaming) with the seam centered lengthwise. Four 1-inch wide specimens shall be die-cut from the trial seam sample. Two specimens shall be tested in the field for shear and two for peel (test both inner and outer welds for dual track fusion welding) and shall be compared to the minimum seam strength requirements specified in the most current version of the GRI Test Method GM19, “Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes”. The current versions of the GRI test methods are included in Appendix B.

If any of the trial seam specimens fail, the entire trial seam operation shall be repeated. If an additional specimen fails during the second trial seam, the seaming machine and seamer shall not be used for seaming until the deficiencies are corrected and two consecutive successful trial seams are achieved. Additional trial seams shall be performed if frequent field seaming problems are experienced or if power to the seaming machines is interrupted sufficiently long to require rewarming.

### 4.3.2 Non-Destructive Testing

Continuous, non-destructive testing shall be performed on all seams by the installer. All leaks must be isolated and repaired by following the procedures described in this LQCP.

Air Pressure Testing – ASTM D5820. The ends of the air channel of the dual-track fusion weld must be sealed and pressured to approximately 30 pounds per square inch (psi), if possible. The air pump must then be shut off and the air pressure observed after 2 minutes. A loss of less than 3 psi is acceptable if it is determined that the air channel is not blocked between the sealed ends. A loss greater or equal to 3 psi indicates the presence of a seam leak that must then be isolated and repaired by following the procedures described in this LQCP. The POR or his/her qualified representative must observe and record all pressure gauge readings.

Vacuum-Box Testing – ASTM D5641. Apply a vacuum of approximately 4 to 8 psi to all extrusion welded seams that can be tested in this manner. The seam must be observed for leaks for at least 10 seconds while subjected to this vacuum. The POR or his/her qualified representative must observe 100% of this testing.

### 4.3.3 Destructive Seam Testing

Destructive samples shall be taken at a minimum frequency of one test location, selected randomly, within each 500 linear feet of seam length, inclusive of both primary longitudinal and cross seams, cap strips, and repairs 20 square feet or larger. Each test sample should be of sufficient length and 12 inches wide with the seam located in the middle. Test specimens, approximately 1 inch wide, shall be cut from both ends of the sample for field testing (peel and shear). The remaining sample should be cut into three parts (one for quality assurance laboratory testing, one for installer quality control laboratory testing, and one for archive storage to be maintained at a location selected by the owner).

The field tests shall be conducted on a certified calibrated tensiometer capable of maintaining a constant extension rate of 2 inches per minute. If one of the field test specimens from the ends of the destructive sample fails, then the seam will be considered to have failed, and repairs shall be initiated as described below. If both specimens pass, then a sample for laboratory testing will be sent to the quality assurance laboratory for testing in both peel and shear. Seam strengths for HDPE geomembranes shall meet the minimum values specified in the most current version of the GRI Test Method GM19 “Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes”, included in Appendix B.

Destructive test results for both field and laboratory tests shall include qualitative data, including the location of the failure and locus-of-break code, as described in ASTM D6392. Peel tests on double-tracked fusion welds shall be performed on both inside and outside tracks of the weld. Seam break classifications for extrusion and fusion welds are shown on Figures 1 and 2, respectively.

At a minimum, a destructive test must be done for each welding machine used for seaming or repairs. A sufficient amount of the seam must be removed to conduct field testing, independent laboratory testing, and archiving of enough material to retest the seam when necessary. Destructive seam testing locations shall be cap-stripped and the cap completely seamed by extrusion welding to the geomembrane. Capped sections shall be non-destructively tested. Additional destructive test samples may be taken if deemed necessary by the POR or his/her qualified representative.

Weld Acceptance Criteria: For HDPE seams, the minimum passing criteria for destructive seam testing are described in the GRI Test Method GM19. The POR must use the most current version of GM19 when evaluating welded seams.

Seam Failure Delineation: When a sample fails a destructive test, the installer shall trace the welding path to an intermediate location at least 10 feet in each direction, or a distance determined by the POR, from the point of the failed test and take 1-inch wide specimens for an additional set of field tests. If these additional samples pass the tests, then two laboratory destructive samples shall be taken adjacent to the intermediate locations or at locations determined by the POR or his/her representative. If these laboratory samples pass the tests, then the seam shall be repaired between these locations. If either sample fails, then the process shall be repeated to establish a zone where the seam should be repaired. All acceptable repaired seams shall be bounded by two locations from which samples passing laboratory destructive tests have been taken.

Seam Failure Repairs: Any portion of the geomembrane exhibiting a flaw or failing a destructive or non-destructive test shall be repaired. Repair methods may include spot welding (extrusion) for minor flaws and punctures; patches for larger holes and tears; capping for large lengths of failed seams or panel damage; and extrusion welding of outer flap to repair an inadequate fusion seam (less than 100-feet cumulative length) that has an exposed edge.

For any repair method, the following provisions shall be satisfied:

- Surfaces of the geomembrane that are to be repaired using extrusion methods shall be ground no more than one hour prior to the repair
- All surfaces shall be clean and dry at the time of repair
- Patches or caps shall extend at least 6 inches beyond the edge of the defect, and all corners of patches shall be rounded with a radius of approximately 3 inches
- All repairs shall be non-destructively tested, as previously described
- All seaming equipment, personnel, and operation procedures used in repair work shall meet the same requirements as for new seaming operations

The POR or his/her qualified representative shall observe all non-destructive testing of repairs and shall record the number of each repair, type, date, and test outcome. Repairs that pass the non-destructive tests shall be taken as an indication of an adequate repair. Repairs more than 150 feet long shall also be required to have a destructive test performed. Repairs that fail the initial retest shall be redone and retested until passing test results achieved. All work and testing of repairs shall be fully documented in a repair log.

When placing overlying material on the geomembrane, effort must be made to minimize wrinkle development. If possible, cover should be placed during the coolest weather available. Small wrinkles should be isolated and covered as quickly as possible to prevent their growth. In no case shall the geomembrane be allowed to fold over on itself.

## 5.0 ++ACCESS RAMP AND PROTECTIVE COVER LAYER

Design improvements to FGD-A include construction of an access ramp. The access ramp will be formed with 2.5H:1V sideslopes as indicated on the Drawings.

A 1.5-foot thick protective cover layer will be placed over the liner system on the floor of FGD-A Pond.

The access ramp, peninsula fill, and protective cover material will consist of soil or bottom ash supplied by OGSES. The installation of the access ramp and protective cover material will have continuous inspection by the POR or his/her qualified representative(s).

The access ramp and protective cover material does not require compaction control; however, it should be stable for construction traffic. Care shall be exercised in placement so as not to shift, wrinkle, or damage the underlying geosynthetic layers, and the placement methods shall be documented. Access ramp and protective cover material placement should be conducted at the coolest part of the day to minimize the development of wrinkles in the geosynthetic materials.

The access ramp and protective cover material shall be placed such that the top surface, while spreading, is at least 2 feet above the geosynthetic layers at all times unless low ground pressure dozers are used (i.e., track

pressure less than 5 psi). A greater thickness shall be maintained to support loaded hauling trucks and trailers and for turning areas. Drivers shall proceed with caution when on the overlying soil and prevent spinning of tires, quick stops, or sharp turns.

Access ramp fill material shall generally be placed in an upslope direction for sidewalls.

The required thickness of protective cover shall be verified by comparing the protective cover surface elevation to top of clay liner elevation shot at the points shown on “Subgrade and Clay Liner Elevations” drawing prepared by SAM in 2008.

# 6.0 DOCUMENTATION AND REPORTING

## 6.1 Liner Evaluation Reports

Upon completion of all required liner construction and evaluation, the POR shall prepare and submit a Liner Evaluation Report (LER) to the TCEQ. The LER shall be signed and sealed by the POR performing the evaluation.

The construction documentation provided in the LER will contain a narrative describing the conduct of work and testing programs required by the LQCP, "as-built" or record drawings, and appendices of field and laboratory data.

The construction documentation report will contain or discuss the following information at a minimum:

- For clay liners:
  - Pre-construction soil test results
  - Summary of construction material conformance tests results
  - Summary of field moisture-density control test methods and results
  - Summary of hydraulic conductivity test results
  - Clay liner construction practices for floor and sidewall sections
  - Placement and processing methods
  - Compaction methods, equipment type, compactor weight and foot length
  - Repair of failed and damaged lifts
  - Clay liner thickness verification
  - Post-construction care of clay liner

- GCL and Geomembrane:
  - Roll shipment and receipt information
  - Manufacturer’s quality control certificates and results
  - Conformance test sampling and test results

  - Subgrade acceptance
  - Anchor trench preparation and backfilling
  - Panel deployment, identification, and placement
  - Seam preparation, orientation
  - 100 percent visual inspection for defects, damage, etc.
- For Geomembrane
  - Trial seam tests for each combination of seaming equipment and personnel
  - Seaming methods, times, temperature, and equipment shutdowns and startups
  - Continuous 100 percent non-destructive seam testing, methods, criteria, and results
  - Destructive testing methods, criteria, and results
  - Repairs, including preparation and procedures, failure delineation, patch size and shape, and retesting
- Access ramp fill, and protective cover material placement procedures

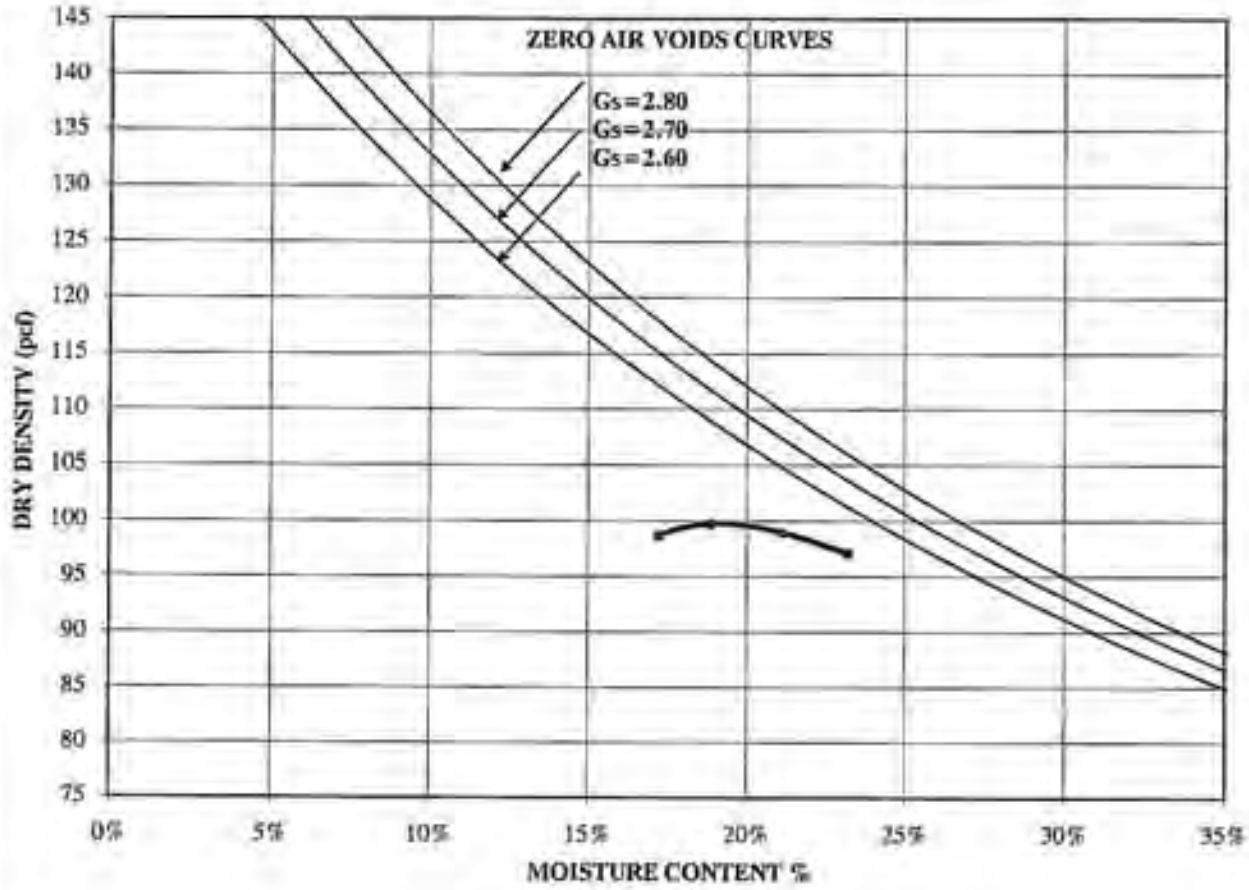
The report shall also include pertinent record drawings including:

- As-built drawings showing the elevations of the clay liner surface to confirm its thickness
- As-built geomembrane panel layout drawings showing location of destructive test samples, patches, and repairs
- As-built drawings showing elevations of protective cover to confirm its thickness
- As-built drawings showing pipe locations at 50-foot intervals, and all fittings, turns, bends, etc.

**APPENDIX A**

# Pre-Construction Testing

# MOISTURE / DRY DENSITY CURVE
## D 698 METHOD A




| | | |
|---|---|---|
| MAXIMUM DRY DENSITY (pcf) | 99.9 | |
| OPTIMUM MOISTURE (%) | 19.2 | NO CORRECTION REQUIRED |

| | |
|---|---|
| SAMPLE ID | FGD-QCL-001 |
| SAMPLE TYPE | Bulk |
| SAMPLE DEPTH | - |

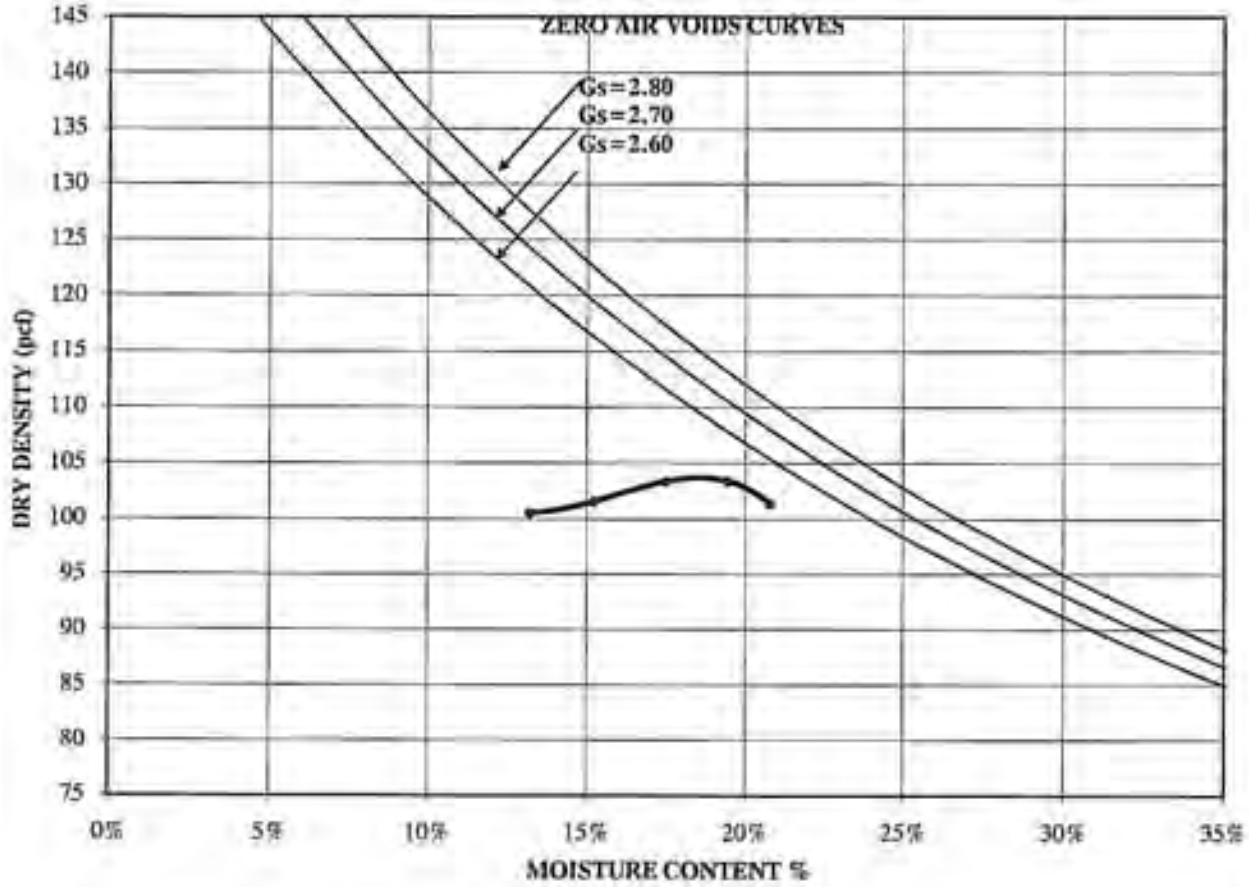
| | |
|---|---|
| LL | 58 |
| PL | 21 |
| PI | 37 |

| | |
|---|---|
| DESCRIPTION | Light reddish brown, CLAY |
| USCS | CH |

JAMES CONST / TXU OAK GROVE / TX
083-94281

| | |
|---|---|
| TECH | SR |
| DATE | 07/22/2008 |
| CHECK | |
| REVIEW | |

# MOISTURE / DRY DENSITY CURVE
## D 698 METHOD A




| | | |
|---|---|---|
| MAXIMUM DRY DENSITY (pcf) | 103.8 | |
| OPTIMUM MOISTURE (%) | 18.5 | NO CORRECTION REQUIRED |

| | |
|---|---|
| SAMPLE ID | FGD-QCL-002 |
| SAMPLE TYPE | Bulk |
| SAMPLE DEPTH | - |

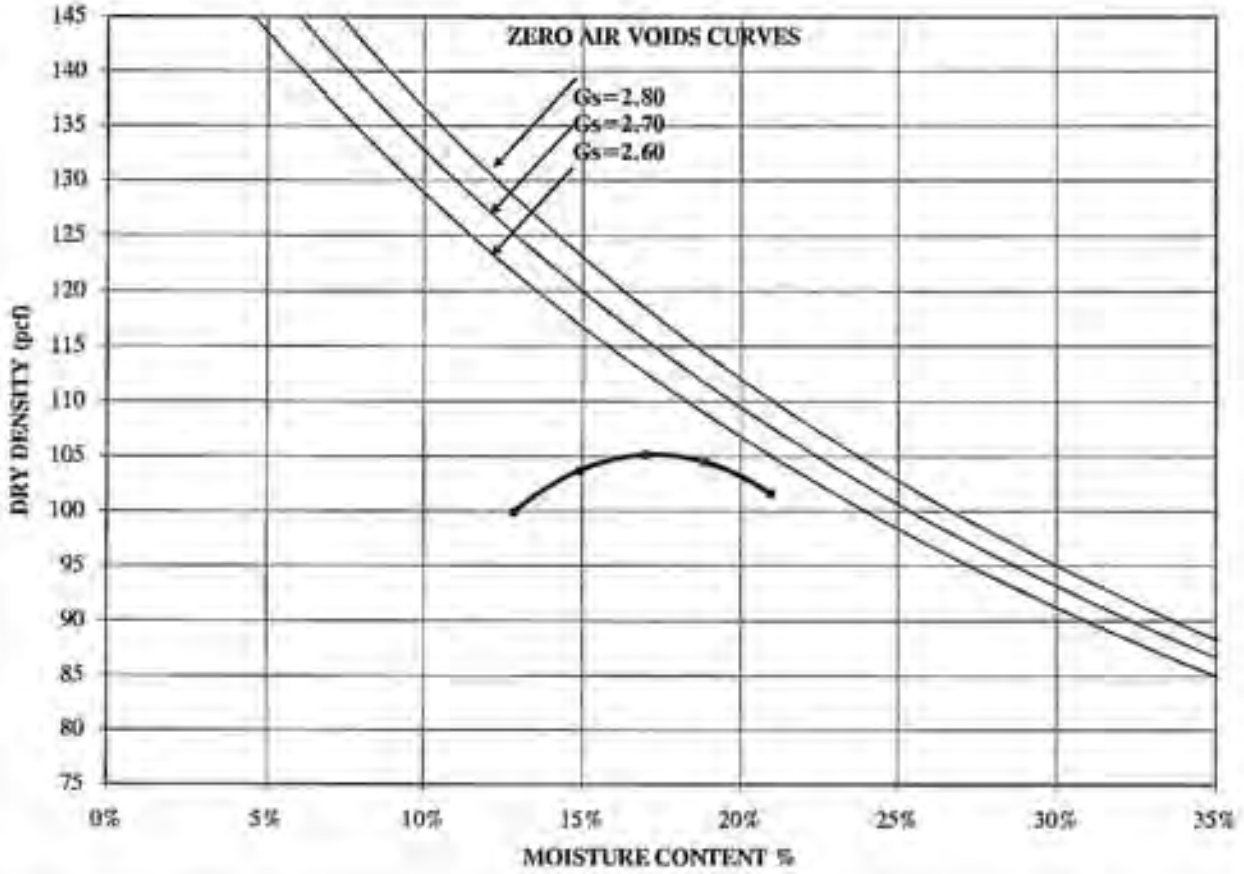
| | |
|---|---|
| LL | 49 |
| PL | 21 |
| PI | 28 |

| | |
|---|---|
| DESCRIPTION | Yellowish brown, CLAY |
| USCS | CL |

JAMES CONST / TXU OAK GROVE / TX
083-94281

| | |
|---|---|
| TECH | SR |
| DATE | 07/22/2008 |
| CHECK | QL |
| REVIEW | WJS |

# MOISTURE / DRY DENSITY CURVE
## D 698 METHOD A




| | | |
|---|---|---|
| MAXIMUM DRY DENSITY (pcf) | 105.1 | |
| OPTIMUM MOISTURE (%) | 17.0 | NO CORRECTION REQUIRED |

| | |
|---|---|
| SAMPLE ID | QCL-009 |
| SAMPLE TYPE | Bulk |
| SAMPLE DEPTH | 0 |

| | |
|---|---|
| LL | 42 |
| PL | 16 |
| PI | 26 |

| | |
|---|---|
| DESCRIPTION | Olive gray, silty sandy, CLAY |
| USCS | CL |

JAMES CONST / TXU OAK GROVE / TX
083-94281

| | |
|---|---|
| TECH | PN |
| DATE | 10/02/2008 |
| CHECK | |
| REVIEW | |

**APPENDIX B**

# GRI Test Methods

*Geosynthetic Institute*
475 Kedron Avenue
Folsom, PA 19033-1208 USA
TEL (610) 522-8440
FAX (610) 522-8441

Revision 15: September 9, 2019
Revision schedule on pg. 11

**GRI - GM13 Standard Specification***

Standard Specification for

"Test Methods, Test Properties and Testing Frequency for
High Density Polyethylene (HDPE) Smooth and Textured Geomembranes" SM

This specification was developed by the Geosynthetic Research Institute (GRI), with the cooperation of the member organizations for general use by the public. It is completely optional in this regard and can be superseded by other existing or new specifications on the subject matter in whole or in part. Neither GRI, the Geosynthetic Institute, nor any of its related institutes, warrant or indemnifies any materials produced according to this specification either at this time or in the future.

1. Scope

1.1 This specification covers high density polyethylene (HDPE) geomembranes with a formulated sheet density of 0.940 g/ml, or higher, in the thickness range of 0.75 mm (30 mils) to 3.0 mm (120 mils). Both smooth and textured geomembrane surfaces are included.

1.2 This specification sets forth a set of minimum, physical, mechanical and chemical properties that must be met, or exceeded by the geomembrane being manufactured. In a few cases a range is specified.

1.3 In the context of quality systems and management, this specification represents manufacturing quality control (MQC).

Note 1: Manufacturing quality control represents those actions taken by a manufacturer to ensure that the product represents the stated objective and properties set forth in this specification.

1.4 This standard specification is intended to ensure good quality and performance of HDPE geomembranes in general applications, but is possibly not adequate for the complete specification in a specific situation. Additional tests, or more restrictive

*This GRI standard specification is developed by the Geosynthetic Research Institute through consultation and review by the member organizations. This specification will be reviewed at least every 2-years, or on an as-required basis. In this regard it is subject to change at any time. The most recent revision date is the effective version and it is kept current on the Institute's Website <<geosynthetic-institute.org>>.

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values for test indicated, may be necessary under conditions of a particular application.

Note 2: For information on installation techniques, users of this standard are referred to the geosynthetics literature, which is abundant on the subject.

2. Referenced Documents

2.1 ASTM Standards

D 792 Specific Gravity (Relative Density) and Density of Plastics by Displacement
D 1004 Test Method for Initial Tear Resistance of Plastics Film and Sheeting
D 1238 Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
D 1603 Test Method for Carbon Black in Olefin Plastics
D 3895 Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis
D 4218 Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
D 4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
D 5199 Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
D 5397 Procedure to Perform a Single Point Notched Constant Tensile Load – (SP-NCTL) Test: Appendix
D 5596 Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
D 5721 Practice for Air-Oven Aging of Polyolefin Geomembranes
D 5885 Test method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry
D 5994 Test Method for Measuring the Core Thickness of Textured Geomembranes
D 6370 Standard Test Method for Rubber-Compositional Analysis by Thermogravimetry (TGA)
D 6693 Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
D 7238 Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent UV Condensation Apparatus
D 7466 Test Method for Measuring the Asperity Height of Textured Geomembranes

2.2 GRI Standards

GM10 Specification for the Stress Crack Resistance of Geomembrane Sheet

2.3 U. S. Environmental Protection Agency Technical Guidance Document "Quality Control Assurance and Quality Control for Waste Containment Facilities," EPA/600/R-93/182, September 1993, 305 pgs.

3. Definitions

Manufacturing Quality Control (MQC) - A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract specifications.
ref. EPA/600/R-93/182

Manufacturing Quality Assurance (MQA) - A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract specifications. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials (resins and additives) and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the manufacturer is in compliance with the product certification and contract specifications for the project.
ref. EPA/600/R-93/182

Formulation - The mixture of a unique combination of ingredients identified by type, properties and quantity. For HDPE polyethylene geomembranes, a formulation is defined as the exact percentages and types of resin(s), additives and carbon black.

Nominal - Representative value of a measurable property determined under a set of conditions, by which a product may be described. Abbreviated as nom. in Tables 1 and 2.

4. Material Classification and Formulation

4.1 This specification covers high density polyethylene geomembranes with a formulated sheet density of 0.940 g/ml, or higher. Density can be measured by ASTM D1505 or ASTM D792. If the latter, Method B is recommended.

4.2 The polyethylene resin from which the geomembrane is made will generally be in the density range of 0.932 g/ml or higher, and have a melt index value per ASTM D1238 of less than 1.0 g/10 min.

4.3 The resin shall be virgin material with no more than 10% rework. If rework is used, it must be a similar HDPE as the parent material.

4.4 No post consumer resin (PCR) of any type shall be added to the formulation.

5. Physical, Mechanical and Chemical Property Requirements

5.1 The geomembrane shall conform to the test property requirements prescribed in Tables 1 and 2. Table 1 is for smooth HDPE geomembranes and Table 2 is for single and double sided textured HDPE geomembranes. Each of the tables are given in English and SI (metric) units. The conversion from English to SI (metric) is soft.

Note 3: The tensile strength properties in this specification were originally based on ASTM D 638 which uses a laboratory testing temperature of 23°C ± 2°C. Since ASTM Committee D35 on Geosynthetics adopted ASTM D 6693 (in place of D 638), this GRI Specification followed accordingly. The difference is that D 6693 uses a testing temperature of 21°C ± 2°C. The numeric values of strength and elongation were not changed in this specification. If a dispute arises in this regard, the original temperature of 23°C ± 2°C should be utilized for testing purposes.

Note 4: There are several tests often included in other HDPE specifications which are omitted from this standard because they are outdated, irrelevant or generate information that is not necessary to evaluate on a routine MQC basis. The following tests have been purposely omitted:

- Volatile Loss
- Dimensional Stability
- Coeff. of Linear Expansion
- Resistance to Soil Burial
- Low Temperature Impact
- ESCR Test (D 1693)
- Wide Width Tensile
- Water Vapor Transmission
- Water Absorption
- Ozone Resistance
- Modulus of Elasticity
- Hydrostatic Resistance
- Tensile Impact
- Field Seam Strength
- Multi-Axial Burst
- Various Toxicity Tests

Note 5: There are several tests which are included in this standard (that are not customarily required in other HDPE specifications) because they are relevant and important in the context of current manufacturing processes. The following tests have been purposely added:

- Oxidative Induction Time
- Oven Aging
- Ultraviolet Resistance
- Asperity Height of Textured Sheet (see Note 6)

Note 6: The minimum average value of asperity height does not represent an expected value of interface shear strength. Shear strength associated with geomembranes is both site-specific and product-specific and should be determined by direct shear testing using ASTM D5321/ASTM D6243 as prescribed. This testing should be included in the particular site's CQA conformance testing protocol for the geosynthetic materials involved, or formally waived by the Design Engineer, with concurrence from the Owner prior to the deployment of the geosynthetic materials.

Note 7: There are other tests in this standard, focused on a particular property, which are updated to current standards. The following are in this category:

- Thickness of Textured Sheet
- Puncture Resistance
- Stress Crack Resistance
- Carbon Black Dispersion (In the viewing and subsequent quantitative interpretation of ASTM D 5596 only near spherical agglomerates shall be included in the assessment).

5.2 The values listed in the tables of this specification are to be interpreted according to the designated test method. In this respect they are neither minimum average roll values (MARV) nor maximum average roll values (MaxARV).

5.3 The properties of the HDPE geomembrane shall be tested at the minimum frequencies shown in Tables 1 and 2. If the specific manufacturer's quality control guide is more stringent and is certified accordingly, it must be followed in like manner.

Note 8: This specification is focused on manufacturing quality control (MQC). Conformance testing and manufacturing quality assurance (MQA) testing are at the discretion of the purchaser and/or quality assurance engineer, respectively.

6. Workmanship and Appearance

6.1 Smooth geomembrane shall have good appearance qualities. It shall be free from such defects that would affect the specified properties of the geomembrane.

6.2 Textured geomembrane shall generally have uniform texturing appearance. It shall be free from agglomerated texturing material and such defects that would affect the specified properties of the geomembrane.

6.3 General manufacturing procedures shall be performed in accordance with the manufacturer's internal quality control guide and/or documents.

7. MQC Sampling

7.1 Sampling shall be in accordance with the specific test methods listed in Tables 1 and 2. If no sampling protocol is stipulated in the particular test method, then test specimens shall be taken evenly spaced across the entire roll width.

7.2 The number of tests shall be in accordance with the appropriate test methods listed in Tables 1 and 2.

7.3 The average of the test results should be calculated per the particular standard cited and compared to the minimum value listed in these tables, hence the values listed are the minimum average values and are designated as "min. ave."

8. MQC Retest and Rejection

8.1 If the results of any test do not conform to the requirements of this specification, retesting to determine conformance or rejection should be done in accordance with the manufacturing protocol as set forth in the manufacturer's quality manual.

9. Packaging and Marketing

9.1 The geomembrane shall be rolled onto a substantial core or core segments and held firm by dedicated straps/slings, or other suitable means. The rolls must be adequate for safe transportation to the point of delivery, unless otherwise specified in the contract or order.

10. Certification

10.1 Upon request of the purchaser in the contract or order, a manufacturer's certification that the material was manufactured and tested in accordance with this specification, together with a report of the test results, shall be furnished at the time of shipment.

**ENGLISH UNITS**

# Table 1(a) – High Density Polyethylene (HDPE) Geomembrane -Smooth

| Properties | Test Method | Test Value | | | | | | | Testing Frequency (minimum) |
|---|---|---|---|---|---|---|---|---|---|
| | | 30 mils | 40 mils | 50 mils | 60 mils | 80 mils | 100 mils | 120 mils | |
| Thickness (min. ave.) - mils | D5199 | nom. | nom. | nom. | nom. | nom. | nom. | nom. | per roll |
| • lowest individual of 10 values - % | | -10 | -10 | -10 | -10 | -10 | -10 | -10 | |
| Formulated Density (min. ave.) - g/cc | D 1505/D 792 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 200,000 lb |
| Tensile Properties *(1)* (min. ave.) | D 6693 | | | | | | | | 20,000 lb |
| • yield strength - lb/in. | Type IV | 63 | 84 | 105 | 126 | 168 | 210 | 252 | |
| • break strength - lb/in. | | 114 | 152 | 190 | 228 | 304 | 380 | 456 | |
| • yield elongation - % | | 12 | 12 | 12 | 12 | 12 | 12 | 12 | |
| • break elongation - % | | 700 | 700 | 700 | 700 | 700 | 700 | 700 | |
| Tear Resistance (min. ave.) - lb | D 1004 | 21 | 28 | 35 | 42 | 56 | 70 | 84 | 45,000 lb |
| Puncture Resistance (min. ave.) - lb | D 4833 | 54 | 72 | 90 | 108 | 144 | 180 | 216 | 45,000 lb |
| Stress Crack Resistance *(2)* - hr. | D5397 (App.) | 500 | 500 | 500 | 500 | 500 | 500 | 500 | per GRI-GM10 |
| Carbon Black Content (range) - % | D 4218 *(3)* | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 20,000 lb |
| Carbon Black Dispersion | D 5596 | note *(4)* | note *(4)* | note *(4)* | note *(4)* | note *(4)* | note *(4)* | note *(4)* | 45,000 lb |
| Oxidative Induction Time (OIT) (min. ave.) *(5)* | | | | | | | | | 200,000 lb |
| (a) Standard OIT - min. | D 3895 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| — or — | | | | | | | | | |
| (b) High Pressure OIT - min. | D 5885 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | |
| Oven Aging at 85°C *(5), (6)* | D 5721 | | | | | | | | |
| (a) Standard OIT (min. ave.) - % retained after 90 days | D 3895 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | per each formulation |
| — or — | | | | | | | | | |
| (b) High Pressure OIT (min. ave.) - % retained after 90 days | D 5885 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | |
| UV Resistance *(7)* | D 7238 | | | | | | | | |
| (a) Standard OIT (min. ave.) | D 3895 | N.R. *(8)* | N.R. *(8)* | N.R. *(8)* | N.R. *(8)* | N.R. *(8)* | N.R. *(8)* | N.R. *(8)* | per each formulation |
| — or — | | | | | | | | | |
| (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(9)* | D 5885 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | |

*(1)* Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 in.

*(2)* The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.

*(3)* Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.

*(4)* Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3

*(5)* The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.

*(6)* It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.

*(7)* The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.

*(8)* Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.

*(9)* UV resistance is based on percent retained value regardless of the original HP-OIT value.

**SI (METRIC) UNITS**

## Table 1(b) – High Density Polyethylene (HPDE) Geomembrane - Smooth

| Properties | Test Method | Test Value | | | | | | | Testing Frequency (minimum) |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.75 mm | 1.00 mm | 1.25 mm | 1.50 mm | 2.00 mm | 2.50 mm | 3.00 mm | |
| Thickness - (min. ave.) - mm<br>• lowest individual of 10 values - % | D5199 | nom.<br>-10 | nom.<br>-10 | nom.<br>-10 | nom.<br>-10 | nom.<br>-10 | nom.<br>-10 | nom.<br>-10 | per roll |
| Formulated Density (min. ave.) - g/cc | D 1505/D 792 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 90,000 kg |
| Tensile Properties *(1)* (min. ave.)<br>• yield strength - kN/m<br>• break strength - kN/m<br>• yield elongation - %<br>• break elongation - % | D 6693<br>Type IV | <br>11<br>20<br>12<br>700 | <br>15<br>27<br>12<br>700 | <br>18<br>33<br>12<br>700 | <br>22<br>40<br>12<br>700 | <br>29<br>53<br>12<br>700 | <br>37<br>67<br>12<br>700 | <br>44<br>80<br>12<br>700 | 9,000 kg |
| Tear Resistance (min. ave.) - N | D 1004 | 93 | 125 | 156 | 187 | 249 | 311 | 374 | 20,000 kg |
| Puncture Resistance (min. ave.) - N | D 4833 | 240 | 320 | 400 | 480 | 640 | 800 | 960 | 20,000 kg |
| Stress Crack Resistance *(2)* - hr. | D 5397<br>(App.) | 500 | 500 | 500 | 500 | 500 | 500 | 500 | per GRI GM-10 |
| Carbon Black Content (range) - % | D 4218 *(3)* | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 9,000 kg |
| Carbon Black Dispersion | D 5596 | note *(4)* | note *(4)* | note *(4)* | note *(4)* | note *(4)* | note *(4)* | note *(4)* | 20,000 kg |
| Oxidative Induction Time (OIT) (min. ave.) *(5)*<br>(a) Standard OIT - min.<br>— or —<br>(b) High Pressure OIT - min. | <br>D 3895<br><br>D 5885 | <br>100<br><br>400 | <br>100<br><br>400 | <br>100<br><br>400 | <br>100<br><br>400 | <br>100<br><br>400 | <br>100<br><br>400 | <br>100<br><br>400 | 90,000 kg |
| Oven Aging at 85°C *(5), (6)*<br>(a) Standard OIT (min. ave.) - % retained after 90 days<br>— or —<br>(b) High Pressure OIT (min. ave.) - % retained after 90 days | D 5721<br>D 3895<br><br>D 5885 | <br>55<br><br>80 | <br>55<br><br>80 | <br>55<br><br>80 | <br>55<br><br>80 | <br>55<br><br>80 | <br>55<br><br>80 | <br>55<br><br>80 | per each formulation |
| UV Resistance *(7)*<br>(a) Standard OIT (min. ave.)<br>— or —<br>(b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(9)* | D 7238<br>D 3895<br><br>D 5885 | <br>N. R. *(8)*<br><br>50 | <br>N.R. *(8)*<br><br>50 | <br>N.R. *(8)*<br><br>50 | <br>N.R. *(8)*<br><br>50 | <br>N.R. *(8)*<br><br>50 | <br>N.R. *(8)*<br><br>50 | <br>N.R. *(8)*<br><br>50 | per each formulation |

*(1)* Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction
Yield elongation is calculated using a gage length of 33 mm
Break elongation is calculated using a gage length of 50 mm

*(2)* The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.

*(3)* Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.

*(4)* Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3

*(5)* The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.

*(6)* It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.

*(7)* The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.

*(8)* Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.

***(9)*** UV resistance is based on percent retained value regardless of the original HP-OIT value.

**ENGLISH UNITS**

# Table 2(a) – High Density Polyethylene (HDPE) Geomembrane - Textured

| Properties | Test Method | Test Value | | | | | | | Testing Frequency (minimum) |
|---|---|---|---|---|---|---|---|---|---|
| | | 30 mils | 40 mils | 50 mils | 60 mils | 80 mils | 100 mils | 120 mils | |
| Thickness mils (min. ave.) - mils | D 5994 | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | per roll |
| • lowest individual for 8 out of 10 values - % | | -10 | -10 | -10 | -10 | -10 | -10 | -10 | |
| • lowest individual for any of the 10 values - % | | -15 | -15 | -15 | -15 | -15 | -15 | -15 | |
| Asperity Height mils (min. ave.) - mils | D 7466 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | every 2nd roll *(1)* |
| Formulated Density (min. ave.) - g/cc | D 1505/D 792 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 200,000 lb |
| Tensile Properties (min. ave.) *(2)* | D 6693 | | | | | | | | 20,000 lb |
| • yield strength - lb/in. | Type IV | 63 | 84 | 105 | 126 | 168 | 210 | 252 | |
| • break strength - lb/in. | | 45 | 60 | 75 | 90 | 120 | 150 | 180 | |
| • yield elongation - % | | 12 | 12 | 12 | 12 | 12 | 12 | 12 | |
| • break elongation - % | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| Tear Resistance (min. ave.) - lb | D 1004 | 21 | 28 | 35 | 42 | 56 | 70 | 84 | 45,000 lb |
| Puncture Resistance (min. ave.) - lb | D 4833 | 45 | 60 | 75 | 90 | 120 | 150 | 180 | 45,000 lb |
| Stress Crack Resistance *(3)* - hr. | D 5397 (App.) | 500 | 500 | 500 | 500 | 500 | 500 | 500 | per GRI GM10 |
| Carbon Black Content (range) - % | D 4218 *(4)* | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 20,000 lb |
| Carbon Black Dispersion | D 5596 | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | 45,000 lb |
| Oxidative Induction Time (OIT) (min. ave.) *(6)* | | | | | | | | | 200,000 lb |
| (a) Standard OIT - min. | D 3895 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| — or — | | | | | | | | | |
| (b) High Pressure OIT - min. | D 5885 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | |
| Oven Aging at 85°C *(6), (7)* | D 5721 | | | | | | | | |
| (a) Standard OIT (min. ave.) - % retained after 90 days | D 3895 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | per each formulation |
| — or — | | | | | | | | | |
| (b) High Pressure OIT (min. ave.) - % retained after 90 days | D 5885 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | |
| UV Resistance *(8)* | D 7238 | | | | | | | | |
| (a) Standard OIT (min. ave.) | D 3895 | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | per each formulation |
| — or — | | | | | | | | | |
| (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(10)* | D 5885 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | |

*(1)* Alternate the measurement side for double sided textured sheet

*(2)* Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 inches

*(3)* SP-NCTL per ASTM D5397 Appendix, is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.

(4) Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.

(5) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3

(6) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.

(7) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.

(8) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.

(9) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.

(10) UV resistance is based on percent retained value regardless of the original HP-OIT value.

# Table 2(b) – High Density Polyethylene (HDPE) Geomembrane - Textured

| Properties | Test Method | Test Value | | | | | | | Testing Frequency (minimum) |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.75 mm | 1.00 mm | 1.25 mm | 1.50 mm | 2.00 mm | 2.50 mm | 3.00 mm | |
| Thickness (min. ave.) - mm | D 5994 | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | nom. -5% | per roll |
| • lowest individual for 8 out of 10 values - % | | -10 | -10 | -10 | -10 | -10 | -10 | -10 | |
| • lowest individual for any of the 10 values - % | | -15 | -15 | -15 | -15 | -15 | -15 | -15 | |
| Asperity Height mils (min. ave.) - mm | D 7466 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | every 2nd roll *(1)* |
| Formulated Density (min. ave.) - g/cc | D 1505/D 792 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 0.940 | 90,000 kg |
| Tensile Properties (min. ave.) *(2)* | D 6693 | | | | | | | | 9,000 kg |
| • yield strength - kN/m | Type IV | 11 | 15 | 18 | 22 | 29 | 37 | 44 | |
| • break strength - kN/m | | 8 | 10 | 13 | 16 | 21 | 26 | 32 | |
| • yield elongation - % | | 12 | 12 | 12 | 12 | 12 | 12 | 12 | |
| • break elongation - % | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| Tear Resistance (min. ave.) - N | D 1004 | 93 | 125 | 156 | 187 | 249 | 311 | 374 | 20,000 kg |
| Puncture Resistance (min. ave.) - N | D 4833 | 200 | 267 | 333 | 400 | 534 | 667 | 800 | 20,000 kg |
| Stress Crack Resistance *(3)* - hr. | D 5397 (App.) | 500 | 500 | 500 | 500 | 500 | 500 | 500 | per GRI GM10 |
| Carbon Black Content (range) - % | D 4218 *(4)* | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 2.0-3.0 | 9,000 kg |
| Carbon Black Dispersion | D 5596 | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | note *(5)* | 20,000 kg |
| Oxidative Induction Time (OIT) (min. ave.) *(6)* | | | | | | | | | 90,000 kg |
| (a) Standard OIT - min. | D 3895 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | |
| — or — | | | | | | | | | |
| (b) High Pressure OIT - min. | D 5885 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | |
| Oven Aging at 85°C *(6), (7)* | D 5721 | | | | | | | | |
| (a) Standard OIT (min. ave.) - % retained after 90 days | D 3895 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | per each formulation |
| — or — | | | | | | | | | |
| (b) High Pressure OIT (min. ave.) - % retained after 90 days | D 5885 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | |
| UV Resistance *(8)* | D 7238 | | | | | | | | |
| (a) Standard OIT (min. ave.) | D 3895 | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | N.R. *(9)* | per each formulation |
| — or — | | | | | | | | | |
| (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(10)* | D 5885 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | |

*(1)* Alternate the measurement side for double sided textured sheet

*(2)* Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 33 mm
Break elongation is calculated using a gage length of 50 mm

*(3)* The SP-NCTL test is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.

*(4)* Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.

*(5)* Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3

*(6)* The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.

*(7)* It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.

*(8)* The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.

*(9)* Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.

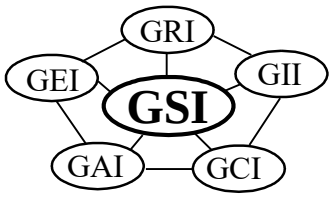
*(10)* UV resistance is based on percent retained value regardless of the original HP-OIT value.

**Adoption and Revision Schedule**
**for**
**HDPE Specification per GRI-GM13**

"Test Methods, Test Properties, Testing Frequency for
High Density Polyethylene (HDPE) Smooth and Textured Geomembranes"

| | |
|---|---|
| Adopted: | June 17, 1997 |
| Revision 1: | November 20, 1998; changed CB dispersion from allowing 2 views to be in Category 3 to requiring all 10 views to be in Category 1 or 2. Also reduced UV percent retained from 60% to 50%. |
| Revision 2: | April 29, 1999: added to Note 5 after the listing of Carbon Black Dispersion the following: "(In the viewing and subsequent quantitative interpretation of ASTM D5596 only near spherical agglomerates shall be included in the assessment)" and to Note (4) in the property tables. |
| Revision 3: | June 28, 2000: added a new Section 5.2 that the numeric table values are neither MARV or MaxARV. They are to be interpreted per the the designated test method. |
| Revision 4: | December 13, 2000: added one Category 3 is allowed for carbon black dispersion. Also, unified terminology to "strength" and "elongation". |
| Revision 5: | May 15, 2003: Increased minimum acceptable stress crack resistance time from 200 hrs to 300 hrs. |
| Revision 6: | June 23, 2003: Adopted ASTM D 6693, in place of ASTM D 638, for tensile strength testing. Also, added Note 2. |
| Revision 7: | February 20, 2006: Added Note 6 on Asperity Height clarification with respect to shear strength. |
| Revision 8: | Removed recommended warranty from specification. |
| Revision 9: | June 1, 2009: Replaced GRI-GM12 test for asperity height of textured geomembranes with ASTM D 7466. |
| Revision 10 | April 11, 2011: Added alternative carbon black content test methods |
| Revision 11 | December 13, 2012: Replaced GRI-GM11 with the equivalent ASTM D 7238. |
| Revision 12 | November 14, 2014: Increased minimum acceptable stress crack resistance time from 300 to 500 hours. Also, increased asperity height of textured sheet from 10 to 16 mils (0.25 to 0.40 mm). |
| Revision 13 | November 4, 2015: Removed Footnote (1) on asperity height from tables. |
| Revision 14 | January 6, 2016: Removed Trouser Tear from Note 5. |
| Revision 15: | September 9, 2019: Editorial update to harmonize tables. |

*Geosynthetic Institute*
475 Kedron Avenue
Folsom, PA 19033-1208 USA
TEL (610) 522-8440
FAX (610) 522-8441




Original: February 28, 2002
Revision 8: February 12, 2015
Revision schedule is on pg. 13

**GRI Test Method GM19***

Standard Specification for

# Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes

This specification was developed by the Geosynthetic Research Institute (GRI), with the cooperation of the member organizations for general use by the public. It is completely optional in this regard and can be superseded by other existing or new specifications on the subject matter in whole or in part. Neither GRI, the Geosynthetic Institute, nor any of its related institutes, warrant or indemnifies any materials produced according to this specification either at this time or in the future.

## 1. Scope

1.1 This specification addresses the required seam strength and related properties of thermally bonded polyolefin geomembranes; in particular, high density polyethylene (HDPE), linear low density polyethylene both nonreinforced (LLDPE) and scrim reinforced (LLDPE-R) and flexible polypropylene both nonreinforced (fPP) and scrim reinforced (fPP-R).

1.2 Numeric values of seam strength and related properties are specified in both shear and peel modes.

Note 1: This specification does not address the test method details or specific testing procedures. It refers to the relevant ASTM test methods where applicable.

1.3 The thermal bonding methods focused upon are hot wedge (single and dual track) and extrusion fillet.

*This GRI standard is developed by the Geosynthetic Research Institute through consultation and review by the member organizations. This specification will be reviewed at least every 5-years, or on an as-required basis. In this regard it is subject to change at any time. The most recent revision date is the effective version.

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Note 2: Other acceptable, but less frequently used, methods of seaming are hot air and ultrasonic methods. They are inferred as being a subcategory of hot wedge seaming.

1.4 This specification does not suggest a specific distance between destructive seam samples to be taken in the field, i.e., the sampling interval. A separate GRI Standard Practice is focused on this issue, see GRI-GM29.

1.5 This specification is only applicable to laboratory testing.

1.6 This specification does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

## 2. Referenced Documents

2.1 ASTM Standards

D6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods

D7747 Standard Test Method for Determining Integrity of Seams Produced Using Thermo-Fusion Methods for Reinforced Geomembranes by the Strip Tensile Method

2.2 EPA Standards

EPA 600/2.88/052 (NTIS PB-89-129670)
Lining of Waste Containment and Other Containment Facilities

2.3 GRI Standards

GM13 Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes

GM14 Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes

GM17 Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes

GM18 Test Properties and Testing Frequency for Flexible Polypropylene (fPP and fPP-R) Geomembranes

GM20 Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using Control Charts

GM25 Test Property and Testing Frequency for Scrim Reinforced Linear Low Density Polyethylene Geomembranes

GM29 Practice for Field Integrity Evaluation of Geomembrane Seams (and Sheet) Using Destructive and Nondestructive Testing

## 3. Definition

3.1 Geomembrane, n – An essentially impermeable geosynthetic composed of one or more synthetic sheets used for the purpose of liquid, gas or solid containment.

3.2 Hot Wedge Seaming – A thermal technique which melts the two opposing geomembrane surfaces to be seamed by running a hot metal wedge or knife between them. Pressure is applied to the top or bottom geomembrane, or both, to form a continuous bond. Seams of this type can be made with dual bond tracks separated by a nonbonded gap. These seams are referred to as dual hot wedge seams or double-track seams.

3.3 Hot Air Seaming – This seaming technique introduces high-temperature air or gas between two geomembrane surfaces to facilitate localized surface melting. Pressure is applied to the top or bottom geomembrane, forcing together the two surfaces to form a continuous bond.

3.4 Ultrasonic Seaming - A thermal technique which melts the two opposing geomembrane surfaces to be seamed by running a ultrasonically vibrated metal wedge or knife between them. Pressure is applied to the top or bottom geomembrane, or both, to form a continuous bond. Some seams of this type are made with dual bond tracks separated by a nonbonded gap. These seams are referred to as dual-track seams or double-track seams.

3.5 Extrusion Fillet Seaming – This seaming technique involves extruding molten resin at the edge of an overlapped geomembrane on another to form a continuous bond. A depreciated method called “extrusion flat” seaming extrudes the molten resin between the two overlapped sheets. In all types of extrusion seaming the surfaces upon which the molten resin is applied must be suitably prepared, usually by a slight grinding or buffing.

## 4. Significance and Use

4.1 The various methods of field fabrication of seams in polyolefin geomembranes are covered in existing ASTM standards mentioned in the referenced document section. What is not covered in those documents is the numeric values of strength and related properties that the completed seam must meet, or exceed. This specification provides this information insofar as minimum, or maximum, property values are concerned when the field fabricated seams are sampled and laboratory tested in shear and peel. A separate GRI standard, GRI-GM29 (DRAFT), provides guidance as to the spacing that destructive samples should be taken in typical field installation projects.

## 5. Sample and Specimen Preparation

5.1 The spacing for taking field seam samples for destructive testing is provided in GRI-GM29 (DRAFT), a standard-of-practice. The process describes a progression from the most restrictive interval of 1 per 500 feet (1 per 150 m) to the complete use and reliance of the electrical leak location survey (ELLS) method. Intermediate between these extremes are variations depending upon the installers experience and performance.

5.2 The size of field seam samples is to be according to the referenced test method, e.g., ASTM D6392 or site-specific CQA plan.

5.3 The individual test specimens taken from the field seam samples are to be tested according to the referenced test method, i.e., ASTM D6392 for HDPE, LLDPE and fPP, and ASTM D751 (modified to a 150 mm + seam width gage length) for fPP-R. The specimens are to be conditioned prior to testing according to these same test methods and evaluated accordingly.

## 6. Assessment of Seam Test Results

6.1 HDPE seams – For HDPE seams (both smooth and textured), the strength of four out of five 1.0 inch (25 mm) wide strip specimens in shear should meet or exceed the values given in Tables 1(a) and 1(b). The fifth must meet or exceed 80% of the given values. In addition, five out five specimens should meet the shear percent elongation, calculated as follows, and exceed the values given in Tables 1(a) and 1(b):

$$E = \frac{L}{L_o}(100) \quad (1)$$

where

E = elongation (%)
L = extension at end of test (in. or mm)
$L_o$ = original average length (usually 1.0 in. or 25 mm)

Note 3: The assumed gage length is considered to be the unseamed sheet material on either side of the welded area. It generally will be 1.0 in. (25 mm) from the edge of the seam to the grip face.

For HDPE seams (both smooth and textured), the strength of four out of five 1.0 in. (25 mm) wide strip specimens tested in peel should meet or exceed the values given in Tables 1(a) and 1(b). The fifth must meet or exceed 80% of the given values.

In addition, the peel separation (or incursion) should not exceed the values given in Tables 1(a) and 1(b) for all five out of five specimens. The value shall be based on

the proportion of area of separated bond to the area of the original bonding as follows:

$$S = \frac{A}{A_o}(100) \qquad (2)$$

where

S = separation (%)
A = average area of separation, or incursion ($in^2$ or $mm^2$)
$A_0$ = original bonding area ($in^2$ or $mm^2$)

Note 4: The area of peel separation can occur in a number of nonuniform patterns across the seam width. The estimated dimensions of this separated area is visual and must be done with care and concern. The area must not include squeeze-out which is part of the welding process.

Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code);

Hot Wedge: AD and AD-Brk > 25%
Extrusion Fillet: AD1, AD2
Exception: AD-WLD (unless strength is achieved)

Note 5: Separation-in-plane (SIP) is a locus-of-break where the failure surface propagates within one of the seamed sheets during destructive testing (usually in the peel mode). It is not merely a surface skin effect producing a few ductile fibrils (sometimes called ductile drawdown). SIP is acceptable if the required strength, shear elongation and peel separation criteria are met.

In this regard, five out of five specimens shall result in acceptable break patterns.

6.2 LLDPE seams – For LLDPE seams (smooth, textured and scrim reinforced), the strength of four out of five 1.0 in. (25 mm) wide strip specimens in shear should meet or exceed the values given in Tables 2(a) through 2(d). The fifth must meet or exceed 80% of the given values. Note that the unreinforced specimens are 1.0 in. (25 mm) wide strips and the scrim reinforced specimens are 4.0 in. (100 mm) wide grab tests. In addition, the shear percent elongation, calculated as follows, should exceed the values given in Tables 2(a) through 2(d). All five out of five should meet the shear elongation requirement.

$$E = \frac{L}{L_o}(100) \qquad (1)$$

where
E = elongation (%)
L = extension at end of test (in. or mm)
$L_o$ = original average length (usually 1.0 in. or 25 mm)

Note 3 (Repeated): The assumed gage length is considered to be the unseamed sheet material on either side of the welded area. It generally will be 1.0 in. (25 mm) from the edge of the seam to the grip face.

Shear elongation is not relevant to scrim reinforced geomembranes and as such is listed as "not applicable" in Tables 2 (c) and (d).

For LLDPE seams (smooth, textured and scrim reinforced), the strength of four out of five 1.0 in. (25 mm) wide strip specimens tested in peel should meet or exceed the values given in Tables 2(a) through 2(d). The fifth must meet or exceed 80% of the given values.

In addition, the peel separation (or incursion) should not exceed the values given in Tables 2(a) through 2(d). All five out of five specimens shall meet the peel separation value. The value shall be based on the proportion of area of separated bond to the area of the original bonding as follows:

$$S = \frac{A}{A_o}(100) \qquad (2)$$

where

S = separation (%)
A = average depth of separation, or incursion ($in.^2$ or $mm^2$)
$A_0$ = original bonding distance ($in.^2$ or $mm^2$)

Note 4 (Repeated): The area of peel separation can occur in a number of nonuniform patterns across the seam width. The estimated dimensions of this separated area is visual and must be done with care and concern. The area must not include squeeze-out which is part of the welding process.

Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code);

Hot Wedge: AD and AD-Brk > 25%
Extrusion Fillet: AD1, AD2
Exception: AD-WLD (unless strength is achieved)

Note 5 (Repeated): Separation-in-plane (SIP) is a locus-of-break where the failure surface propagates within one of the seamed sheets during destructive testing (usually in the peel mode). It is not merely a surface skin effect producing a few ductile fibrils (sometimes called ductile drawdown). SIP is acceptable if the required strength, shear elongation and peel separation criteria are met.

In this regard, five out of five specimens shall result in acceptable break patterns.

6.3 fPP Seams – For fPP seams (both nonreinforced and scrim reinforced), the strength of four out of five specimens in shear should meet or exceed the values given in Tables 3(a) and 3(b). The fifth must meet or exceed 80% of the given values. Note that the unreinforced specimens are 1.0 in. (25 mm) wide strips and the scrim reinforced specimens are 4.0 in. (100 mm) wide grab tests. In addition, the shear percent elongation on the unreinforced specimens, calculated as follows, should exceed the values given in Tables 3(a) and 3(b). All five out of five specimens should meet the shear elongation requirement.

$$E = \frac{L}{L_o}(100) \quad (1)$$

where
E = elongation (%)
L = extension at end of test (in. or mm)
$L_o$ = original gauge length (usually 1.0 in. or 25 mm)

Note 3 (Repeated): The assumed gage length is considered to be the unseamed sheet material on either side of the welded area. It generally will be 1.0 in. (25 mm) from the edge of the seam to the grip face.

Shear elongation is not relevant to scrim reinforced geomembranes and as such is listed as "not applicable" in Tables 3(a) and 3(b).

For fPP seams (both nonreinforced and scrim reinforced), the strength of four out of five specimens in peel should meet or exceed the values given in Tables 3(a) and 3(b). The fifth must meet or exceed 80% of the given values. Note that the unreinforced specimens are 1.0 in. (25 mm) wide strips and the scrim reinforced specimens are grab tests. In addition, the peel percent separation (or incursion) should not exceed the values given in Tables 3(a) and 3(b). All five out of five specimens should meet the peel separation value. The values should be based on the proportion of area of separated bond to the area of the original bonding as follows.

$$S = \frac{A}{A_o}(100) \quad (2)$$

where

S = separation in (%)
A = average depth of separation, or incursion (in.$^2$ or mm$^2$)
$A_o$ = original bonding distance (in.$^2$ or mm$^2$)

Note 4 (Repeated): The area of peel separation can occur in a number of nonuniform patterns across the seam width. The estimated dimensions of this separated area is visual and must be done with care and concern. The area must not include squeeze-out which is part of the welding process.

Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code);

Hot Wedge: AD and AD-Brk > 25%
Extrusion Fillet: AD1, AD2
Exception: AD-WLD (unless strength is achieved)

Note 5 (Repeated): Separation-in-plane (SIP) is a locus-of-break where the failure surface propagates within one of the seamed sheets during destructive testing (usually in the peel mode). It is not merely a surface skin effect producing a few ductile fibrils (sometimes called ductile drawdown). SIP is acceptable if the required strength, shear elongation and peel separation criteria are met.

In this regard, five out of five specimens shall result in acceptable break patterns.

## 7. Retest and Rejection

7.1 If the results of the testing of a sample do not conform to the requirements of this specification, retesting to determine conformance or rejection should be done in accordance with the construction quality control or construction quality assurance plan for the particular site under construction.

## 8. Certification

8.1 Upon request of the construction quality assurance officer or certification engineer, an installer's certification that the geomembrane was installed and tested in accordance with this specification, together with a report of the test results, shall be furnished at the completion of the installation.

Table 1(a) – Seam Strength and Related Properties of Thermally Bonded **Smooth and Textured** High Density Polyethylene (HDPE) Geomembranes **(English Units)**

| Geomembrane Nominal Thickness | 30 mils | 40 mils | 50 mils | 60 mils | 80 mils | 100 mils | 120 mils |
|---|---|---|---|---|---|---|---|
| Hot Wedge Seams[1] | | | | | | | |
| shear strength[2], lb/in. | 57 | 80 | 100 | 120 | 160 | 200 | 240 |
| shear elongation at break[3], % | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| peel strength[2], lb/in. | 45 | 60 | 76 | 91 | 121 | 151 | 181 |
| peel separation, % | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Extrusion Fillet Seams | | | | | | | |
| shear strength[2], lb/in. | 57 | 80 | 100 | 120 | 160 | 200 | 240 |
| shear elongation at break[3], % | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| peel strength[2], lb/in. | 39 | 52 | 65 | 78 | 104 | 130 | 156 |
| peel separation, % | 25 | 25 | 25 | 25 | 25 | 25 | 25 |

Notes for Tables 1(a) and 1(b):

1. Also for hot air and ultrasonic seaming methods
2. Value listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing

Table 1(b) – Seam Strength and Related Properties of Thermally Bonded **Smooth and Textured** High Density Polyethylene (HDPE) Geomembranes **(S.I. Units)**

| Geomembrane Nominal Thickness | 0.75 mm | 1.0 mm | 1.25 mm | 1.5 mm | 2.0 mm | 2.5 mm | 3.0 mm |
|---|---|---|---|---|---|---|---|
| Hot Wedge Seams[1] | | | | | | | |
| shear strength[2], N/25 mm. | 250 | 350 | 438 | 525 | 701 | 876 | 1050 |
| shear elongation at break[3], % | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| peel strength[2], N/25 mm | 197 | 263 | 333 | 398 | 530 | 661 | 793 |
| peel separation, % | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Extrusion Fillet Seams | | | | | | | |
| shear strength[2], N/25 mm | 250 | 350 | 438 | 525 | 701 | 876 | 1050 |
| shear elongation at break[3], % | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| peel strength[2], N/25 mm | 170 | 225 | 285 | 340 | 455 | 570 | 680 |
| peel separation, % | 25 | 25 | 25 | 25 | 25 | 25 | 25 |

Table 2(a) – Seam Strength and Related Properties of Thermally Bonded **Smooth and Textured** Linear Low Density Polyethylene (LLDPE) Geomembranes (English Units)

| Geomembrane Nominal Thickness | 20 mils | 30 mils | 40 mils | 50 mils | 60 mils | 80 mils | 100 mils | 120 mils |
|---|---|---|---|---|---|---|---|---|
| Hot Wedge Seams[1] | | | | | | | | |
| shear strength[2], lb/in. | 30 | 45 | 60 | 75 | 90 | 120 | 150 | 180 |
| shear elongation[3], % | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| peel strength[2], lb/in. | 25 | 38 | 50 | 63 | 75 | 100 | 125 | 150 |
| peel separation, % | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Extrusion Fillet Seams | | | | | | | | |
| shear strength[2], lb/in. | 30 | 45 | 60 | 75 | 90 | 120 | 150 | 180 |
| shear elongation[3], % | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| peel strength[2], lb/in. | 22 | 34 | 44 | 57 | 66 | 88 | 114 | 136 |
| peel separation, % | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |

Notes for Tables 2(a) and 2(b):
1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing

Table 2(b) – Seam Strength and Related Properties of Thermally Bonded **Smooth and Textured** Linear Low Density Polyethylene (LLDPE) Geomembranes (S.I. Units)

| Geomembrane Nominal Thickness | 0.50 mm | 0.75 mm | 1.0 mm | 1.25 mm | 1.5 mm | 2.0 mm | 2.5 mm | 3.0 mm |
|---|---|---|---|---|---|---|---|---|
| Hot Wedge Seams[1] | | | | | | | | |
| shear strength[2], N/25 mm | 131 | 197 | 263 | 328 | 394 | 525 | 657 | 788 |
| shear elongation[3], % | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| peel strength[2], N/25 mm | 109 | 166 | 219 | 276 | 328 | 438 | 547 | 657 |
| peel separation, % | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Extrusion Fillet Seams | | | | | | | | |
| shear strength[2], N/25 mm | 131 | 197 | 263 | 328 | 394 | 525 | 657 | 788 |
| shear elongation[3], % | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| peel strength[2], N/25 mm | 95 | 150 | 190 | 250 | 290 | 385 | 500 | 595 |
| peel separation, % | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |

Table 2(c) – Seam Strength and Related Properties of Thermally Bonded **Scrim Reinforced** Linear Low Density Polyethylene (LLDPE-R) Geomembranes (English Units)

| Geomembrane Nominal Thickness | 36 mil[4] | 45 mil[4] |
|---|---|---|
| Hot Wedge Seams[1] | | |
| shear strength[2], lb | 200 | 200 |
| shear elongation[3], % | n/a | n/a |
| peel strength[2], lb | 20 | 20 |
| peel separation, % | n/a | n/a |
| Extrusion Fillet Seams | | |
| shear strength[2], lb | 200 | 200 |
| shear elongation[3], % | n/a | n/a |
| peel strength[2], lb | 20 | 20 |
| peel separation, % | n/a | n/a |

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing
4. Values are based on grab tensile strength and elongation per D7747 for laboratory tested specimens

Table 2(d) – Seam Strength and Related Properties of Thermally Bonded **Scrim Reinforced** Linear Low Density Polyethylene (LLDPE-R) Geomembranes (S.I. Units)

| Geomembrane Nominal Thickness | 36 mil[4] | 45 mil[4] |
|---|---|---|
| Hot Wedge Seams[1] | | |
| shear strength[2], N | 890 | 890 |
| shear elongation[3], % | n/a | n/a |
| peel strength[2], N | 90 | 90 |
| peel separation, % | n/a | n/a |
| Extrusion Fillet Seams | | |
| shear strength[2], N | 890 | 890 |
| shear elongation[3], % | n/a | n/a |
| peel strength[2], N | 90 | 90 |
| peel separation, % | n/a | n/a |

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing
4. Values are based on grab tensile strength and elongation per D7747 for laboratory tested specimens

Table 3(a) – Seam Strength and Related Properties of Thermally Bonded **Nonreinforced and Scrim Reinforced** Flexible Polypropylene (fPP) Geomembranes (English Units)

| Geomembrane Nominal Thickness | 30 mil-NR | 40 mil-NR | 36 mil-R[4] | 45 mil-R[4] |
|---|---|---|---|---|
| Hot Wedge Seams[1] | | | | |
| shear strength[2], lb/in. (NR); lb (R) | 25 | 30 | 200 | 200 |
| shear elongation[3], % | 50 | 50 | n/a | n/a |
| peel strength[2], lb/in. (NR); lb (R) | 20 | 25 | 20 | 20 |
| peel separation, % | 25 | 25 | n/a | n/a |
| Extrusion Fillet Seams | | | | |
| shear strength[2], lb/in. (NR); lb (R) | 25 | 30 | 200 | 200 |
| shear elongation[3], % | 50 | 50 | n/a | n/a |
| peel strength[2], lb/in. (NR); lb (R) | 20 | 25 | 20 | 20 |
| peel separation, % | 25 | 25 | n/a | n/a |

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing
4. Values are based on grab tensile strength and elongation per D7747 for laboratory tested specimens

Table 3(b) – Seam Strength and Related Properties of Thermally Bonded **Nonreinforced and Scrim Reinforced** Flexible Polypropylene (fPP) Geomembranes (S.I. Units)

| Geomembrane Nominal Thickness | 0.75 mm-NR | 1.0 mm-NR | 0.91 mm-R[4] | 1.14 mm-R[4] |
|---|---|---|---|---|
| Hot Wedge Seams[1] | | | | |
| shear strength[2], N/25 mm (NR); N (R) | 110 | 130 | 890 | 890 |
| shear elongation[3], % | 50 | 50 | n/a | n/a |
| peel strength[2], N/25 mm (NR); N (R) | 85 | 110 | 90 | 90 |
| peel separation, % | 25 | 25 | n/a | n/a |
| Extrusion Fillet Seams | | | | |
| shear strength[2], N/25 mm (NR); N (R) | 110 | 130 | 890 | 890 |
| shear elongation[3], % | 50 | 50 | n/a | n/a |
| peel strength[2], N/25 mm (NR); N (R) | 85 | 110 | 90 | 90 |
| peel separation, % | 25 | 25 | n/a | n/a |

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing
4. Values are based on grab tensile strength and elongation per D7747 for laboratory tested specimens

**Adoption and Revision Schedule**
**for**
**Seam Specification per GRI-GM19**

"Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes"

Adopted: February 18, 2002

Revision 1: May 15, 2003; Increased selected shear and peel test requirements, per the following:

| Material | Test | Seam Type | Current GM19 | Proposed GM19 | Difference |
|---|---|---|---|---|---|
| HDPE | Shear | Hot Wedge | 95% yield | 95% yield | no change |
| | | Extrusion | 95% yield | 95% yield | no change |
| | Peel | Hot Wedge | 62% yield | 72% yield | 16% increase |
| | | Extrusion | 62% yield | 62% yield | no change |
| LLDPE | Shear | Hot Wedge | 1300 psi break | 1500 psi break | 15% increase |
| | | Extrusion | 1300 psi break | 1500 psi break | 15% increase |
| | Peel | Hot Wedge | 1100 psi break | 1250 psi break | 14% increase |
| | | Extrusion | 1100 psi break | 1100 psi break | no change |

Revision 2: January 28, 2005; added Note 6 (in three locations) stating that incursion is measured on an area basis and not depth as in ASTM D6392.

Revision 3: June 4, 2010; Removed Note 6 on peel incursion since ASTM D6392 (2008) now uses area of incursion whereas previously they used linear length of incursion. Thus ASTM is now in agreement with GM19 in this regard.

Revision 4: November 15, 2010; Added Note 6 (in three locations) stating what separation-in-plane (SIP) is, and is not, and that it is acceptable if the required strength, shear elongation and peel separation criteria are met.

Revision 5: July 12, 2011; AD1 and AD2 breaks are now unacceptable even if strength is achieved.

Revision 6: October 3, 2011; Added LLDPE-R to the various geomembrane types, in particular, Tables 2(c) and 2(d) and made editorial changes.

Revision 7: November 3, 2013; clarified issues of 4 out of 5 passing strength and 5 out of 5 passing locus-of-break, shear elongation and peel separation.

Revision 8: February 12, 2015; upgraded standards and terminology

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 10/27/2021** | **Report No.**: 1 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 54°, cloudy<br>PM: 76°, clear | **Rain Gauge Reading: 0.5"** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0800 | 1900 | 11 |
| | | | | |

| Name | Position |
|---|---|
| Melvin Mejia | Luminant Project Manager |
| Sam Franco | CQA Project Manager |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul excavated material |
| Volvo Haul Truck | 2 | A40G | MSI used to haul excavated material |
| Komatsu Haul Truck | 1 | HM-400 | MSI used to haul excavated material |
| Volvo Trackhoe | 1 | EC350E | MSI used to cut material |
| CAT Bulldozer | 2 | D6 | MSI used to cut material |
| Water Truck | 1 | 4,000 Gal | Not used today |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (0)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br><br>**Water Management**<br>• Oak Grove Steam Electric Station received approximately 0.5" of rain in the morning. Rain stopped at approximately 0900.<br>• MSI placed pumps in low spots on the pond floor to have water removed from FGD-A Pond (See Photo 1).<br>• Daily load count for the water truck (4,000 gal): 0<br>• Due to morning rain events, water truck was not needed for the day.<br><br>**Construction Activities:**<br>• MSI installed silt fence around FGD-A Pond.<br>• MSI continued to remove unsuitable clay material from pond floor and side slopes (See Photo 2).<br>• See Progress Map on page 4 for approximate area where unsuitable material has been removed.<br><br>**Surveying Activities:**<br>• Not applicable. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

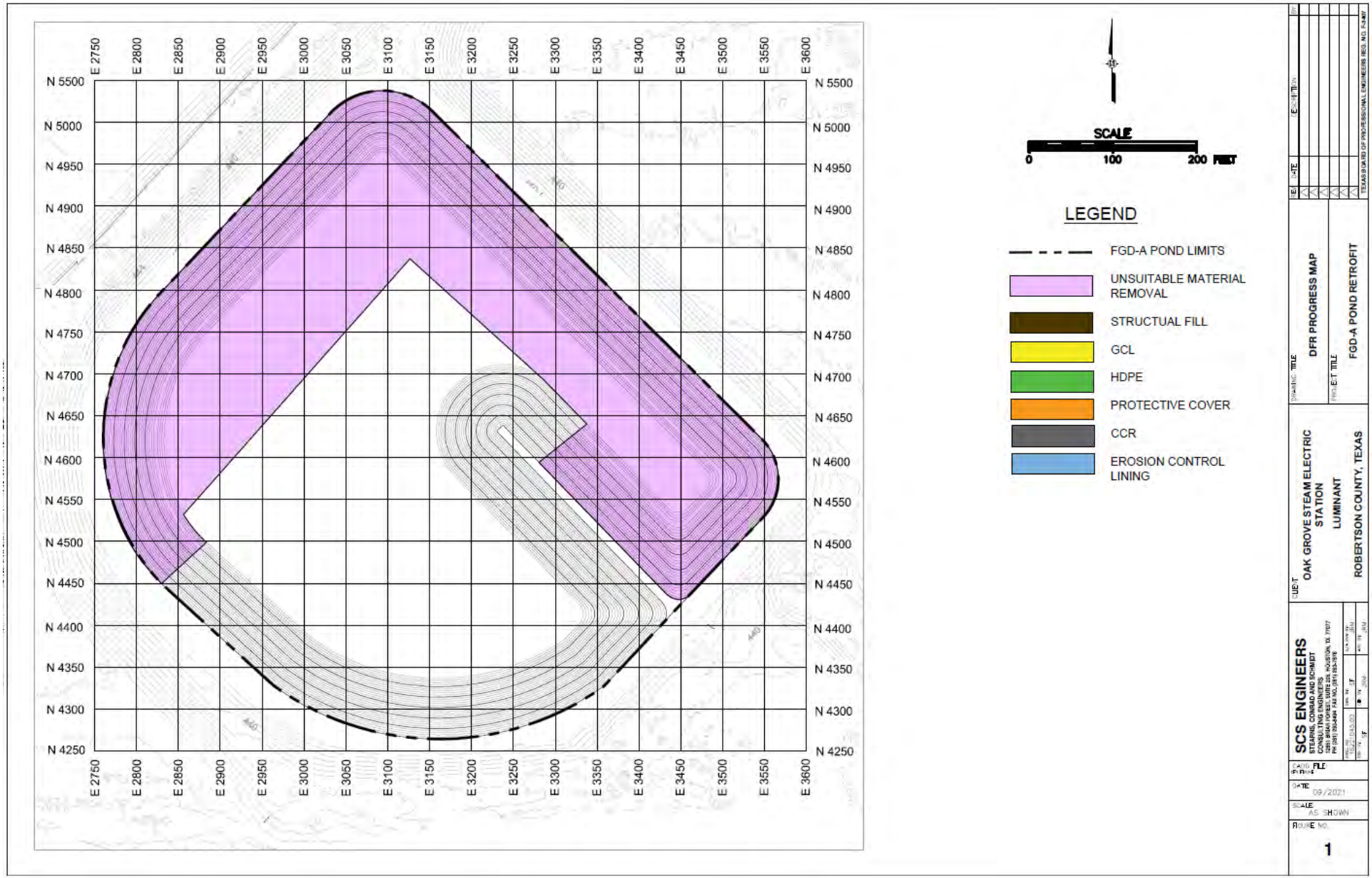
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 10/27/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 10/27/2021 |

**Photo 1** – MSI pumping water out of low spots of pond

**Photo 2** – Excavation of unsuitable clay material

*Note: Pictures represent work in progress and do not represent work as certified complete.*

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.:** 1 |
| | | **Date: 10/27/2021** |




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 1** |
| | | **Date: 10/27/2021** |

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 10/28/2021** | **Report No.**: 2 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 53°, clear, high winds approx. 20 mph<br>PM: 73°, clear, high winds approx. 20 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0700 | 1900 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul excavated material |
| Volvo Haul Truck | 2 | A40G | MSI used to haul excavated material |
| Komatsu Haul Truck | 1 | HM-400 | MSI used to haul excavated material |
| Volvo Trackhoe | 1 | EC350E | MSI used to cut material |
| CAT Bulldozer | 2 | D6 | MSI used to cut material |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Water from previous rain event (October 27, 2021) continues to be pumped out of the pond.
- Daily load count for the water truck (4,000 gal): 10
- MSI used the 4,000 gal water truck for dust control around FGD-A Pond.

**Construction Activities:**

- MSI continued to remove the access ramp located on the southwestern side slope of FGD-A Pond.
- MSI began removing CCR and unsuitable clay material for the southern corner of the pond. (See Photo 1)
- After all available water was pumped out, MSI mixed in dry material with the remaining ponded water to have all water removed from the pond area.
- CAT D6 bulldozer and Volvo trackhoe were used to remove CCR on southern slope, west of peninsula.(See Photo 2)
- See Progress Map on page 4 for approximate area where unsuitable material has been removed.

**Surveying Activities:**

- Not applicable.

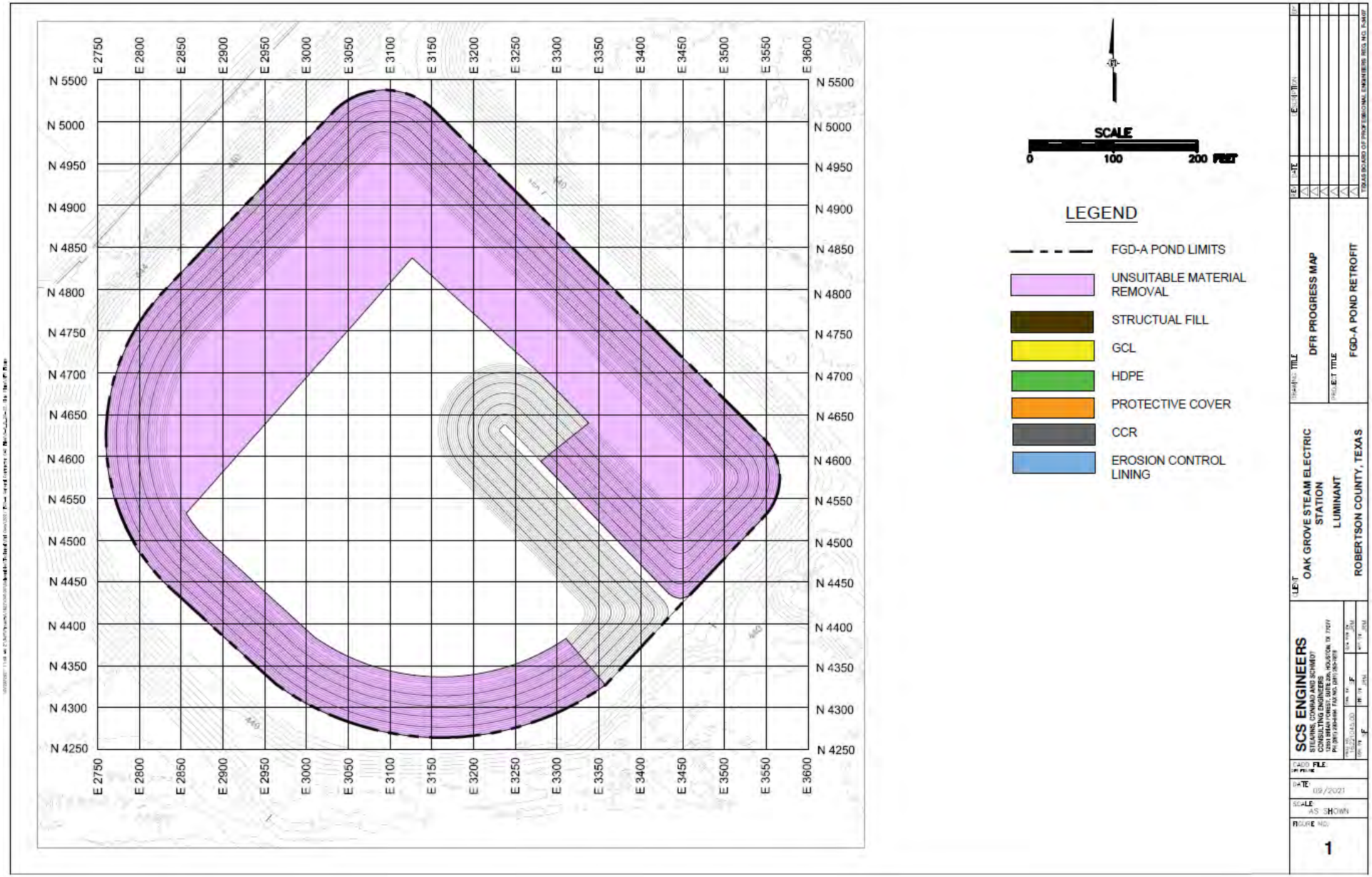
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 10/28/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 10/28/2021 |

**Photo 1** – Southwestern access ramp being removed

**Photo 2** – Removal of southwestern access ramp and grading southern side slope

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 2** |
| | | **Date: 10/28/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 10/29/2021** | **Report No.**: 3 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 41°, clear, high winds approx. 20 mph<br>PM: 72°, clear, high winds approx. 20 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0700 | 1500 | 8 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul excavated material |
| Volvo Haul Truck | 2 | A40G | MSI used to haul excavated material |
| Komatsu Haul Truck | 1 | HM-400 | MSI used to haul excavated material |
| Volvo Trackhoe | 1 | EC350E | MSI used to cut material |
| CAT Bulldozer | 2 | D6 | MSI used to cut material |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (0)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 6<br>• MSI used the 4,000 gal water truck for dust control around FGD-A Pond.<br><br>**Construction Activities:**<br>• MSI continued to remove CCR and unsuitable material along the southern side slope and west peninsula side slope. (See Photos 1 and 2)<br>• MSI completed removal of the access ramp along the southwestern side slope and is grading the side slope to clay liner elevations. (See Photo 3)<br>• See Progress Map on page 5 for approximate area where unsuitable material removal is in progress.<br><br>**Surveying Activities:**<br>• Not applicable. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

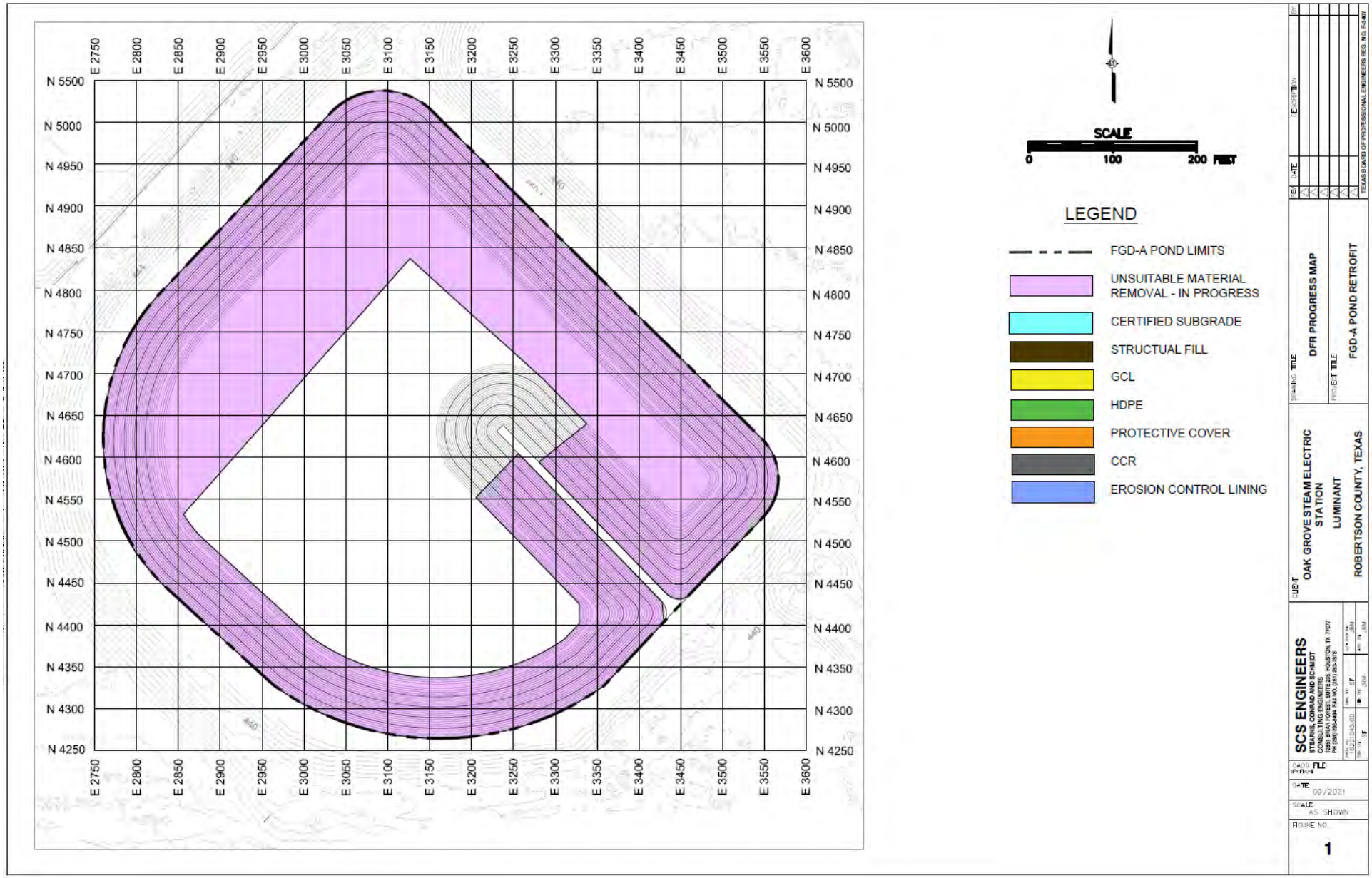
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 10/29/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 10/29/2021 |

**Photo 1** – Trackhoe excavating west peninsula side slope and bulldozer grading western slope

**Photo 2** – Excavation and grading of southern side slope, west of peninsula

**Photo 3** – CAT D6 bulldozer grading the western side slope

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 3** |
| | | **Date: 10/29/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/01/2021** | **Report No.**: 4 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 54°, clear, light winds approx.. 5 mph<br>PM: 80°, clear, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0700 | 1900 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | MSI used 1 Volvo A40G to haul excavated material |
| Komatsu Haul Truck | 1 | HM-400 | MSI used to haul excavated material |
| Volvo Trackhoe | 1 | EC350E | MSI used to cut material |
| CAT Bulldozer | 2 | D6 | MSI used to cut material |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 9
- MSI used the 4,000 gal water truck for dust control around FGD-A Pond.

**Construction Activities:**

- MSI continued to remove CCR and unsuitable material on the pond floor. The Volvo trackhoe and CAT D6 bulldozer were used to excavate material into the haul trucks. (See Photos 1 and 2)
- MSI used the CAT D6 bulldozer to fine grade the side slopes of FGD-A Pond. (See Photo 3)
- MSI mixed in dry material to the last remaining ponded water to remove from FGD-A Pond. (See Photo 4)
- See Progress Map on page 5 for approximate area where unsuitable material removal is in progress.

**Surveying Activities:**

- Not applicable.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/01/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/01/2021 |

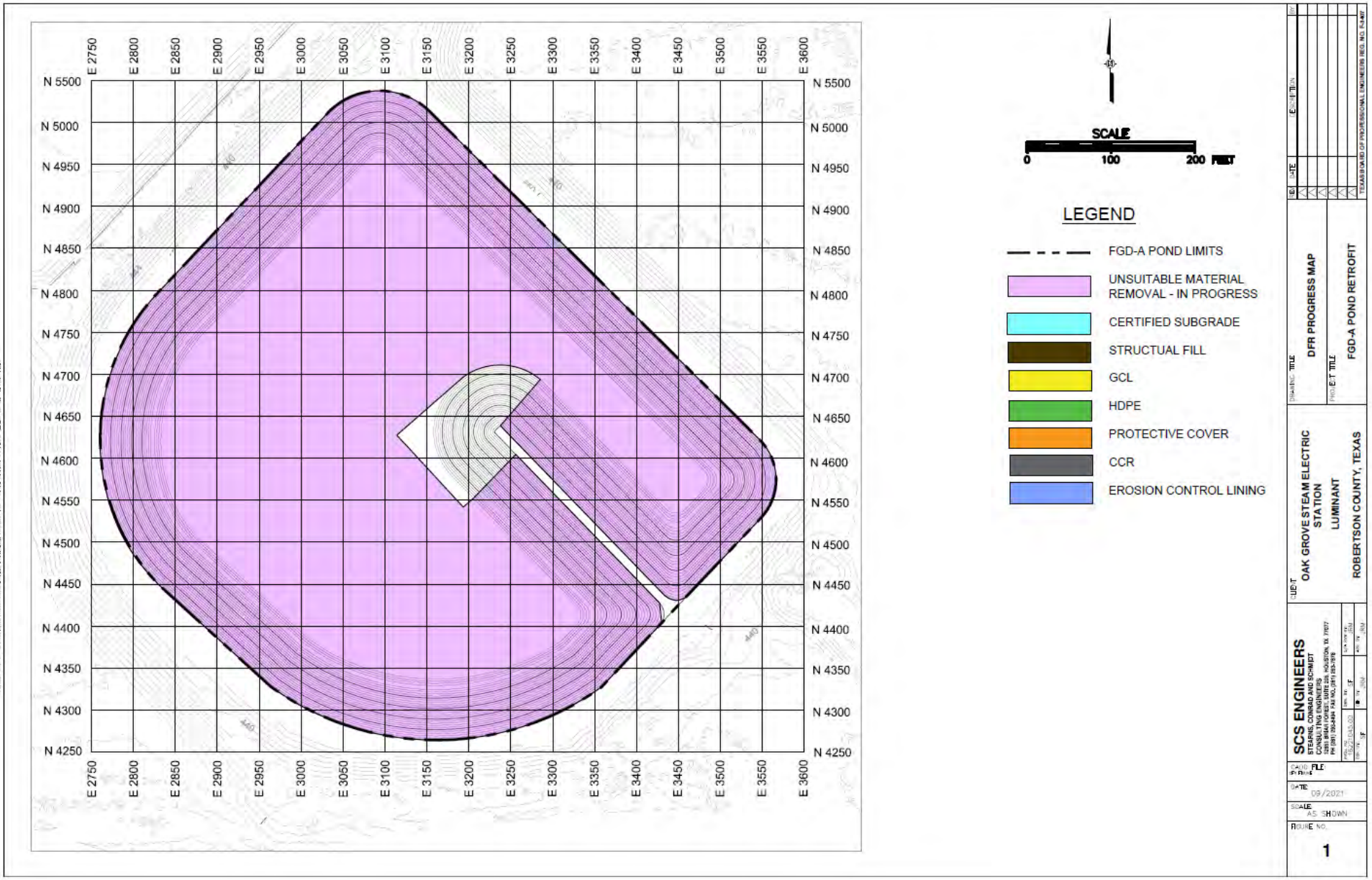
**Photo 1** – Trackhoe excavating southern corner of pond floor, west of peninsula

**Photo 2** – Excavation and grading of southern pond floor, west of peninsula

**Photo 3** – CAT D6 bulldozer fine grading east slope

**Photo 4** – Mixing of dry material with water to remove from pond

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 4** |
| | | **Date: 11/01/2021** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/02/2021** | **Report No.**: 5 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 53°, cloudy, light winds approx.. 5 mph<br>PM: 77°, cloudy, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0700 | 1900 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| J. Roy Murray | CQA Project Director |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul excavated material |
| Volvo Haul Truck | 2 | A40G | MSI used to haul excavated material |
| Komatsu Haul Truck | 1 | HM-400 | MSI used to haul excavated material |
| Volvo Trackhoe | 1 | EC350E | MSI used to cut and load material |
| CAT Bulldozer | 2 | D6 | MSI used 1 CAT D6 to cut material<br>MSI used 1 CAT D6 in the landfill |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 1
- MSI used the 4,000 gal water truck for dust control around FGD-A Pond.

**Construction Activities:**

- MSI continued to remove CCR and unsuitable material on the west pond floor. The Volvo trackhoe and CAT D6 bulldozer were used to excavate material into the haul trucks. (See Photos 1 and 2)
- MSI used the CAT D6 bulldozer to grade the pond floor, east of the peninsula. (See Photo 3)
- See Progress Map on page 5 for approximate area where unsuitable material removal is in progress.

**Surveying Activities:**

- Survey with Jeremy Davis scheduled for Friday, November 5, 2021.
- Survey will determine areas of FGD-A Pond below clay liner grade that will require GCL lining.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

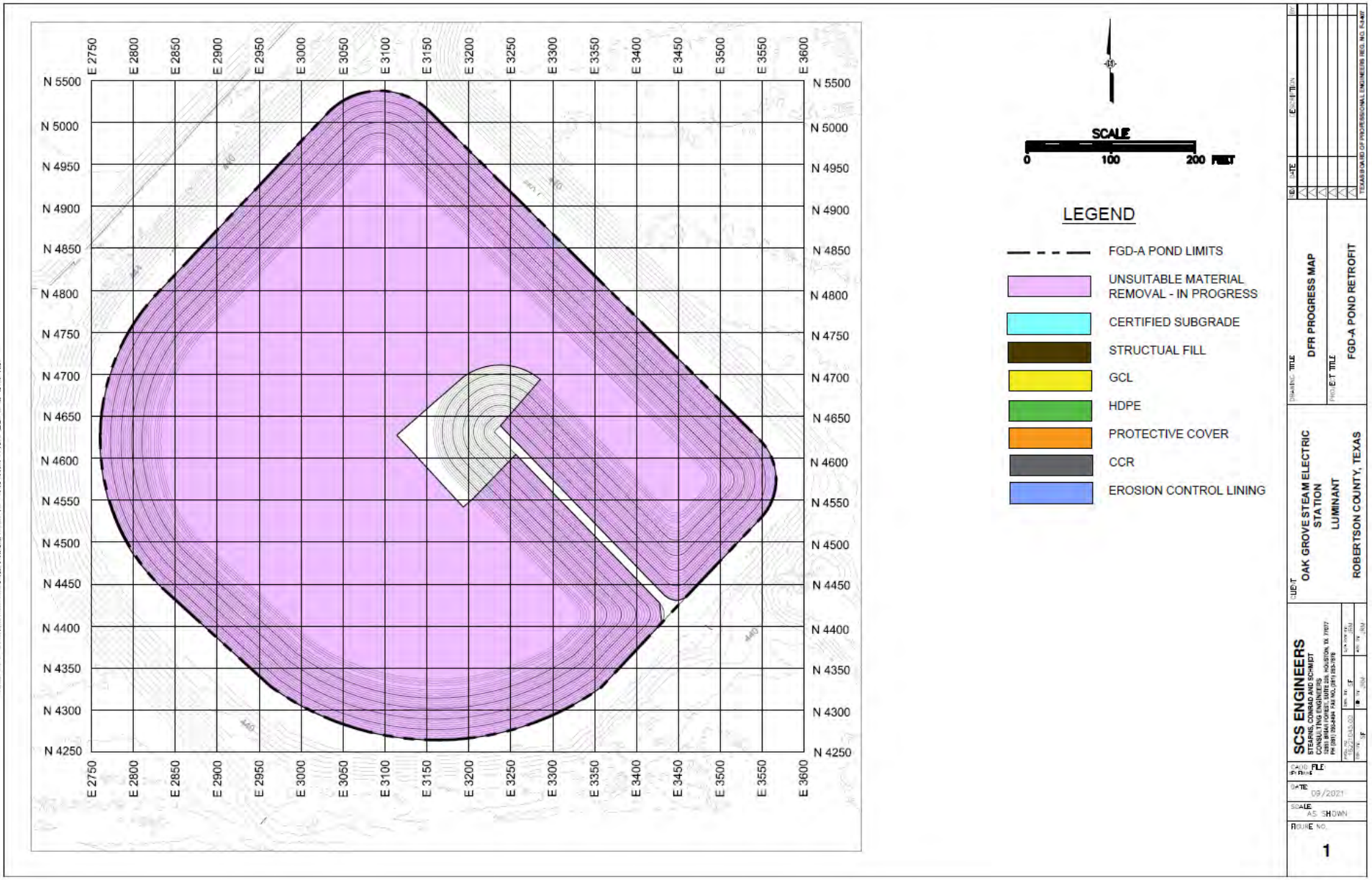
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/02/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/02/2021 |

**Photo 1** – Trackhoe excavating pond floor, west of peninsula

**Photo 2** – Excavation and grading of pond floor, west of peninsula

**Photo 3** – CAT D6 bulldozer fine grading pond floor, east of peninsula

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 5**<br>**Date: 11/02/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/03/2021** | **Report No.**: 6 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 45°, raining, winds approx.. 10 mph<br>PM: 58°, raining, winds approx. 10 mph | **Rain Gauge Reading: 0.75"** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0700 | 0800 | 1 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

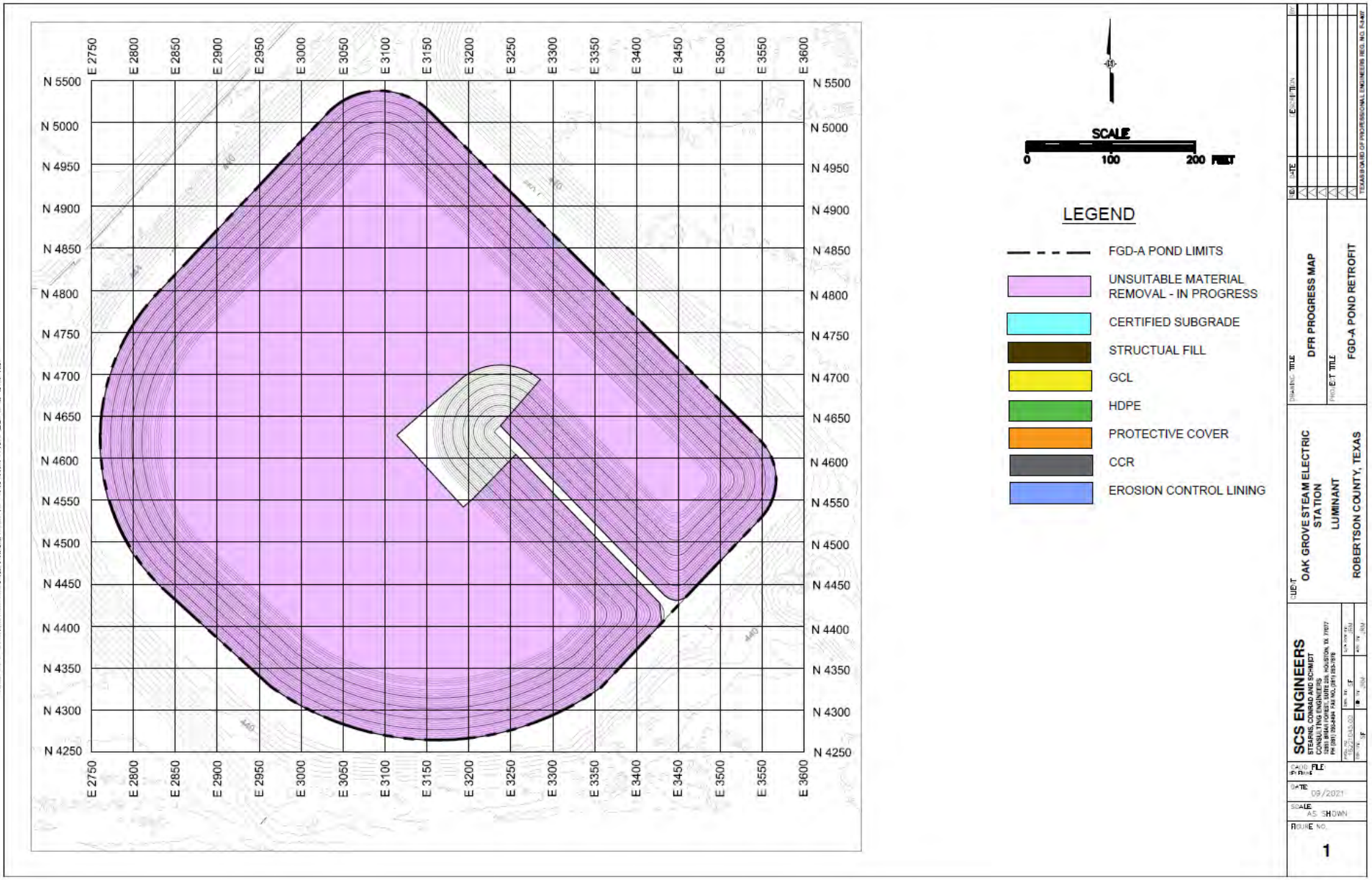
## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Komatsu Haul Truck | 1 | HM-400 | Not used today |
| Volvo Trackhoe | 1 | EC350E | Not used today |
| CAT Bulldozer | 2 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (0)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br>• Water truck was not used due to rain event.<br><br>**Construction Activities:**<br>• Rain began at 0730 and continued for the rest of the day.<br>• MSI sent crew home due to rain event.<br><br>**Surveying Activities:**<br>• Due to rain events on November 3, 2021, survey has been delayed until Monday, November 8, 2021. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/03/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/03/2021 |




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 6**<br>**Date: 11/03/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/04/2021** | **Report No.**: 7 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 45°, cloudy, light winds approx. 5 mph<br>PM: 58°, cloudy, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0700 | 1700 | 10 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Komatsu Haul Truck | 1 | HM-400 | Not used today |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to place pumps in pond and to prepare borrow area to haul structural fill |
| CAT Bulldozer | 2 | D6 | MSI used bulldozer to place pumps in pond and to prepare borrow area to haul structural fill |
| Water Truck | 1 | 4,000 Gal | Not used today |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (0)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br>• Water truck was not used due to rain event from Wednesday, November 3rd.<br><br>**Construction Activities:**<br>• MSI used the Volvo trackhoe and CAT D6 bulldozer to place pumps in FGD-A Pond. (See Photo 1)<br>• MSI pumped all ponded water into one area. (See Photo 2)<br>• MSI will receive a pump with a longer hose tomorrow to pump all water out of FGD-A into FGD-B Pond.<br>• MSI removed large rocks and vegetation around borrow area to prepare for hauling of structural fill next week.<br><br>**Surveying Activities:**<br>• Due to rain events on November 3, 2021, survey has been delayed until Monday, November 8, 2021. |

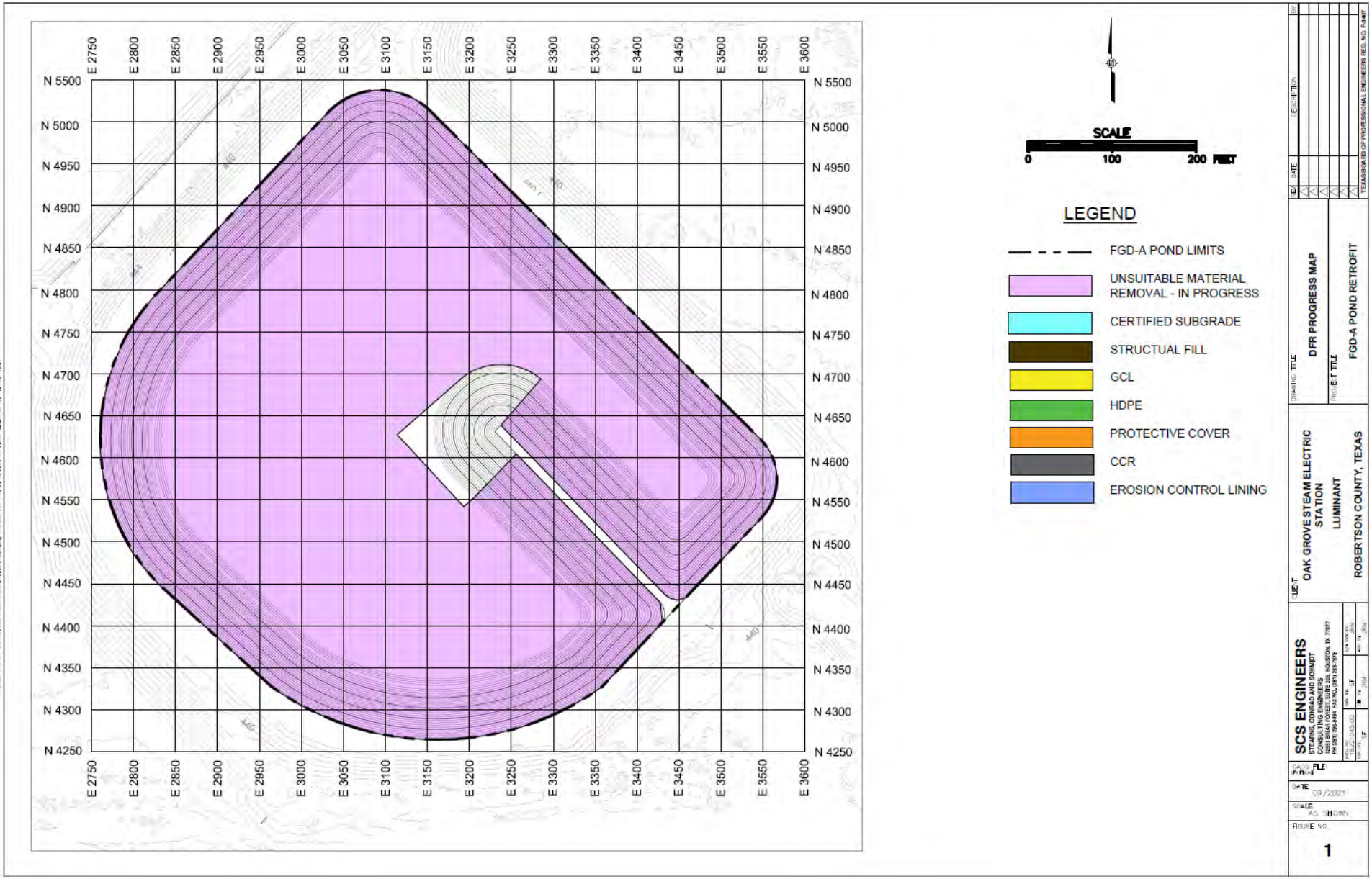
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/04/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/04/2021 |

**Photo 1** – Volvo trackhoe placing pumps in FGD-A Pond

**Photo 2** – Ponded water in FGD-A has all been pumped into one area

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 7** |
| | | **Date: 11/04/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/05/2021** | **Report No.**: 8 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 37°, clear, light winds approx. 5 mph<br>PM: 63°, clear, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0700 | 1700 | 10 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Komatsu Haul Truck | 1 | HM-400 | Removed from site today |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to place pump in pond |
| CAT Bulldozer | 2 | D6 | MSI used bulldozer to fine grade slopes and floor |
| Water Truck | 1 | 4,000 Gal | Not used today |
| CAT Sheeps Foot Roller | 1 | CP56 | Delivered to site today |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (0)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br>• Water truck was not used today.<br><br>**Construction Activities:**<br>• MSI used the Volvo trackhoe to place a larger pump in FGD-A.<br>• MSI pumped ponded water from FGD-A into FGD-B Pond. (See Photo 1)<br>• MSI used CAT D6 bulldozer to fine grade slopes. (See Photo 2)<br><br>**Surveying Activities:**<br>• Survey for FGD-A Pond is scheduled for Monday, November 8, 2021.<br>• Survey will determine all areas below clay liner elevations. |

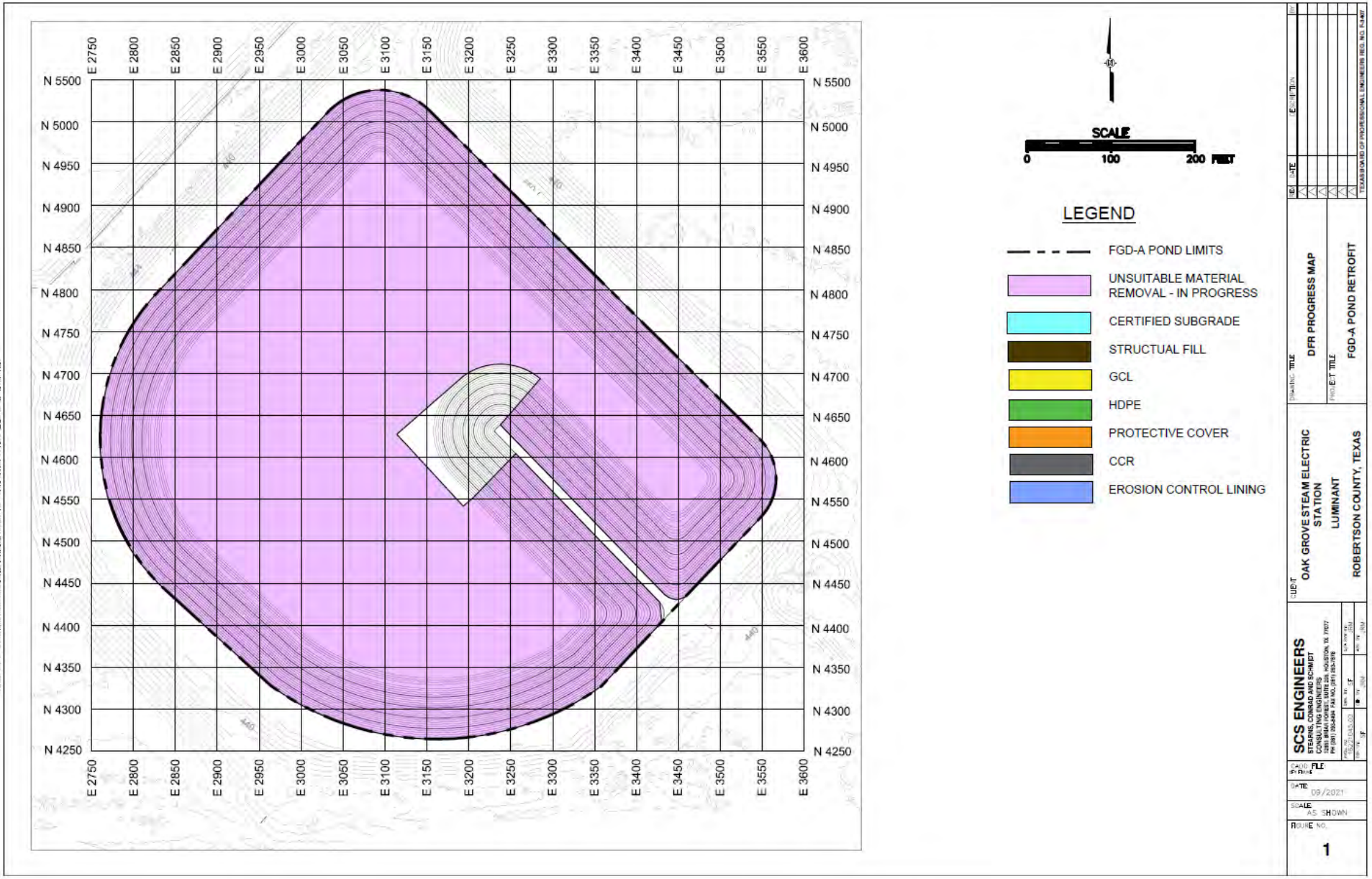
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/05/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/05/2021 |

**Photo 1** – Volvo trackhoe placing pump in FGD-A Pond

**Photo 2** – CAD D6 bulldozer fine grading east slope

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 8** |
| | | **Date: 11/05/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/06/2021** | **Report No.**: 9 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 41°, clear, light winds approx. 5 mph<br>PM: 67°, clear, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0700 | 1900 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul excavated material |
| Volvo Haul Truck | 2 | A40G | MSI used to haul excavated material |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to place pump and excavate unsuitable material from the pond floor |
| CAT Bulldozer | 2 | D6 | MSI used 1 bulldozer to fine grade slopes and floor<br>MSI used 1 bulldozer to spread material in the landfill |
| Water Truck | 1 | 4,000 Gal | Not used today |
| CAT Sheeps Foot Roller | 1 | CP56 | Not used today |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- Water truck was not used today.

**Construction Activities:**

- MSI used the Volvo trackhoe to remove the pump in FGD-A. (See Photo 1)
- MSI continued to excavate unsuitable material from FGD-A Pond floor. (See Photo 2)
- MSI used (1) CAT D6 bulldozer to fine grade slopes. (See Photo 3)
- MSI used (1) CAT D6 bulldozer to spread material at the landfill.

**Surveying Activities:**

- Survey for FGD-A Pond is scheduled for Monday, November 8, 2021.
- Survey will determine all areas below clay liner elevations.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

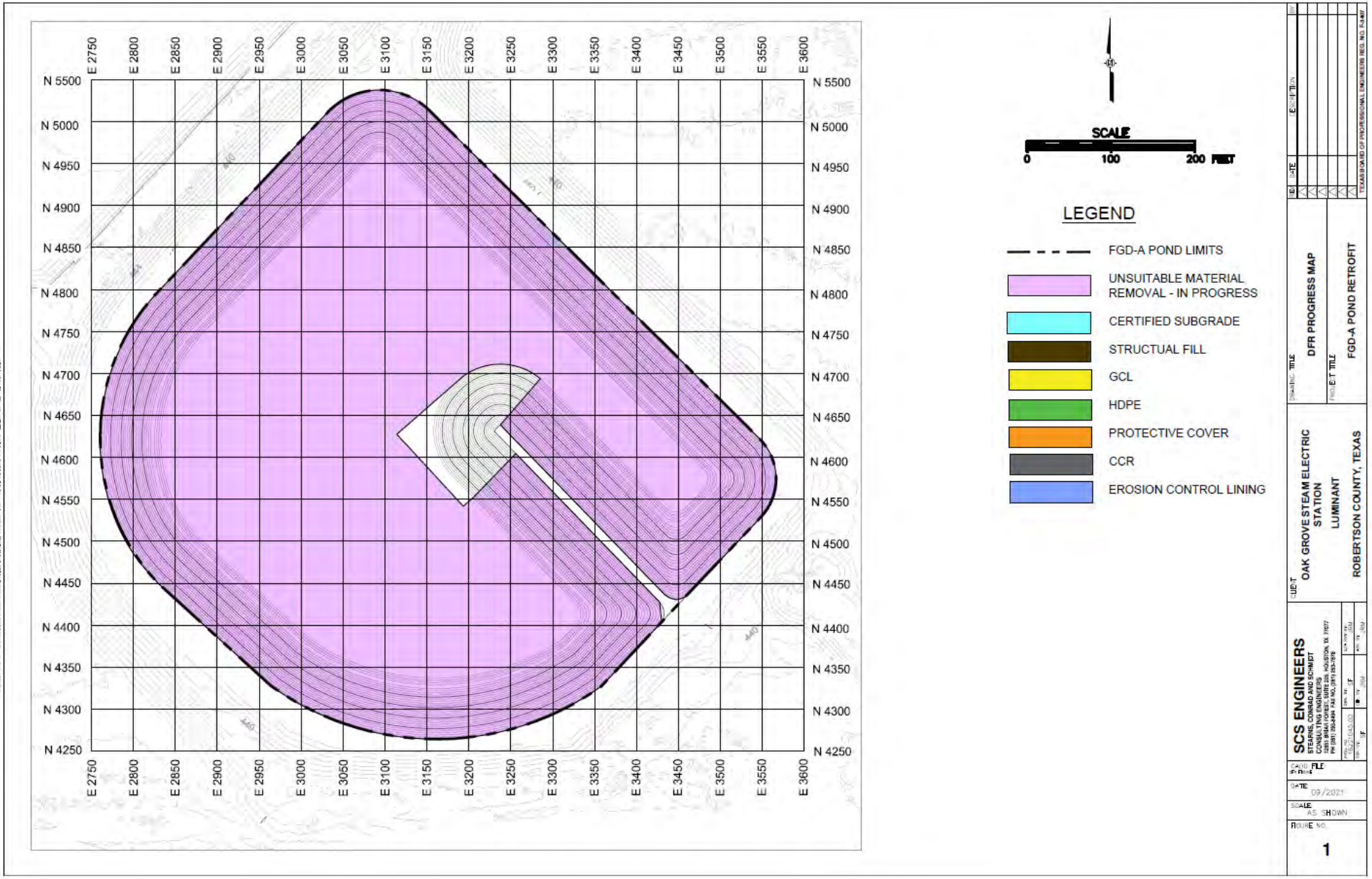
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/06/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/06/2021 |

**Photo 1** – Volvo trackhoe removing pump from FGD-A Pond

**Photo 2** – Volvo trackhoe excavating unsuitable material from western pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*

**Photo 3** – Fine grading and excavation of north slope




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 9** |
| | | **Date: 11/06/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/07/2021** | **Report No.**: 10 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 47°, clear, light winds approx. 5 mph<br>PM: 73°, clear, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1400 | 8 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul excavated material |
| Volvo Haul Truck | 2 | A40G | MSI used to haul excavated material |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to excavate unsuitable material from the pond floor |
| CAT Bulldozer | 2 | D6 | MSI used 1 bulldozer to fine grade slopes and floor<br>MSI used 1 bulldozer to spread material in the landfill |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control |
| CAT Sheeps Foot Roller | 1 | CP56 | Not used today |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 6
- MSI used 4,000 gal water truck for dust control around FGD-A Pond.

**Construction Activities:**

- MSI continued to fine grade FGD-A Pond floor and slopes. (See Photos 1 and 2)
- MSI used Volvo trackhoe and (1) CAT D6 bulldozer to excavate unsuitable material from pond floor. (See Photos 3 and 4)
- MSI used (1) CAT D6 bulldozer to spread material at the landfill.

**Surveying Activities:**

- Survey for FGD-A Pond is scheduled for Monday, November 8, 2021.
- Survey will determine all areas below clay liner elevations.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/07/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/07/2021 |

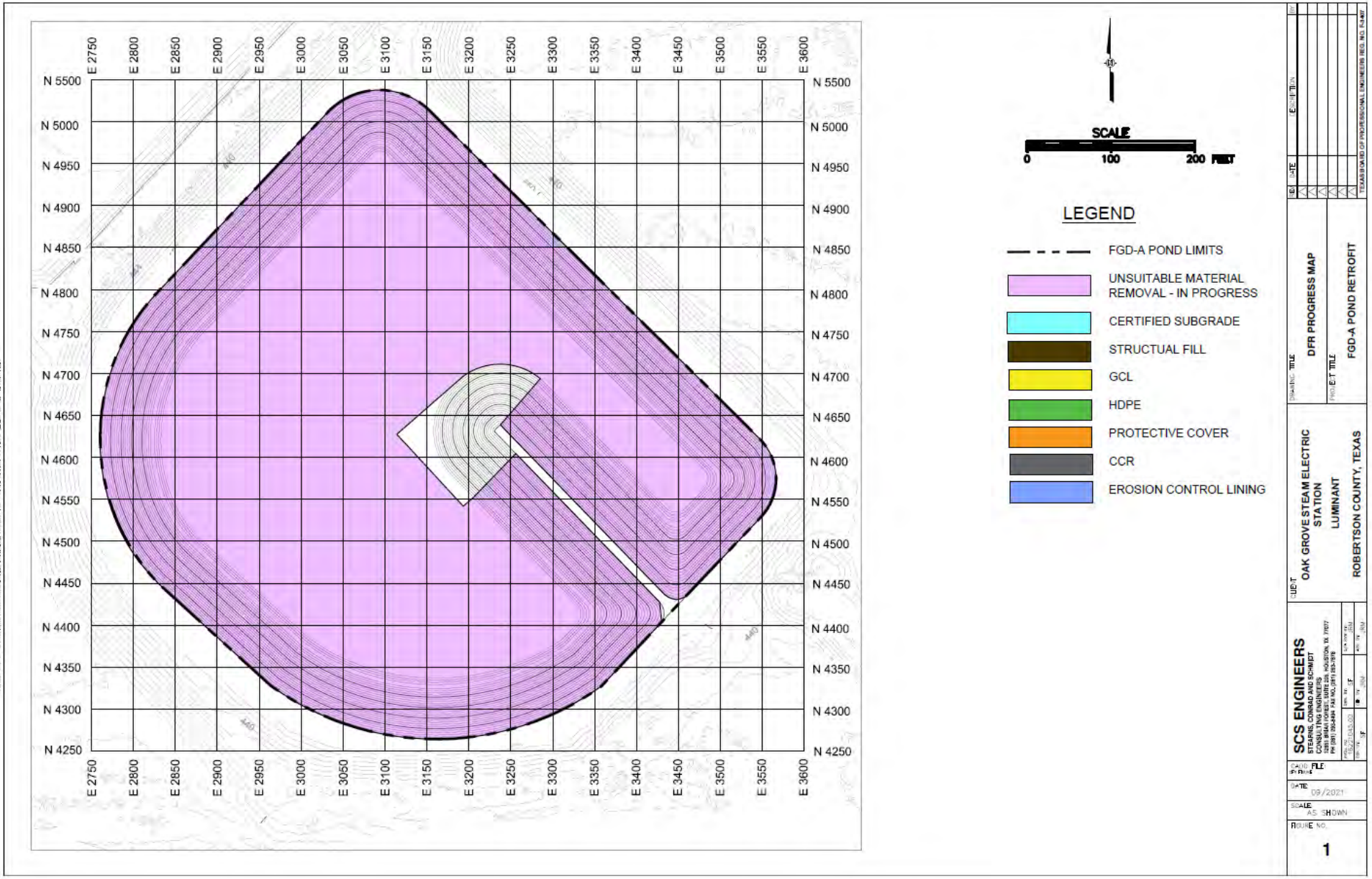
**Photo 1** – CAT D6 bulldozer fine grading eastern floor

**Photo 2** – CAT D6 bulldozer fine grading northern slope

**Photo 3** – Volvo trackhoe and CAT D6 bulldozer excavating unsuitable material from northern pond floor

**Photo 4** – Volvo trackhoe and CAT D6 bulldozer excavating unsuitable material from western pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 10** |
| | | **Date: 11/07/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/08/2021** | **Report No.**: 11 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 55°, clear, medium winds approx. 10 mph<br>PM: 75°, clear, medium winds approx. 10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Jeremy Davis | CQA Surveyor |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul structural fill |
| Volvo Haul Truck | 2 | A40G | MSI used to haul structural fill |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used to spread structural fill in over excavated areas |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 5
- MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.

**Construction Activities:**

- MSI used the Volvo trackhoe to load structural fill into haul trucks. (See Photo 1)
- MSI haul trucks placed structural fill on FGD-A Pond floor and used CAT D6 bulldozer to spread material. (See Photos 2 and 3)
- MSI used CAT sheeps foot roller to compact material.
- Structural fill was only placed in areas that were already determined to have been over excavated.
- See Progress Map on page 5 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- Jeremy Davis was on site to survey FGD-A Pond and borrow area. (See Photo 4)
- Survey will determine all areas below clay liner elevations and volume of structural fill available in borrow area. Results to be provided by November 9, 2021.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/08/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/08/2021 |

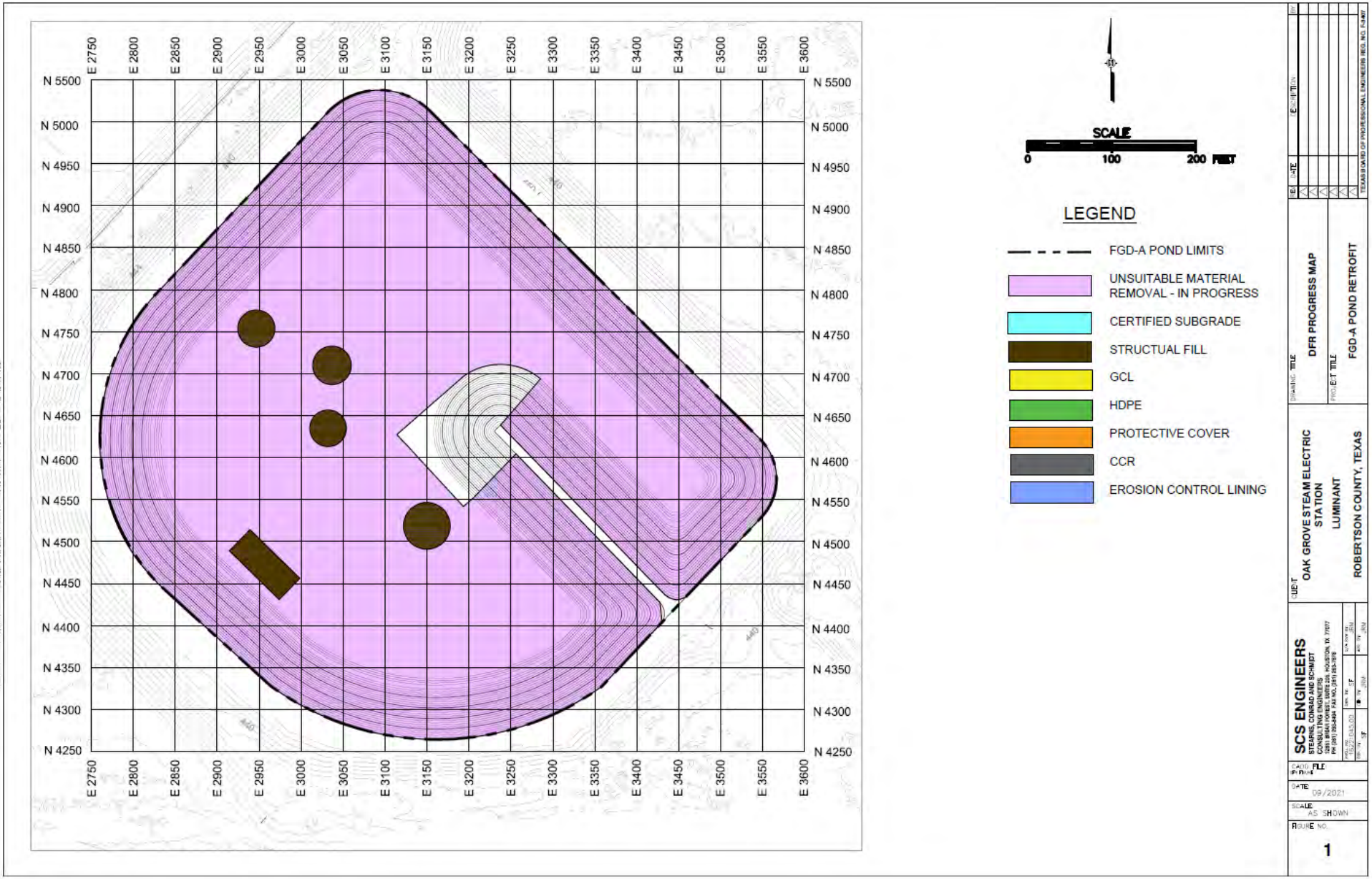
*Note: Pictures represent work in progress and do not represent work as certified complete.*

**Photo 1** – Volvo trackhoe loading haul trucks with structural fill

**Photo 2** – CAT D6 bulldozer and sheeps foot roller spreading and compacting of structural fill on western pond floor

**Photo 3** – Placement and compaction of structural fill

**Photo 4** – Surveying of FGD-A Pond




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 11** |
| | | **Date: 11/08/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/09/2021** | **Report No.**: 12 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 58°, clear, light winds approx. 5 mph<br>PM: 75°, partly cloudy, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul structural fill |
| Volvo Haul Truck | 2 | A40G | MSI used 1 to haul structural fill<br>1 haul truck was not in use |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used to spread structural fill in over excavated areas |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill |
| | | | |
| | | | |
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| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (0)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 3<br>• MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.<br><br>**Construction Activities:**<br>• MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.<br>• MSI haul trucks continued to place structural fill on FGD-A Pond floor and used CAT D6 bulldozer to spread material. (See Photos 1 and 2)<br>• MSI continued to use CAT sheeps foot roller to compact material.<br>• 10 passing density tests were taken.<br>• Structural fill was only placed in areas that were already determined to have been over excavated.<br>• See Progress Map on page 4 for approximate areas where structural fill has been placed.<br><br>**Surveying Activities:**<br>• No surveying activities today. |

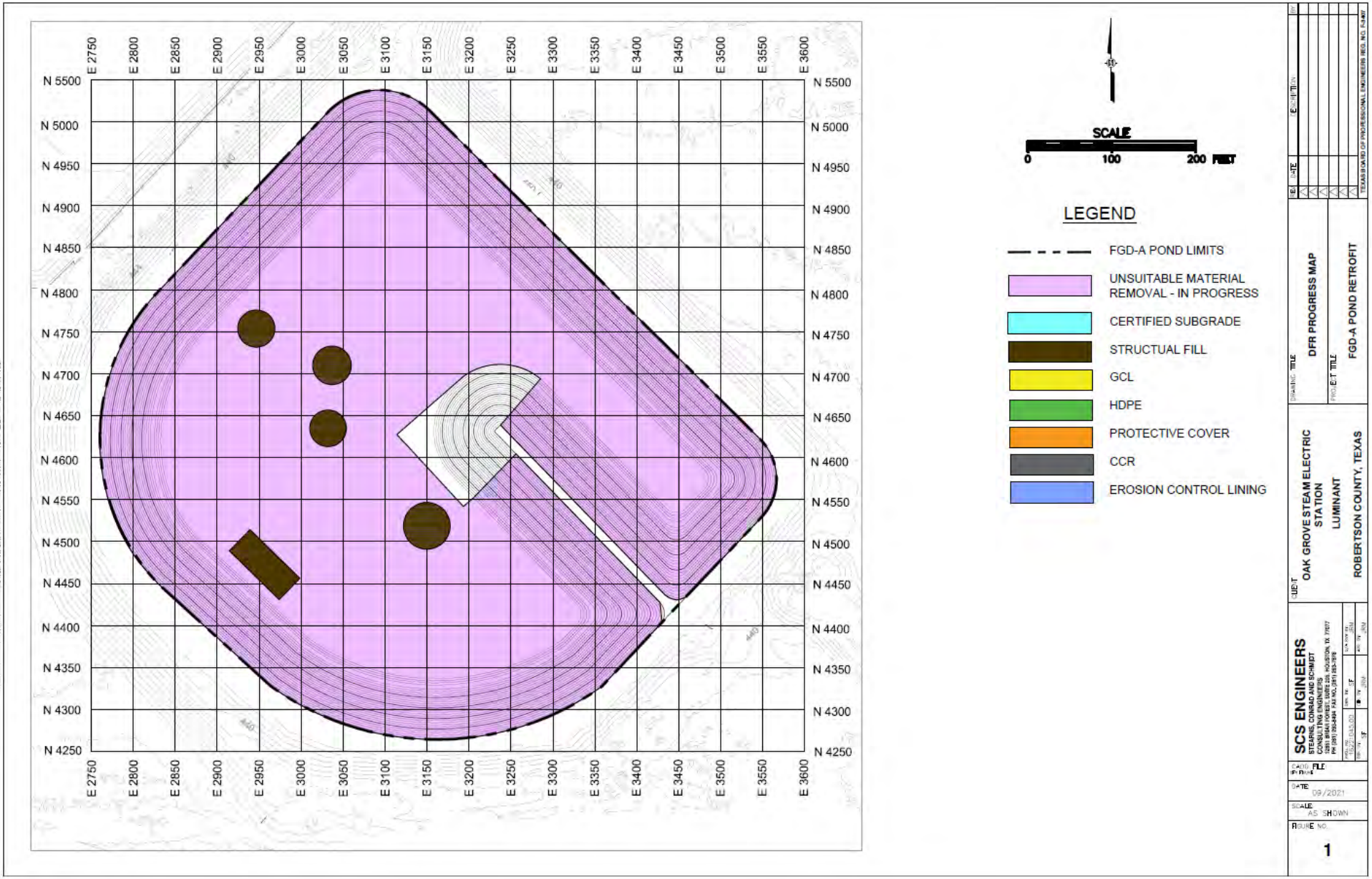
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/09/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/09/2021 |

**Photo 1** – CAT D6 bulldozer and sheeps foot roller spreading and compacting of structural fill on western pond floor

**Photo 2** – Placement and processing of structural fill on western pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 12** |
| | | **Date: 11/09/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/10/2021** | **Report No.**: 13 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 57°, cloudy, medium winds approx. 15 mph<br>PM: 78°, partly cloudy, medium winds approx. 15 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Melvin Mejia | Luminant Project Manager |
| Sam Franco | CQA Project Manager |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul structural fill |
| Volvo Haul Truck | 2 | A40G | MSI used 1 to haul structural fill<br>1 haul truck was not in use |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used to spread structural fill in over excavated areas |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill |
| | | | |
| | | | |
| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 2
- MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.
- MSI haul trucks continued to place structural fill on FGD-A Pond floor and used CAT D6 bulldozer to spread material. Structural fill has been placed west and north of the peninsula. (See Photos 1 and 2)
- MSI continued to use CAT sheeps foot roller to compact material.
- 9 passing density tests were taken.
- 18" shelby tubes were collected from the bottom 18 inches of existing clay liner and shipped via FedEx.
- Structural fill was only placed in areas that were already determined to have been over excavated.
- See Progress Map on page 4 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- No surveying activities today.
- Survey scheduled for Friday, November 12th, to survey the remainder of the borrow area.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

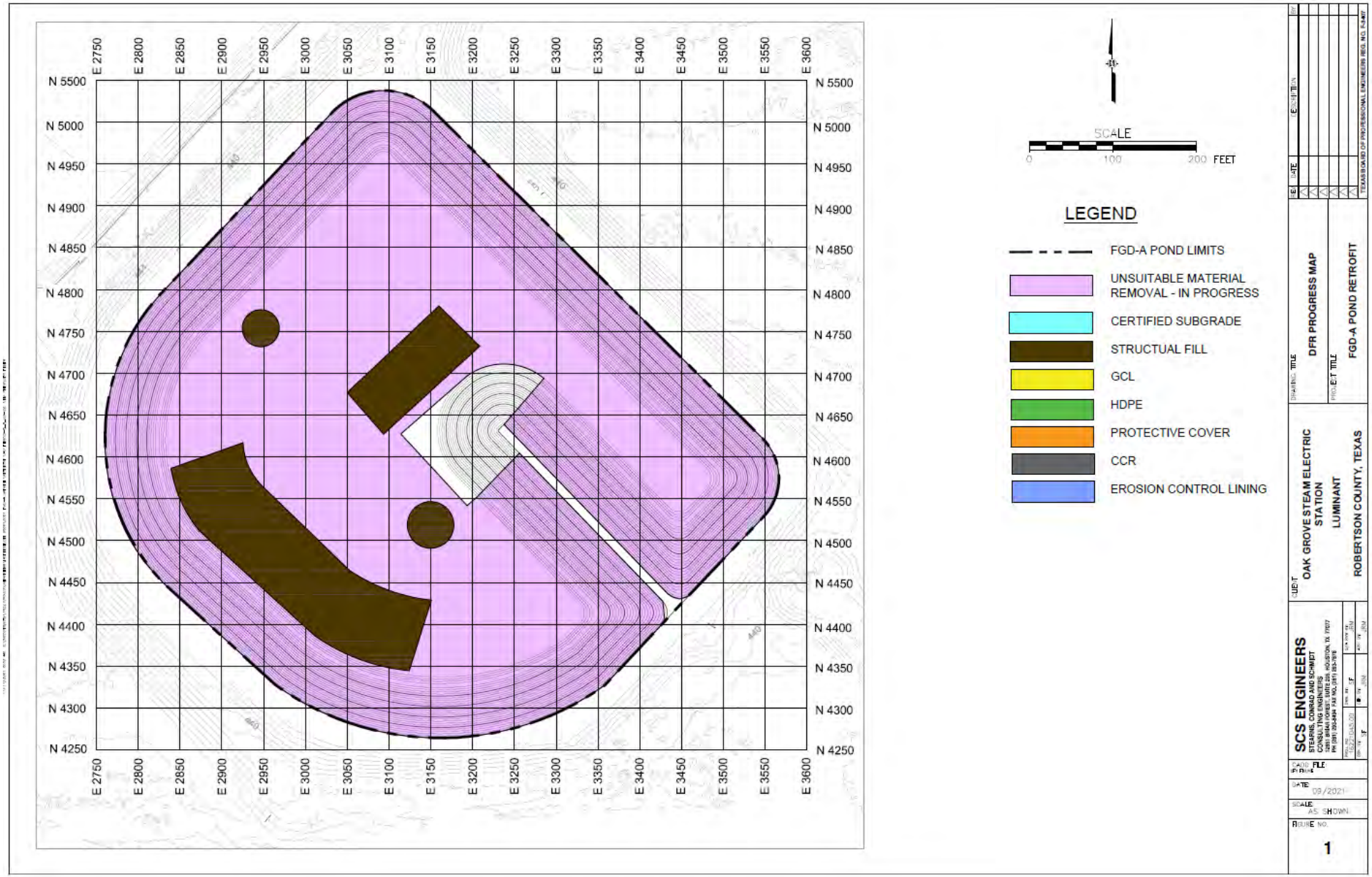
## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | *Danny Rennicks* | 11/10/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/10/2021 |

**Photo 1** – CAT D6 bulldozer and sheeps foot roller spreading and compacting of structural fill on western and northern pond floor

**Photo 2** – Placement and processing of structural fill on western and northern pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 3** |
| | | **Date: 11/10/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/11/2021** | **Report No.**: 14 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 43°, clear, light winds approx. 5 mph<br>PM: 72°, clear, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul structural fill |
| Volvo Haul Truck | 2 | A40G | MSI used to haul structural fill |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used to spread structural fill in over excavated areas |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 3
- MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.
- MSI haul trucks continued to place structural fill on FGD-A Pond floor and used CAT D6 bulldozer to spread material. Structural fill has been placed north and west of the peninsula. (See Photo 1)
- MSI continued to use CAT sheeps foot roller to compact material.
- 7 passing density tests were taken.
- Structural fill was only placed in areas that were already determined to have been over excavated.
- See Progress Map on page 4 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- No surveying activities today.
- Survey scheduled for Friday, November 12th, to survey the remainder of the borrow area.

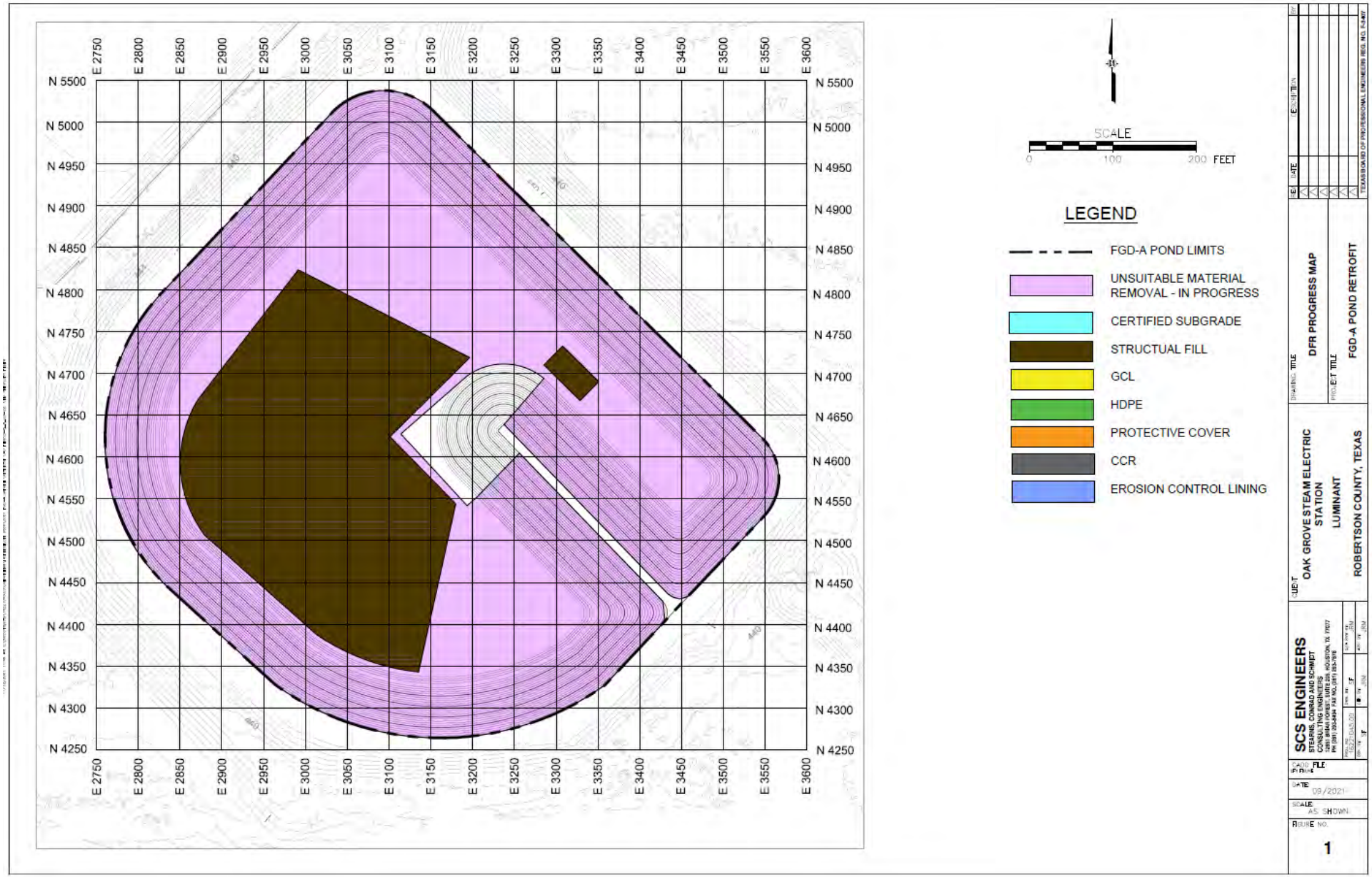
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/11/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/11/2021 |

**Photo 1** – CAT D6 bulldozer spreading structural fill across northern pond floor

**Photo 2** – Pond floor with structural fill

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 14** |
| | | **Date: 11/11/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/12/2021** | **Report No.**: 15 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 38°, clear, medium winds approx. 15 mph<br>PM: 73°, clear, medium winds approx. 15 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1500 | 9 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Jeremy Davis | CQA Surveyor |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul structural fill |
| Volvo Haul Truck | 2 | A40G | MSI used to haul structural fill |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used to spread structural fill in over excavated areas<br>GPS bulldozer down for repairs |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 3
- MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.
- MSI haul trucks continued to place structural fill on FGD-A Pond floor and used CAT D6 bulldozer to spread material. Structural fill has been placed north and west of the peninsula. (See Photos 1 and 2)
- MSI continued to use CAT sheeps foot roller to compact material.
- 6 passing density tests were taken.
- Structural fill was only placed in areas that were already determined to have been over excavated.
- See Progress Map on page 4 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- Jeremy Davis was on site to survey the entire borrow area.

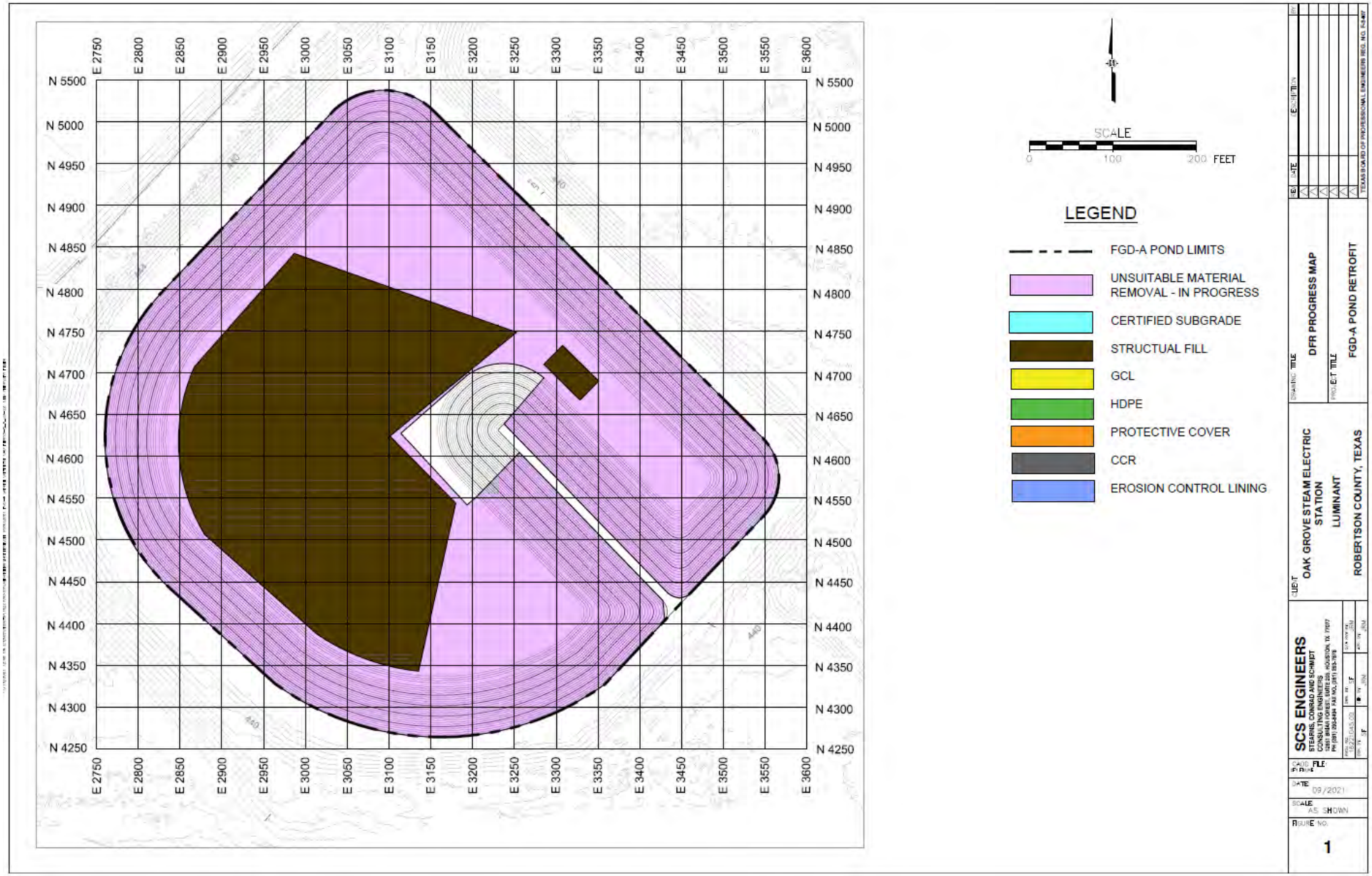
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/12/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/12/2021 |

**Photo 1** – CAT sheeps foot compactor compacting structural fill across northern pond floor

**Photo 2** – CAT D6 bulldozer grading western pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 15**<br>**Date: 11/12/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/15/2021** | **Report No.**: 16 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 60°, partly cloudy, light winds approx. 5 mph<br>PM: 80°, partly cloudy, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul structural fill |
| Volvo Haul Truck | 2 | A40G | MSI used to haul structural fill<br>1 Volvo haul truck not used |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used to spread structural fill in over excavated areas<br>GPS bulldozer down for repairs |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (0)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 3<br>• MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.<br><br>**Construction Activities:**<br>• MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.<br>• MSI haul trucks continued to place structural fill on FGD-A Pond floor and used CAT D6 bulldozer to spread material. Structural fill has been placed north and west of the peninsula. (See Photo 1)<br>• MSI continued to use CAT sheeps foot roller to compact material.<br>• Structural fill was only placed in areas that were already determined to have been over excavated.<br>• MSI used the CAT D6 bulldozer and CAT sheeps foot roller to scarify and recompact the top 6 inches of clay liner.<br>• 14 density tests and 6 shelby tubes were taken on the clay liner.<br>• Shelby tubes were collected and shipped via FedEx for Tuesday, November 16th, delivery to CQA lab.<br>• MSI also removed the 12 inlet pipes on the southern corner of FGD-A Pond. (See Photo 2)<br>• See Progress Map on page 4 for approximate areas where structural fill has been placed and clay liner shelby tube locations.<br><br>**Surveying Activities:**<br>• No surveying activities. |

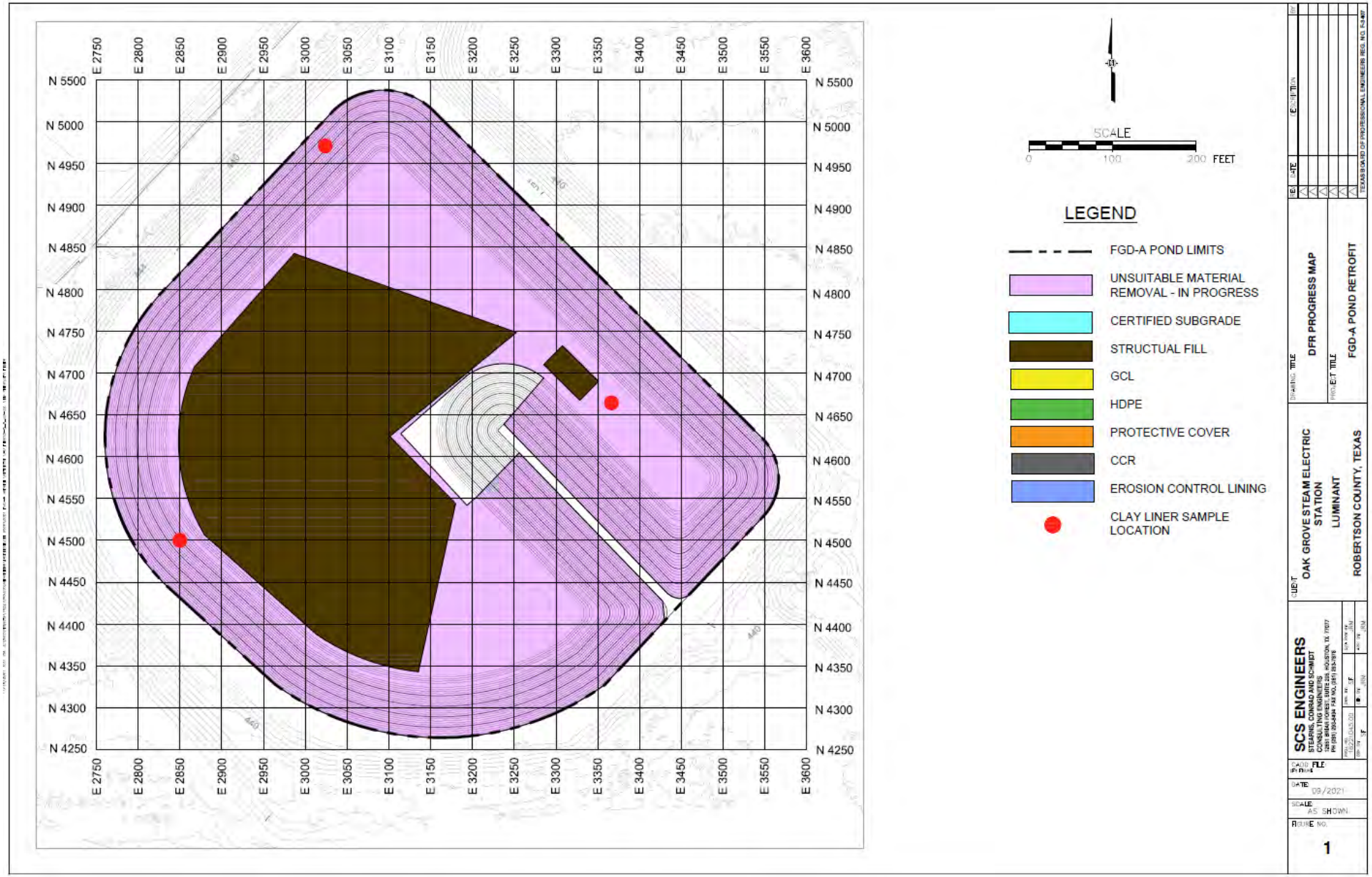
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/15/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/15/2021 |

**Photo 1** – Placement and hydration of structural fill on northern pond floor

**Photo 2** – Removal of 12 inlet pipes to FGD-A Pond

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 16** |
| | | **Date: 11/15/2021** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/16/2021** | **Report No.**: 17 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 62°, cloudy, high winds approx. 20 mph<br>PM: 82°, cloudy, high winds approx. 20 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul structural fill |
| Volvo Haul Truck | 2 | A40G | MSI used to haul structural fill<br>1 Volvo haul truck not used |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used to spread structural fill in over excavated areas |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 3
- MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.
- MSI haul trucks continued to place structural fill on FGD-A Pond floor and used CAT D6 bulldozer to spread material. Structural fill has been placed on the pond floor north and west of the peninsula. (See Photo 1)
- MSI continued to use CAT sheeps foot roller to compact material.
- 9 density tests were taken on the structural fill.
- See Progress Map on page 4 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- No surveying activities.

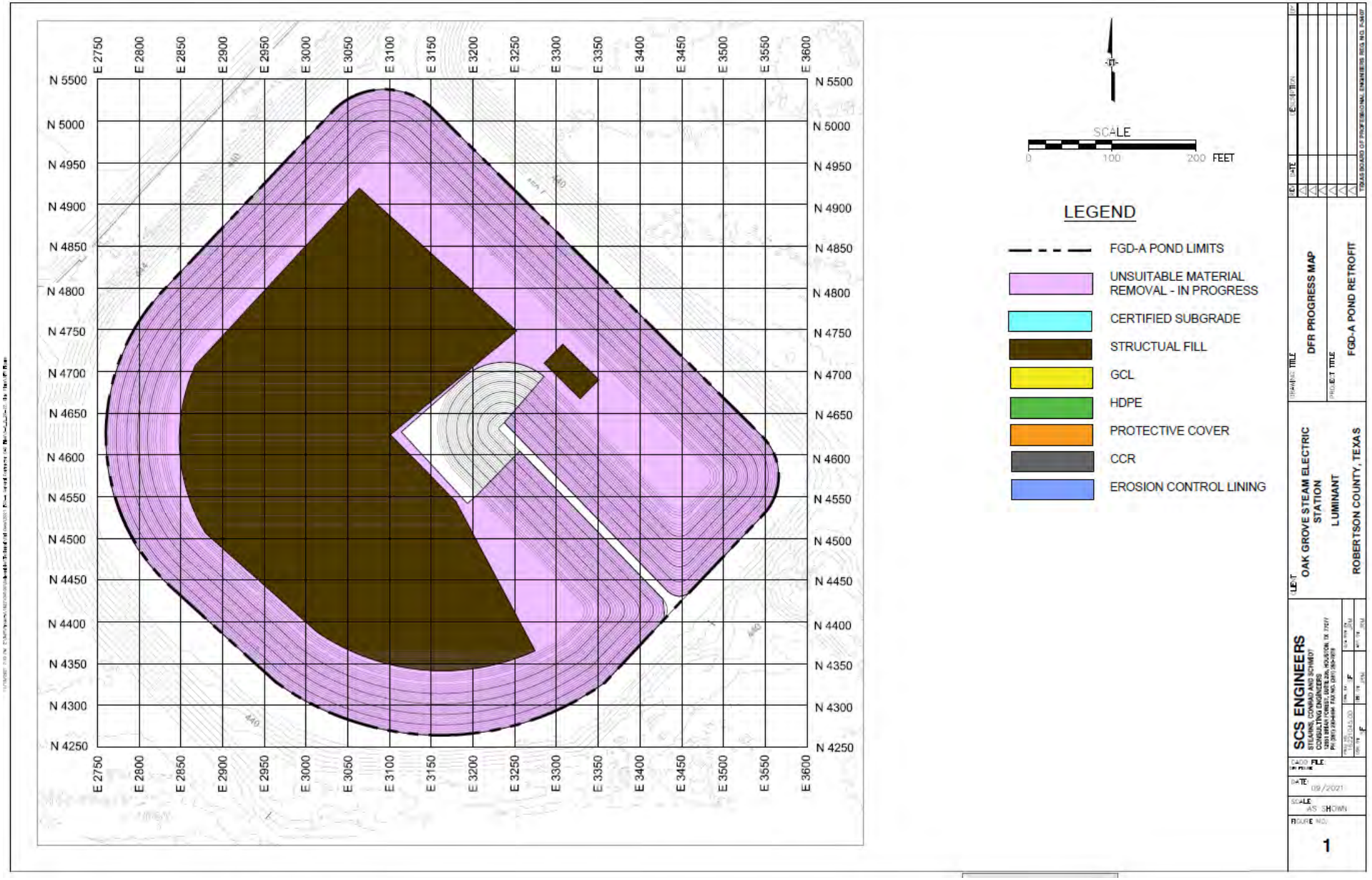
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/16/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/16/2021 |

**Photo 1** – Placement and grading of structural fill across western pond floor

**Photo 2** – CAT D6 bulldozer placing structural fill on northern pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 17**<br>**Date: 11/16/2021** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/17/2021** | **Report No.**: 18 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 51°, clear, high winds approx. 20 mph<br>PM: 82°, clear, high winds approx. 20 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Melvin Mejia | Luminant Project Manager |
| Sam Franco | CQA Project Manager |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | MSI used to haul structural fill |
| Volvo Haul Truck | 2 | A40G | MSI used to haul structural fill |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used to spread structural fill in over excavated areas |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (0)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 3<br>• MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.<br><br>**Construction Activities:**<br>• MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.<br>• MSI haul trucks placed structural fill on FGD-A Pond western floor and sideslope and used CAT D6 bulldozer to spread material. (See Photo 1)<br>• MSI began constructing the peninsula ramp with structural fill. (See Photo 2)<br>• MSI continued to use CAT sheeps foot roller to compact material. (See Photo 3)<br>• 13 density tests were taken on the structural fill. (See Photo 4)<br>• See Progress Map on page 5 for approximate areas where structural fill has been placed.<br><br>**Surveying Activities:**<br>• No surveying activities. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/17/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/17/2021 |

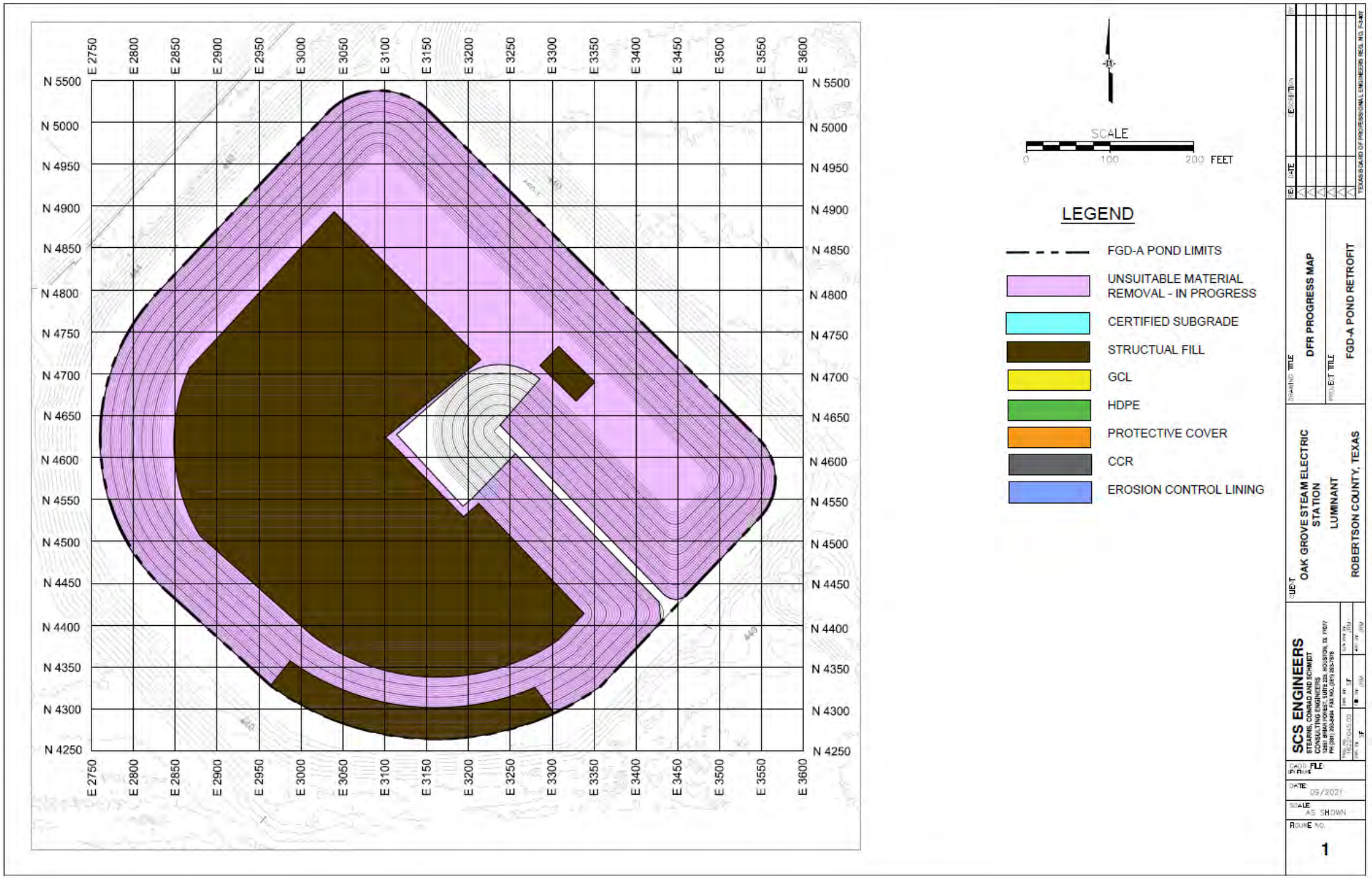
**Photo 1** – Placement of structural fill on western slope

**Photo 2** – Beginning of construction for peninsula ramp

**Photo 3** – Compaction of structural fill

**Photo 4** – Structural fill density test

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 18**<br>**Date: 11/17/2021** |

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/18/2021** | **Report No.**: 19 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 37°, partly cloudy, medium winds approx. 10 mph<br>PM: 63°, partly cloudy, medium winds approx. 10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | MSI used 1 to haul structural fill |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used 1 GPS bulldozer to spread structural fill in over excavated areas |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill |
| | | | |
| | | | |
| | | | |

| | | | |
|---|---|---|---|
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 4
- MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.
- MSI haul trucks placed structural fill on FGD-A Pond northern and western floor and used CAT D6 bulldozer to spread material. (See Photos 1 and 2)
- MSI continued to construct the peninsula ramp with structural fill. (See Photo 3)
- MSI continued to use CAT sheeps foot roller to compact material.
- 16 density tests were taken on the structural fill.
- See Progress Map on page 5 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- No surveying activities.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

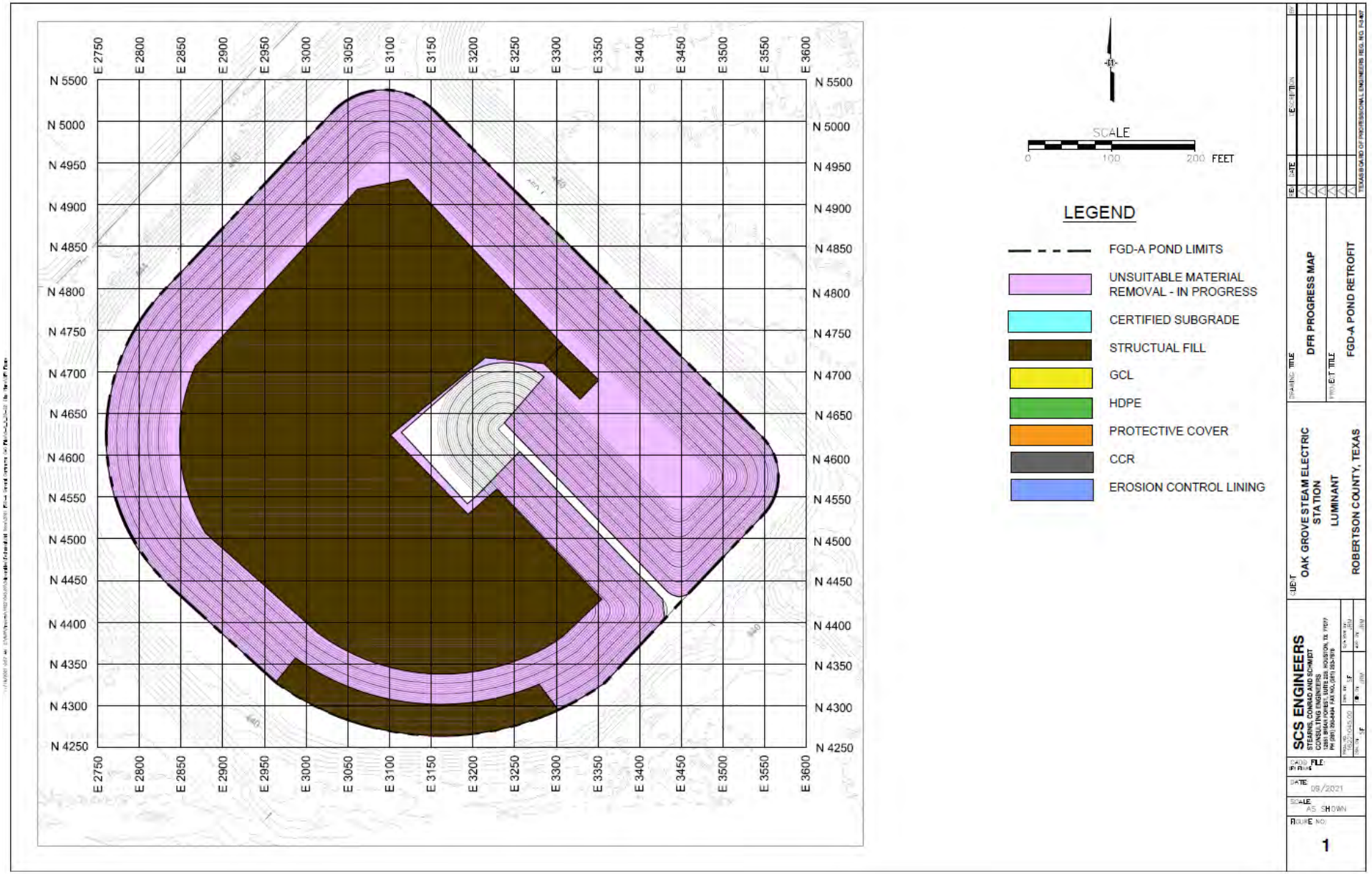
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/18/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/18/2021 |

**Photo 1** – Placement of structural fill on western pond floor

**Photo 2** – CAT D6 grading structural fill on northern pond floor

**Photo 3** – Construction of the peninsula ramp

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 19** |
| | | **Date: 11/18/2021** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/19/2021** | **Report No.**: 20 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 45°, clear, light winds approx. 5 mph<br>PM: 65°, clear, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | MSI used to haul structural fill |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used 1 GPS bulldozer to spread structural fill in over excavated areas |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (0)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 4<br>• MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.<br><br>**Construction Activities:**<br>• MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.<br>• MSI haul trucks placed structural fill on FGD-A Pond western floor and used CAT D6 bulldozer to spread material.<br>• MSI continued to construct the peninsula ramp with structural fill. (See Photo 1)<br>• MSI continued to use CAT sheeps foot roller to compact material. (See Photo 2)<br>• 10 passing density tests were taken on the structural fill.<br>• See Progress Map on page 4 for approximate areas where structural fill has been placed.<br><br>**Surveying Activities:**<br>• No surveying activities. |

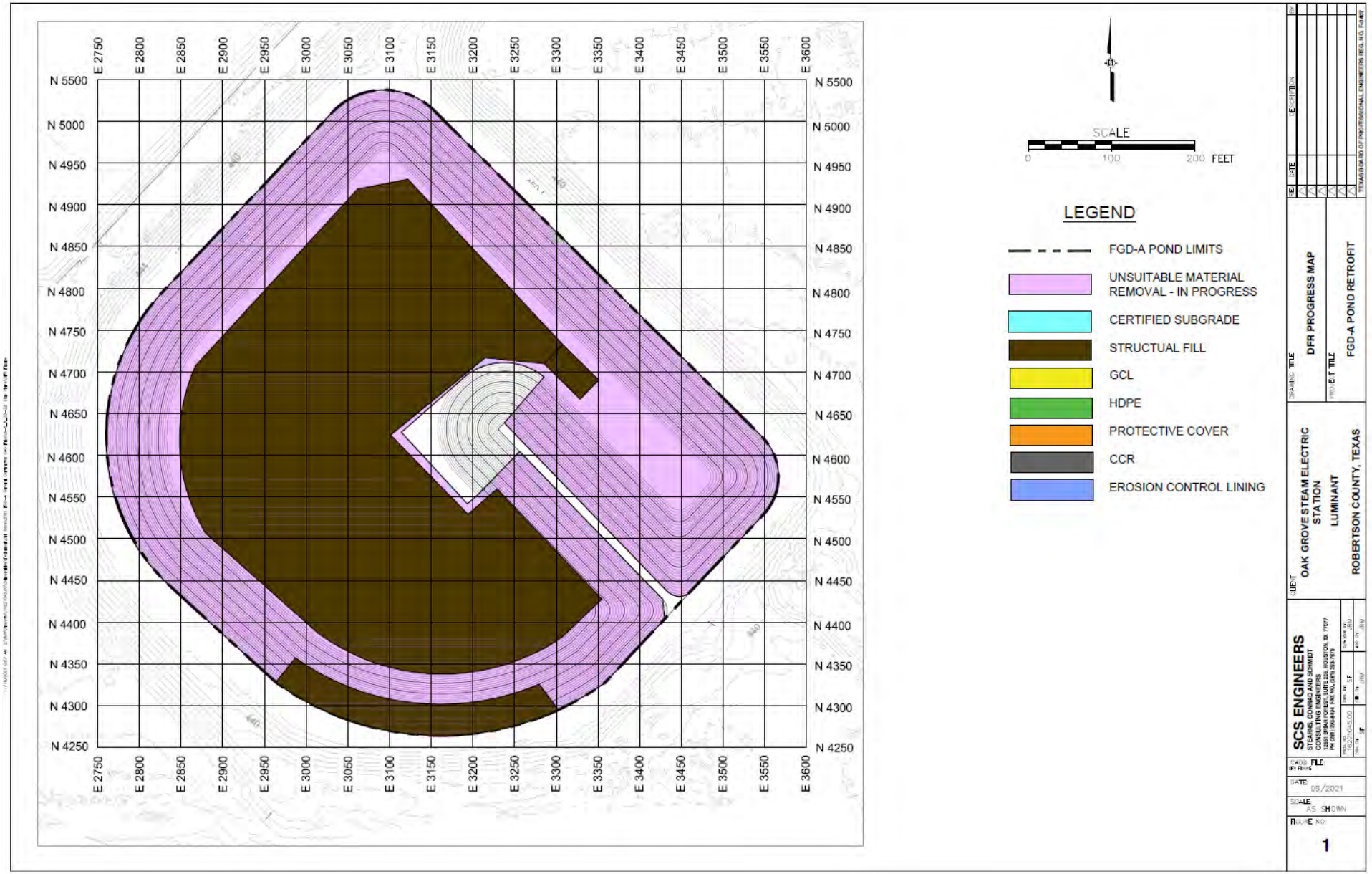
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/19/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/19/2021 |

**Photo 1** – Compaction and grading on peninsula ramp

**Photo 2** – Compaction of structural fill on western pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 20** |
| | | **Date: 11/19/2021** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/20/2021** | **Report No.**: 21 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 42°, cloudy, light winds approx. 5 mph<br>PM: 69°, cloudy, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | MSI used to haul structural fill |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used 1 GPS bulldozer to spread structural fill in over excavated areas |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| CAT Sheeps Foot Roller | 1 | CP56 | Used to compact structural fill.<br>Demobilized toady at 1100. |
| Volvo Sheeps Foot Roller | 1 | SD115B | Mobilized today at 1100. Used to compact structural fill on side slopes. |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 4
- MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.
- MSI haul trucks placed structural fill on FGD-A Pond northern and western floor and used CAT D6 bulldozer to spread material. (See Photo 1)
- MSI continued to construct the peninsula ramp with structural fill. (See Photo 2)
- MSI continued to use CAT sheeps foot roller to compact material.
- 18 passing density tests were taken on the structural fill.
- See Progress Map on page 4 for approximate areas where structural fill has been placed.
- A Volvo Sheeps Foot Compactor was mobilized on site today at 1100. Due to the grade of the side slopes, the CAT compactor was not able to travel up the slopes.
- CAT compactor was demobilized from site at 1100.

**Surveying Activities:**

- No surveying activities.

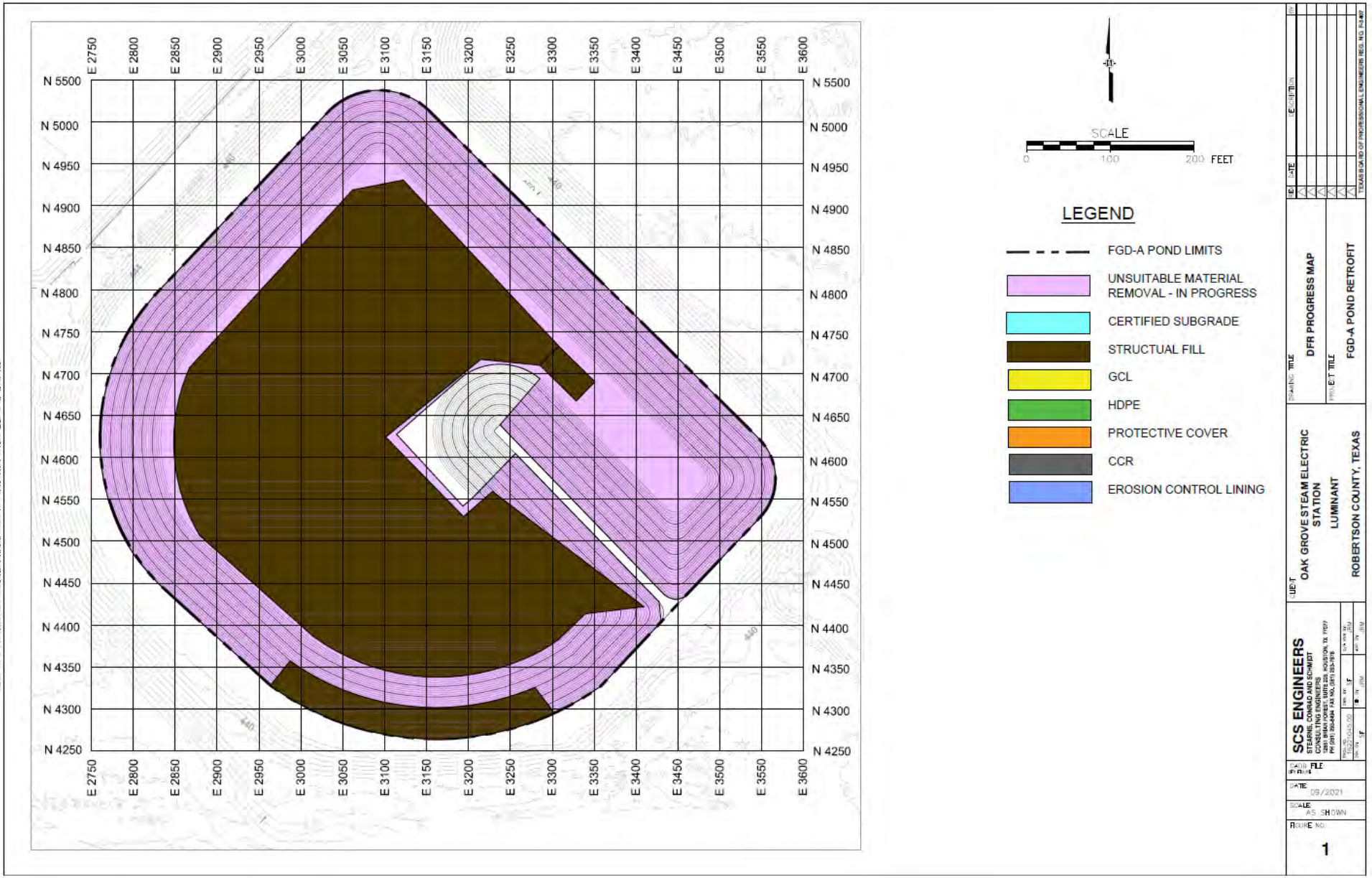
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/20/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/20/2021 |

**Photo 1** – Placement and grading of structural fill on the northern and western pond floor

**Photo 2** – Grading and hydration of structural fill on the peninsula ramp

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 21**<br>**Date: 11/20/2021** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/21/2021** | **Report No.**: 22 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 46°, cloudy, light winds approx. 5 mph<br>PM: 73°, cloudy, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | MSI used to haul structural fill |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill from borrow area |
| CAT Bulldozer | 2 | D6 | MSI used 1 GPS bulldozer to spread structural fill in over excavated areas |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill. |
| | | | |
| | | | |
| | | | |
| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 2
- MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.
- MSI haul trucks placed structural fill on FGD-A Pond northern and western floor. (See Photos 1 and 2)
- MSI placed structural fill on the northern and southern side slope, west of the peninsula.
- MSI used the CAT D6 bulldozer to spread material.
- MSI completed the construction of the peninsula ramp with structural fill. (See Photo 3)
- MSI began fine grading the peninsula ramp. (See Photo 4)
- MSI continued to use CAT sheeps foot roller to compact material.
- 16 passing density tests were taken on the structural fill.
- See Progress Map on page 5 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- No surveying activities.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | *Danny Rennicks* | 11/20/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/20/2021 |

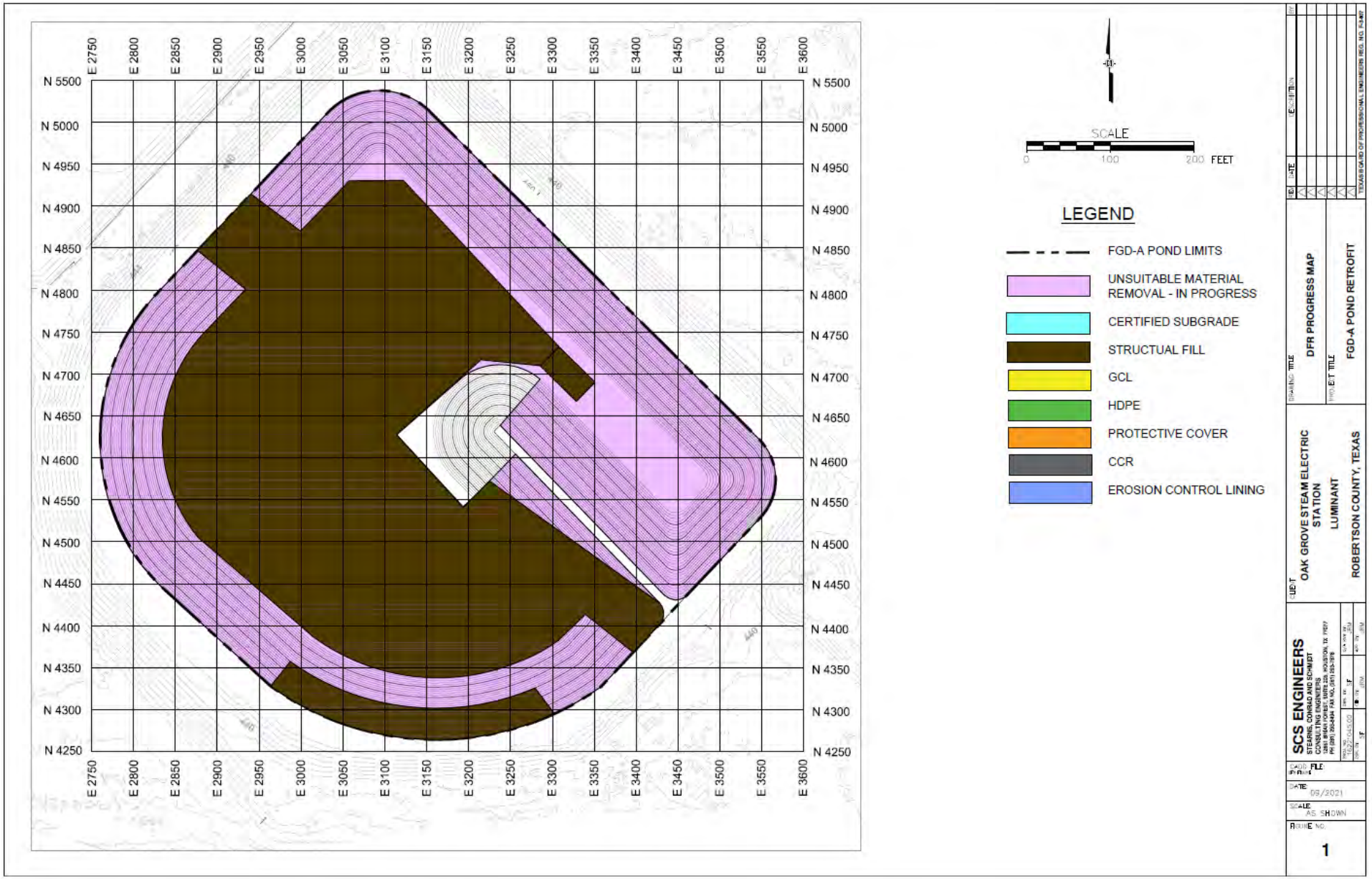
**Photo 1** – Placement and grading of structural fill on the northern pond floor

**Photo 2** – Grading of structural fill on the southern side slope, west of the peninsula

**Photo 3** – Constructed peninsula ramp

**Photo 4** – Fine grading of the peninsula ramp

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 22** |
| | | **Date: 11/21/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/22/2021** | **Report No.**: 23 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 39°, clear, medium winds approx. 10 mph<br>PM: 68°, clear, medium winds approx. 10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | MSI used to haul unsuitable material from peninsula ramp excavation |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to excavate existing peninsula ramp |
| CAT Bulldozer | 1 | D6 | MSI used 1 GPS bulldozer to spread structural fill and remove existing peninsula ramp |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill. |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (0)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 3
- MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.
- MSI placed structural fill on the northern side slope and western pond floor.
- MSI used the CAT D6 bulldozer to spread material. (See Photo 1)
- MSI used the Volvo trackhoe and CAT D6 bulldozer to excavate the existing peninsula ramp. (See Photos 2 and 3)
- Volvo haul trucks were used to haul unsuitable material into the landfill.
- MSI continued to use CAT sheeps foot roller to compact material.
- Placement and compaction of structural fill is estimated to be complete by December 1, 2021.
- 6 passing density tests were taken on the structural fill.
- See Progress Map on page 4 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- No surveying activities.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

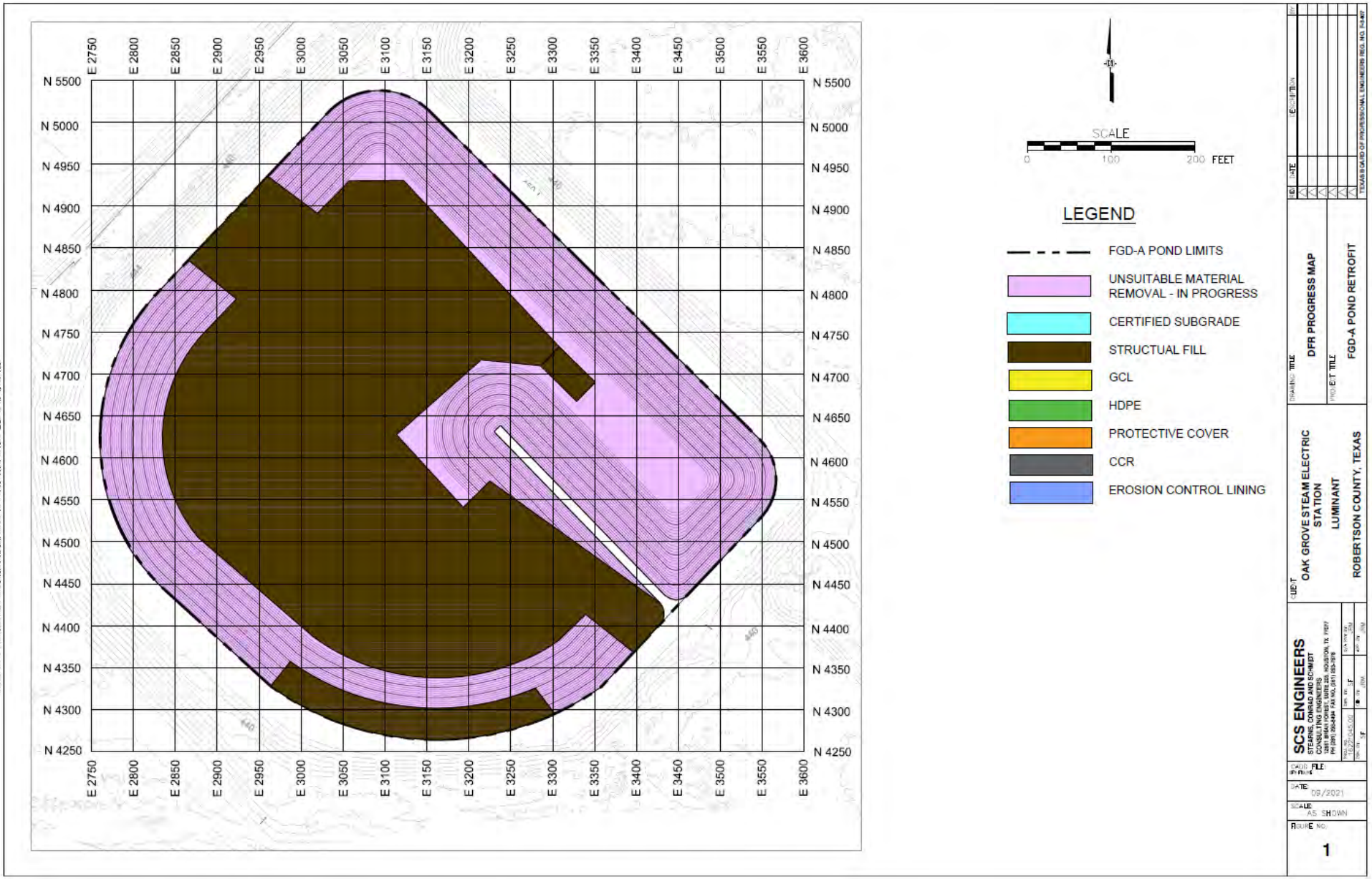
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/22/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/22/2021 |

**Photo 1** – Grading of structural fill on the northern slope

**Photo 2** – Excavation of peninsula ramp

**Photo 3** – Excavation of peninsula ramp and loading haul trucks

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 23**<br>**Date: 11/22/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/23/2021** | **Report No.**: 24 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 55°, clear, medium winds approx. 10 mph<br>PM: 70°, clear, medium winds approx. 10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | MSI used to haul structural fill and unsuitable material from peninsula ramp excavation |
| Volvo Trackhoe | 1 | EC350E | MSI used trackhoe to load structural fill and excavate existing peninsula ramp |
| CAT Bulldozer | 1 | D6 | MSI used 1 GPS bulldozer to spread structural fill and remove existing peninsula ramp |
| Water Truck | 1 | 4,000 Gal | MSI used for dust control and hydrate structural fill |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill. |
| Hitachi Trackhoe | 1 | 350 LG | Mobilized to site today, not used |
| | | | |
| | | | |
| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 1 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- At approximately 1:00 PM an accident involving the Volvo trackhoe occurred causing the trackhoe to turn on its side.
    1. Oak Grove Control Room was promptly notified.
    2. MSI and Luminant safety personnel arrived on site to conduct an on going investigation.

**Water Management**

- Daily load count for the water truck (4,000 gal): 3
- MSI used 4,000 gal water truck for dust control around FGD-A Pond and to hydrate structural fill.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.
- MSI placed structural fill on the western side slope of the pond.
- MSI used the CAT D6 bulldozer to spread material.
- MSI used the Volvo trackhoe and CAT D6 bulldozer to excavate the existing peninsula ramp.
- Existing peninsula ramp was completely excavated. (See Photos 1 and 2)
- Volvo haul trucks were used to haul unsuitable material into the landfill.
- MSI continued to use CAT sheeps foot roller to compact material.
- Placement and compaction of structural fill is estimated to be complete by December 1, 2021.
- 2 passing density tests were taken on the structural fill.
- See Progress Map on page 4 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- No surveying activities.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

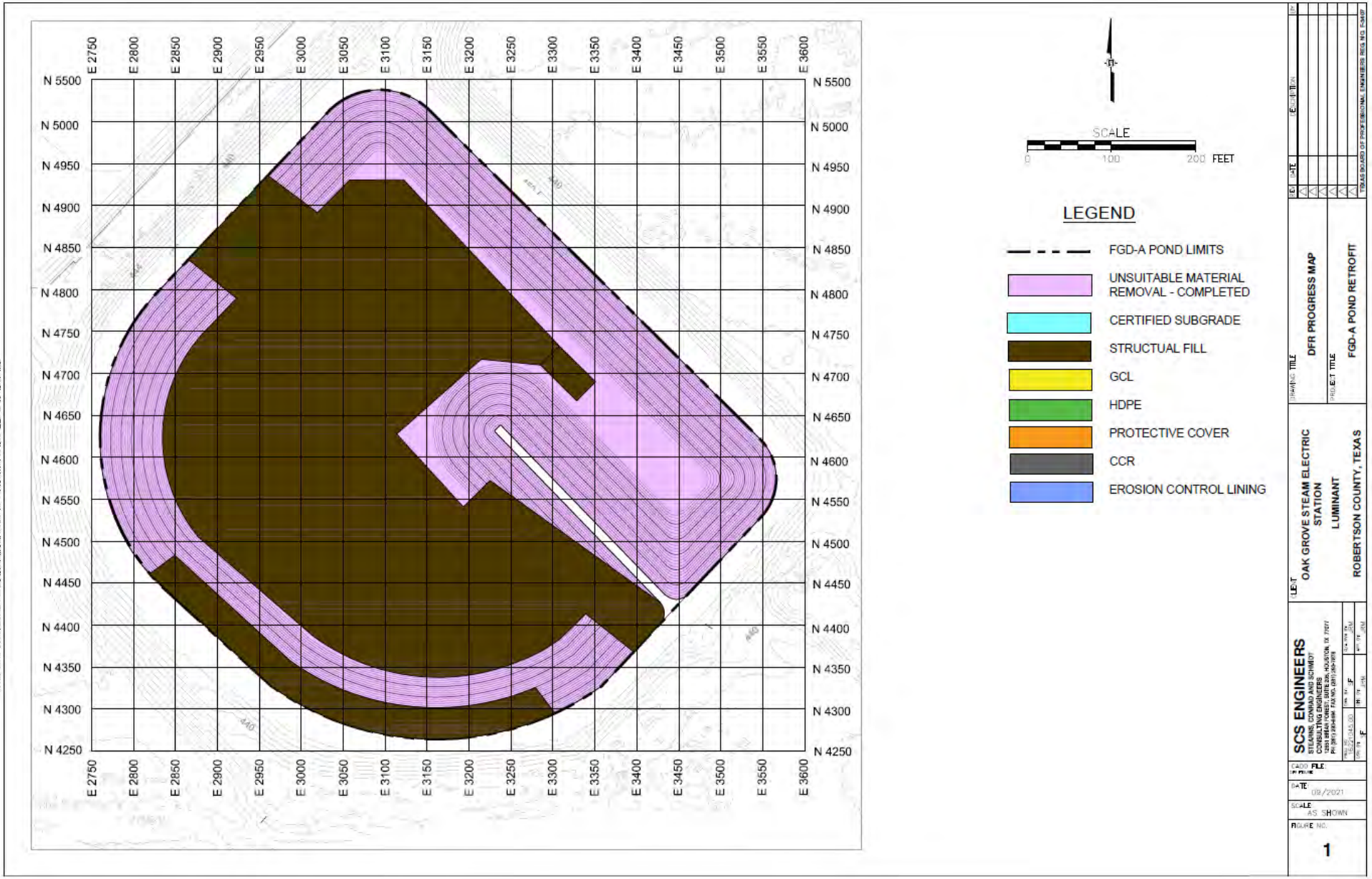
## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | *Danny Rennicks* | 11/23/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/23/2021 |

**Photo 1** – Excavation of peninsula ramp

**Photo 2** – Excavation of peninsula ramp

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 24** |
| | | **Date: 11/23/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/24/2021** | **Report No.**: 25 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 58°, cloudy, light winds approx. 5 mph<br>PM: 77°, cloudy, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1400 | 8 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Jeremy Davis | CQA Surveyor |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Volvo Trackhoe | 1 | EC350E | Not used today |
| CAT Bulldozer | 1 | D6 | MSI used to fine grade side slopes and floor |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Hitachi Trackhoe | 1 | 350 LG | Not used today |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- 4,000 gal water truck was not used today.

**Construction Activities:**

- Two truck of GCL were brought on site today.
- MSI unloaded the GCL rolls onto the geosynthetic storage pad. (See Photo 1)
- All GCL rolls have been covered with a plastic tarp to protect from rain.
- MSI used the CAT D6 bulldozer to fine grade pond side slopes and floor.

**Surveying Activities:**

- Jeremy Davis was on site to survey subgrade after the removal of the existing peninsula ramp.

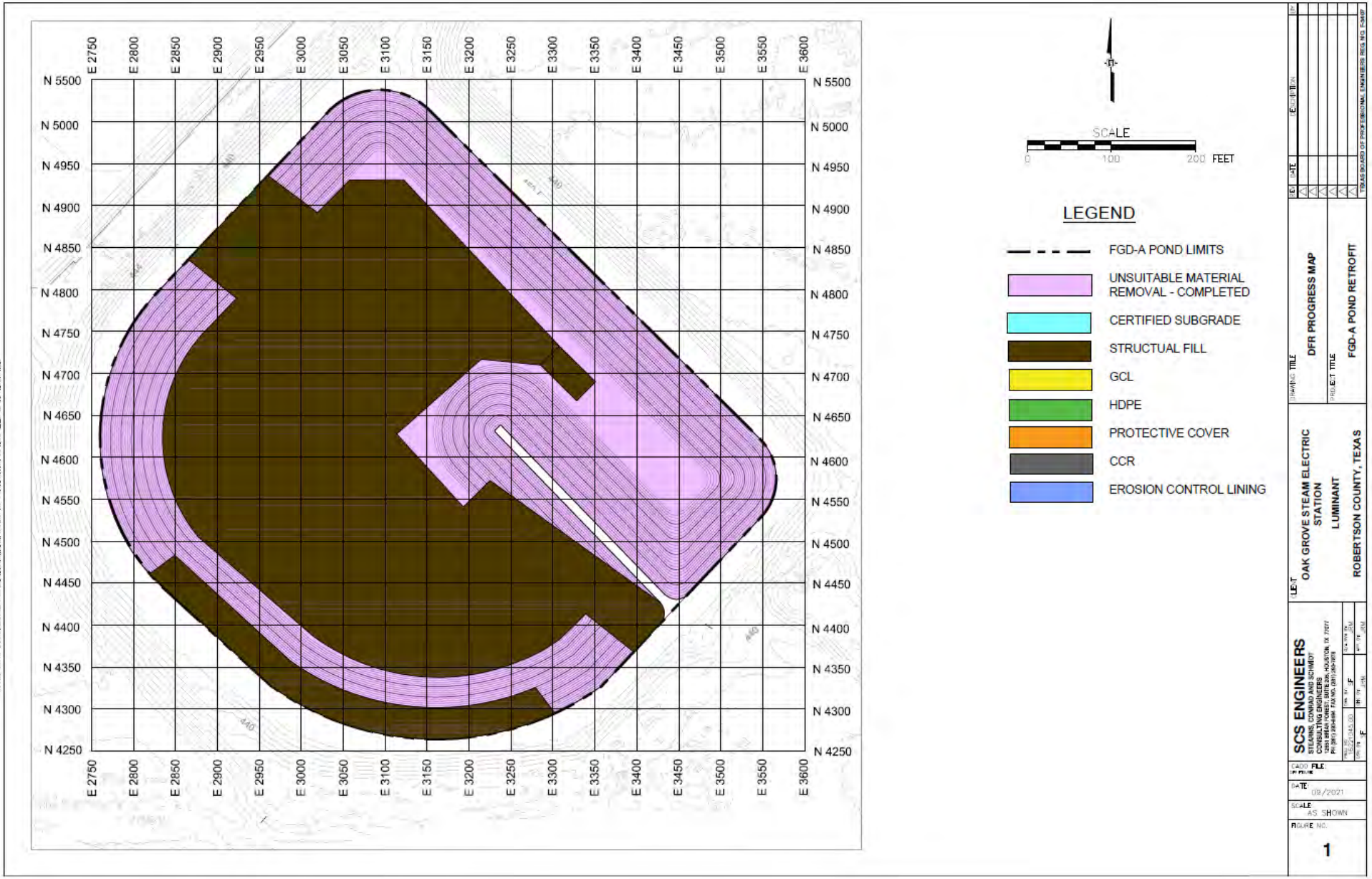
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| CETCO GCL | 22 rolls | No damage to any GCL rolls |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/24/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/24/2021 |

**Photo 1** – Unloading of GCL rolls

**Photo 2** – Western pond floor and side slopes

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 25**<br>**Date: 11/24/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/29/2021** | **Report No.**: 26 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 46°, cloudy, light winds approx. 5 mph | **Rain Gauge Reading: 1.5"** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 0700 | 1 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

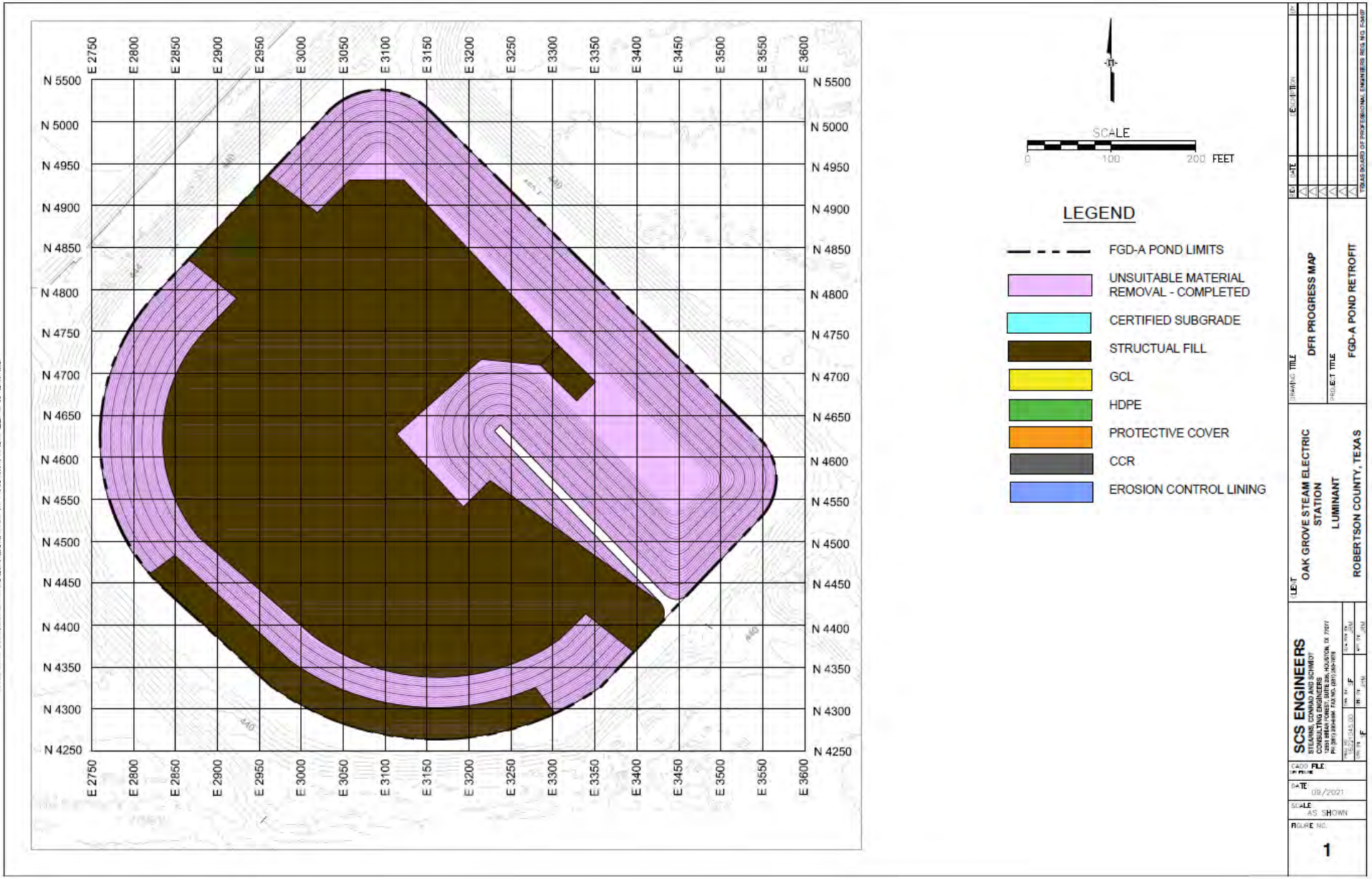
## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Volvo Trackhoe | 1 | EC350E | Not used today |
| CAT Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Hitachi Trackhoe | 1 | 350 LG | Not used today |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Construction Activities:**<br>• Oak Grove received 1.5" of rain over the weekend.<br>• No work was done, as site was too wet to work. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | Danny Rennicks | 11/29/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | Samuel Franco | 11/29/2021 |




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 26** |
| | | **Date: 11/29/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 11/30/2021** | **Report No.**: 27 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 51°, clear, light winds approx. 5 mph<br>PM: 72°, clear, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1600 | 10 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Volvo Trackhoe | 1 | EC350E | Out of service |
| CAT GPS Bulldozer | 1 | D6 | MSI used to fine grade slopes |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Hitachi Excavator | 1 | 350 LC | Demobilized from site |
| Volvo Excavator | 1 | EC 480 | Mobilized to site today; used to place pump in pond |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br>• 4,000 gal water truck was not used today.<br><br>**Construction Activities:**<br>• Pond floor was still too wet to conduct any work. (See Photo 1)<br>• MSI used the CAT D6 bulldozer to fine grade slopes.<br>• MSI used the Volvo trackhoe to place the 6" pump near the ramp in FGD-A Pond.<br>• Water in Pond A was pumped into Pond B.<br>• See Progress Map on page 4 for approximate areas where structural fill has been placed.<br>• 1 Volvo Excavator (EC 480) was mobilized to site today.<br>• 1 Hitachi Excavator (350 LC) was demobilized from site today.<br><br>**Surveying Activities:**<br>• No surveying activities. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

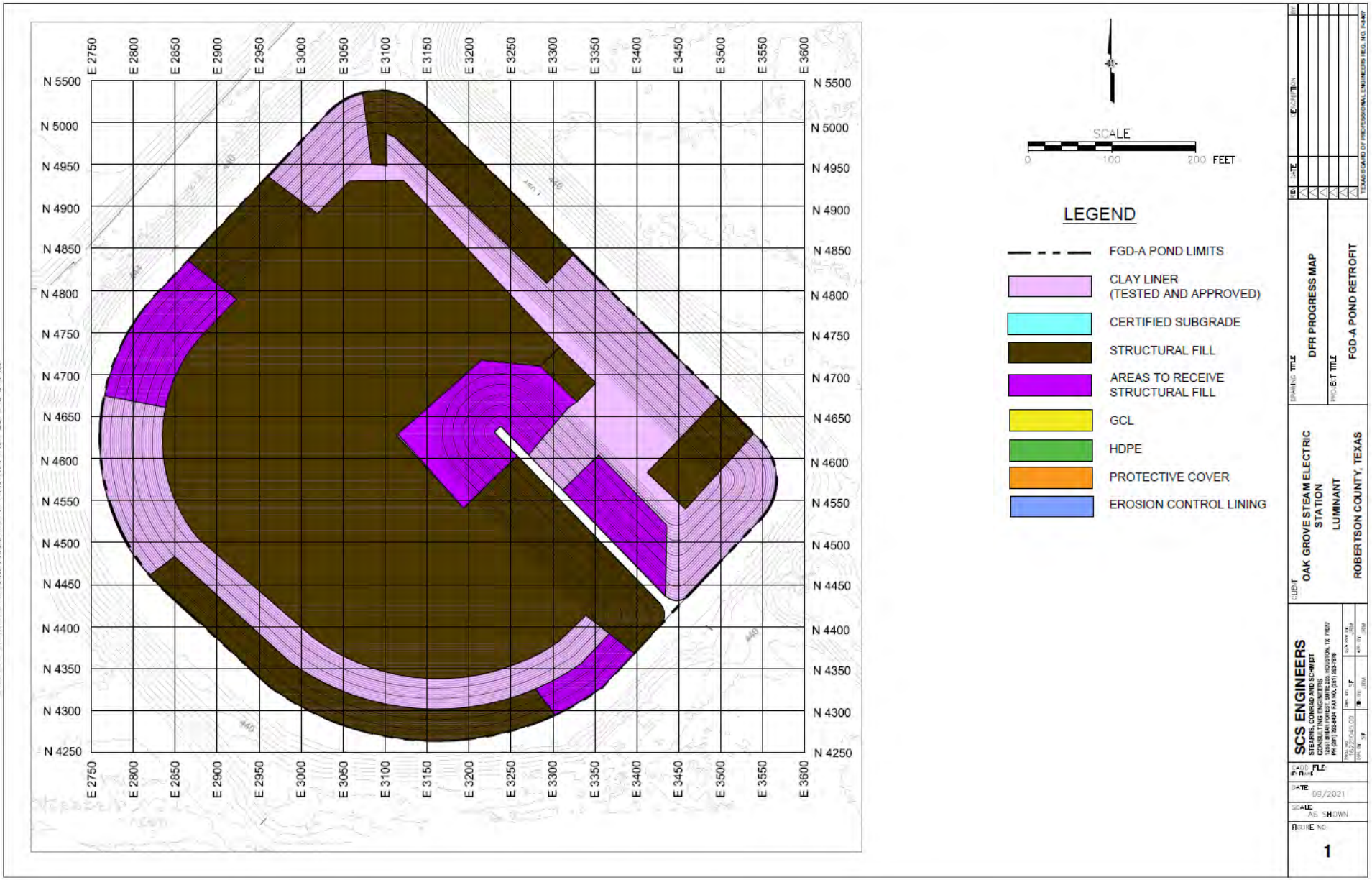
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 11/30/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 11/30/2021 |

**Photo 1** – FGD-A Pond after rain event

**Photo 2** – Fine grading eastern slope

**Photo 3** – Placing pump in FGD-A Pond

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 27** |
| | | **Date: 11/30/2021** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/01/2021** | **Report No.**: 28 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J.Roy Murray, P.E. | |
| **Weather:** AM: 47°, clear, light winds approx. 5 mph<br>PM: 75°, clear, light winds approx. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Volvo Trackhoe | 1 | EC350E | Demobilized from site today |
| CAT GPS Bulldozer | 1 | D6 | Used to excavate FGD-A/B Pond embankment |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Not used today |
| Genie Forklift | 1 | GTH 844 | Not used today |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- 4,000 gal water truck was not used today.

**Construction Activities:**

- MSI installed the silt fence between FGD-A/B Pond embankment for crossover pipeline. (See Photo 1)
- MSI used the CAD D6 bulldozer to begin excavation of the FGD-A/B Pond embankment. (See Photo 2)
- MSI demobilized the Volvo Trackhoe (EC350E) from site today.
- SCS obtained a bucket of soil to be used to backfill the FGD-A/B embankment and shipped via FedEx for preconstruction testing. Results expected by December 6, 2021.
- See map on page 4 for project progress.

**Surveying Activities:**

- No surveying activities.

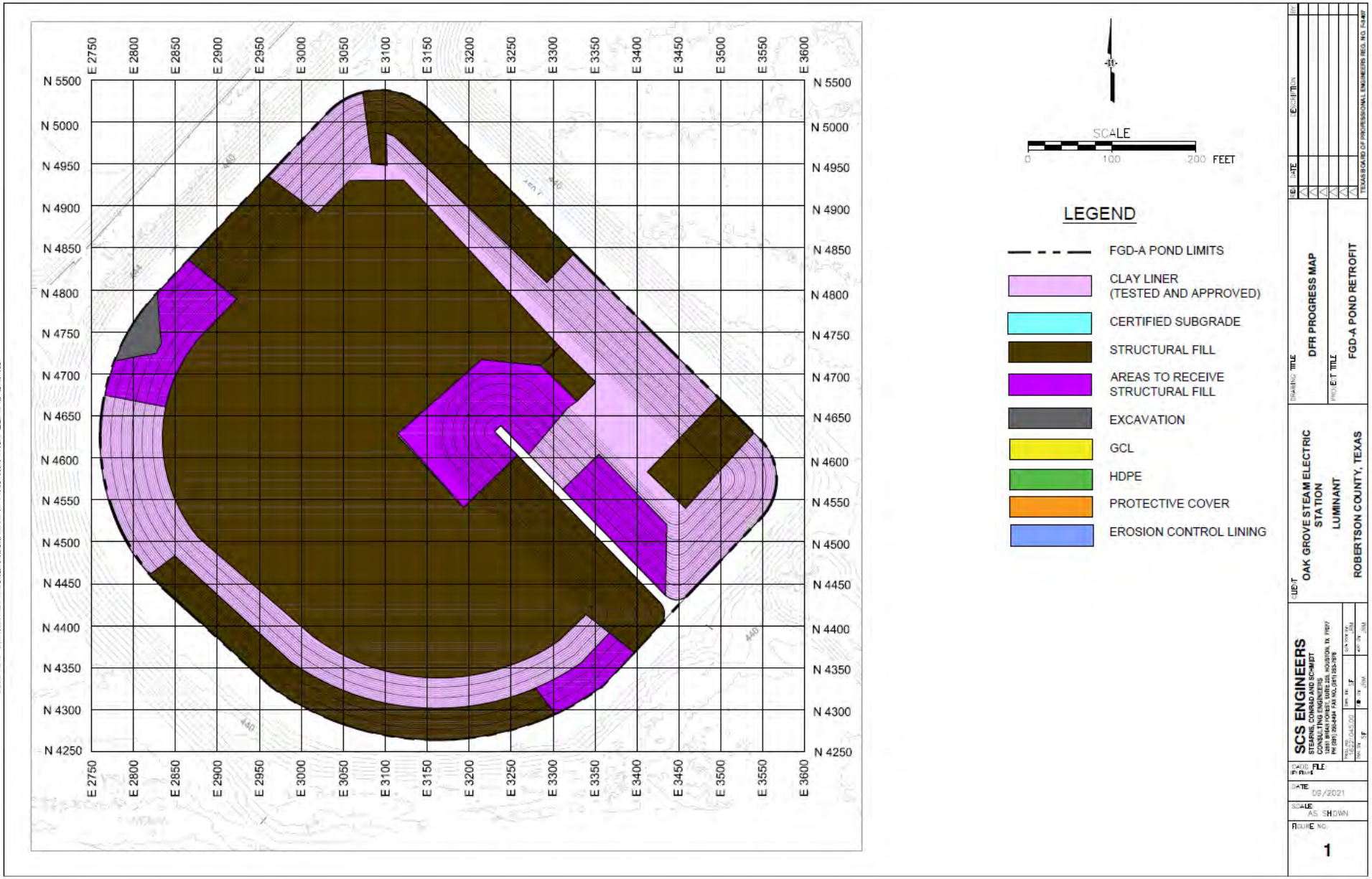
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/01/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Sam Franco, P.E. | *Samuel Franco* | 12/01/2021 |

**Photo 1** – Silt fence between FGD-A/B Ponds

**Photo 2** – Excavation of embankment for FGD-A/B crossover pipeline

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 28**<br>**Date: 12/01/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/02/2021** | **Report No.**: 37 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 61°, cloudy, light winds approx. 5 – 10 mph<br>PM: 79°, cloudy, light winds approx. 5 – 10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to process slopes and to excavate west drain pipes (A & B) |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used for compacting peninsula |
| Volvo Excavator | 1 | EC 480 | Used to excavate west drain pipes (A & B) |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- 4,000 gal water truck was not used today.

**Construction Activities:**

- MSI use the Volvo excavator and the Cat D6 GPS dozer to excavate the west drainpipe for FGD-A pond (A & B drains).
- MSI used the CAD D6 bulldozer to process slopes in the FGD-A Pond.
- SCS continued density testing with passing results.
- MSI started excavating the peninsula.
- MSI is using the sheeps foot roller to compact the peninsula.
- See map on page 4 for project progress.

**Surveying Activities:**

- No surveying activities.

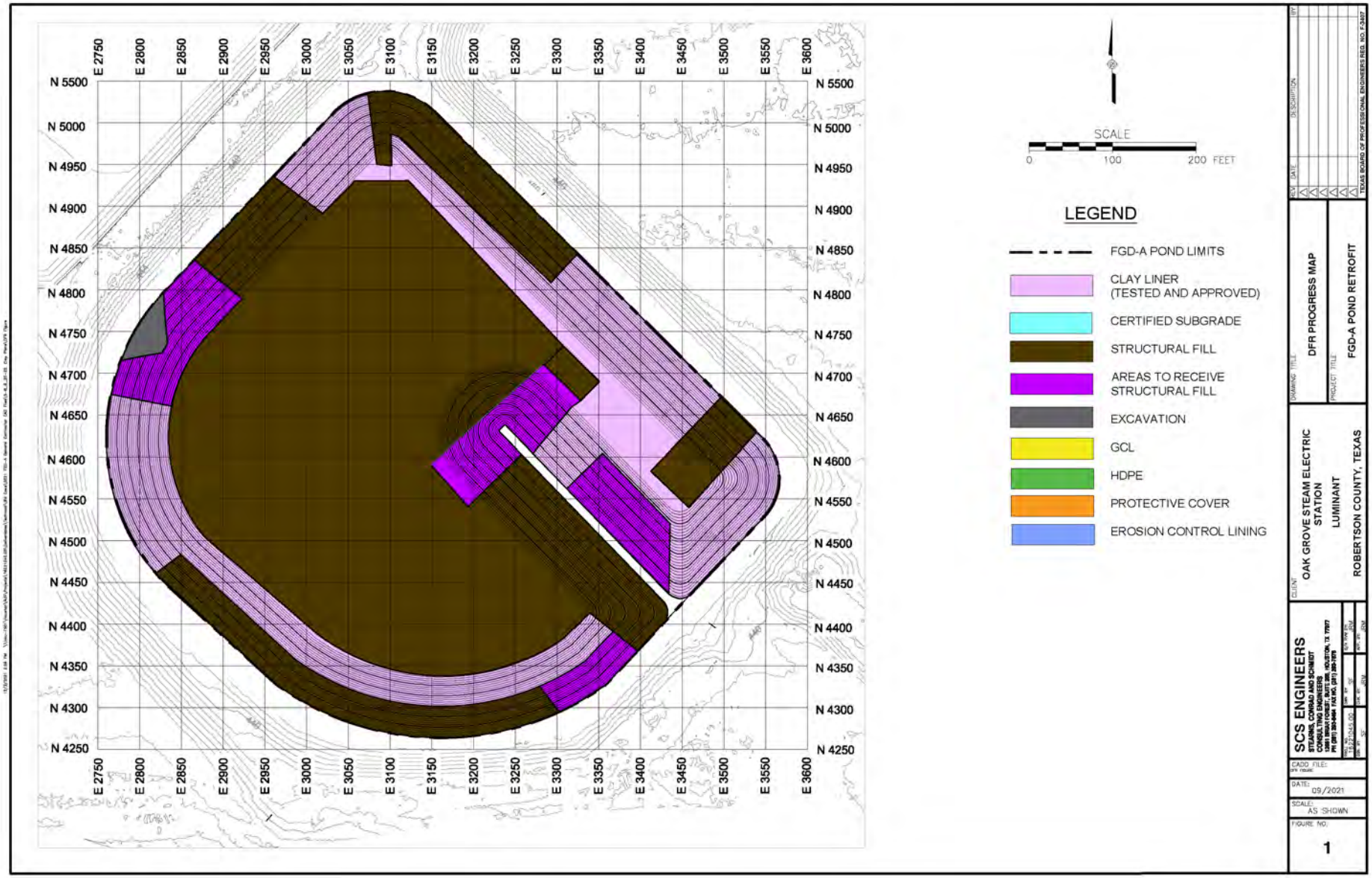
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/02/2021 |
| **Report Approved By** | **Signature** | **Date** |
| J. Roy Murray, P.E. | *J. Roy Murray* | 12/02/2021 |

**Photo 1** – Excavation of embankment for FGD-A/B crossover pipeline

**Photo 2** – Excavation and compaction of the peninsula

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 37** |
| | | **Date: 12/02/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/03/2021** | **Report No.**: 38 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 64°, cloudy, light winds approx. 10 mph<br>PM: 76°, cloudy, light winds approx. 10 – 15 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Used to haul structural fill |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to spread structural fill |
| Water Truck | 1 | 4,000 Gal | Used to hydrate structural fill |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to load structural fill in borrow area / used to excavate crossover pipe (A & B) |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 1<br><br>**Construction Activities:**<br>• MSI continued excavating the FGD-A crossover pipe with the Volvo excavator. (Issue with valve 3' lower than project point).<br>• MSI used the Volvo excavator to load 2 dump trucks with structural fill at the borrow area.<br>• Hauling structural fill to FGD-A pond.<br>• MSI is using the D6 GPS dozer to spread structural fill onto west peninsula.<br>• MSI is hydrating structural fill with the 4,000 gal water truck.<br>• MSI is compacting structural fill with the CAT sheeps foot roller.<br>• SCS continued density testing with passing results.<br>• MSI is using excess material from slopes for the peninsula.<br>• See map on page 4 for project progress.<br><br>**Surveying Activities:**<br>• No surveying activities. |

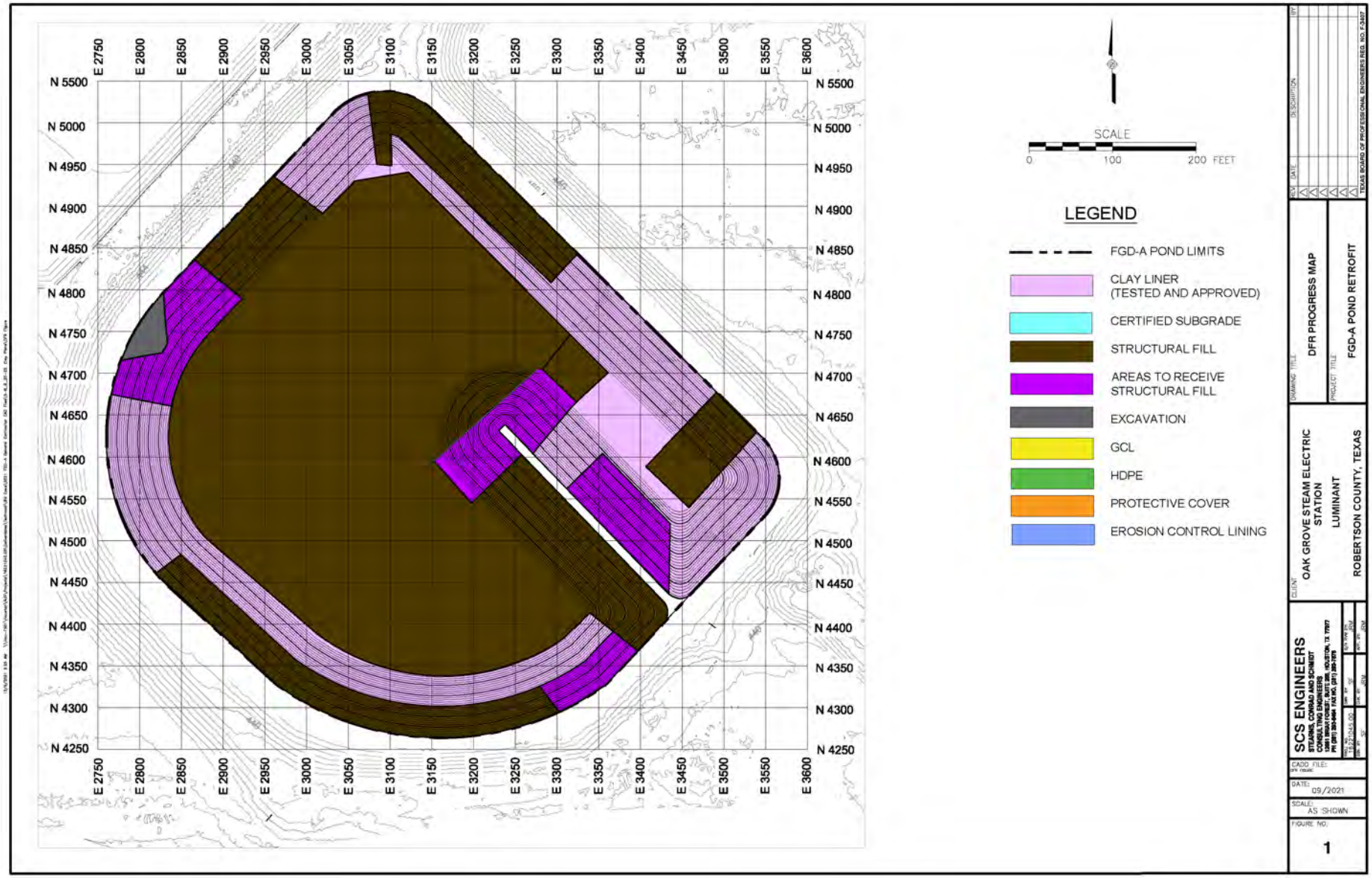
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/03/2021 |
| **Report Approved By** | **Signature** | **Date** |
| J. Roy Murray, P.E. | *J. Roy Murray* | 12/03/2021 |

**Photo 1** – Hauling, spreading and processing structural fill at the peninsula

**Photo 2** – Fine grading northeast slopes and using excess material for peninsula

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 38**<br>**Date: 12/03/2021** |

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/04/2021** | **Report No.**: 39 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 65°, cloudy, light winds approx. 5 mph<br>PM: 75°, cloudy, light winds approx. 5 – 10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Used to haul structural fill |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to spread structural fill |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to load structural fill |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- 4,000 gal water truck was not used today.

**Construction Activities:**

- MSI continued placing structural fill onto the west peninsula.
- MSI is using the Volvo excavator to load dump trucks with structural fill. Hauling material to the West Peninsula.
- MSI is spreading structural fill onto the peninsula with the D6 GPS dozer. Compacting material with the Volvo sheeps foot roller.
- SCS continued density testing with passing results.
- See map on page 4 for project progress.

**Surveying Activities:**

- No surveying activities.

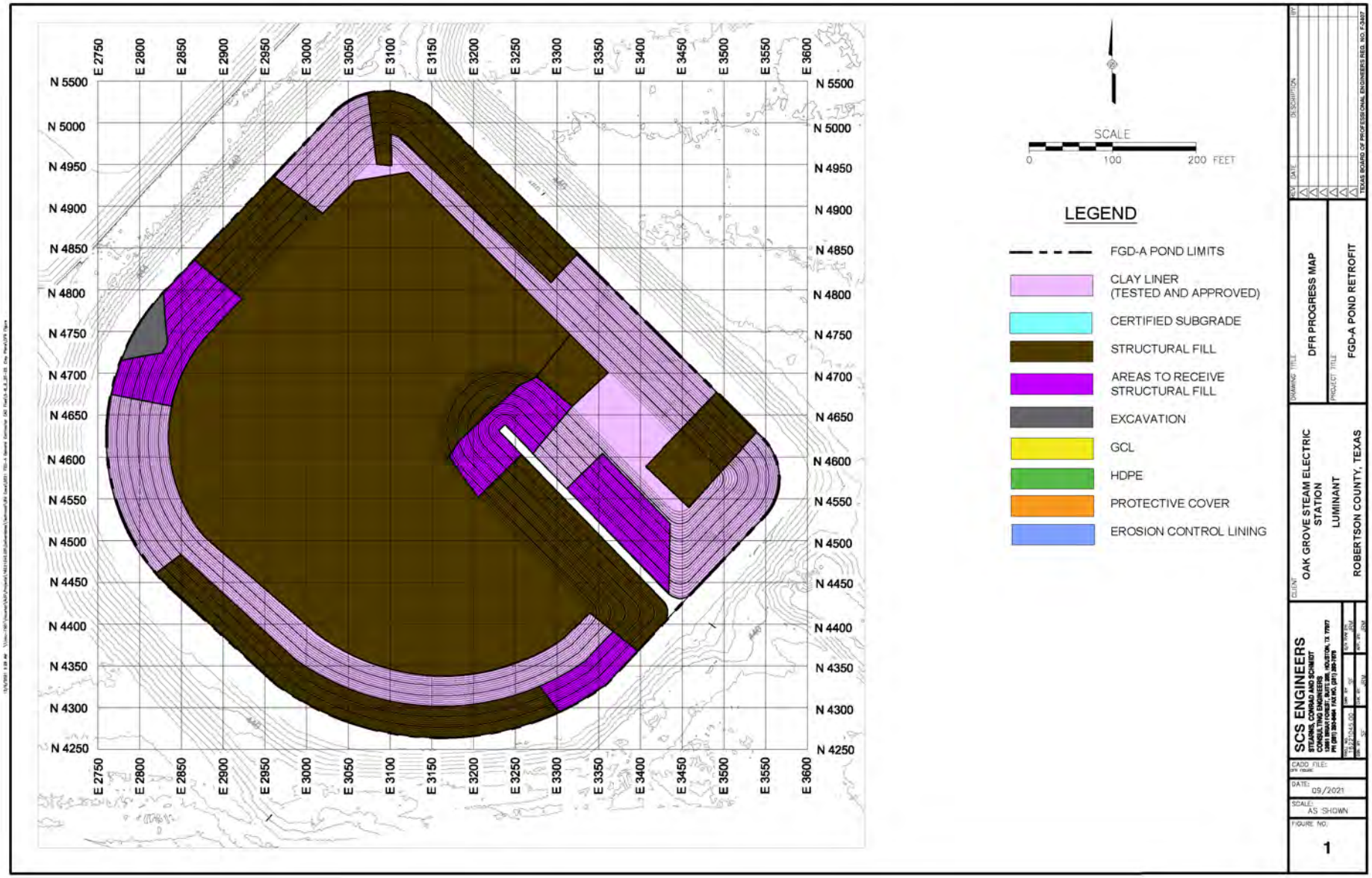
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/04/2021 |
| **Report Approved By** | **Signature** | **Date** |
| J. Roy Murray, P.E. | *J. Roy Murray* | 12/04/2021 |

**Photo 1** – Fine grading northeast slope and floors and using excess material for peninsula

**Photo 2** – Hauling, spreading and compacting structural fill at the peninsula

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 39**<br>**Date: 12/04/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/05/2021** | **Report No.**: 40 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 62°, cloudy, light winds approx. 10 mph<br>PM: 76°, cloudy, light winds approx. 10 – 15 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | One truck used to haul material inside pond area |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to press structural fill |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to process structural fill |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br>• 4,000 gal water truck was not used today.<br><br>**Construction Activities:**<br>• MSI continues placing structural fill onto the west peninsula.<br>• MSI used the Volvo excavator to process material inside the pond area. Also used excavator to load 1 dump truck inside the pond area. Hauling material to the west peninsula.<br>• MSI is using the CAT D6 GPS dozer to spread material on the west peninsula.<br>• MSI used the Volvo sheeps foot roller to compact material on the peninsula.<br>• SCS continued density testing with passing results.<br>• MSI prepped the FGD-A pond for expected rain on Monday.<br>• See map on page 4 for project progress.<br><br>**Surveying Activities:**<br>• No surveying activities. |

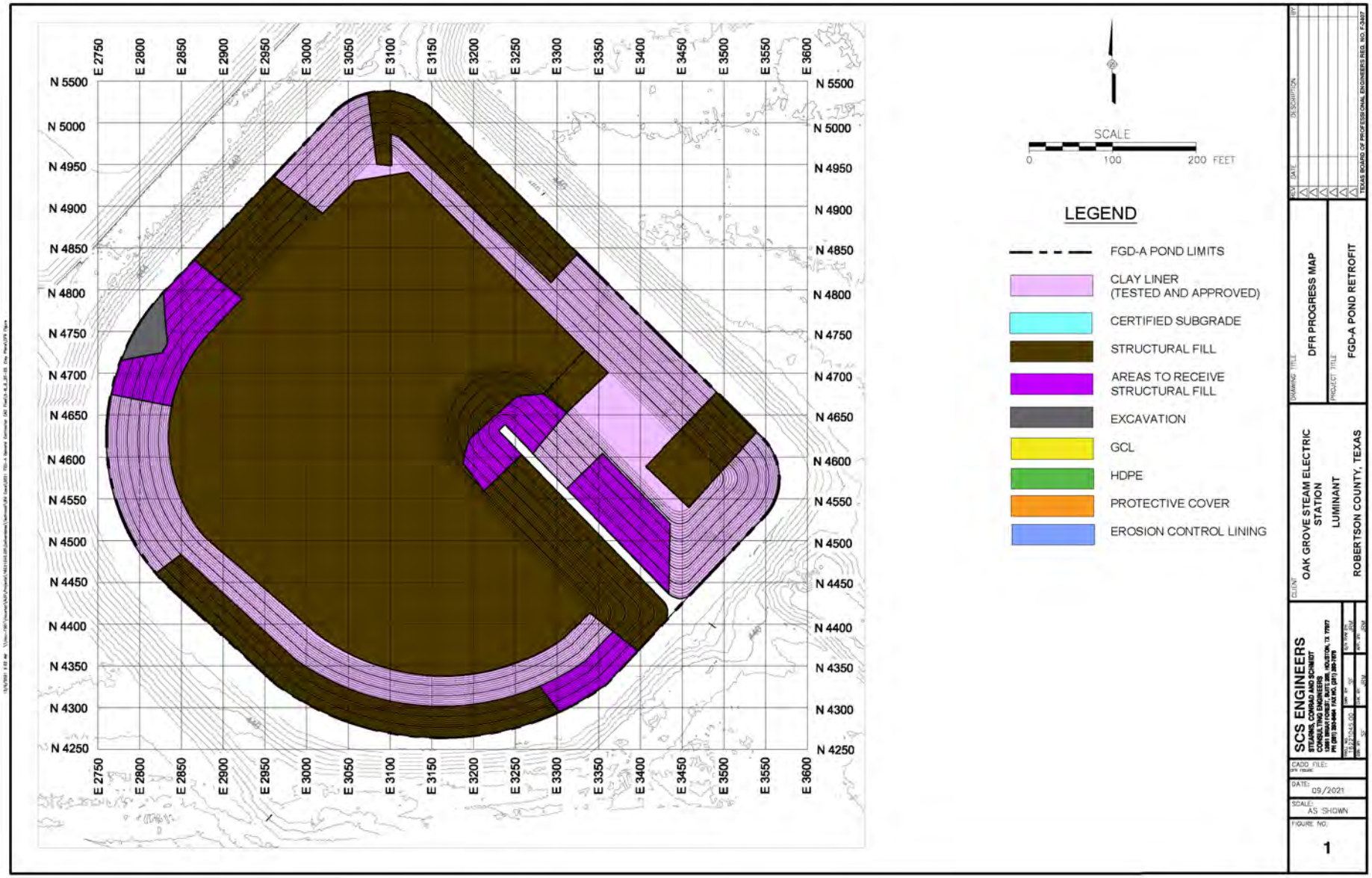
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/05/2021 |
| **Report Approved By** | **Signature** | **Date** |
| J. Roy Murray, P.E. | *J. Roy Murray* | 12/05/2021 |

**Photo 1** – Fine grading northeast slopes and floor and using excess material for peninsula

**Photo 2** – Hauling, spreading and compacting structural fill at the peninsula

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 40** |
| | | **Date: 12/05/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/06/2021** | **Report No.**: 41 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 42°, cloudy, high winds approx. 20 – 30 mph<br>PM: 72°, cloudy, high winds approx. 20 – 30 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | 1 used to haul structural fill |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to spread material in pond A |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact material on west peninsula |
| Volvo Excavator | 1 | EC 480 | Used to process material in pond A |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- 4,000 gal water truck was not used today.

**Construction Activities:**

- MSI continues placing structural fill on W Peninsula.
- MSI is using the CAT D6 GPS dozer to spread material. Also using the Volvo excavator to process material on peninsula.
- MSI is using the Volvo sheeps foot to compact material on the peninsula.
- SCS continued density testing with passing results.
- See map on page 4 for project progress.

**Surveying Activities:**

- No surveying activities.

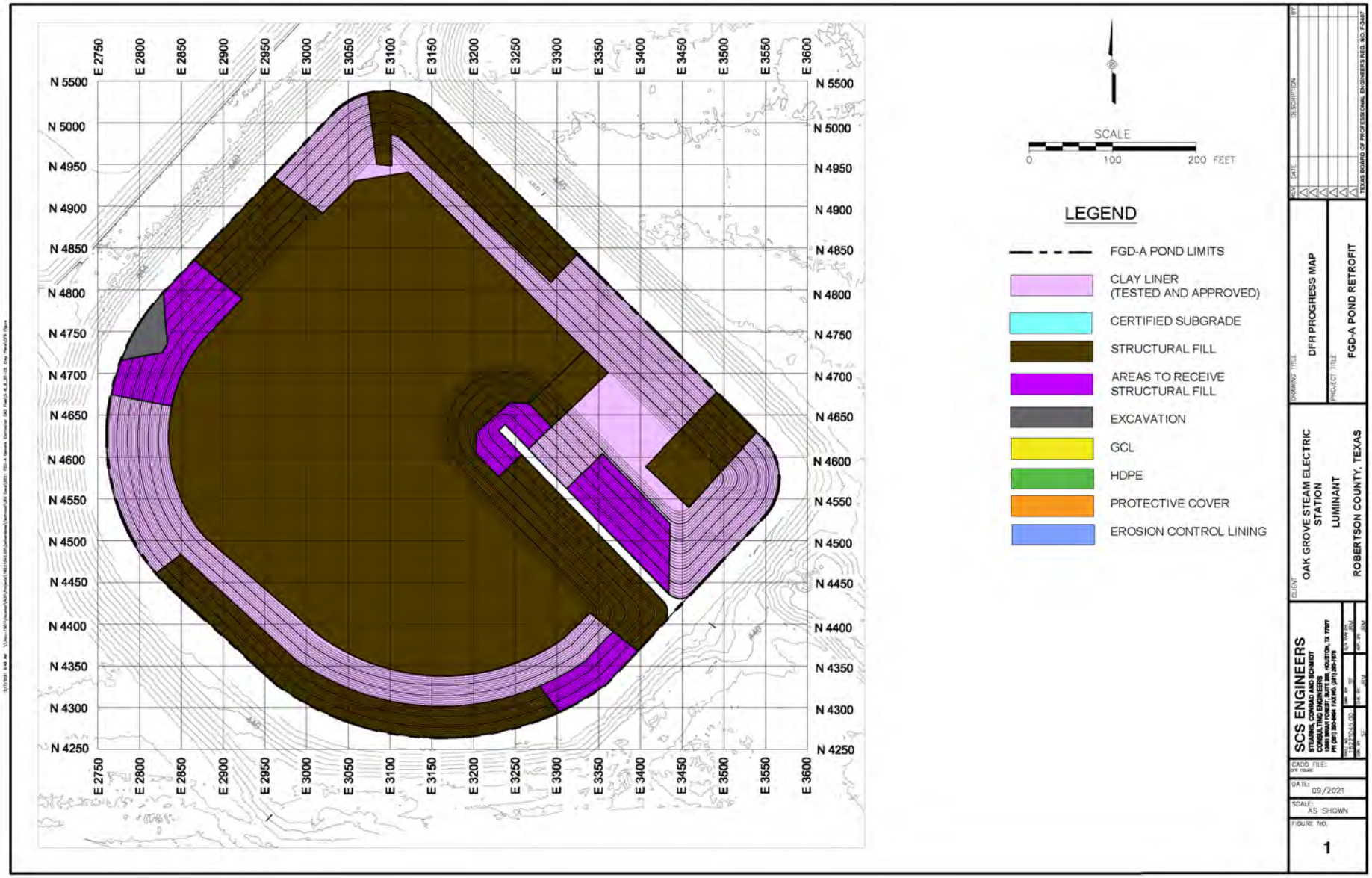
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/06/2021 |
| **Report Approved By** | **Signature** | **Date** |
| J. Roy Murray, P.E. | *J. Roy Murray* | 12/06/2021 |

**Photo 1** – Fine grading southwest slopes and floor

**Photo 2** – Hauling, spreading and compacting structural fill at the peninsula

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 41**<br>**Date: 12/06/2021** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/07/2021** | **Report No.**: 42 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 47°, cloudy, light winds<br>PM: 66°, cloudy, light winds | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Used 1 truck to haul structural fill |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to spread structural fill |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to load structural fill |
| | | | |
| | | | |
| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- 4,000 gal water truck was not used today.

**Construction Activities:**

- MSI continued placing structural fill on the west peninsula.
- MSI is using the Volvo excavator to load structural fill at the borrow area. Hauling material to the FGD-A pond.
- MSI is spreading material with the CAT D6 GPS dozer.
- MSI is using the Volvo sheeps foot to compact structural fill.
- MSI fine graded the East/South slope.
- SCS continued density testing with passing results.
- See map on page 4 for project progress.

**Surveying Activities:**

- No surveying activities.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| Torpedo Rock | 3 trucks | For cross over pipe |

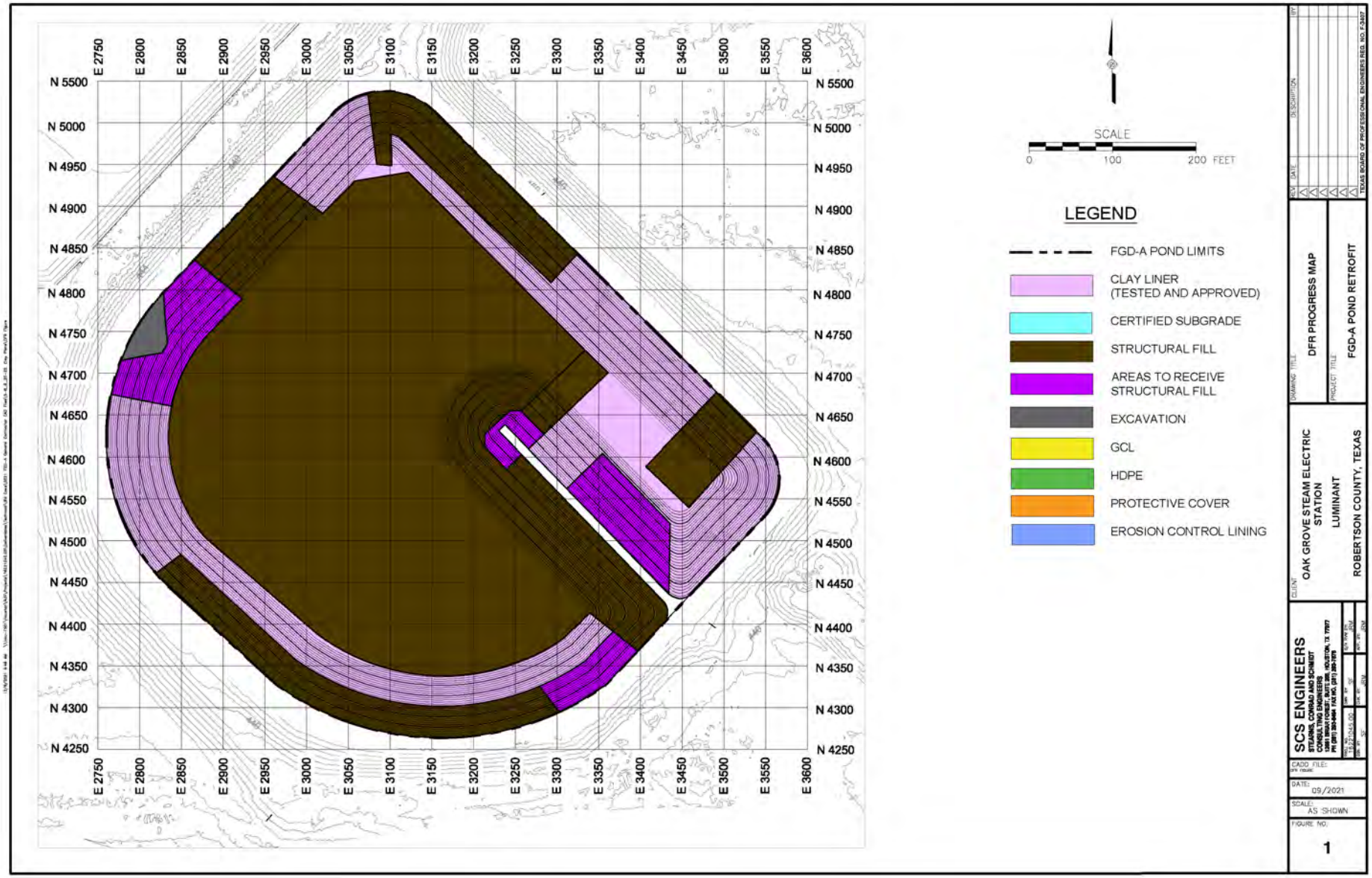
## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | *Danny Rennicks* | 12/07/2021 |
| **Report Approved By** | **Signature** | **Date** |
| J. Roy Murray, P.E. | *J. Roy Murray* | 12/07/2021 |

**Photo 1** – Grading west peninsula

**Photo 2** – Fine grading East/South slope

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 42**<br>**Date: 12/07/2021** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/08/2021** | **Report No.**: 43 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 58°, cloudy, light winds<br>PM: 72°, partly cloudy, light winds | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| JRoy Murray (SCS) | Certifying Engineer |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | 1 used to haul structural fill |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to spread structural fill |
| Water Truck | 1 | 4,000 Gal | Used to hydrate structural fill |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to load structural fill |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 2<br><br>**Construction Activities:**<br>• MSI continued placing structural fill onto the peninsula.<br>• MSI is using the Volvo excavator to load 1 dump truck with structural fill at the borrow area.<br>• MSI is using the CAT D6 to spread structural fill on the peninsula. Using the Volvo sheeps foot roller to compact material.<br>• MSI used the 4,000 gal water truck to hydrate structural fill.<br>• See map on page 4 for project progress.<br><br>**Surveying Activities:**<br>• No surveying activities. |

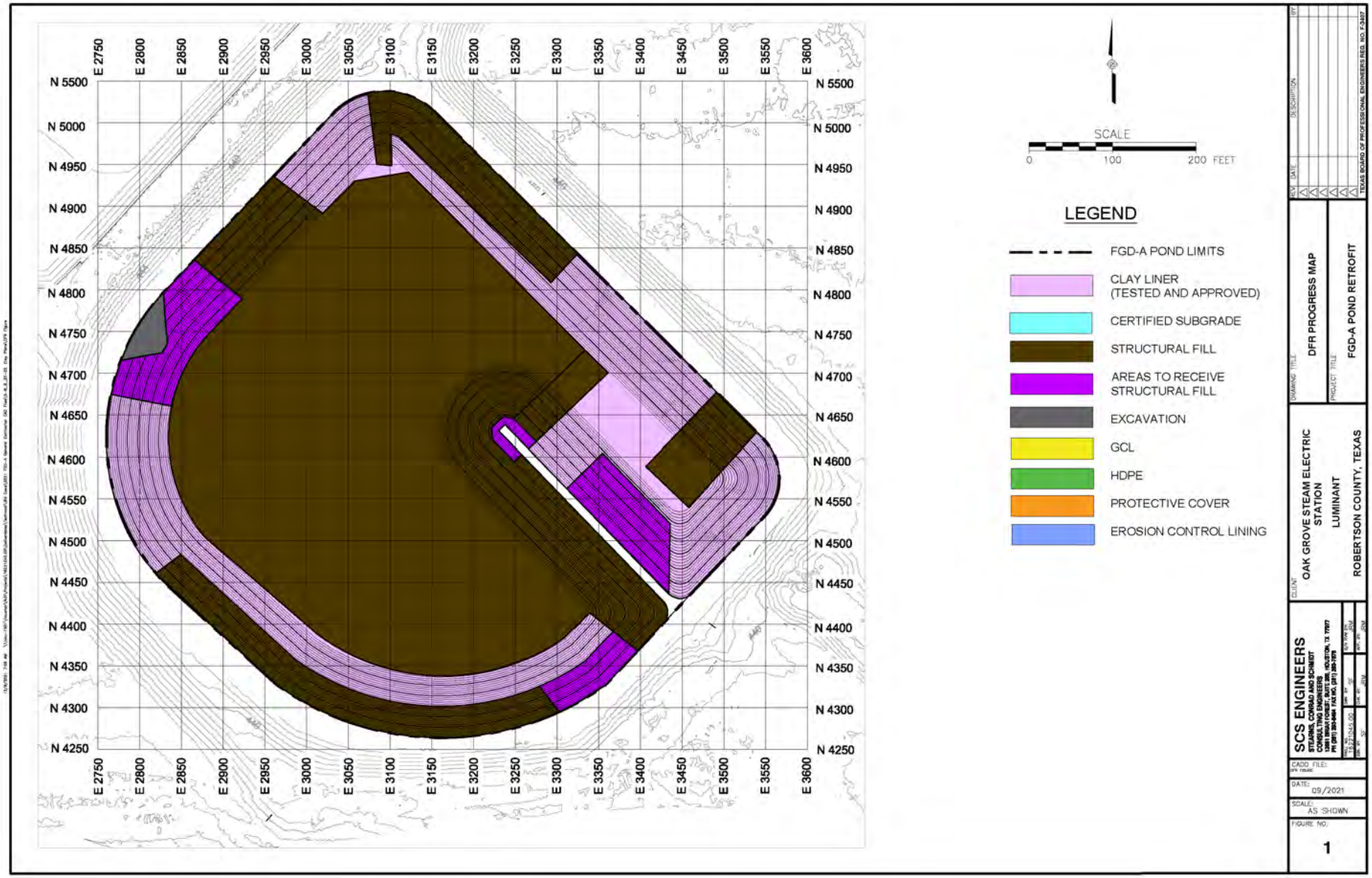
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/08/2021 |
| **Report Approved By** | **Signature** | **Date** |
| J. Roy Murray, P.E. | *J. Roy Murray* | 12/08/2021 |

**Photo 1** – Fine grading south floor, hauling, spreading and compacting excess onto peninsula

**Photo 2** – Spreading, compacting and hydrating structural fill

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 43**<br>**Date: 12/08/2021** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/09/2021** | **Report No.**: 44 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 68°, cloudy, light winds approx. 10-20 mph<br>PM: 79°, cloudy, light winds approx. 10-20 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Used to haul structural fill |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to spread structural fill |
| Water Truck | 1 | 4,000 Gal | Used to hydrate structural fill |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to load structural fill at borrow area |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 3

**Construction Activities:**

- MSI continues placing structural fill onto the peninsula.
- MSI is using the Volvo excavator to load 2 dump trucks at the borrow area. Hauling material to pond, placing on peninsula.
- MSI is using the CAT D6 to spread material on peninsula.
- MSI is using the Volvo sheeps foot roller to compact structural fill.
- SCS continues density resting with passing results.
- MSI used the Volvo excavator to complete excavating the cross over pipe.
- See map on page 4 for project progress.

**Surveying Activities:**

- No surveying activities.

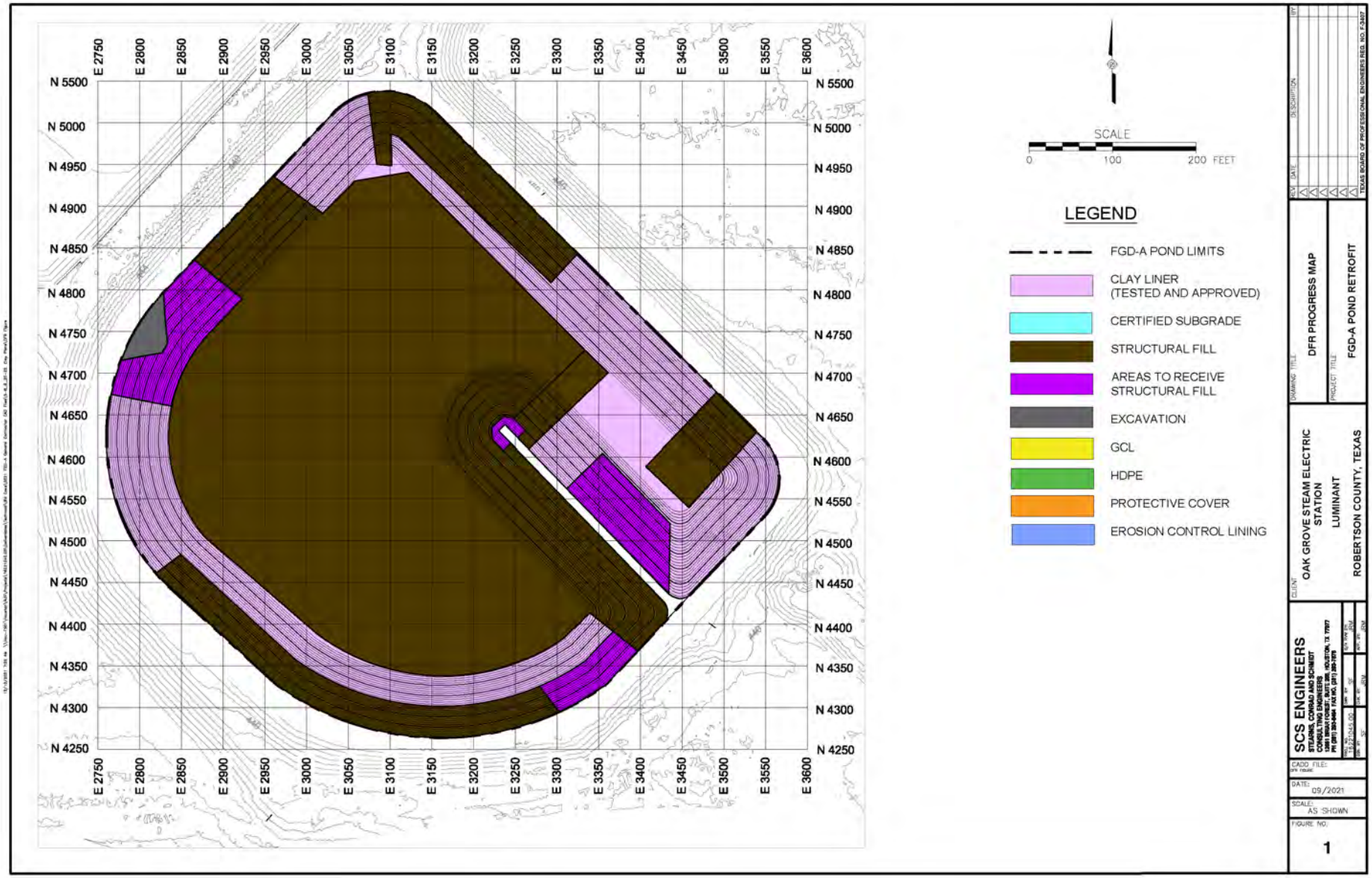
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/09/2021 |
| **Report Approved By** | **Signature** | **Date** |
| J. Roy Murray, P.E. | *J. Roy Murray* | 12/09/2021 |

**Photo 1** – Spreading and hydrating structural fill onto peninsula. Continued excavation of cross over pipe

**Photo 2** – Complete excavation of cross over pipe

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 44**<br>**Date: 12/09/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/10/2021** | **Report No.**: 45,46,47 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 51°, cloudy, light winds approx. 15-25 mph<br>PM: 80°, cloudy, light winds approx. 15-25 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1400 | 8 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to fine grade pond area |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Used to excavate existing drain inlets from plant |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br>• 4,000 gal water truck was not used today.<br><br>**Construction Activities:**<br>• MSI used the D6 dozer to fine grade the FGD-A pond.<br>• MSI used the Volvo excavator to excavate the existing drain lines from plant.<br>• MSI will be off 12/11-Saturday and 12/12-Sunday.<br>• See map on page 4 for project progress.<br><br>**Surveying Activities:**<br>• No surveying activities. |

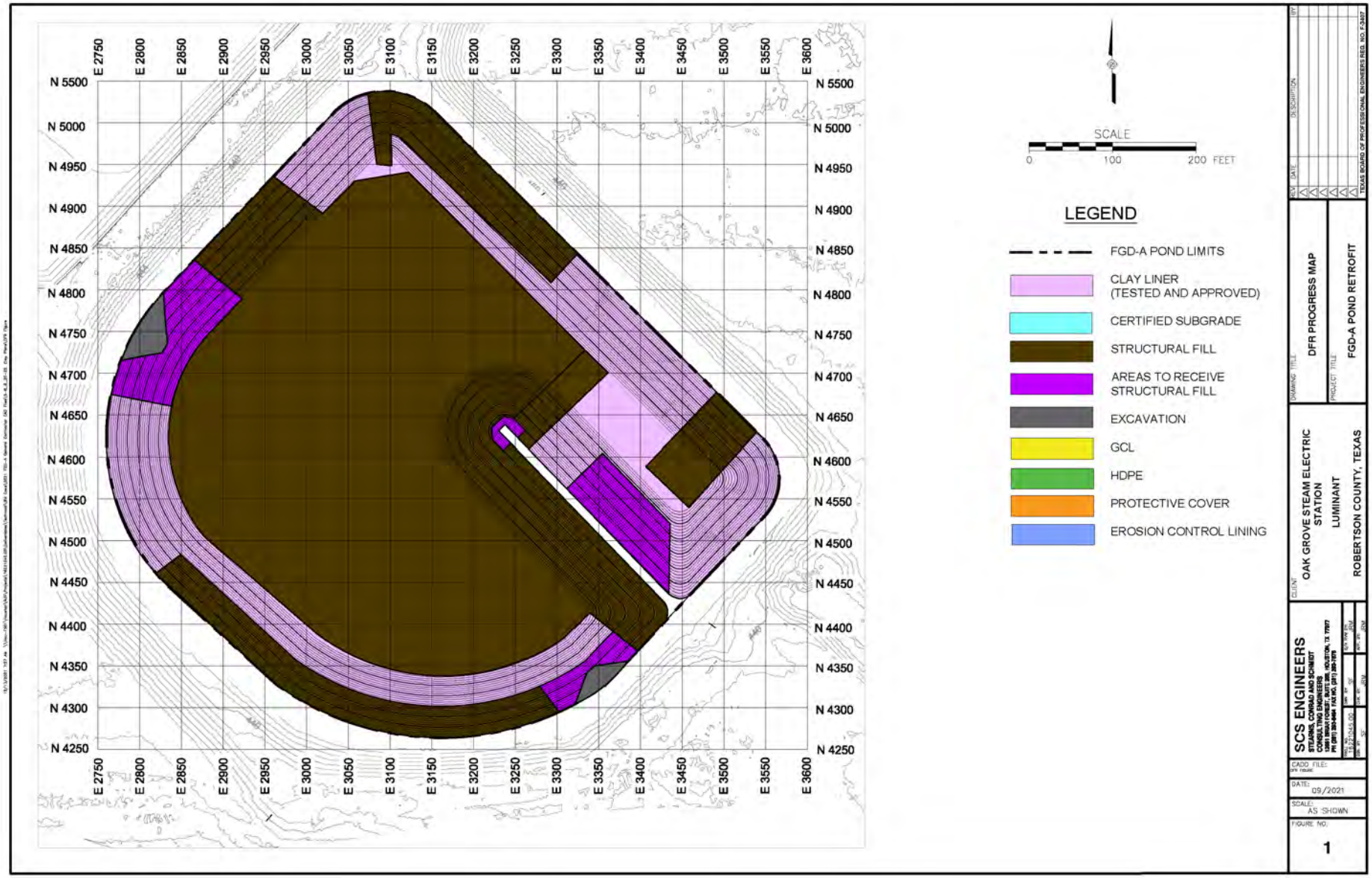
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/10/2021 |
| **Report Approved By** | **Signature** | **Date** |
| J. Roy Murray, P.E. | *J. Roy Murray* | 12/10/2021 |

**Photo 1** – Fine grading of FGD-A pond

**Photo 2** – Excavation of existing drain lines from plant

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 45,46,47** |
| | | **Date: 12/10/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/13/2021** | **Report No.**: 48 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 57°, partly cloudy, light winds<br>PM: 64°, partly cloudy, light winds | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1700 | 11 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | 1 used to haul torpedo rock |
| Genie Forklift | 1 | GTH 844 | Used to install cross over pipe |
| CAT GPS Bulldozer | 1 | D6 | Used to fine grade pond |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact pond area |
| Volvo Excavator | 1 | EC 480 | Used to load/spread torpedo rock |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- 4,000 gal water truck was not used today.

**Construction Activities:**

- MSI continued fine grading the FGD-A pond with the CAT D6 GPS dozer.
- MSI started welding pipe for the A/B cross over.
- MSI used the Volvo excavator to load 1 dump truck with torpedo rock for the cross over pipe.
- MSI used the Volvo excavator to spread the torpedo rock on the floor of the cross over ditch.
- Pipe wasn't set in ditch today.
- See map on page 4 for project progress.

**Surveying Activities:**

- No surveying activities.

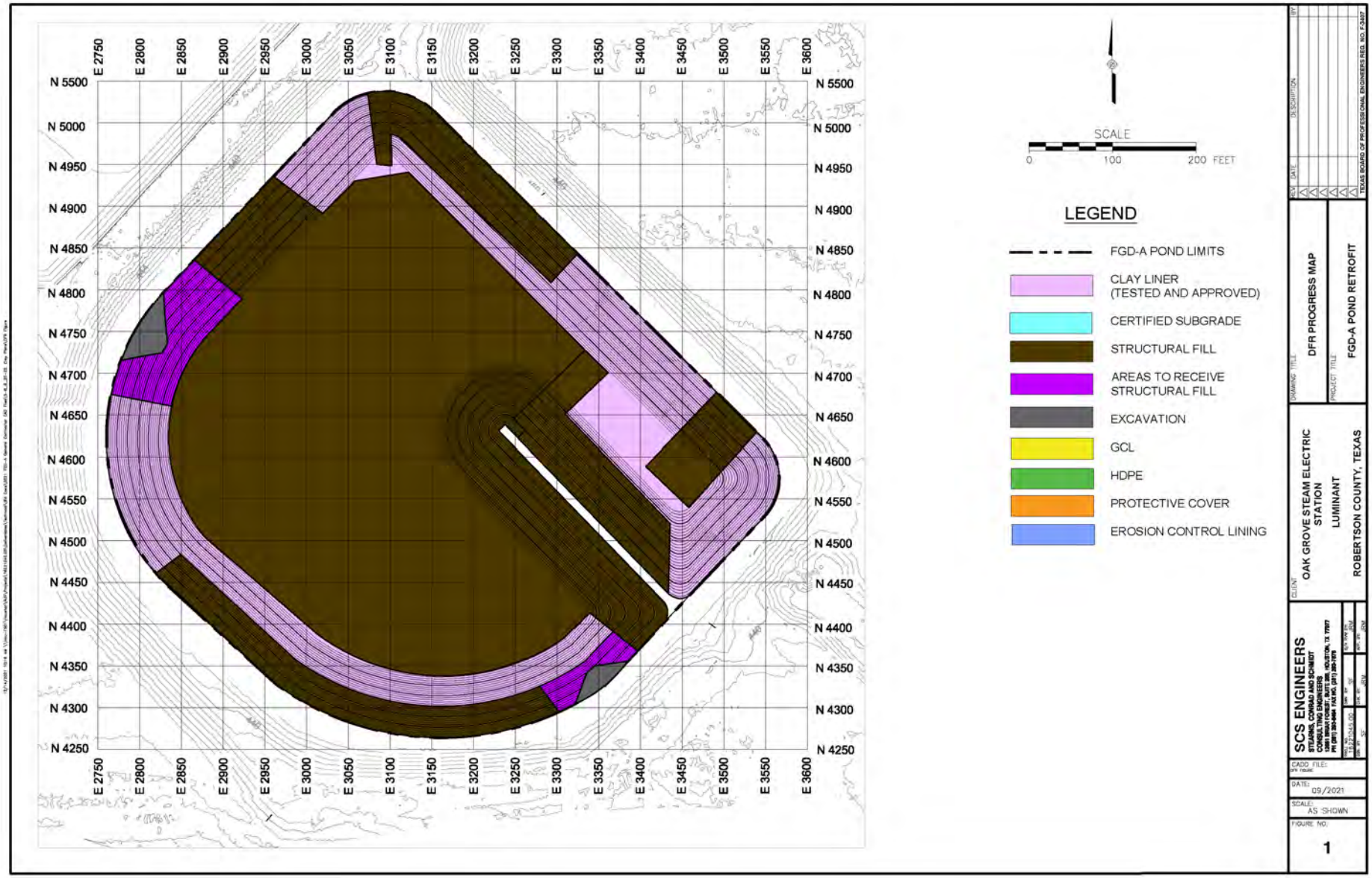
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/13/2021 |
| **Report Approved By** | **Signature** | **Date** |
| J. Roy Murray, P.E. | *J. Roy Murray* | 12/13/2021 |

**Photo 1** – Hauling and placing torpedo rock in cross over pipe

**Photo 2** – Welding of pipe for the A/B cross over

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 48** |
| | | **Date: 12/13/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/14/2021** | **Report No.**: 49 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 67°, cloudy, light winds approx. 10 mph<br>PM: 76°, cloudy, light winds approx. 10-15 mph | **Rain Gauge Reading: TBD** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 0700 | 1 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

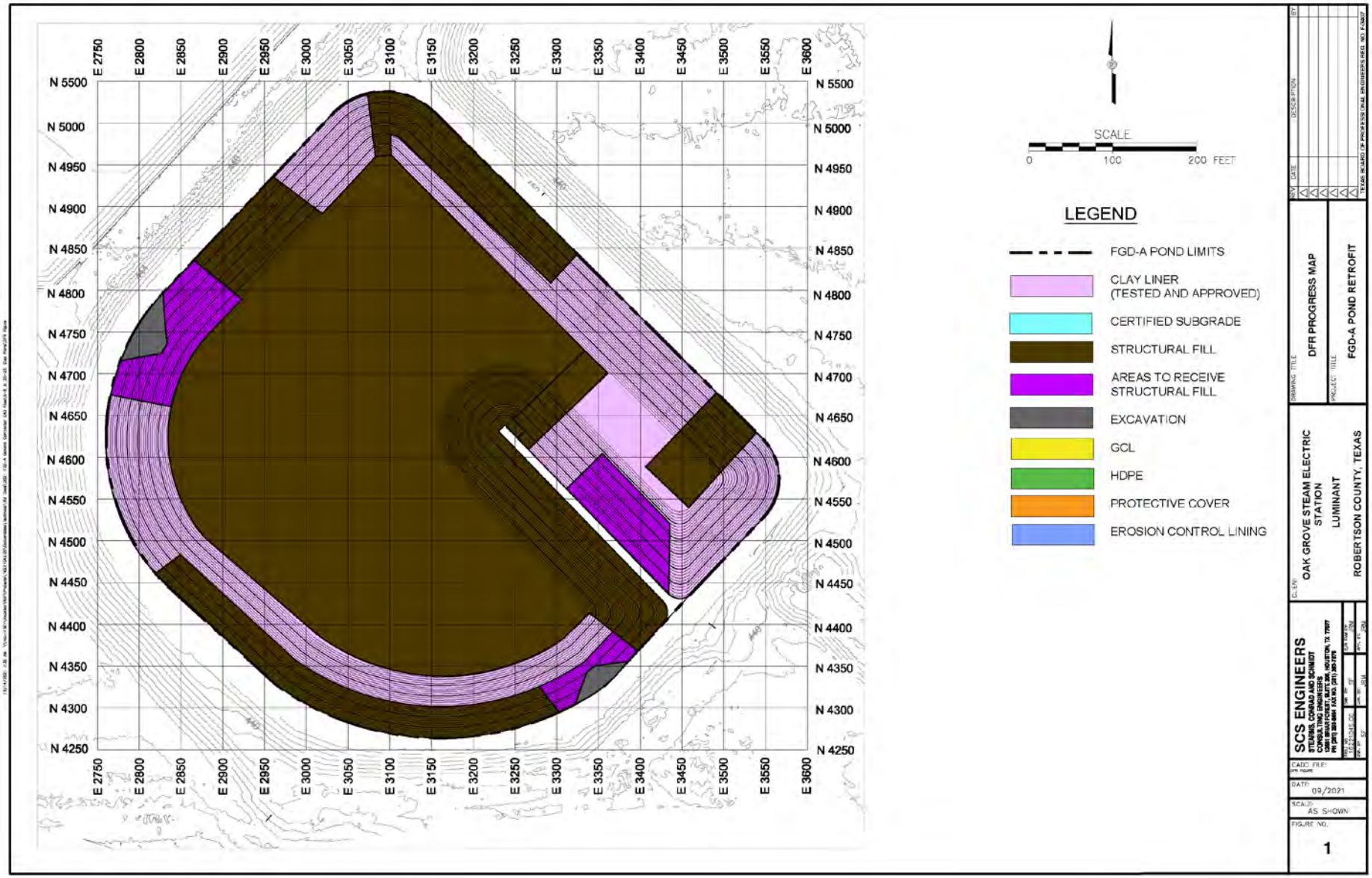
## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Not used today |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Construction Activities:**<br>• Due to rain events, no work was performed today.<br>• See map on page 3 for project progress. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | Danny Rennicks | 12/14/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 12/14/2021 |




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 49** |
| | | **Date: 12/14/2021** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/15/2021** | **Report No.**: 50 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 68°, cloudy, light winds approx. 10 mph<br>PM: | **Rain Gauge Reading: TBD** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 0700 | 1 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

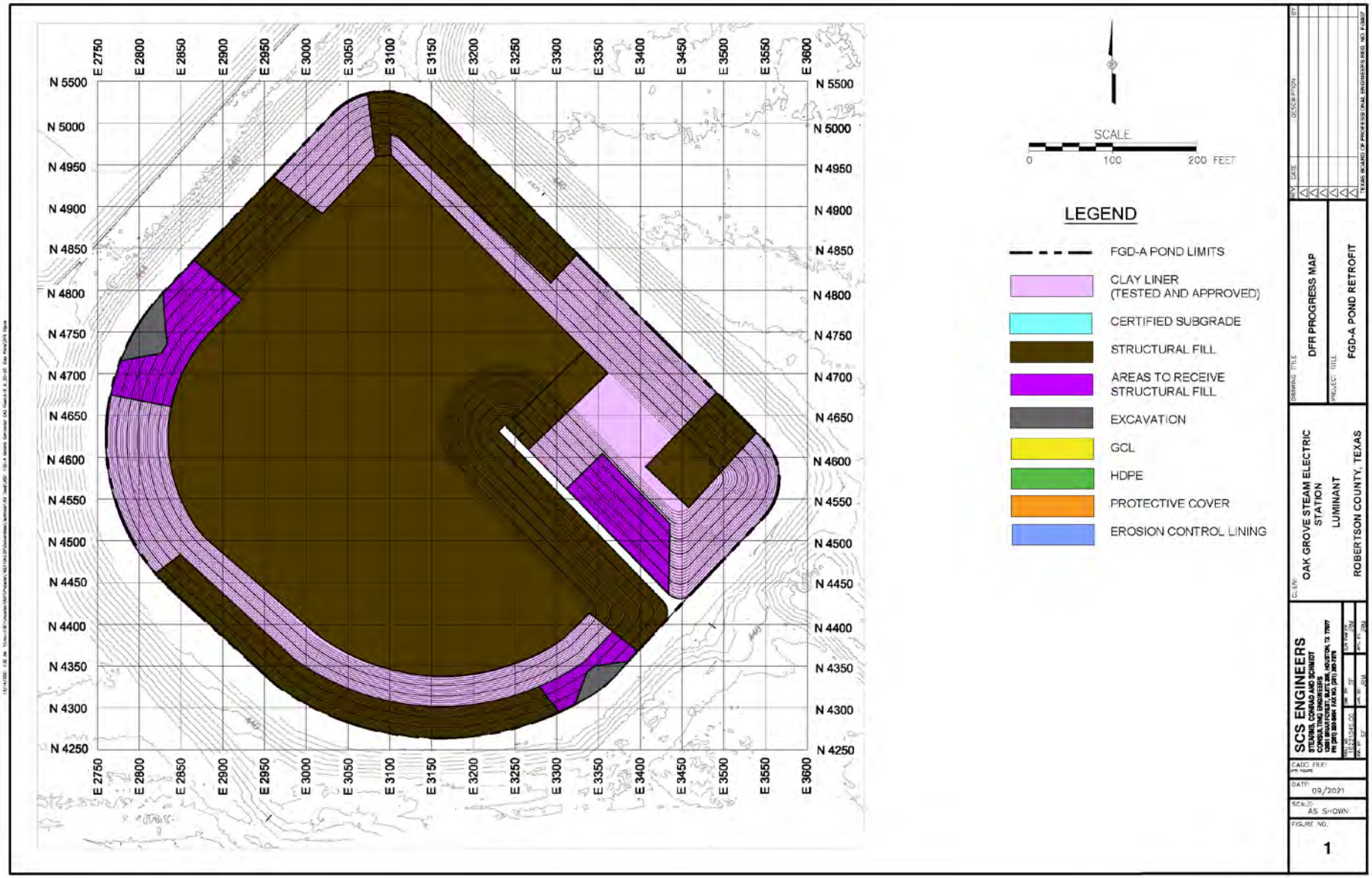
## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Not used today |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Construction Activities:**<br>• Rain events continued overnight, no work was performed today.<br>• See map on page 3 for project progress. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | Danny Rennicks | 12/15/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 12/15/2021 |




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 50** |
| | | **Date: 12/15/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/16/2021** | **Report No.**: 41 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 68°, cloudy, light winds approx. 10 mph<br>PM: 77°, cloudy, light winds approx.. 10 mph | **Rain Gauge Reading: 0.5" from 12/14 – 12/15** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1700 | 11 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Melvin Mejia | Luminant Project Manager |
| J.Roy Murray | CQA Project Director |
| Sam Franco | CQA Project Manager |
| Pat Kamesch | Lone Star Lining Project Manager |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Used to haul structural fill |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to grade structural fill |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to load structural fill into haul trucks |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- Due to recent rain events, water truck was not needed.
- Site received 0.5" of rain over 12/14 – 12/15.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to load structural fill into haul trucks.
- MSI backfilled the area where the existing plant inlet pipes were located (southern corner).
- MSI used the CAT D6 bulldozer to spread material.
- MSI continued to use CAT sheeps foot roller to compact material.
- 4 passing density tests were taken on the structural fill.
- See Progress Map on page 4 for approximate areas where structural fill has been placed.

**Surveying Activities:**

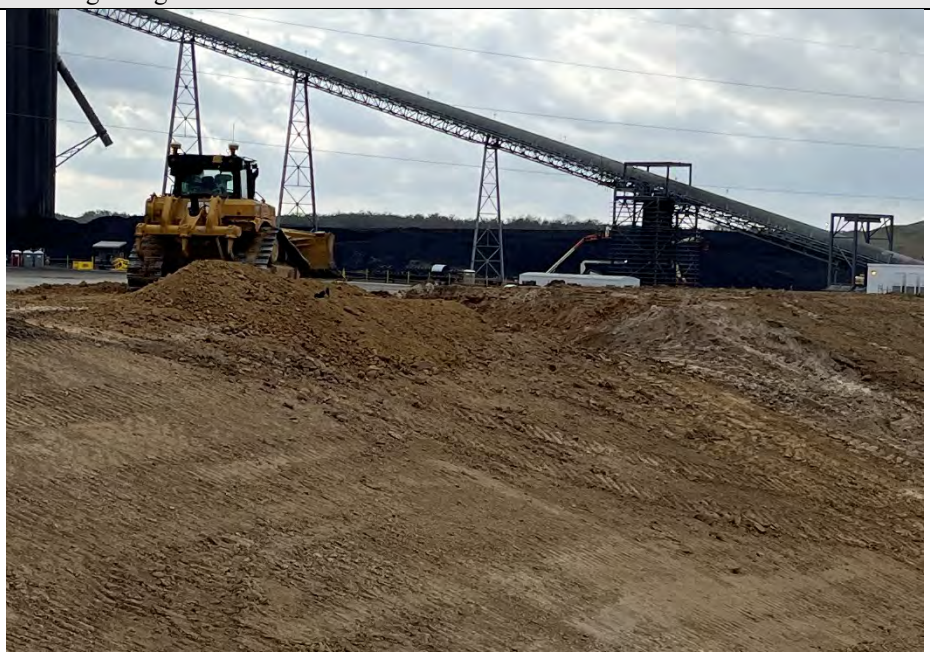
- Survey is scheduled for December 20, 2021 for subgrade certification.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

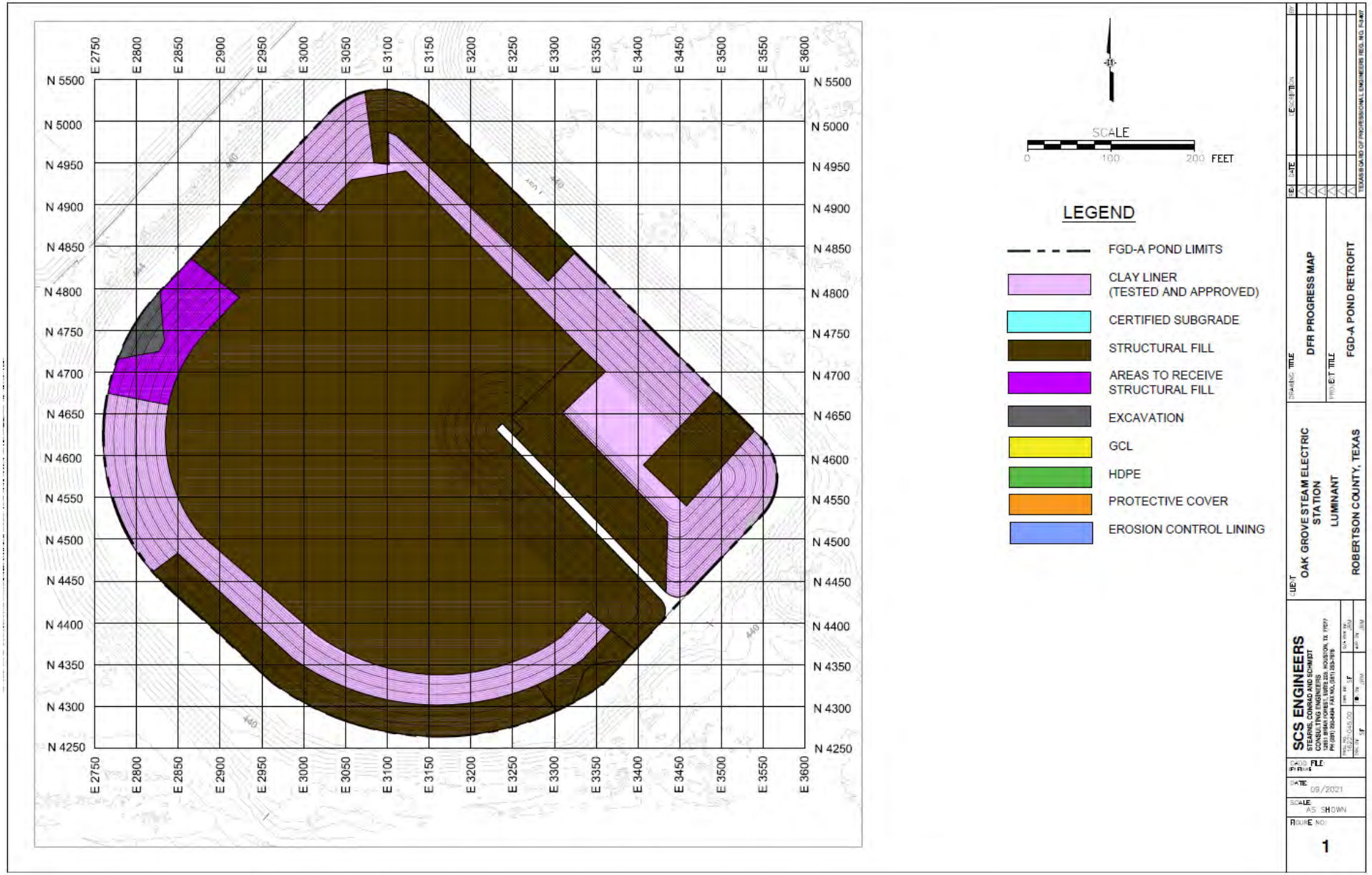
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/16/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/16/2021 |

**Photo 1** – Hauling structural fill to backfill area where inlet pipes were removed

**Photo 2** – Placement and grading of structural fill



*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 41**<br>**Date: 12/16/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/17/2021** | **Report No.**: 42 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 63°, cloudy, light winds approx. 10 mph<br>PM: 78°, cloudy, light winds approx.. 10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1100 | 5 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to spread structural fill |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to remove existing FGD-A Pond to pump suction pipeline |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- Due to recent rain events, water truck was not needed.

**Construction Activities:**

- MSI continued to use the Volvo trackhoe to remove the existing FGD-A Pond to pump suction pipeline.
- MSI completed backfilling the area where the existing plant inlet pipes were located (southern corner).
- MSI used the CAT D6 bulldozer to spread material.
- MSI continued to use CAT sheeps foot roller to compact material.
- 3 passing density tests were taken on the structural fill.
- See Progress Map on page 4 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- Due to rain events over the weekend, December 18-19, survey to be rescheduled.

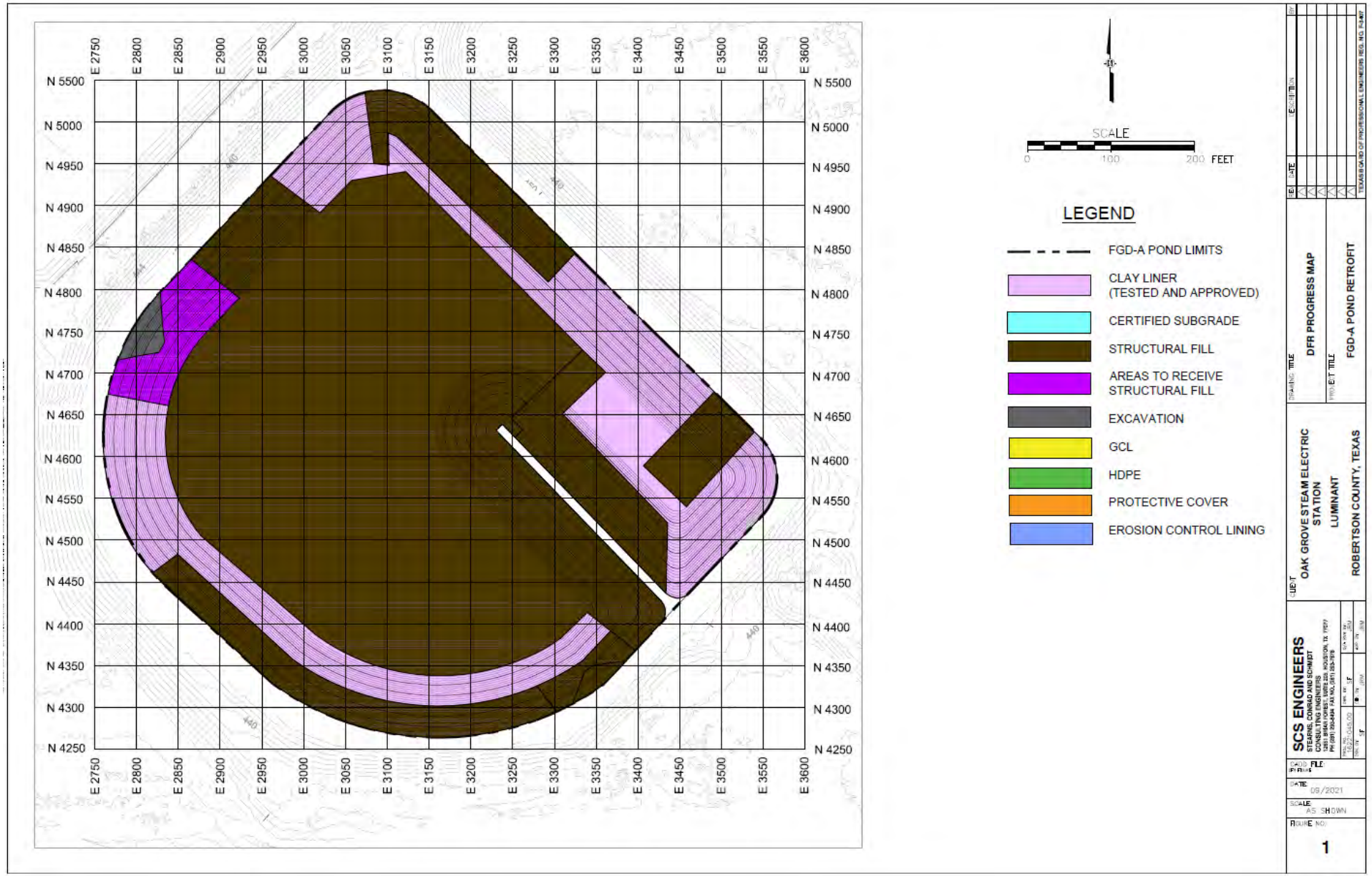
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 12/17/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/17/2021 |

**Photo 1** – Removal of existing FGD-A Pond to pump suction pipeline

**Photo 2** – Removed pump suction pipeline

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 42** |
| | | **Date: 12/17/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/20/2021** | **Report No.**: 43 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 39°, partly cloudy, light winds approx. 10 mph<br>PM: 65°, partly cloudy, light winds approx.. 10 mph | **Rain Gauge Reading: 2.25"** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| | | | | |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

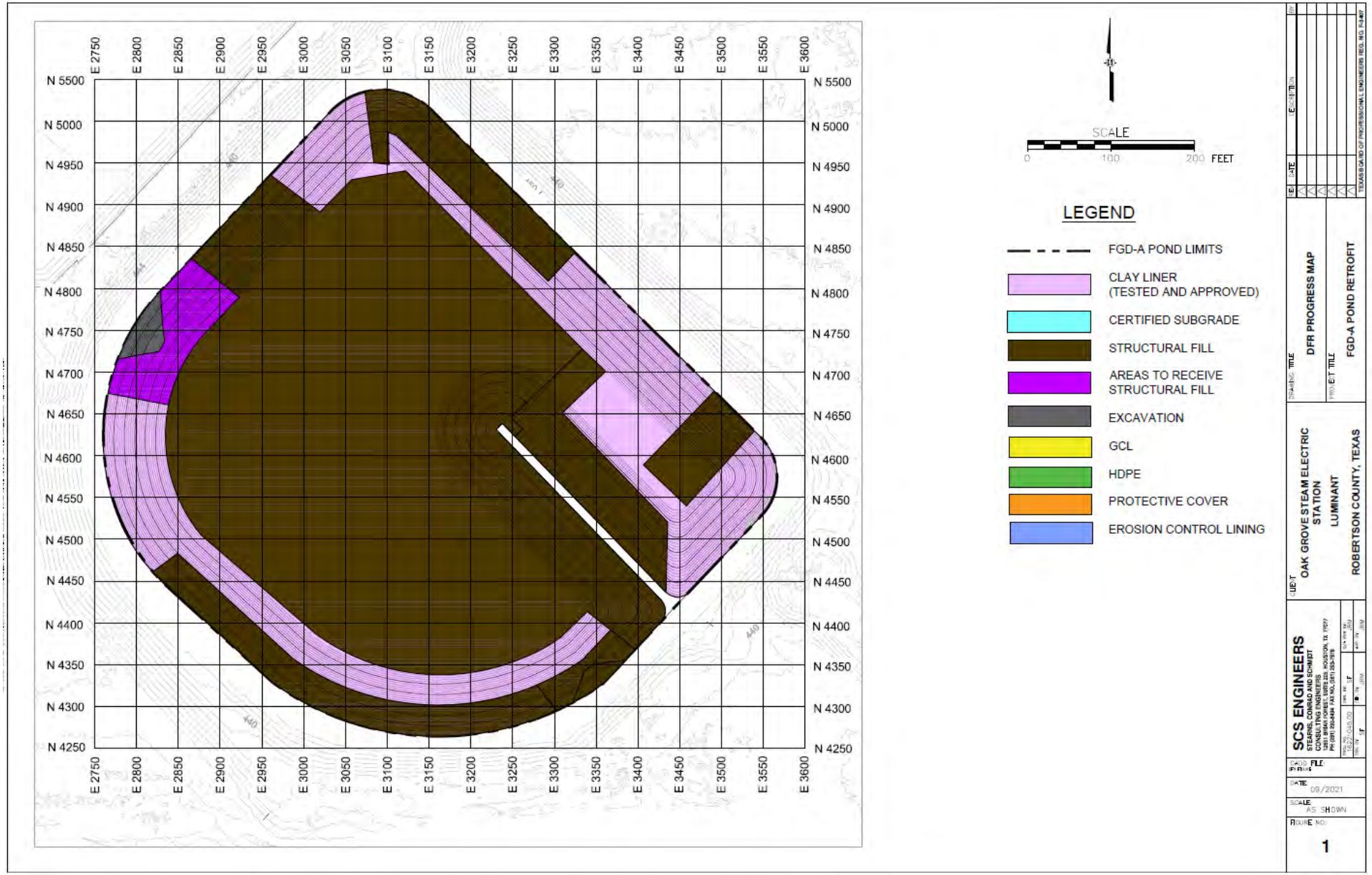
## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Not used today |
| | | | |
| | | | |

| Description of Work |
|---|
| **Construction Activities:**<br>• Oak Grove received 2.25" of rain on Sunday, December 19th.<br>• No work was conducted due to wet conditions. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/20/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/20/2021 |




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 43**<br>**Date: 12/20/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/22/2021** | **Report No.**: 44 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 54°, clear, light winds approx. 5 mph<br>PM: 75°, clear, light winds approx.. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Ricardo Espinoza | CQA Technician | 0900 | 1800 | 9 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to spread structural fill |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to place FGD-A/B crossover pipeline and pipe bedding material |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br>• MSI did not use water truck today.<br><br>**Construction Activities:**<br>• MSI completed welding of the FGD-A/B crossover pipeline.<br>• MSI used the Volvo trackhoe to place the FGD-A/B crossover pipeline. (See Photo 1)<br>• MSI used the Volvo trackhoe to place the pipe bedding material under and above the crossover pipeline. (See Photo 2)<br>• MSI used the CAT D6 bulldozer to spread the pipe bedding material.<br>• MSI to begin backfilling the crossover embankment tomorrow, December 23rd.<br>• See Progress Map on page 4 for approximate areas where structural fill has been placed.<br><br>**Surveying Activities:**<br>• Certification survey is scheduled for December 23rd. |

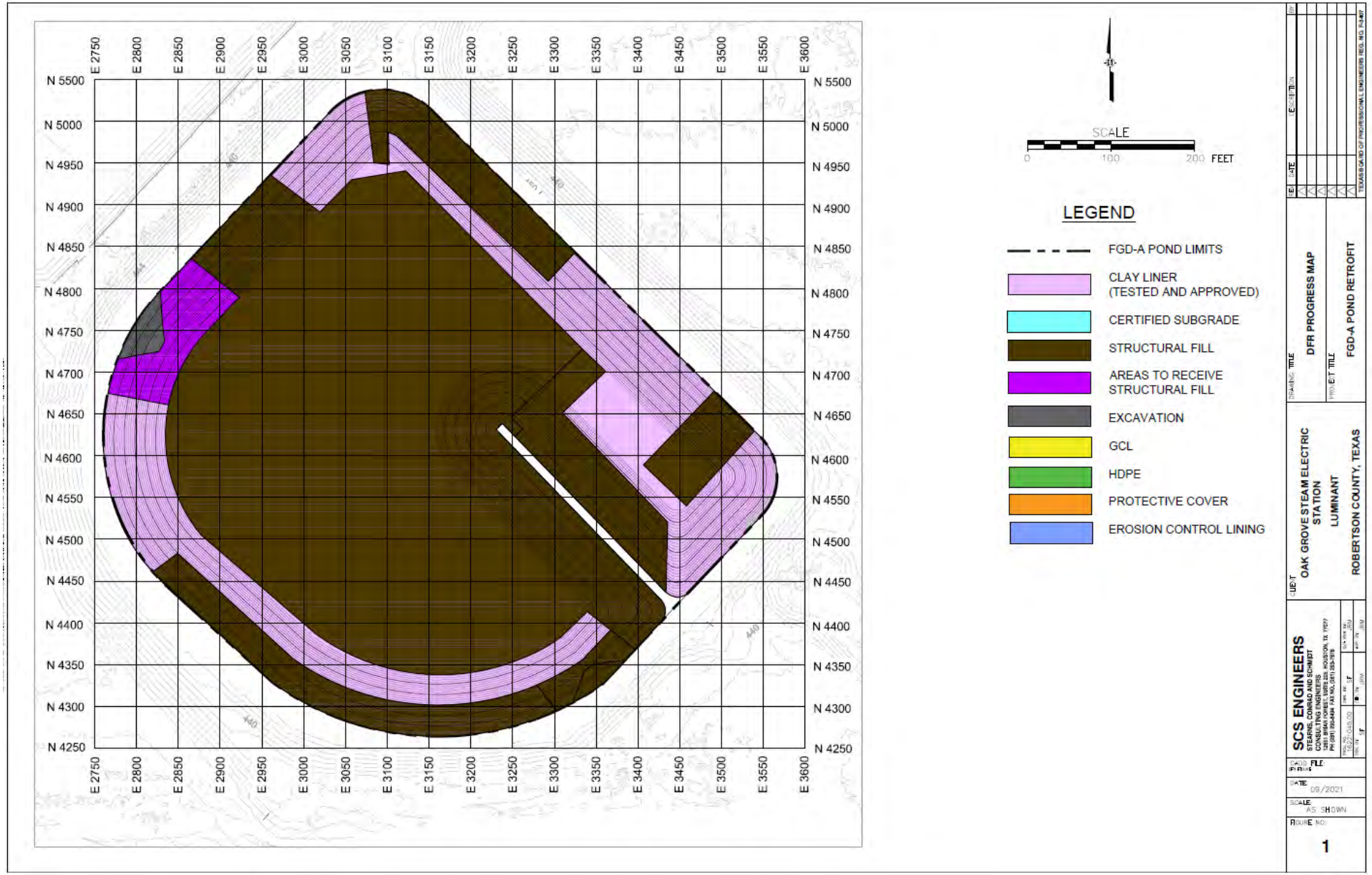
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Ricardo Espinoza | *Ricardo Espinoza* | 12/22/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/22/2021 |

**Photo 1** – Placement of FGD-A/B crossover pipeline

**Photo 2** – Placement of pipe bedding material

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 44**<br>**Date: 12/22/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/23/2021** | **Report No.**: 45 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 55°, clear, light winds approx. 5 mph<br>PM: 75°, clear, light winds approx.. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Ricardo Espinoza | CQA Technician | 0600 | 1400 | 8 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Jeremy Davis | CQA Surveyor |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to spread structural fill |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to place FGD-A/B crossover pipeline and pipe bedding material |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI used the Volvo trackhoe to backfill the FGD-A/B crossover pipeline embankment.
- MSI used the CAT D6 bulldozer to spread the backfill material.
- MSI used the Volvo sheeps foot roller to compact the backfill material. (See Photo 1)
- 12 density tests were taken. (See Photo 2)
- See Progress Map on page 4 for approximate areas where structural fill has been placed.

**Surveying Activities:**

- Jeremy Davis on site for certification of side slopes.
- Due to wet conditions, pond floor was unable to be surveyed. Additional survey date to be determined.

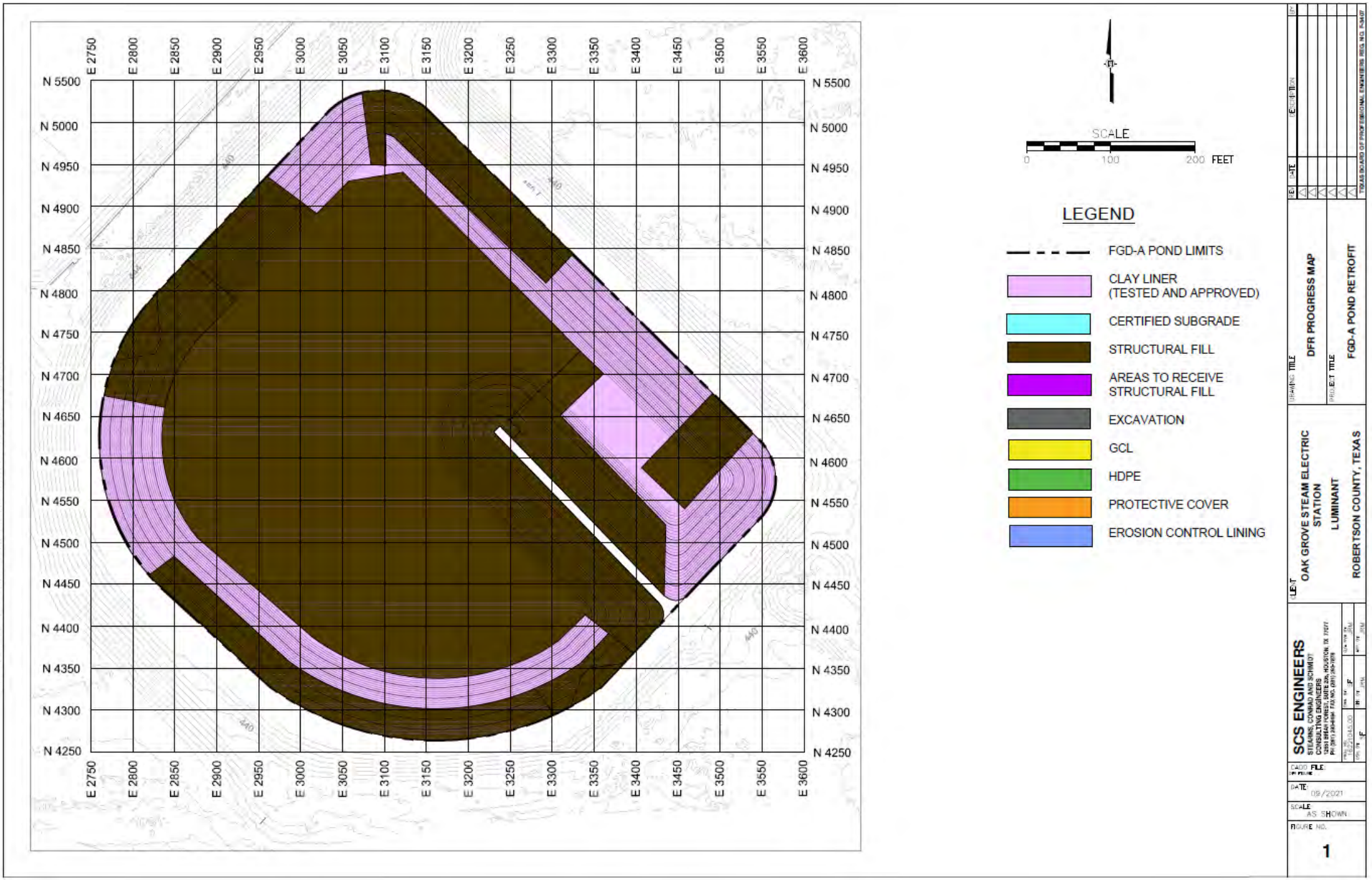
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Ricardo Espinoza | *Ricardo Espinoza* | 12/23/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/23/2021 |

**Photo 1** – Compaction of embankment backfill

**Photo 2** – Density testing of embankment backfill

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 45**<br>**Date: 12/23/2021** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/28/2021** | **Report No.**: 46 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 70°, cloudy, light winds approx. 5 mph<br>PM: 78°, clear, light winds approx.. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Sam Franco | CQA Technician | 0800 | 1600 | 8 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to spread structural fill |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Used to compact structural fill |
| Volvo Excavator | 1 | EC 480 | Used to place structural fill into crossover embankment |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI used the Volvo trackhoe to backfill the FGD-A/B crossover pipeline embankment.
- MSI used the CAT D6 bulldozer to spread the backfill material. (See Photo 1)
- MSI used the Volvo sheeps foot roller to compact the backfill material. (See Photo 2)
- 12 density tests were taken.
- MSI has completed all structural fill placement.
- See Progress Map on page 4 for approximate areas where structural fill has been placed and certified areas.

**Surveying Activities:**

- Due to wet conditions, pond floor was unable to be surveyed. Additional survey date to be determined.

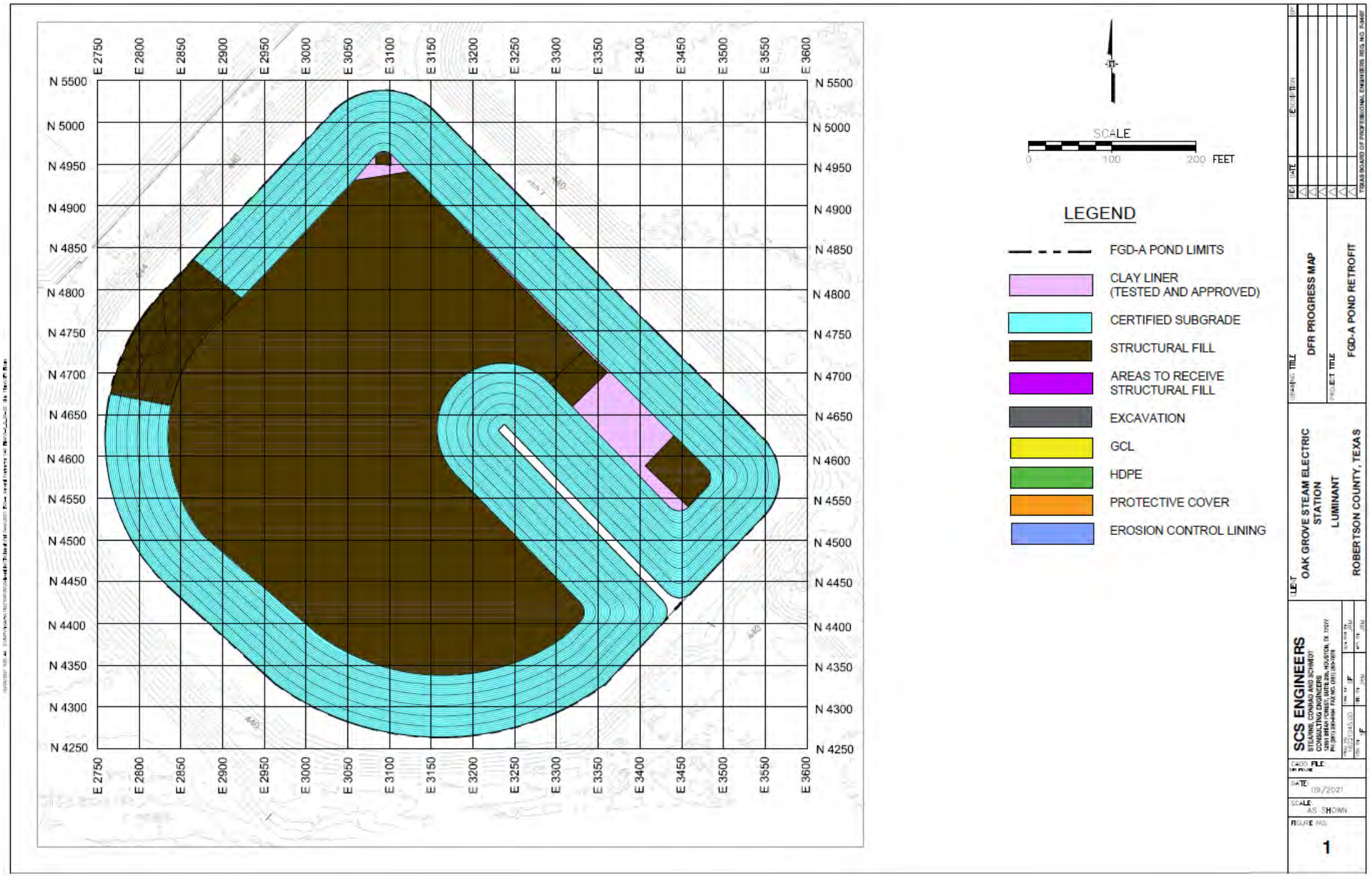
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/28/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/28/2021 |

**Photo 1** – Placement of embankment backfill

**Photo 2** – Compaction of embankment backfill

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 46** |
| | | **Date: 12/28/2021** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/29/2021** | **Report No.**: 47 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Sam Franco | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 72°, clear, light winds approx. 5 mph<br>PM: 80°, clear, light winds approx.. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Sam Franco | CQA Technician | 1200 | 1600 | 4 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Used to unload GCL |
| CAT GPS Bulldozer | 1 | D6 | Used to mix dry material on pond floor |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Not used today |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- 2 trucks of GCL were delivered to Oak Grove today. (See Photo 1)
- MSI used the Genie forklift to remove GCL rolls from the shipping trucks and place them on the geosynthetic pad. (See Photo 2)
- All GCL rolls were covered with a plastic tarp with sandbags placed around the edges of the tarp.
- MSI used the CAT D6 bulldozer to mix in dry material on the pond floor.
- See Progress Map on page 4 for approximate areas where structural fill has been placed and certified areas.

**Surveying Activities:**

- Due to wet conditions, pond floor was unable to be surveyed.
- Survey is tentatively scheduled for Tuesday, January 4, 2022.

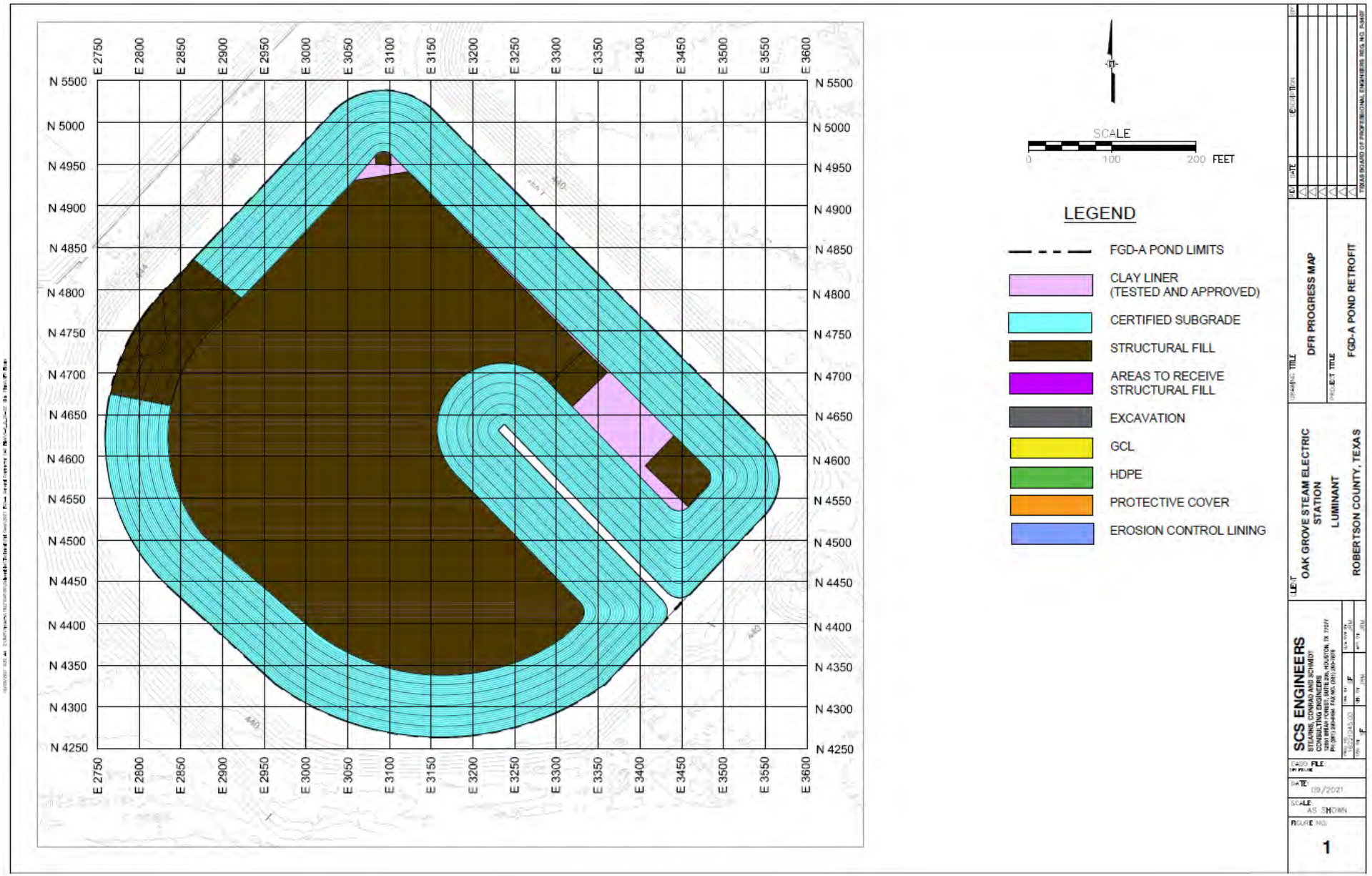
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| CETCO GCL | 30 rolls | Material delivered in good condition |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/28/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/28/2021 |

**Photo 1** – Removal of tarp on shipping truck

**Photo 2** – Unloading of GCL rolls onto geosynthetic pad

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 47** |
| | | **Date: 12/29/2021** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 12/30/2021** | **Report No.**: 48 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Joey Litchfield | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 67°, clear, light winds approx. 5 mph<br>PM: 74°, clear, light winds approx.. 5 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Joey Litchfield | CQA Technician | 0700 | 1230 | 5.5 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Not used today |
| Genie Forklift | 1 | GTH 844 | Used to unload GCL |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Not used today |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- 2 trucks of GCL were delivered to Oak Grove today.
- MSI used the Genie forklift to remove GCL rolls from the shipping trucks and place them on the geosynthetic pad.
- All GCL rolls were covered with a plastic tarp with sandbags placed around the edges of the tarp. (See Photo 1)
- See Progress Map on page 4 for approximate areas where structural fill has been placed and certified areas.

**Surveying Activities:**

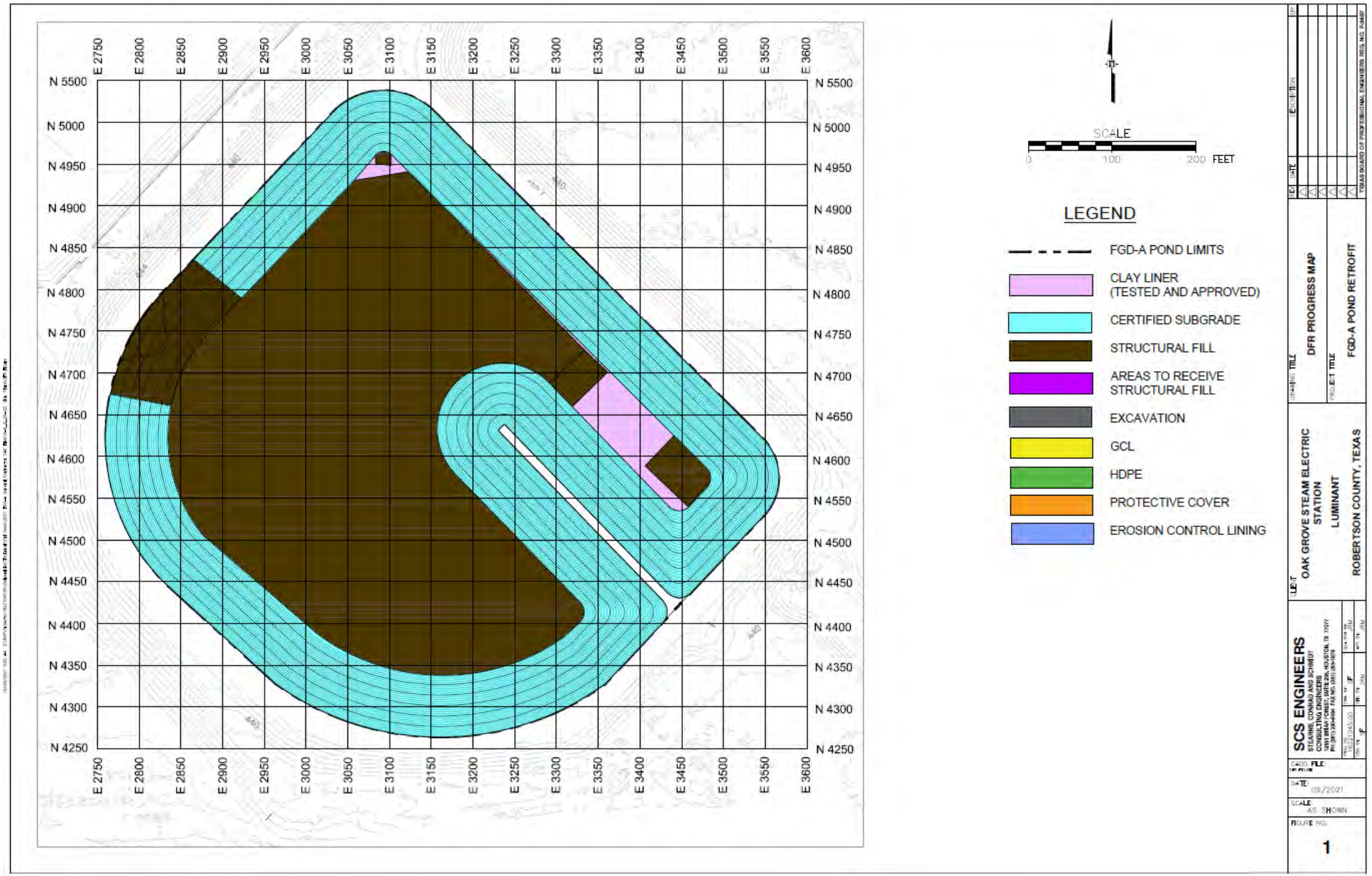
- Survey is tentatively scheduled for Tuesday, January 4, 2022.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| CETCO GCL | 25 rolls | Material delivered in good condition |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Joey Litchfield | *Joey Litchfield* | 12/30/2021 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 12/30/2021 |

**Photo 1** – Plastic tarp placed over GCL rolls

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 48** |
| | | **Date: 12/30/2021** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/30/2022** | **Report No.**: 49 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 30°, clear, light winds approx. 5-10 mph<br>PM: 53°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Used to unload GCL |
| CAT GPS Bulldozer | 1 | D6 | Used to fine grade pond floor |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Smooth drum used to roll side slopes |
| Volvo Excavator | 1 | EC 480 | Not used today |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- 2 trucks of GCL were delivered to Oak Grove today. (See Photo 1)
- MSI used the Genie forklift to remove GCL rolls from the shipping trucks and place them on the geosynthetic pad.
- All GCL rolls were covered with a plastic tarp with sandbags placed around the edges of the tarp.
- MSI used the Volvo smooth drum roller to begin rolling the side slopes. (See Photo 2)
- MSI used the CAT D6 bulldozer to fine grade the pond floor. (See Photo 3)
- See Progress Map on page 5 for approximate areas where structural fill has been placed and certified areas.

**Surveying Activities:**

- Survey is scheduled for Wednesday, January 5th.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| CETCO GCL | 30 rolls | Material delivered in good condition |

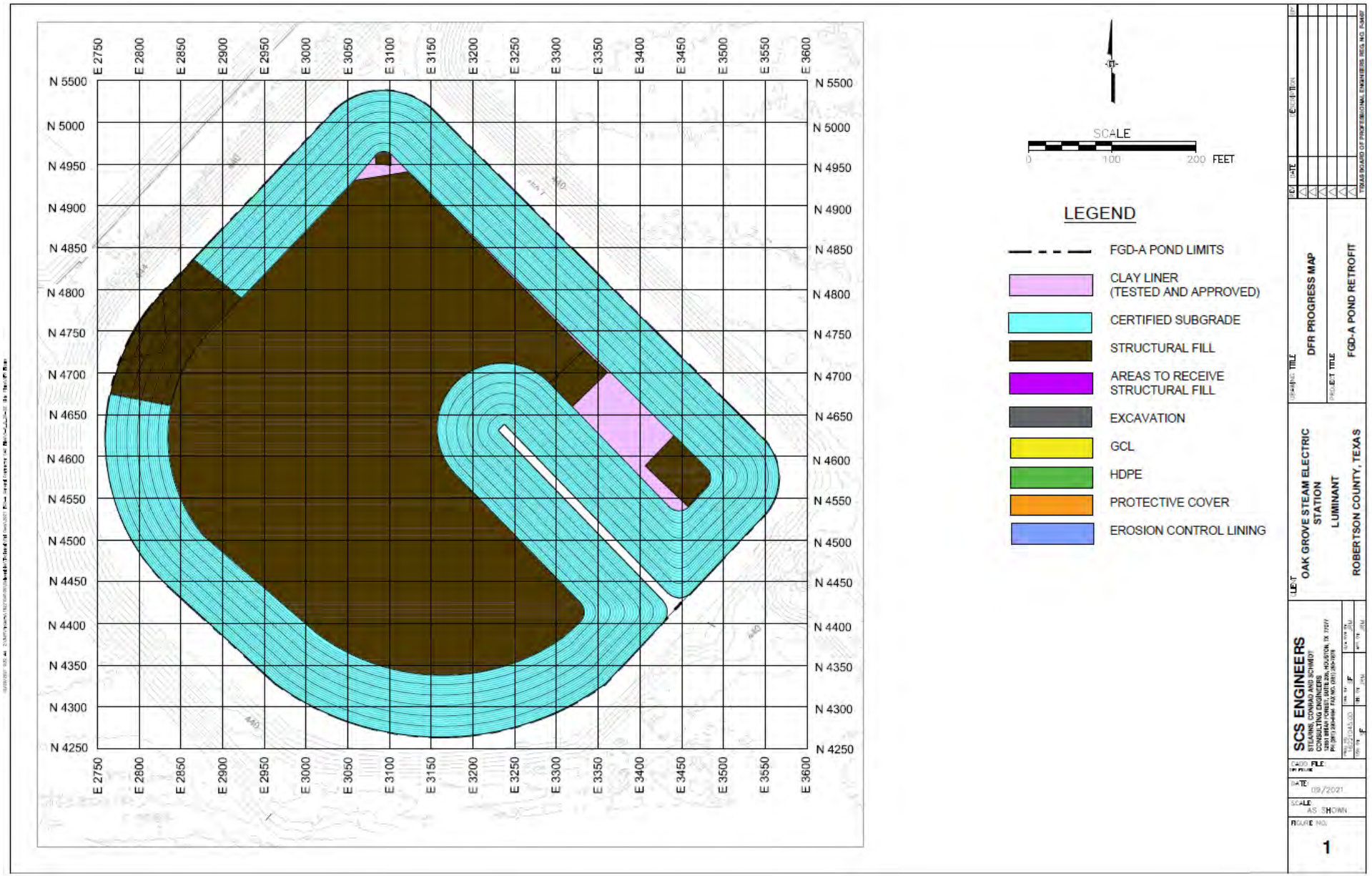
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/03/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/03/2022 |

**Photo 1** – GCL shipping truck

**Photo 2** – Smooth drum rolling peninsula slopes

**Photo 3** – Fine grading pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 49** |
| | | **Date: 01/03/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/04/2022** | **Report No.**: 50 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 44°, clear, medium winds approx. 15-25 mph<br>PM: 63°, clear, medium winds approx. 15-25 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to fine grade pond floor |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Smooth drum used to roll side slopes |
| Volvo Excavator | 1 | EC 480 | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br>• MSI did not use water truck today.<br><br>**Construction Activities:**<br>• MSI used the Volvo smooth drum roller to begin rolling the side slopes. (See Photo 1)<br>• MSI used the CAT D6 bulldozer to fine grade the pond floor. (See Photo 2)<br>• See Progress Map on page 4 for approximate areas where structural fill has been placed and certified areas.<br><br>**Surveying Activities:**<br>• Survey is scheduled for Wednesday, January 5th. |

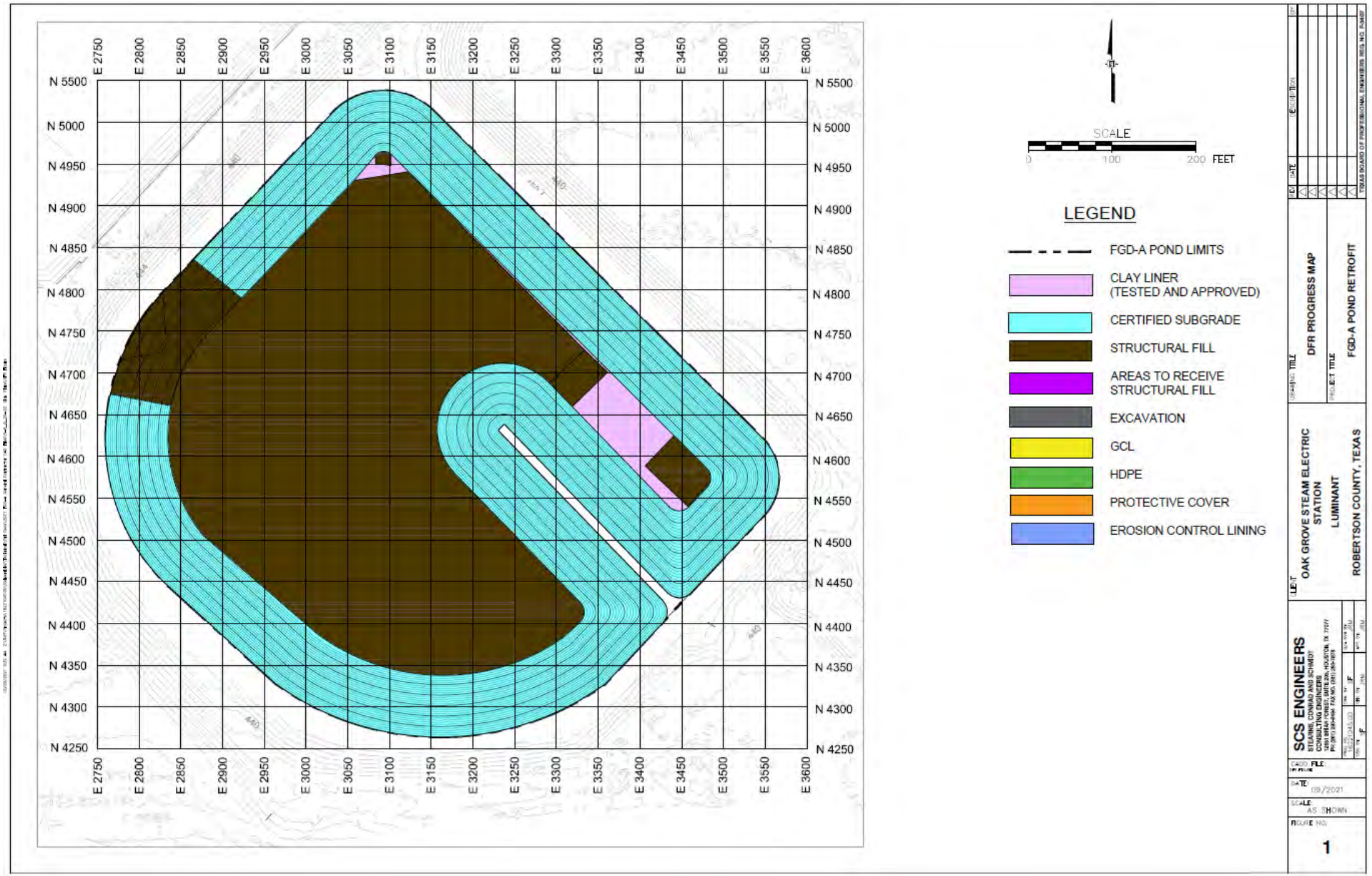
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/04/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/04/2022 |

**Photo 1** – Smooth drum rolling of subgrade

**Photo 2** – Smooth drum rolling and fine grading subgrade

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 50**<br>**Date: 01/04/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/05/2022** | **Report No.**: 51 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 40°, clear, light winds approx. 5-10 mph<br>PM: 64°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Sam Franco | CQA Project Manager |
| Jeremy Davis | CQA Surveyor |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Used to haul excess material from pond floor |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to fine grade pond floor |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Used to load excess material from pond floor |
| CAT Mini Excavator | 1 | 304E | Not used today |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI used the CAT D6 bulldozer to fine grade the pond floor. (See Photo 1)
- MSI used the Volvo excavator and haul truck to remove excess material from the pond floor. (See Photo 2)
- See Progress Map on page 4 for certified areas.

**Surveying Activities:**

- Jeremy Davis on site to complete subgrade certification survey.
- CQA surveyor confirmed all subgrade certification points have been approved.

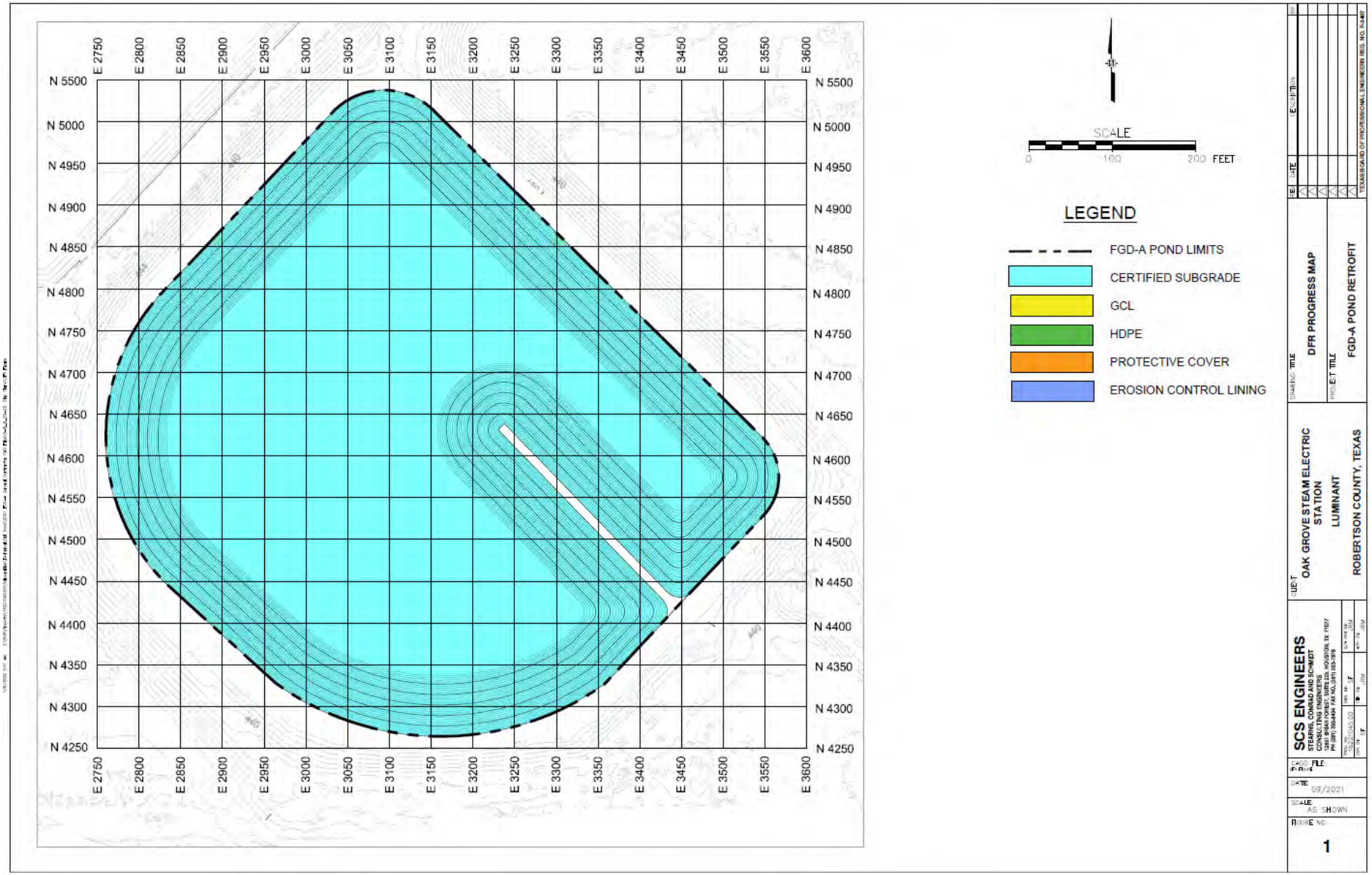
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/05/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/05/2022 |

**Photo 1** – Fine grading pond floor

**Photo 2** – Volvo excavator and haul truck removing excess material from pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 51** |
| | | **Date: 01/05/2022** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/06/2022** | **Report No.**: 52 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 29°, clear, high winds approx. 15-25 mph<br>PM: 51°, clear, high winds approx. 15-25 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Used to haul excess material from pond floor |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Used to unload GCL |
| CAT GPS Bulldozer | 1 | D6 | Used to fine grade pond floor |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Used to load excess material from pond floor |
| CAT Mini Excavator | 1 | 304E | Used to excavate anchor trench |
| | | | |
| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI used the CAT D6 bulldozer to fine grade the pond floor. (See Photo 1)
- MSI began excavating the liner anchor trench along the southwestern border of the pond. (See Photo 2)
- 1 truck of GCL was delivered to the site.
- Lone Star Lining crew arrived for safety training at 10:30 AM.
- Lone Star began filling sand bags in the afternoon. (See Photo 3)
- Lone Star will begin liner installation tomorrow, January 7th.
- See Progress Map on page 5 for certified areas.

**Surveying Activities:**

- No surveying activities.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| CETCO GCL | 13 | All GCL rolls in good condition |

## Review and Approval

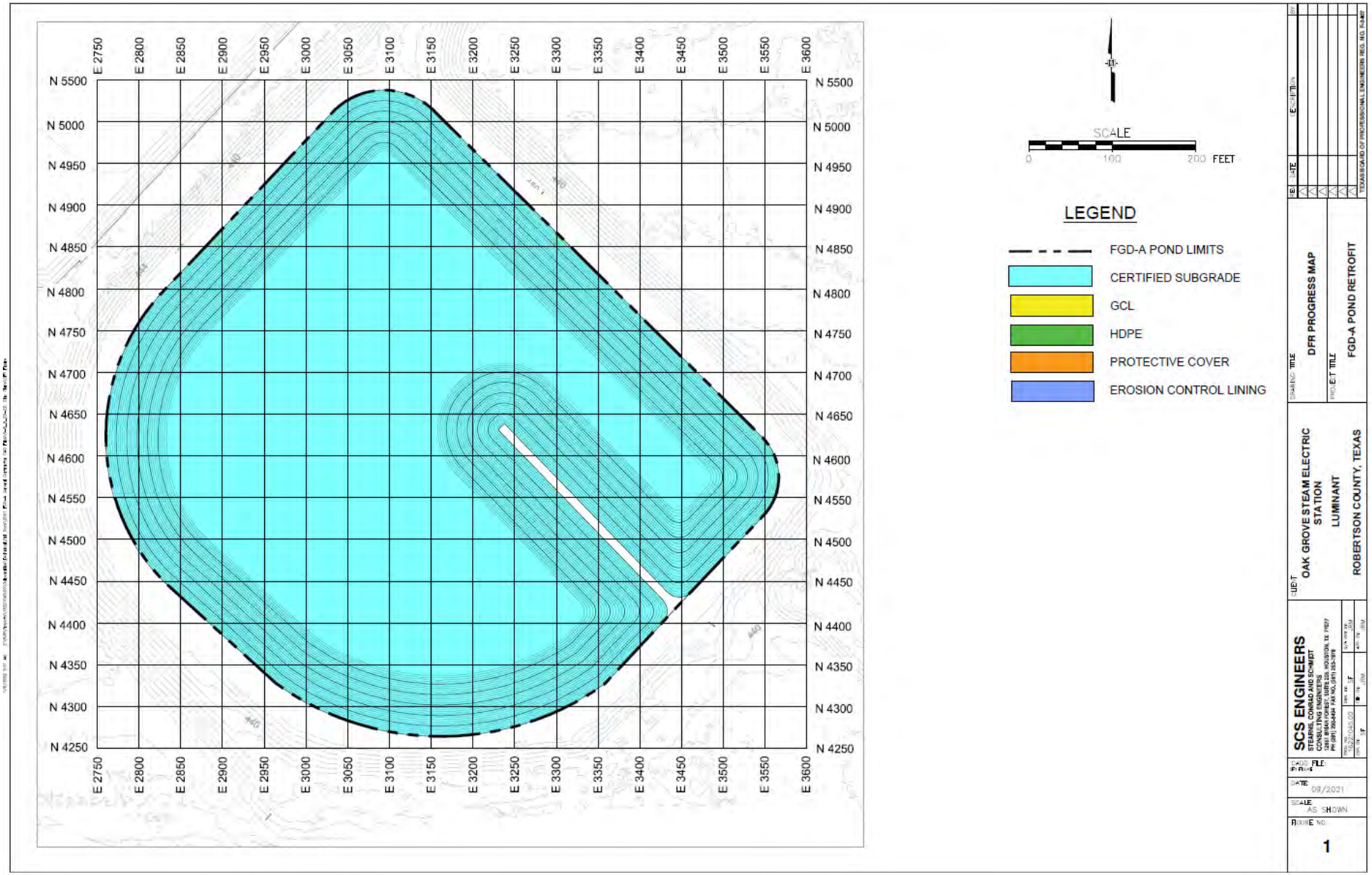
| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | Danny Rennicks | 01/06/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 01/06/2022 |

**Photo 1** – Fine grading pond floor

**Photo 2** – Excavating anchor trench along southwestern border

**Photo 3** – Lone Star crew filling sandbags

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 52**<br>**Date: 01/06/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/07/2022** | **Report No.**: 53 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 49°, clear, light winds approx. 5-10 mph<br>PM: 55°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Used to haul excess material from pond floor |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Used to fine grade pond floor |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Used to load excess material from pond floor |
| CAT Mini Excavator | 1 | 304E | Used to excavate anchor trench |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI used the CAT D6 bulldozer to fine grade the pond floor.
- MSI used the Volvo trackhoe to remove excess material from the pond floor. (See Photo 1)
- MSI continued to excavate the liner anchor trench along the peninsula of the pond. (See Photo 2)
- MSI continued to roll subgrade with CAT smooth drum. (See Photo 3)
- Lone Star continued filling sand bags for geomembrane installation.
- See Progress Map on page 5 for certified areas.

**Surveying Activities:**

- No surveying activities.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

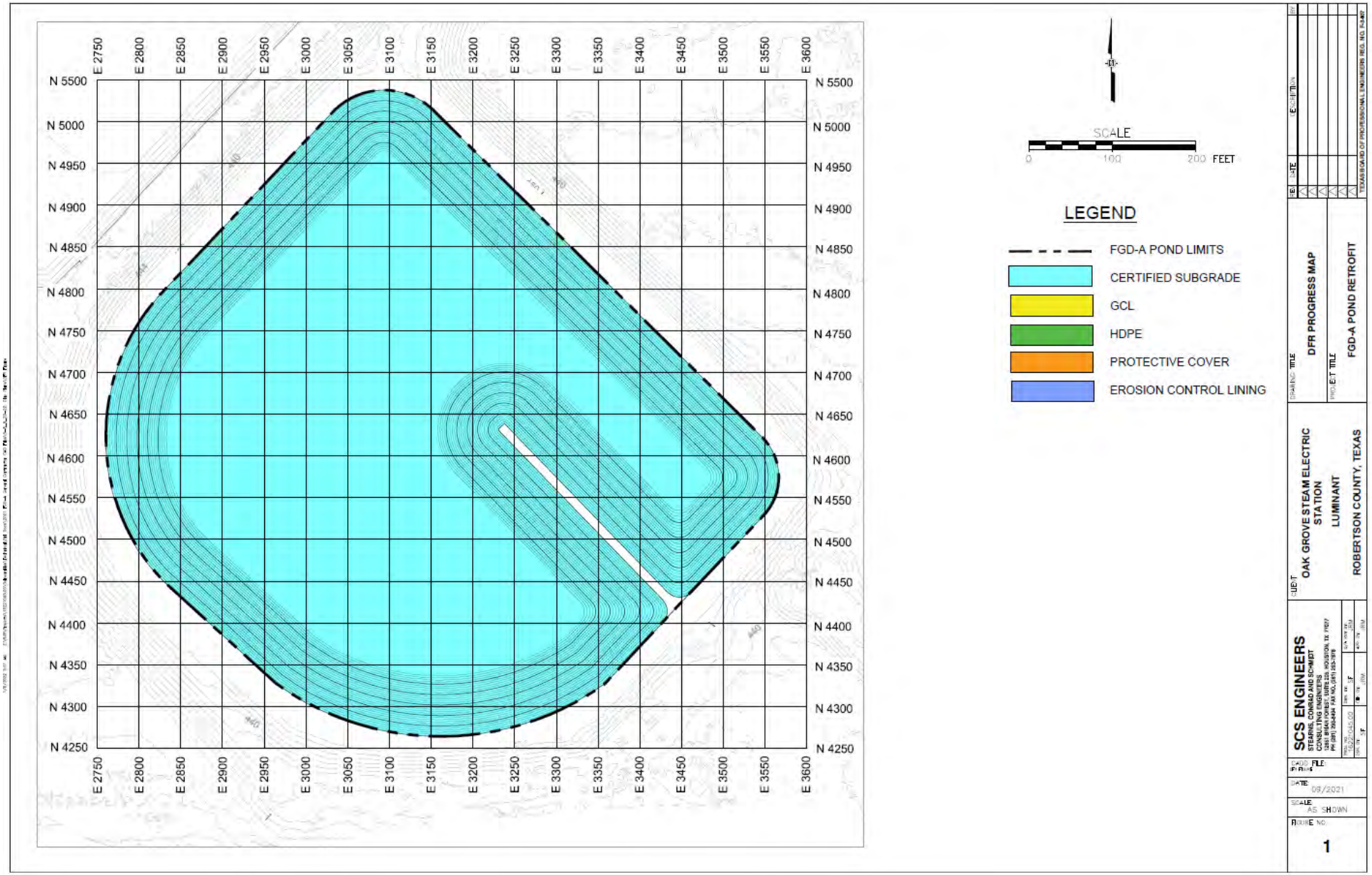
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/07/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/07/2022 |

**Photo 1** – Removing excess material from pond floor

**Photo 2** – Rolling subgrade with smooth drum roller

**Photo 3** – Cutting anchor trench on peninsula

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 53** |
| | | **Date: 01/07/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/08/2022** | **Report No.**: 54 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 54°, cloudy, light winds approx. 5-10 mph<br>PM: 63°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: TBD** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1030 | 4 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Not used today |
| CAT Mini Excavator | 1 | 304E | Used to excavate anchor trench |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- Oak Grove received light amount of rain overnight.
- MSI continued to excavate the liner anchor trench along the peninsula of the pond. (See Photo 1)
- Lone Star on site; pond subgrade was too wet for deployment.
- Began raining again at 10:00 AM.
- See Progress Map on page 4 for certified areas.

**Surveying Activities:**

- No surveying activities.

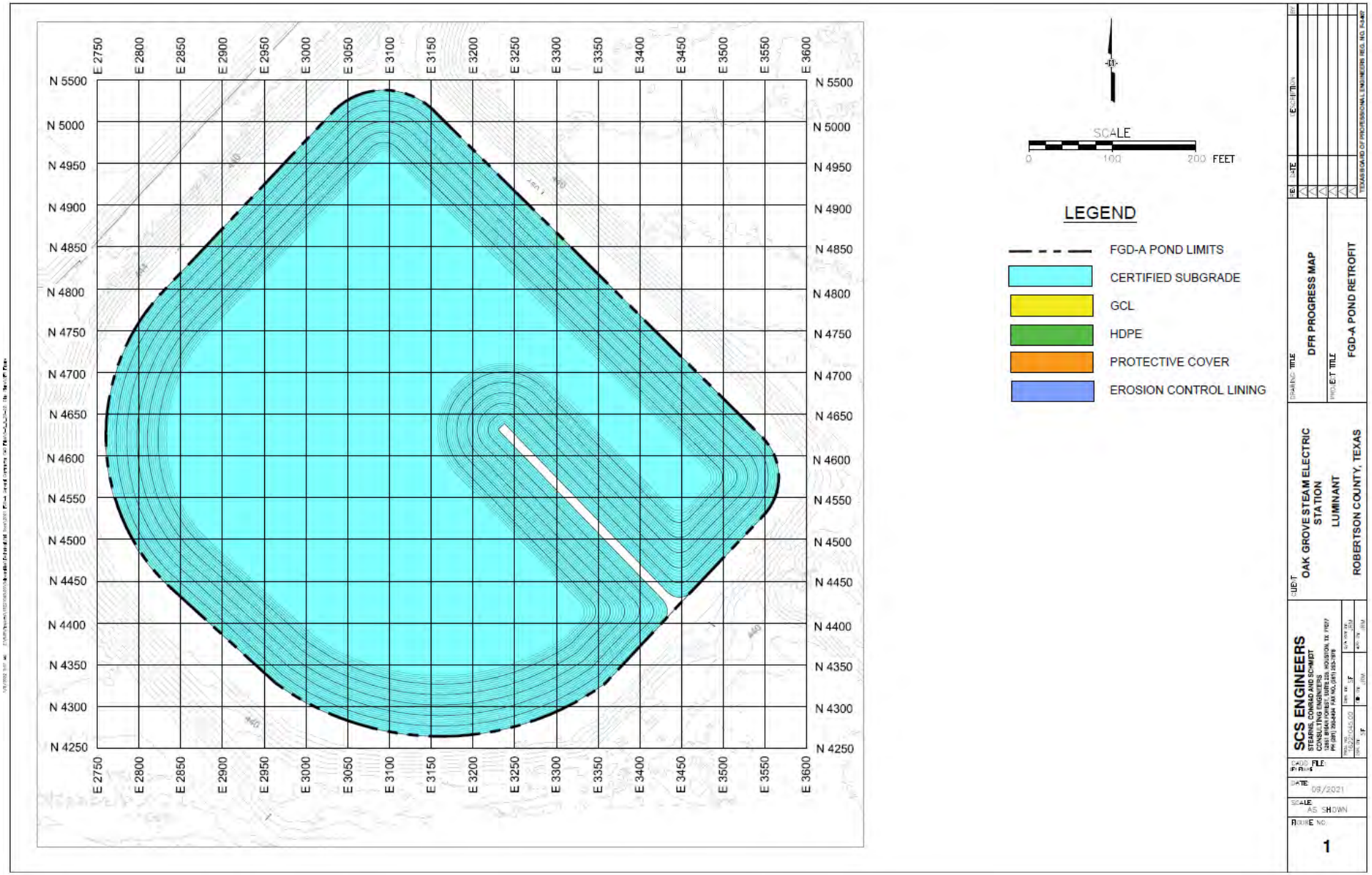
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/08/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/08/2022 |

**Photo 1** – Removing excess material from pond floor

**Photo 2** – Prepared pond subgrade

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 54** |
| | | **Date: 01/08/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/09/2022** | **Report No.**: 55 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM:<br>PM: | **Rain Gauge Reading: 0.5"** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| | | | | |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| | | | |
| | | | |

| Description of Work |
|---|
| **Construction Activities:**<br>• No work was conducted due to wet conditions. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | Danny Rennicks | 01/09/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 01/09/2022 |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/10/2022** | **Report No.**: 56 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 34°, clear, light winds approx. 5-10 mph<br>PM: 56°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1700 | 10 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Used to haul excess material from pond subgrade |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Used to stage geosynthetic material |
| CAT GPS Bulldozer | 1 | D6 | Used to fine grade pond subgrade |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Sheeps Foot Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Used to load excess material from pond subgrade |
| CAT Mini Excavator | 1 | 304E | Used to excavate anchor trench |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI used the CAT D6 bulldozer to fine grade the eastern pond floor.
- MSI used the Volvo trackhoe to remove excess material from the eastern pond floor.
- MSI continued to excavate the liner anchor trench along the western side slope
- MSI continued to roll subgrade with CAT smooth drum.
- Lone Star began GCL and HDPE deployment on the south slope, west of the peninsula, and continued in west direction. (See Photos 1 and 2)
- Lone Star welded all available HDPE seams. (See Photo 3)
- All deployed GCL was covered by HDPE.
- All HDPE edges were lined with sandbags to protect against wind. (See Photo 4)
- See Progress Map on page 5 for approximate area of geosynthetic installation.

**Surveying Activities:**

- No surveying activities.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/10/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/10/2022 |

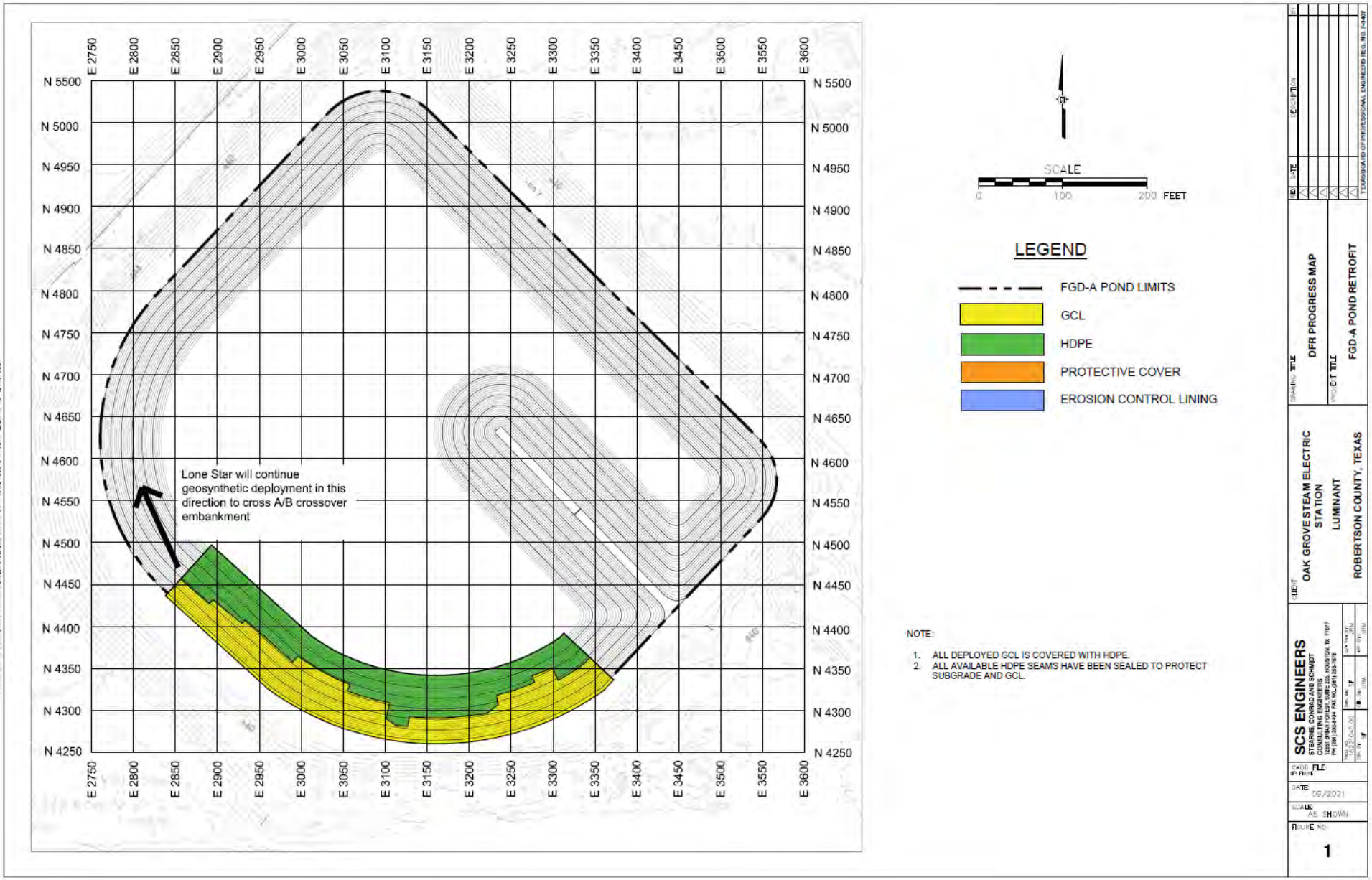
**Photo 1** – GCL and HDPE deployment

**Photo 2** – GCL deployment

**Photo 3** – Fusion welding HDPE

**Photo 4** – End of day deployed geosynthetics

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 56**<br>**Date: 01/10/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/11/2022** | **Report No.**: 57 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 38°, clear, light winds approx. 5-10 mph<br>PM: 54°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: N/A** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1500 | 8 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Used to stage geosynthetic material |
| CAT GPS Bulldozer | 1 | D6 | Used to fine grade pond subgrade |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Used to roll pond floor |
| Volvo Excavator | 1 | EC 480 | Not used today |
| CAT Mini Excavator | 1 | 304E | Used to excavate anchor trench |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI used the CAT D6 bulldozer to fine grade the eastern pond floor.
- MSI continued to excavate the liner anchor trench along the northern side slope. (See Photo 1)
- MSI continued to roll subgrade with CAT smooth drum.
- Lone Star continued GCL and HDPE deployment on the west slope, west of the peninsula, and continued deploying towards the FGD-A/B crossover embankment. (See Photo 2)
- Lone Star welded all available HDPE seams.
- All deployed GCL was covered by HDPE.
- All HDPE edges were lined with sandbags to protect against wind. (See Photo 4)
- See Progress Map on page 5 for approximate area and quantities of geosynthetic installation.

**Surveying Activities:**

- No surveying activities.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/11/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/11/2022 |

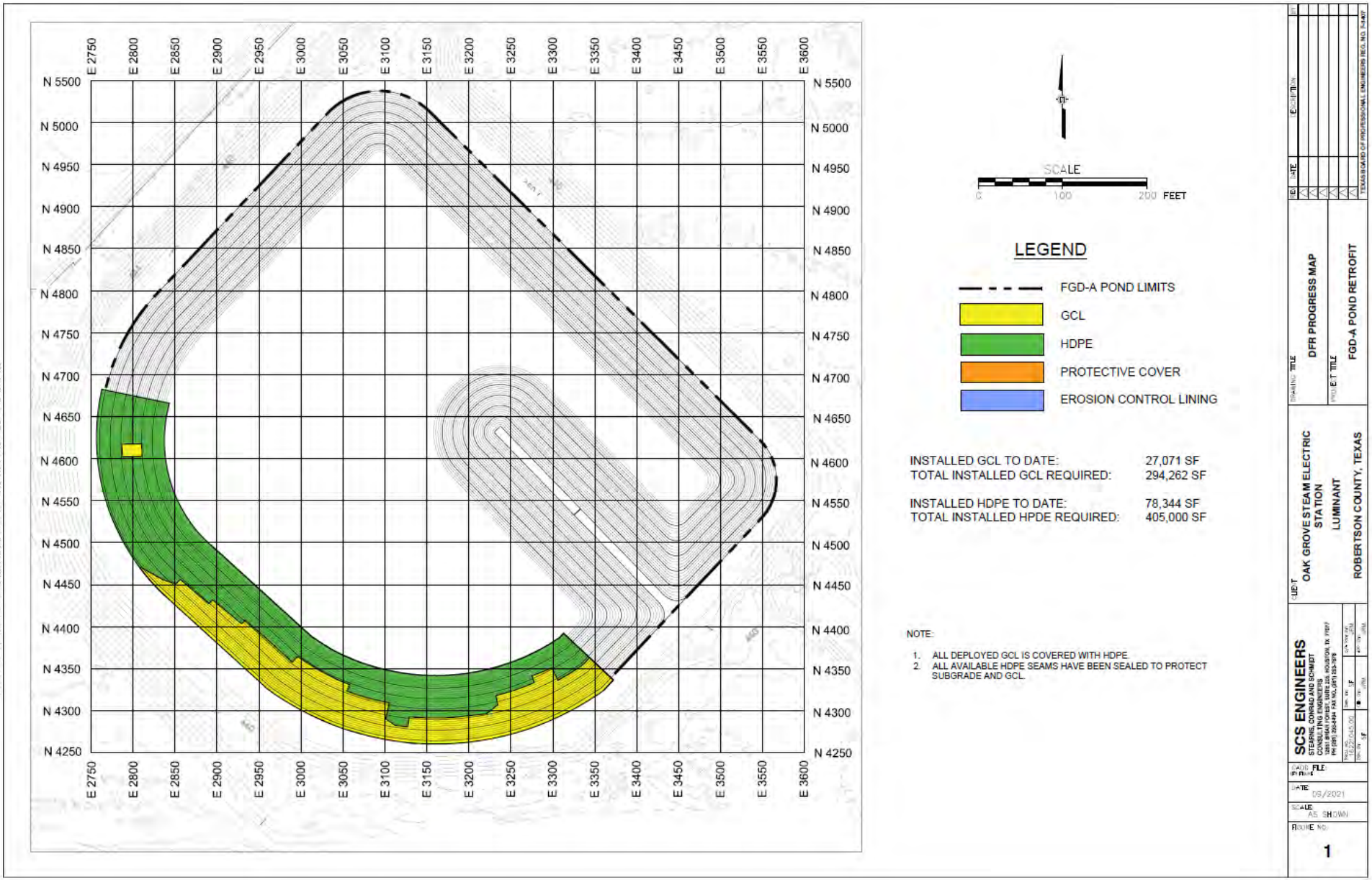
**Photo 1** – GCL and HDPE deployment

**Photo 2** – HDPE deployment

**Photo 3** – Measuring HDPE panels

**Photo 4** – End of day deployed geosynthetics

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 57**<br>**Date: 01/11/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/12/2022** | **Report No.**: 58 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 39°, partly cloudy, light winds approx. 5-10 mph<br>PM: 63°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: ¼"** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Melvin Mejia | Luminant Project Manager |
| J.Roy Murray | CQA Project Director |
| Sam Franco | CQA Project Manager |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Used to stage geosynthetic material |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Not used today |
| CAT Mini Excavator | 1 | 304E | Used to excavate anchor trench |
| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- Oak Grove received ¼" of rain overnight.
- Pond floor was too wet for equipment.
- No GCL was compromised from the rain event.
- Pond subgrade was too wet for geosynthetic deployment in the morning.
- Lone Star began air testing all fusion welded seams and completed all available repairs.
- Destructive Samples (DS) were collected and shipped to TRI via FedEx.
- In the afternoon, Lone Star continued deployment of GCL and HDPE across the FGD-A/B crossover embankment and continued across the northern slope in the east direction. (See Photos 1 and 2)
- Lone Star welded all available HDPE seams.
- All deployed GCL was covered by HDPE.
- All HDPE edges were lined with sandbags to protect against wind.
- See Progress Map on page 4 for approximate area and quantities of geosynthetic installation.

**Surveying Activities:**

- Geomembrane panel location survey scheduled for Friday, January 14th.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

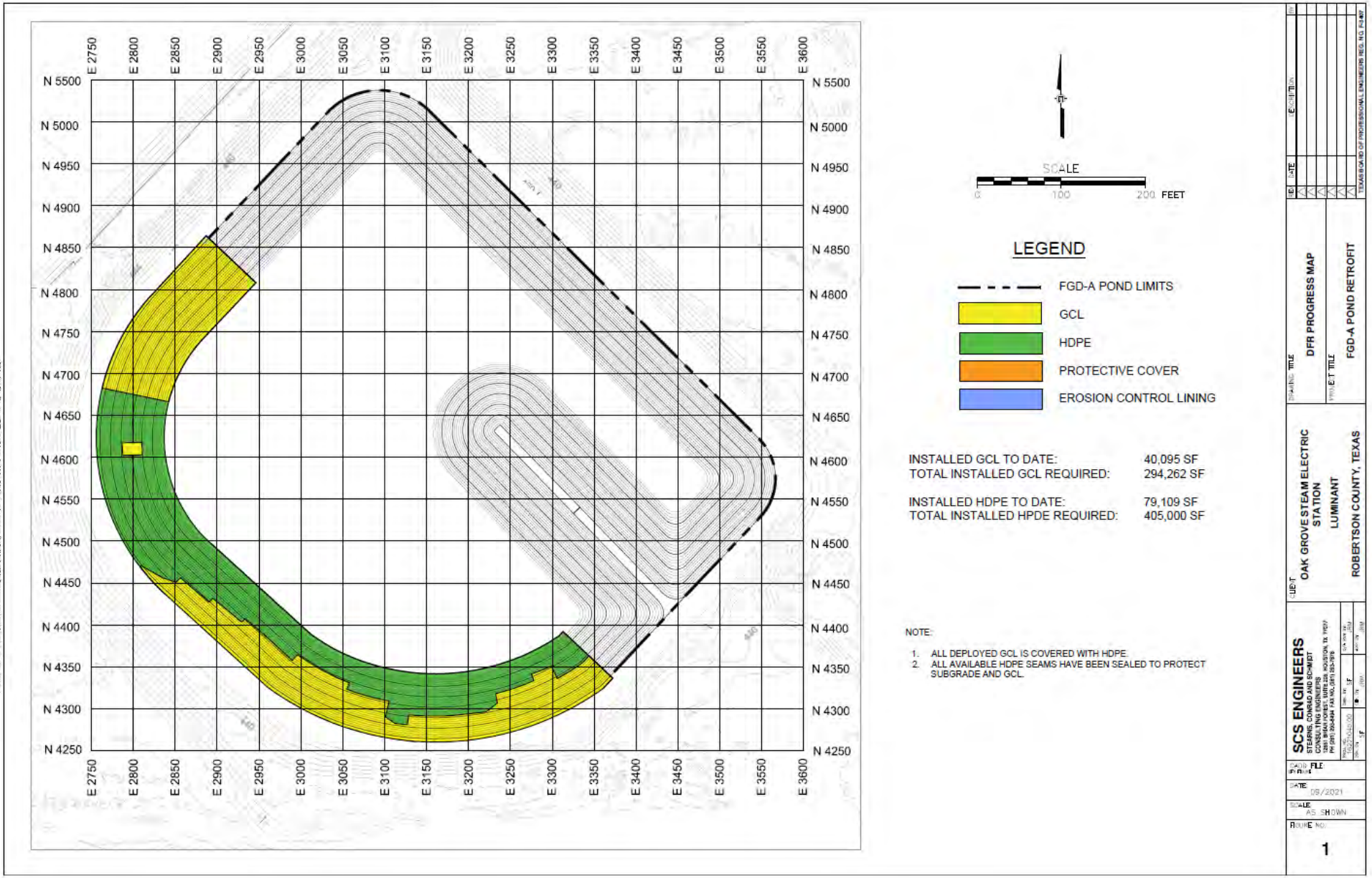
## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | Danny Rennicks | 01/12/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 01/12/2022 |

**Photo 1** – GCL deployment around A/B crossover pipeline and drain line

**Photo 2** – HDPE deployment around A/B crossover pipeline and drain line

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 58**<br>**Date: 01/12/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/13/2022** | **Report No.**: 59 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 42°, clear, light winds approx. 5-10 mph<br>PM: 72°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Used to stage geosynthetic material |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Used to roll floor subgrade |
| Volvo Excavator | 1 | EC 480 | Not used today |
| CAT Mini Excavator | 1 | 304E | Used to excavate anchor trench |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI continued to cut anchor trench along the east and southeast boundaries of the pond.
- MSI used the Volvo smooth drum roller to roll the floor subgrade for geomembrane deployment.
- Lone Star continued deployment of GCL and HDPE across the northern slope and northern pond floor.
- Lone Star welded all available HDPE seams.
- All deployed GCL was covered by HDPE.
- All HDPE edges were lined with sandbags to protect against wind.
- See Progress Map on page 5 for approximate area and quantities of geosynthetic installation.

**Surveying Activities:**

- Geomembrane panel location survey scheduled for Friday, January 14th.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

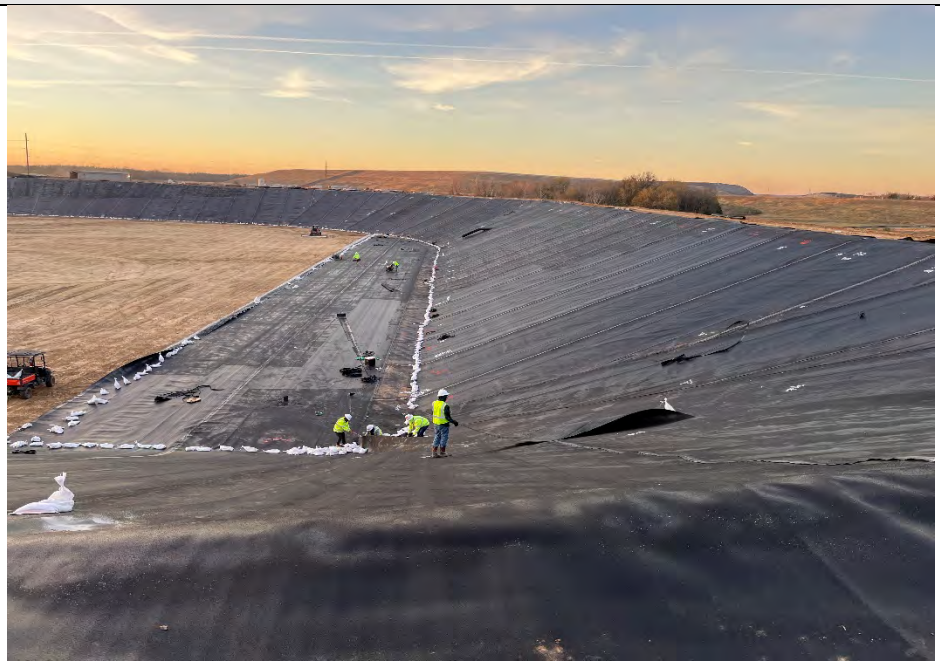
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/13/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/13/2022 |

**Photo 1** – Cutting anchor trench on southern boundary of pond

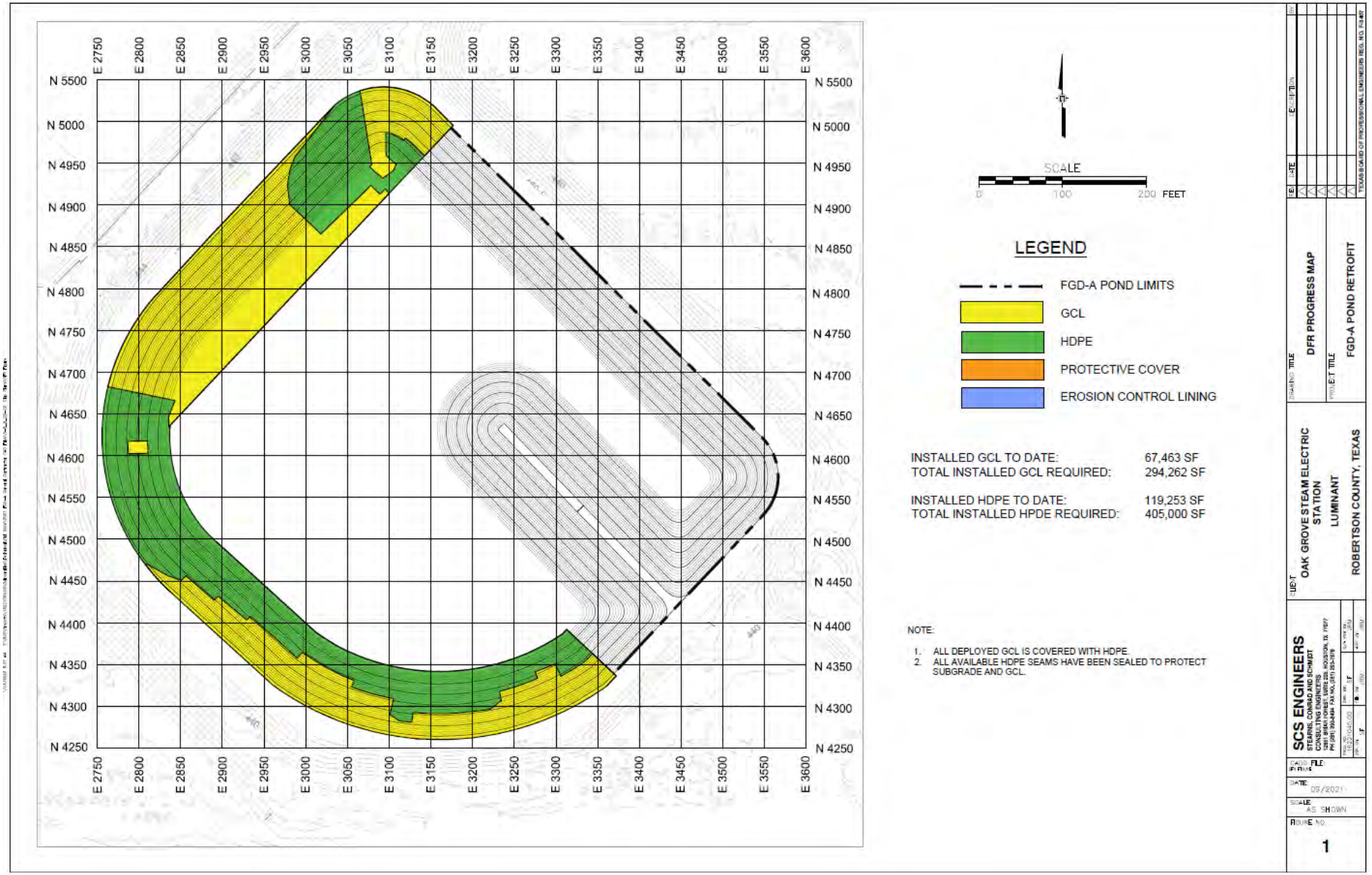
**Photo 2** – Rolling pond subgrade on floor

**Photo 3** – GCL deployment on northern corner

**Photo 4** – End of day deployed geosynthetics



*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 59** |
| | | **Date: 01/13/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/14/2022** | **Report No.**: 60 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 40°, clear, light winds approx. 5-10 mph<br>PM: 76°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Jeremy Davis | CQA Surveyor |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Used to stage geosynthetic material |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Used to roll floor subgrade |
| Volvo Excavator | 1 | EC 480 | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI used the Volvo smooth drum roller to roll the floor subgrade for geomembrane deployment.
- MRGeo (revetment installer) began staging the HYDROTEX fabric forms around FGD-A Pond.
- Lone Star continued deployment of GCL and HDPE across the western slope and northern pond floor.
- Lone Star welded all available HDPE seams.
- All deployed GCL was covered by HDPE.
- All HDPE edges were lined with sandbags to protect against wind.
- See Progress Map on page 4 for approximate area and quantities of geosynthetic installation.

**Surveying Activities:**

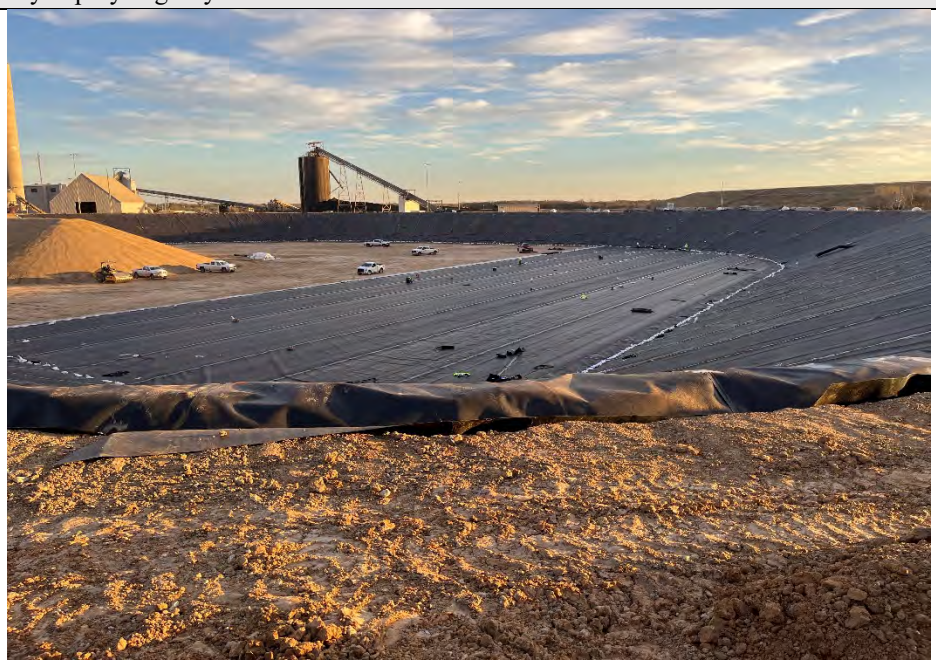
- Jeremy Davis on site to survey deployed geomembrane

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

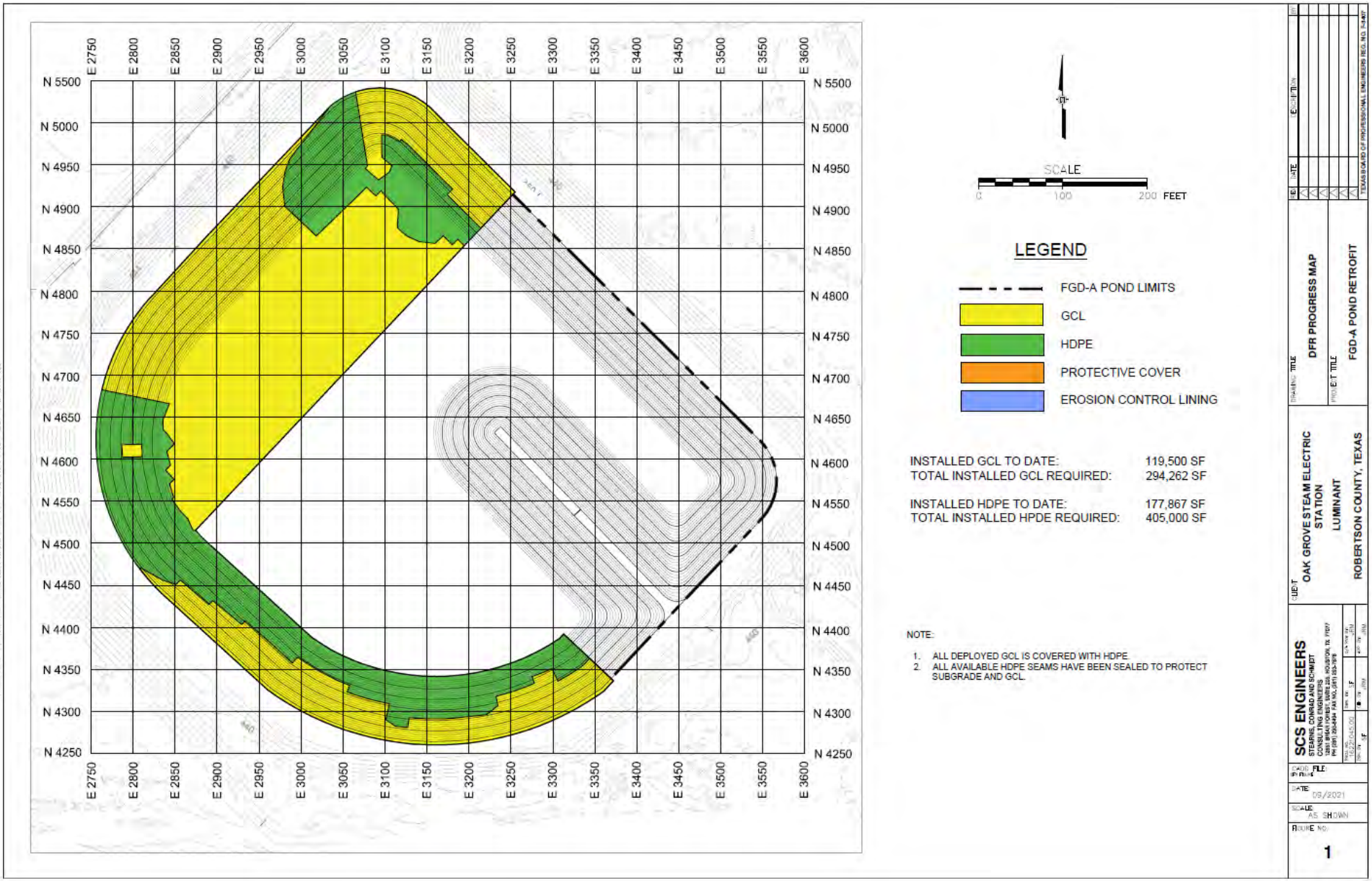
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/14/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/14/2022 |

**Photo 1** – Fusion welding of HDPE

**Photo 2** – End of day deployed geosynthetics



*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 60**<br>**Date: 01/14/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/15/2022** | **Report No.**: 61 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 30°, clear, high winds approx. 30-40 mph<br>PM: 48°, clear, high winds approx. 30-40 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Volvo Excavator | 1 | EC 480 | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- Due to high winds, HYDROTEX fabric forms and geosynthetics were not deployed today.
- Lone Star continued air testing all welded seams throughout the deployed area.
- Lone Star continued to make repairs across all the deployed area. (See Photo 1)
- A geomembrane "boot" was placed around the A/B crossover pipeline and FGD-A drain line. (See Photo 2)
- All repairs have been vacuum tested. (See Photo 3)
- All deployed GCL was covered by HDPE.
- All HDPE edges were lined with sandbags to protect against wind.
- See Progress Map on page 5 for approximate area and quantities of geosynthetic installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/15/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/15/2022 |

**Photo 1** – Extrusion welding of HDPE repairs

**Photo 2** – Geomembrane boot around FGD-A pipelines

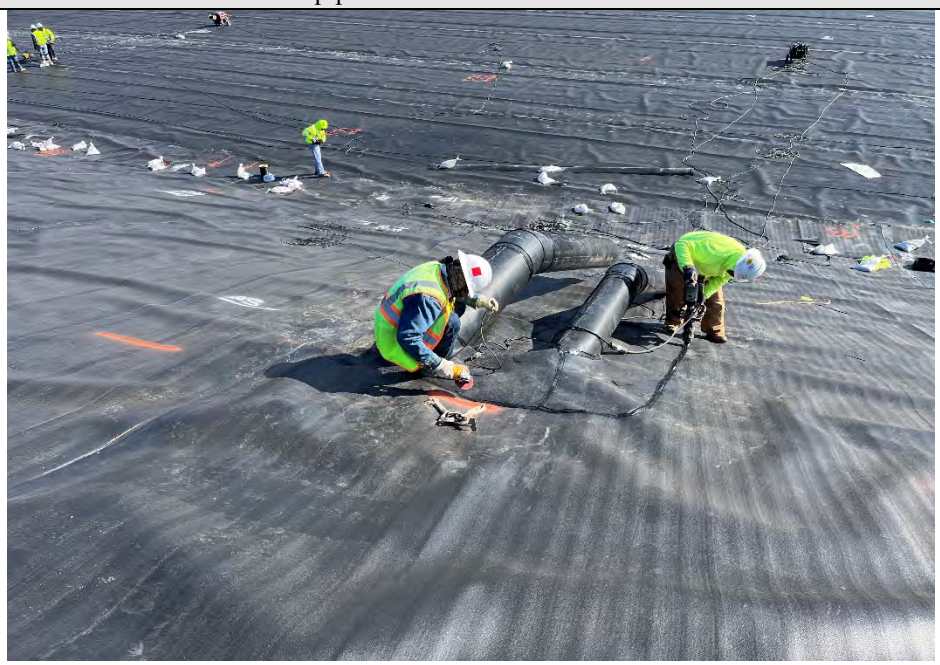
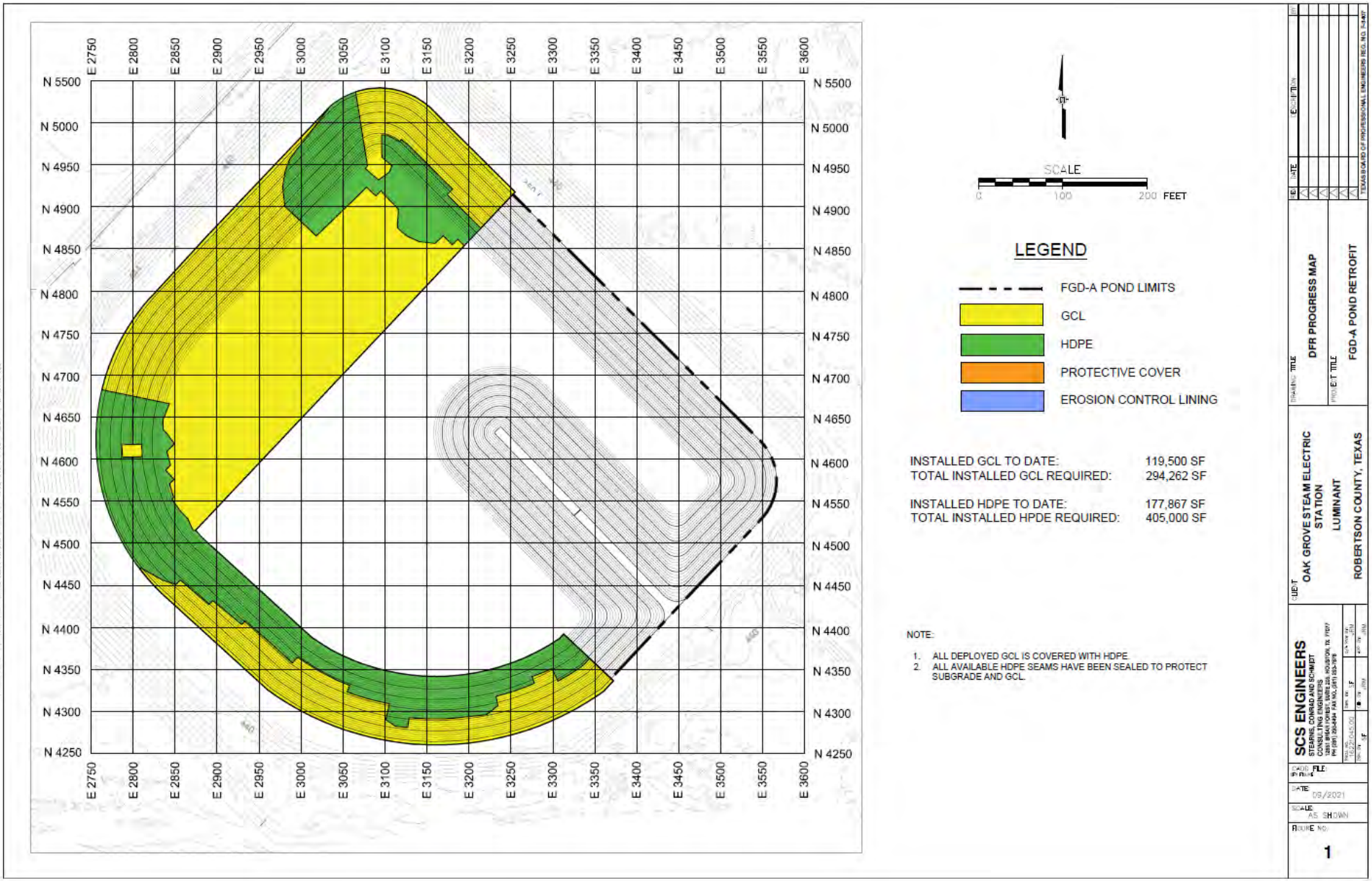


**Photo 3** – Vacuum testing of repairs

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 61**<br>**Date: 01/15/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/16/2022** | **Report No.**: 62 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 32°, clear, light winds approx. 5-10 mph<br>PM: 56°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Used to stage geosynthetic material |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Used to roll pond subgrade |
| Volvo Excavator | 1 | EC 480 | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI used the Volvo smooth drum roller to roll the floor subgrade for geomembrane deployment.
- MRGeo (revetment installer) began deploying the HYDROTEX fabric forms along the western side slope. (See Photo 1)
- Lone Star continued deployment of GCL and HDPE across the western slope and northern pond floor.
- Lone Star welded all available HDPE seams.
- All deployed GCL was covered by HDPE.
- All HDPE edges were lined with sandbags to protect against wind.
- See Progress Map on page 5 for approximate area and quantities of geosynthetic installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/16/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/16/2022 |

**Photo 1** – Deployed HYDROTEX fabric forms

**Photo 2** – HDPE deployment

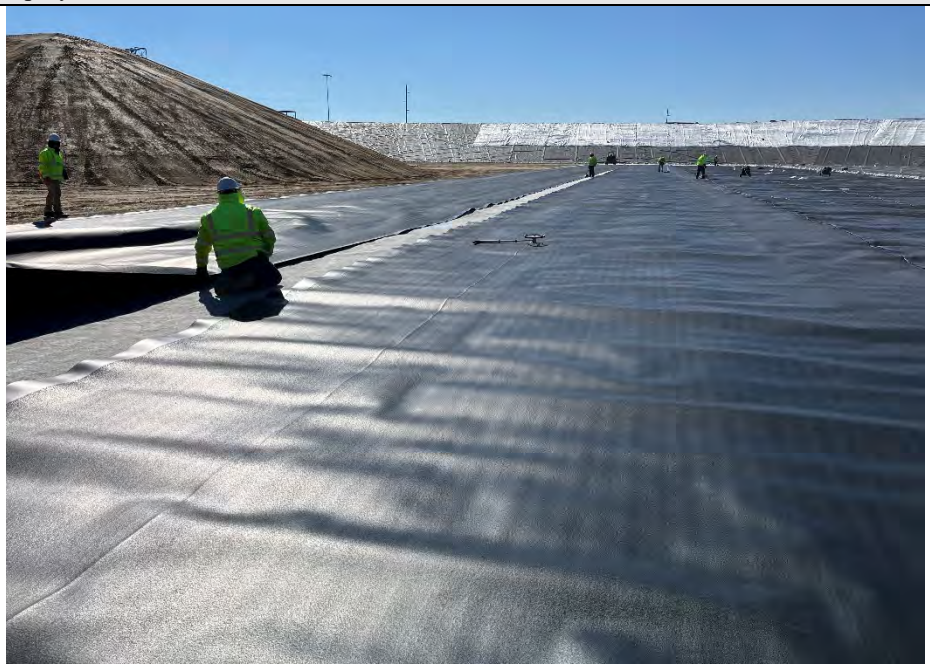
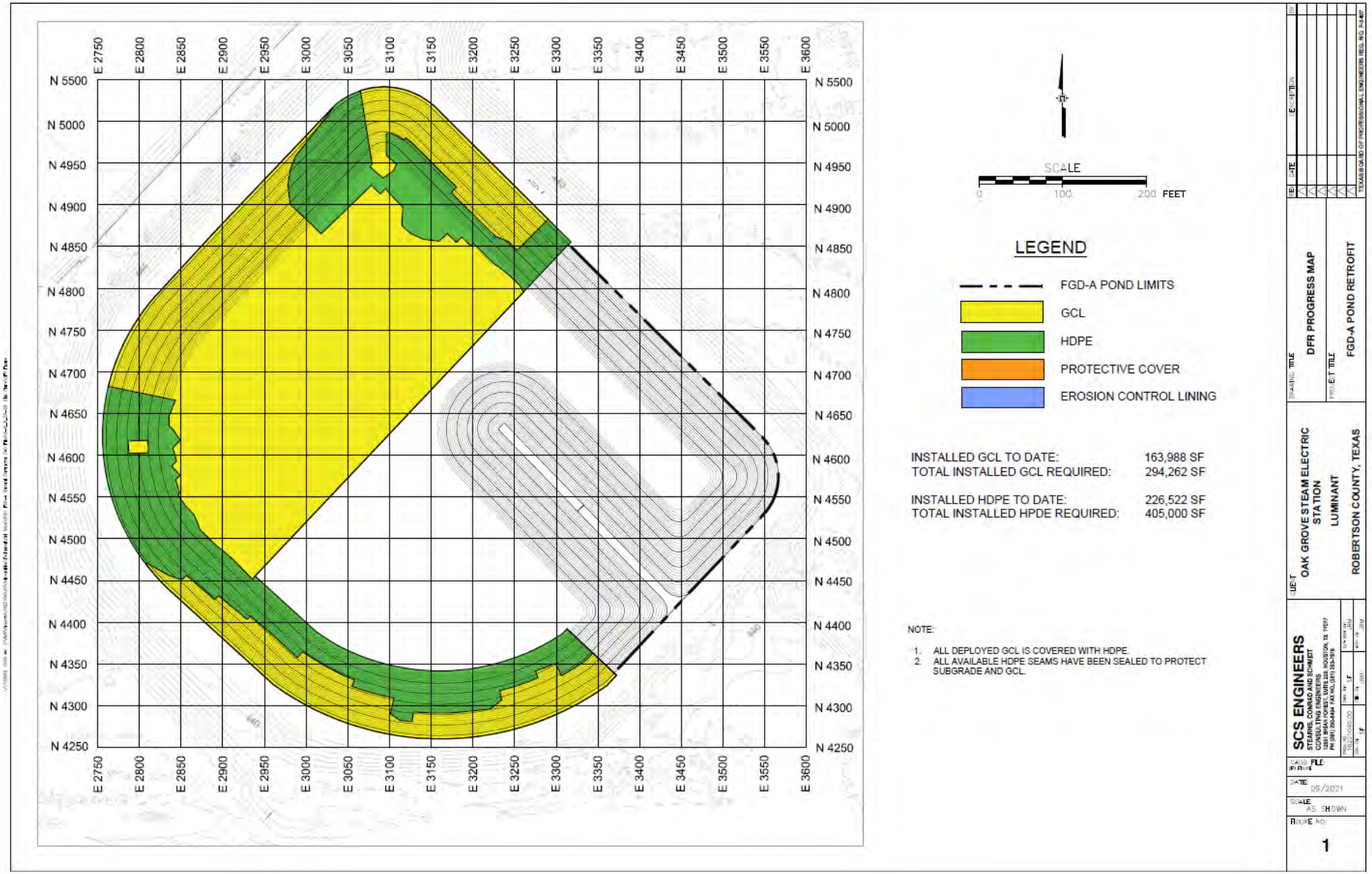


**Photo 3** – Fusion welding HDPE on pond floor

**Photo 4** – End of day deployed geosynthetics

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 60** |
| | | **Date: 01/14/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/17/2022** | **Report No.**: 63 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 42°, clear, light winds approx. 5-10 mph<br>PM: 65°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| Genie Forklift | 1 | GTH 844 | Not used today |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Used to roll pond subgrade |
| Volvo Excavator | 1 | EC 480 | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| | | | |
| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0
- MSI did not use water truck today.

**Construction Activities:**

- MSI used the Volvo smooth drum roller to roll the floor subgrade for geomembrane deployment.
- MRGeo (revetment installer) began pumping concrete into the HYDROTEX fabric forms along the western side slope. (See Photo 1)
- Lone Star continued deployment of GCL and HDPE across the western pond floor and the west side of the peninsula. (See Photo 2)
- Lone Star welded all available HDPE seams. (See Photo 3)
- All deployed GCL was covered by HDPE.
- All HDPE edges were lined with sandbags to protect against wind. (See Photo 4)
- 14 HDPE destructive samples will be sent out on Tuesday, January 18th, for delivery to TRI lab on Wednesday, January 19th. Results of the samples will be noted in this week's DFRs.
- See Progress Map on page 5 for approximate area and quantities of geosynthetic and revetment installation.

**Surveying Activities:**

- Geomembrane panel survey is scheduled for Wednesday, January 19th.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | Danny Rennicks | 01/17/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 01/17/2022 |

**Photo 1** – Concrete pumping into HYDROTEX fabric forms

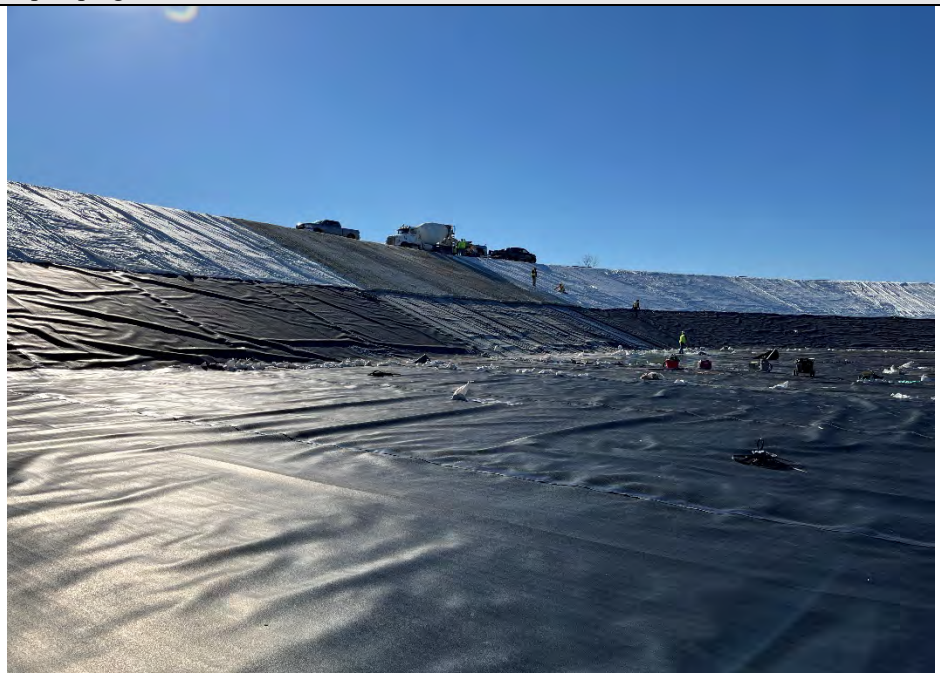


**Photo 2** – HDPE deployment on peninsula ramp

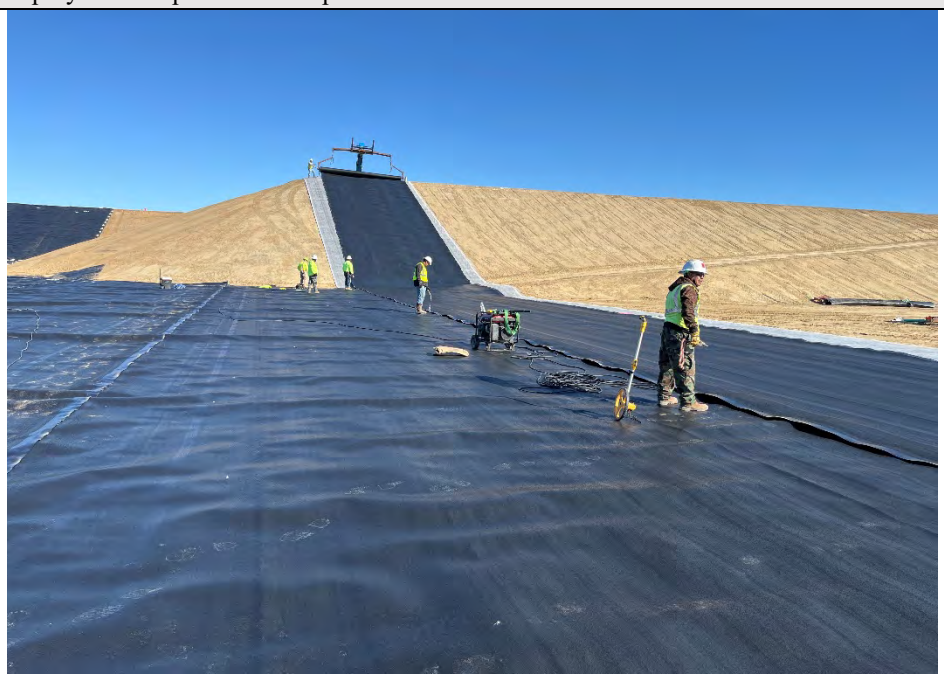


**Photo 3** – HDPE deployment and fusion welding on the peninsula ramp and pond floor

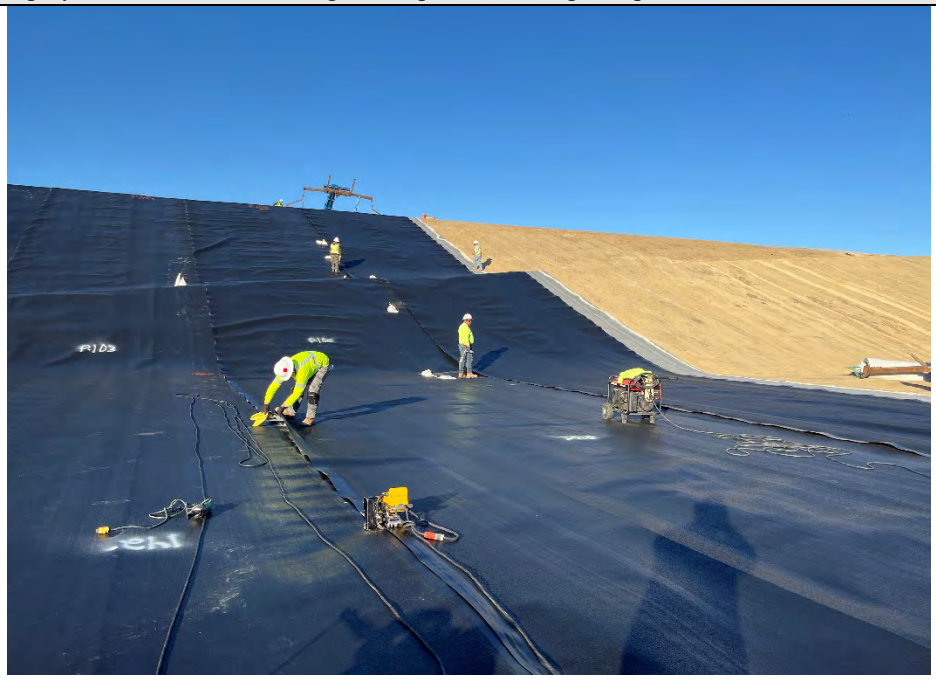
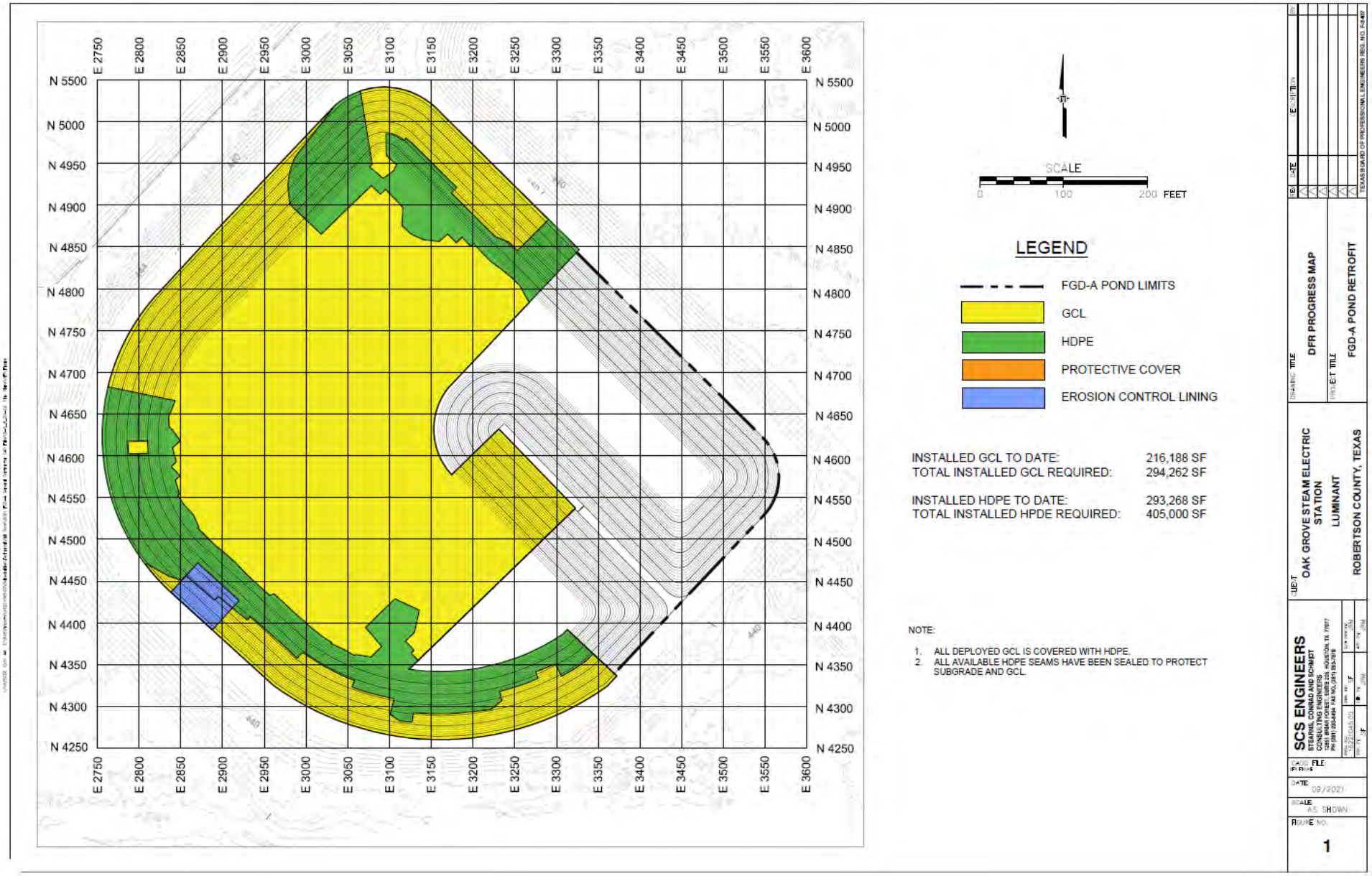


**Photo 4** – End of day deployed geosynthetics

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 63**<br>**Date: 01/17/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/18/2022** | **Report No.**: 64 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 42°, clear, medium winds approx. 15-20 mph<br>PM: 65°, clear, high winds approx. 30 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Used to stage geosynthetic material |
| | | | |
| | | | |
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| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) began pumping concrete into the HYDROTEX fabric forms along the western side slope. (See Photo 1)
- Lone Star continued deployment of GCL and HDPE across the western pond floor and the west side of the peninsula. (See Photo 2)
- Due to high winds, no deployment took place after 12:00 PM.
- Lone Star welded all available HDPE seams.
- Lone Star continued to complete repairs and air tests fusion welds. (See Photo 3)
- All deployed GCL was covered by HDPE.
- All HDPE edges were lined with sandbags to protect against wind.
- 14 HDPE destructive samples were sent out on today, for delivery to TRI lab on Wednesday, January 19th. Results of the samples will be noted in this week's DFRs.
- See Progress Map on page 5 for approximate area and quantities of geosynthetic and revetment installation.

**Surveying Activities:**

- Geomembrane panel survey is scheduled for Wednesday, January 19th.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

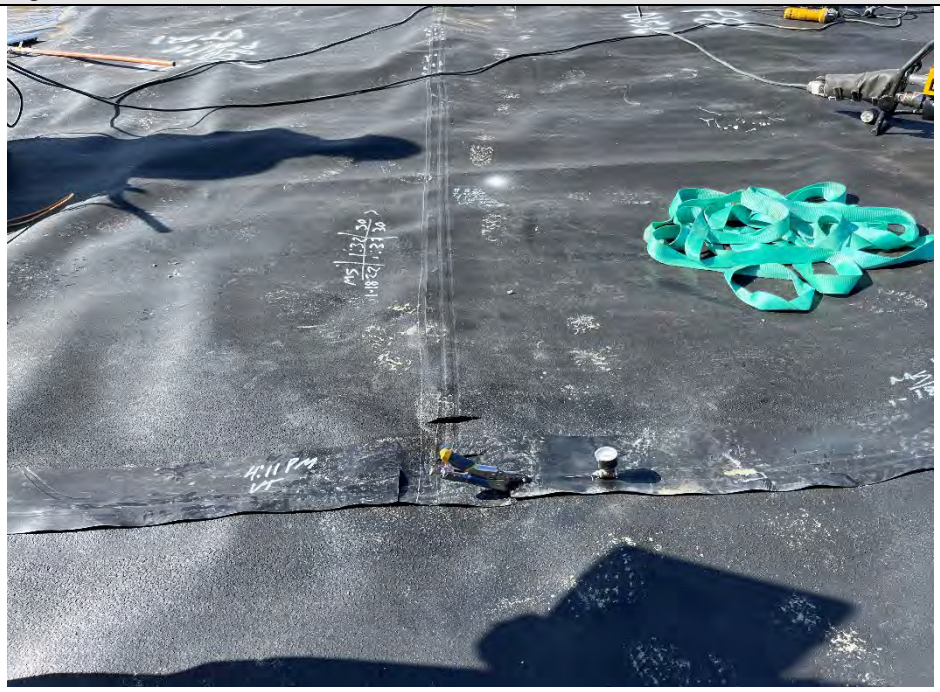
## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | *Danny Rennicks* | 01/18/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/18/2022 |

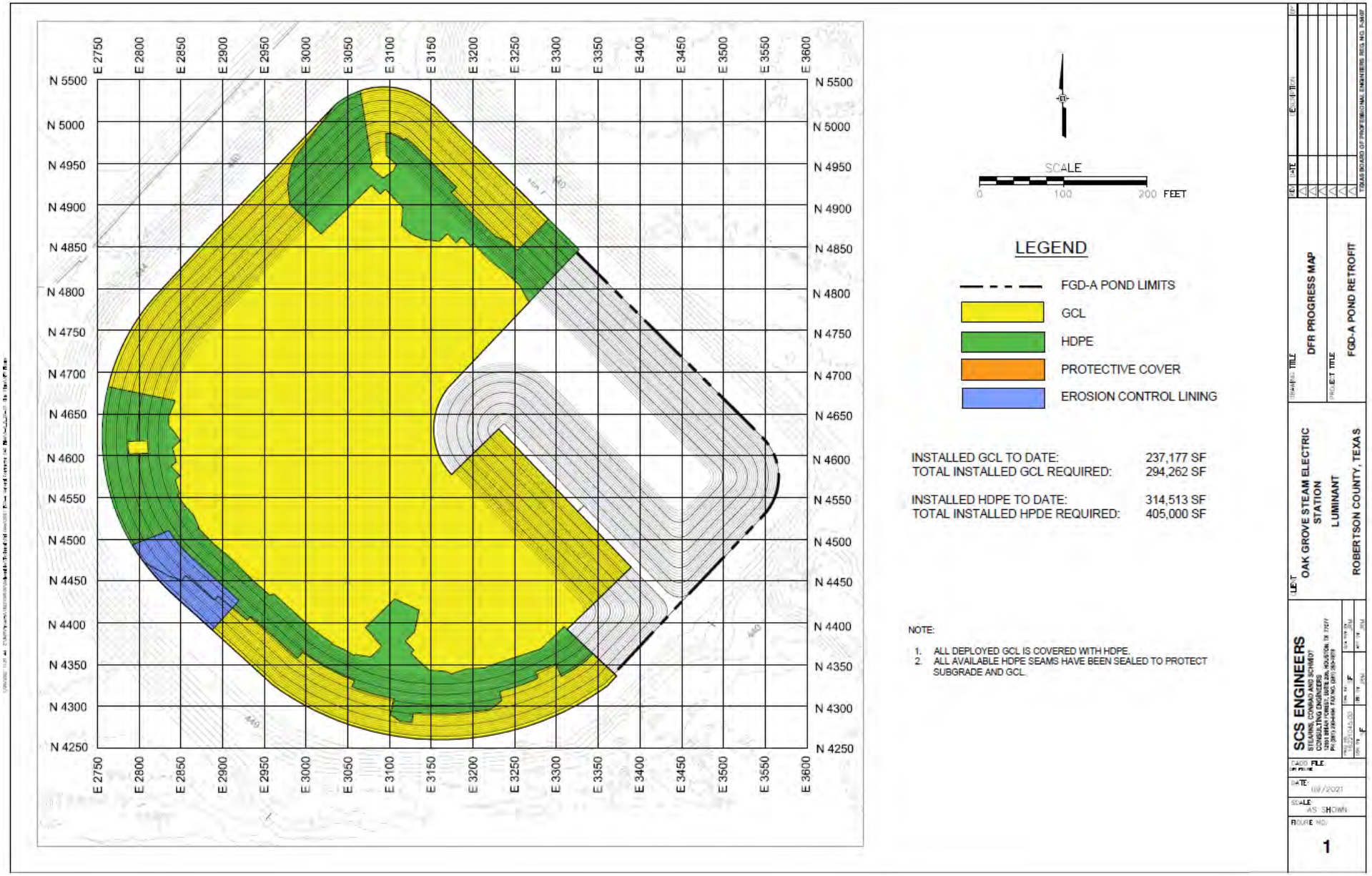
**Photo 1** – Concrete pumping into HYDROTEX fabric forms

**Photo 2** – GCL deployment west of peninsula

**Photo 3** – Air testing fusion welds



*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 64**<br>**Date: 01/18/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/19/2022** | **Report No.**: 65 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 46°, partly cloudy, medium winds approx. 15-20 mph<br>PM: 68°, clear, high winds approx. 30 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Melvin Mejia | Luminant Project Manager |
| Sam Franco | CQA Project Manager |
| Jeremy Davis | CQA Surveyor |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Used to stage geosynthetic material |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) began pumping concrete into the HYDROTEX fabric forms along the western side slope.
- Lone Star continued deployment of GCL and HDPE in the corner, west of the peninsula. (See Photo 1)
- Due to high winds, no deployment took place after 12:00 PM.
- Lone Star welded all available HDPE seams.
- Lone Star continued to complete repairs and air tests fusion welds.
- Lone Star also continued to vacuum test all repairs. (See Photo 2)
- All deployed GCL was covered by HDPE.
- All HDPE edges were lined with sandbags to protect against wind.
- 14 HDPE destructive samples all passed lab testing.
- See Progress Map on page 4 for approximate area and quantities of geosynthetic and revetment installation.

**Surveying Activities:**

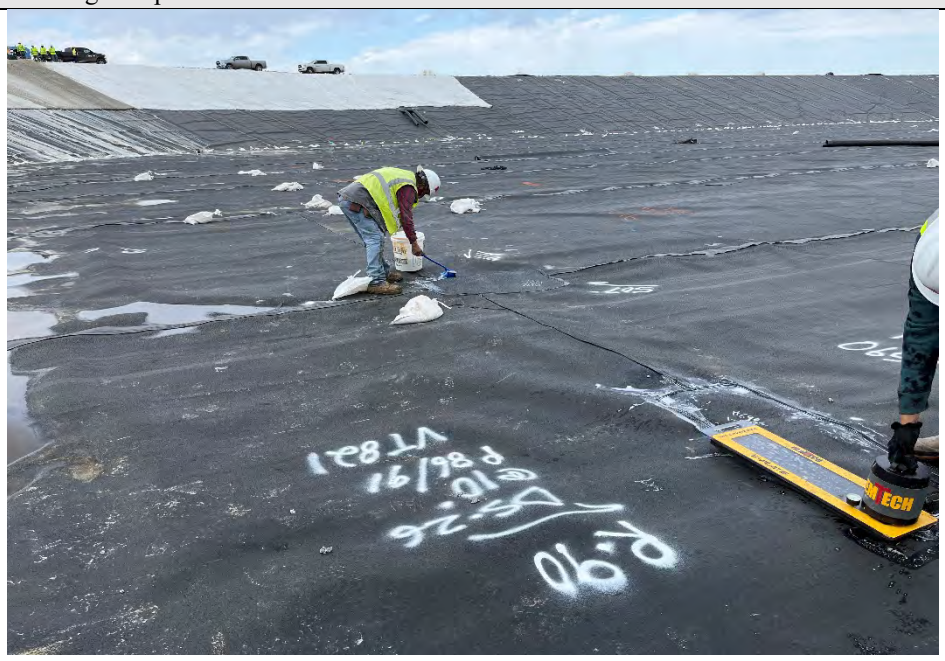
- Jeremy Davis was on site for geomembrane panel surveying.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

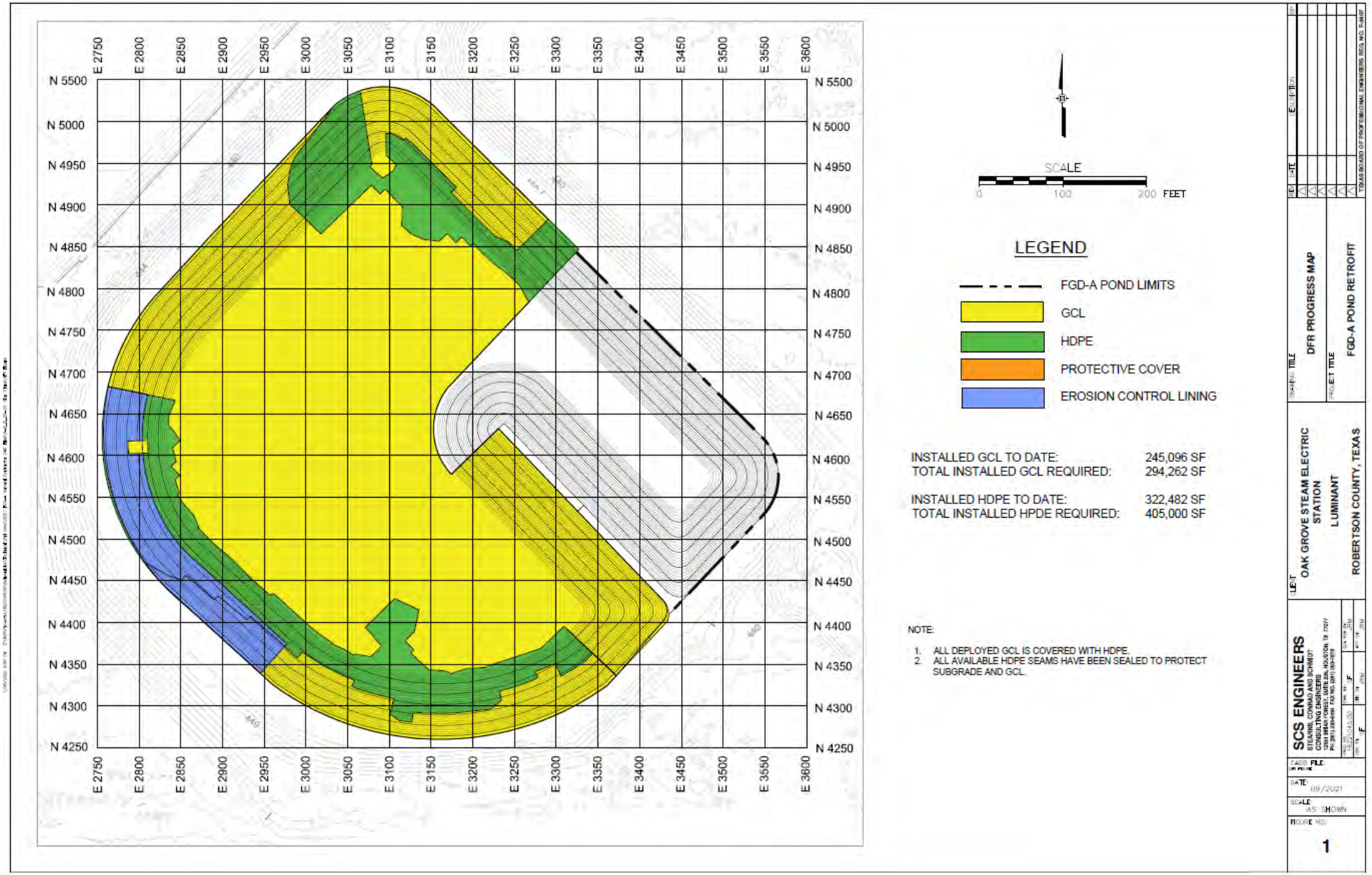
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/19/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/19/2022 |

**Photo 1** – GCL and HDPE deployment west of peninsula

**Photo 2** – Vacuum testing of repairs



*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 65** |
| | | **Date: 01/19/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/20/2022** | **Report No.**: 66 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 26°, cloudy, medium winds approx. 20-25 mph<br>PM: 39°, cloudy, high winds approx. 30 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1400 | 7.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1400 | 7 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Used to stage geosynthetic material |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) continued pumping concrete into the HYDROTEX fabric forms along the western side slope.
- Due to high winds, no GCL or HDPE deployment took place today.
- Due to low temperatures, no welding was allowed to take place until 10:00 AM.
- Lone Star continued to work on repairs and vacuum testing all repairs.
- 17 HDPE destructive were shipped to the testing lab for delivery on January 21st.
- See Progress Map on page 4 for approximate area and quantities of geosynthetic and revetment installation.

**Surveying Activities:**

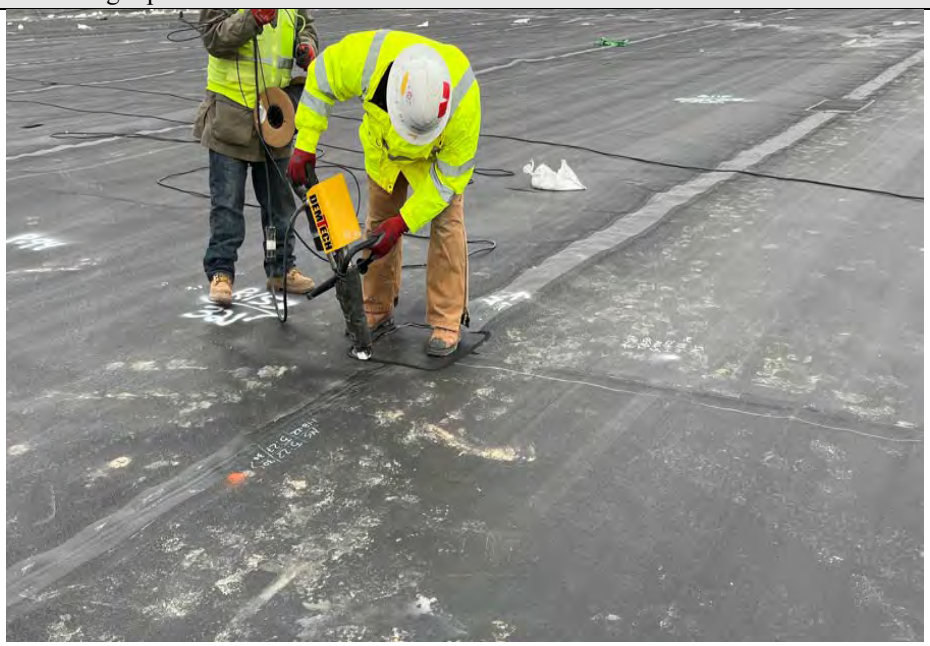
- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

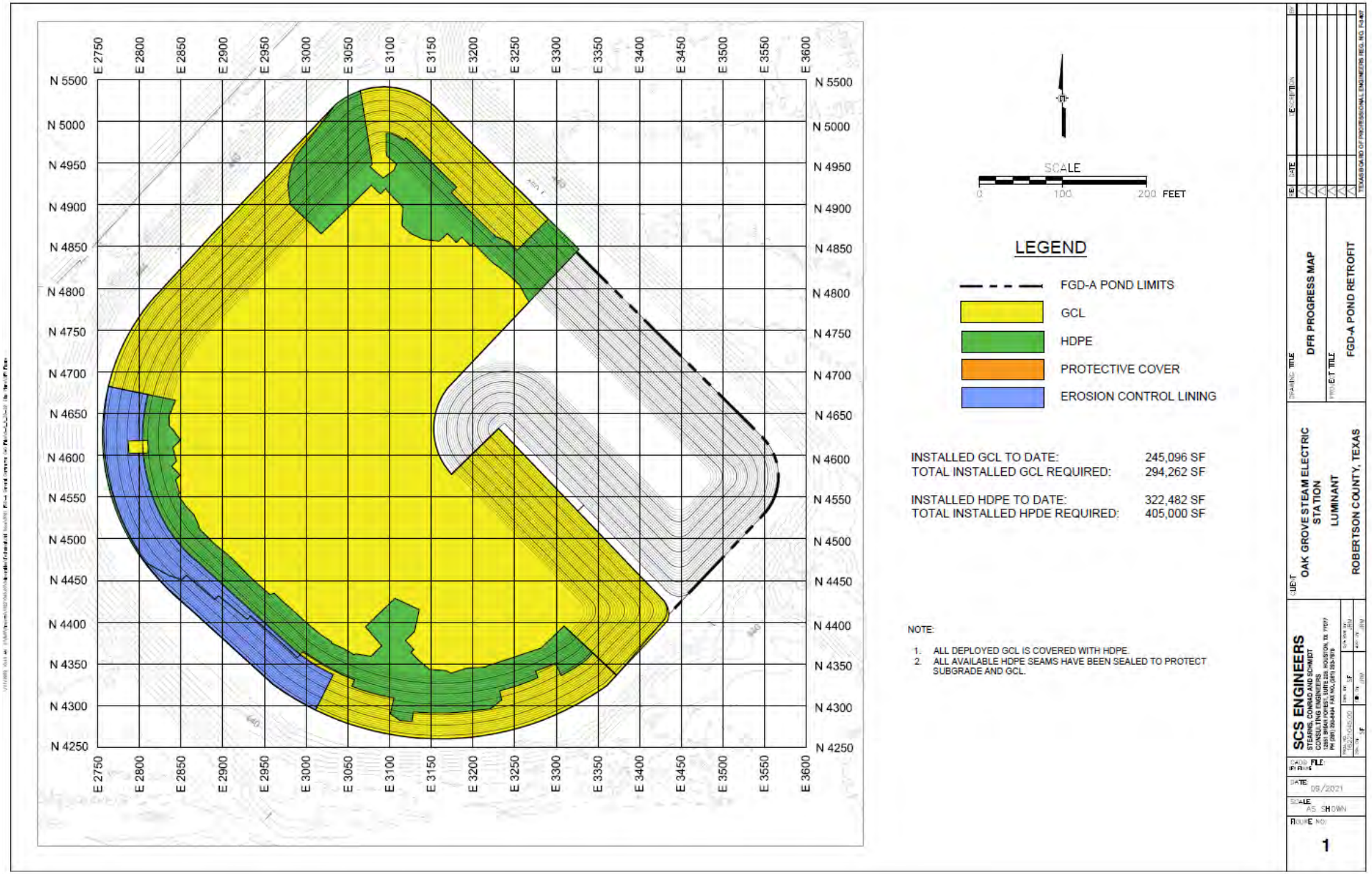
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/20/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/20/2022 |

**Photo 1** – Revetment installation along western side slope

**Photo 2** – Extrusion welding repairs



*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 66** |
| | | **Date: 01/20/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/21/2022** | **Report No.**: 67 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 25°, clear, light winds approx. 5-10 mph<br>PM: 48°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Used to stage geosynthetic material |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) continued deploying HYDROTEX fabric forms along the western side slope moving towards the southwestern corner. (See Photo 1)
- Due to low temperatures, no welding was allowed to take place until 10:30 AM.
- Lone Star continued to deploy GCL and HDPE around the north end of the peninsula and the eastern side slope to the southeastern corner. (See Photo 2)
- All available HDPE seams were welded to protect GCL and subgrade.
- All deployed GCL was covered with HDPE.
- 17 HDPE destructive all passed lab testing.
- See Progress Map on page 5 for approximate area and quantities of geosynthetic and revetment installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

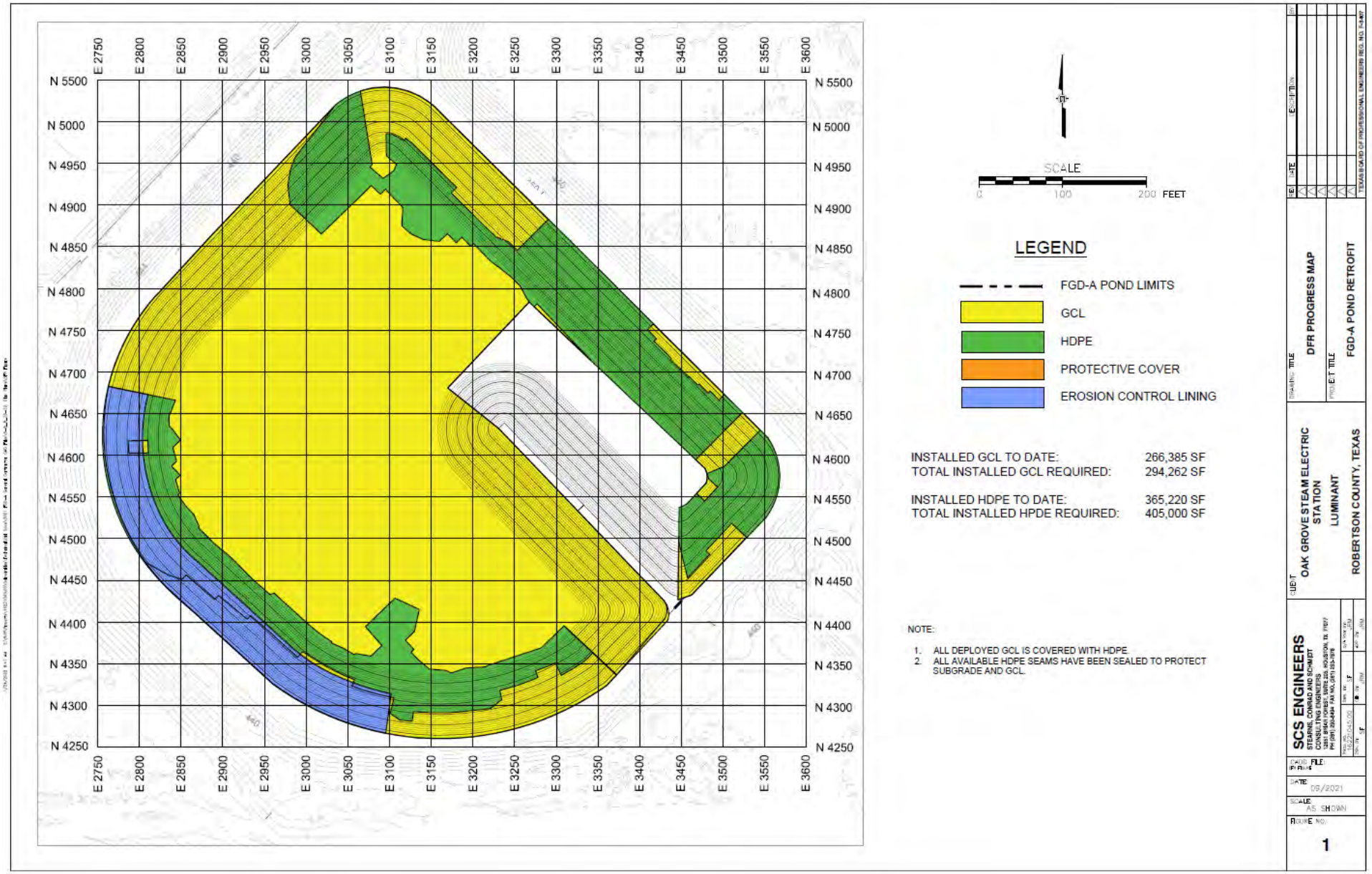
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | Danny Rennicks | 01/21/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 01/21/2022 |

**Photo 1** – HYDROTEX fabric form deployment along the southwestern corner

**Photo 2** – HDPE deployment east of peninsula

**Photo 3** – End of day deployed geosynthetics

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 67**<br>**Date: 01/21/2022** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/22/2022** | **Report No.**: 68 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 31°, clear, light winds approx. 5-10 mph<br>PM: 53°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Used to stage geosynthetic material |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) continued deploying HYDROTEX fabric forms and pumping concrete along the southwestern corner. (See Photo 1)
- Due to low temperatures, no welding was allowed to take place until 9:30 AM.
- Lone Star continued to deploy GCL and HDPE on the north end and eastern slope of the peninsula. (See Photo 2)
- All available HDPE seams have been welded to protect GCL and subgrade.
- See Progress Map on page 5 for approximate area and quantities of geosynthetic and revetment installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

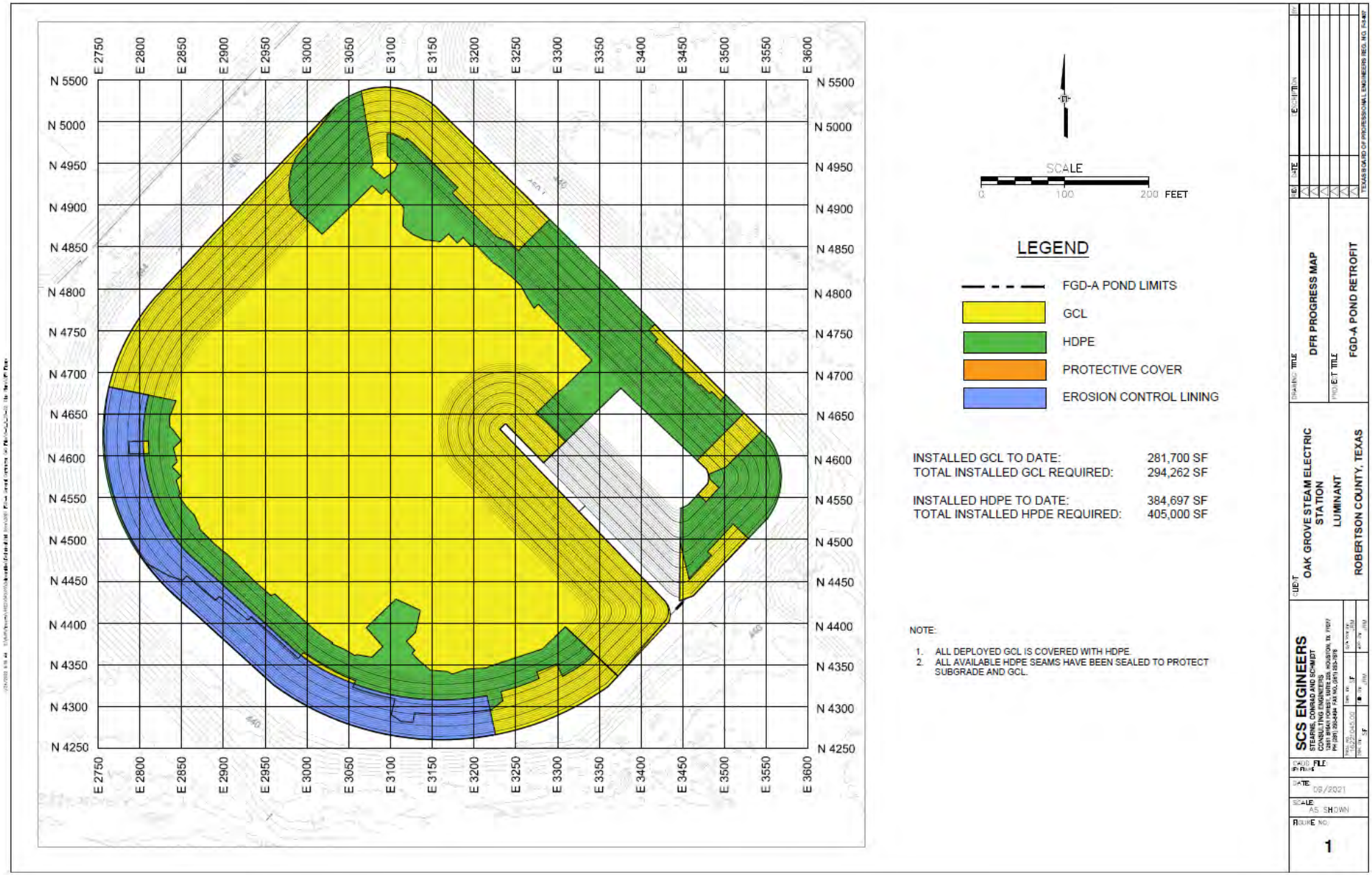
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/22/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/22/2022 |

**Photo 1** – HYDROTEX fabric form deployment along the southwestern corner

**Photo 2** – GCL deployment on end of peninsula

**Photo 3** – Deployed geosynthetics around peninsula

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 67** |
| | | **Date: 01/21/2022** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/23/2022** | **Report No.**: 69 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 46°, partly cloudy, medium winds approx. 10-15 mph<br>PM: 63°, partly cloudy, medium winds approx. 10-15 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1800 | 11 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Used to stage geosynthetic material |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) was not on site today.
- Lone Star completed deployment of GCL and HDPE today.
- All available HDPE seams were welded to protect GCL and subgrade.
- Lone Star continued to work on air tests and repairs throughout the pond.
- Due to predicted rain on Monday, January 24th, all uncompleted repairs had a temporary seal placed to protect HDPE from any leaks.
- 16 HDPE destructive seams were collected to be shipped on Monday, January 24th, for delivery and testing on Tuesday, January 24th.
- See Progress Map on page 4 for approximate area and quantities of geosynthetic and revetment installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/23/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/23/2022 |

**Photo 1** – HDPE deployment on eastern corner of peninsula

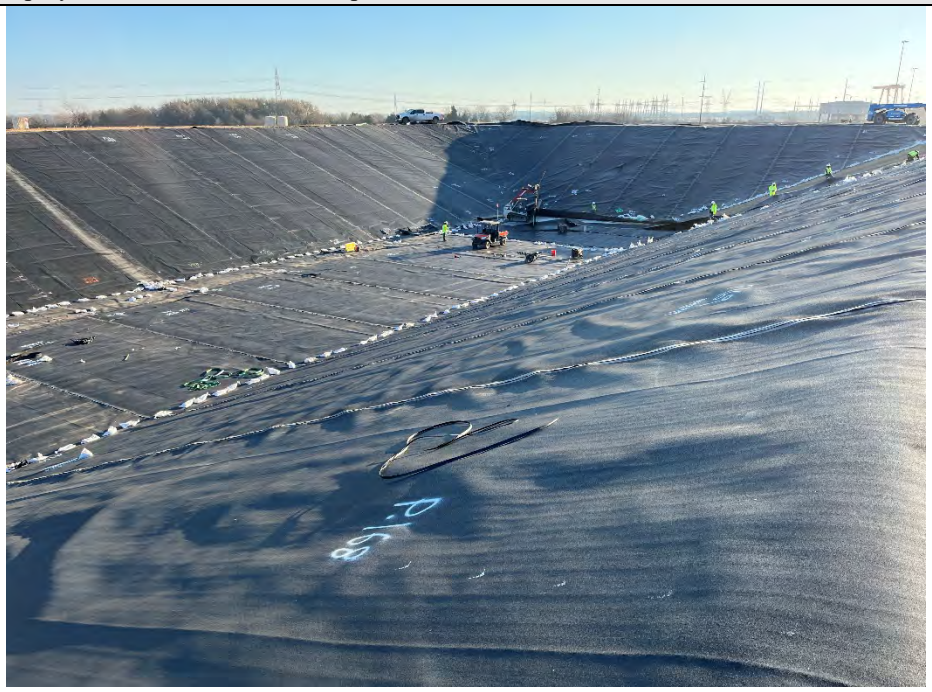
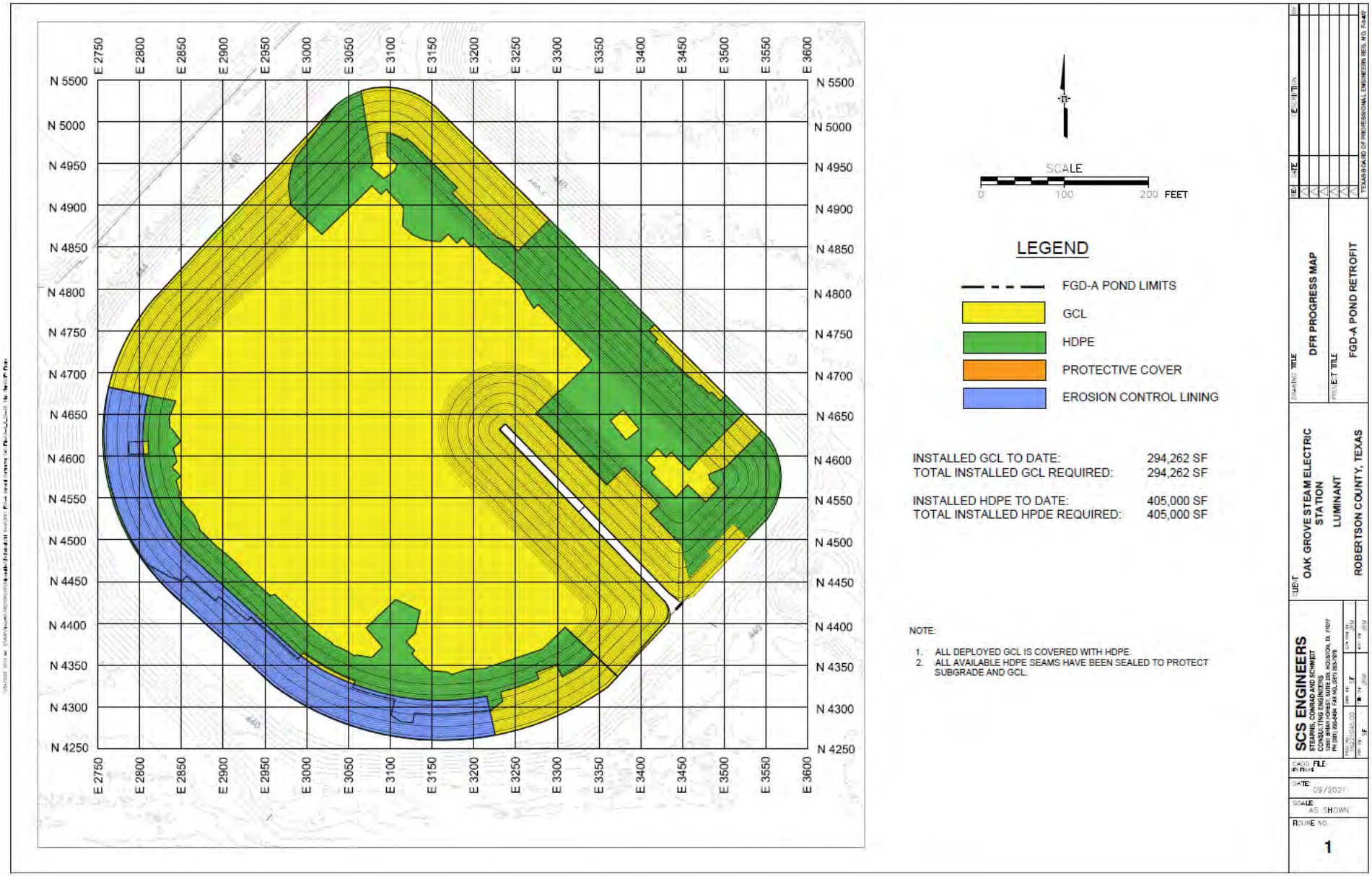


**Photo 2** – Fusion welding of HDPE

**Photo 3** – Extrusion welding repairs on HDPE

**Photo 4** – Completed HDPE deployment

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 69** |
| | | **Date: 01/23/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/24/2022** | **Report No.**: 70 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 43°, cloudy, medium winds approx. 10-15 mph<br>PM: 52°, cloudy, medium winds approx. 10-15 mph | **Rain Gauge Reading: 0.5"** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1000 | 3.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1000 | 3 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Not used today |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) was not on site until 0900.
- Lone Star continued to vacuum test repairs. (See Photo 1)
- Due to rain, all contractors were off site by 1000.
- MSI had pumps placed in FGD-A Pond.
- 16 HDPE destructive seams were collected to be shipped on Monday, January 24th, for delivery and testing on Tuesday, January 25th.
- See Progress Map on page 4 for approximate area and quantities of geosynthetic and revetment installation.

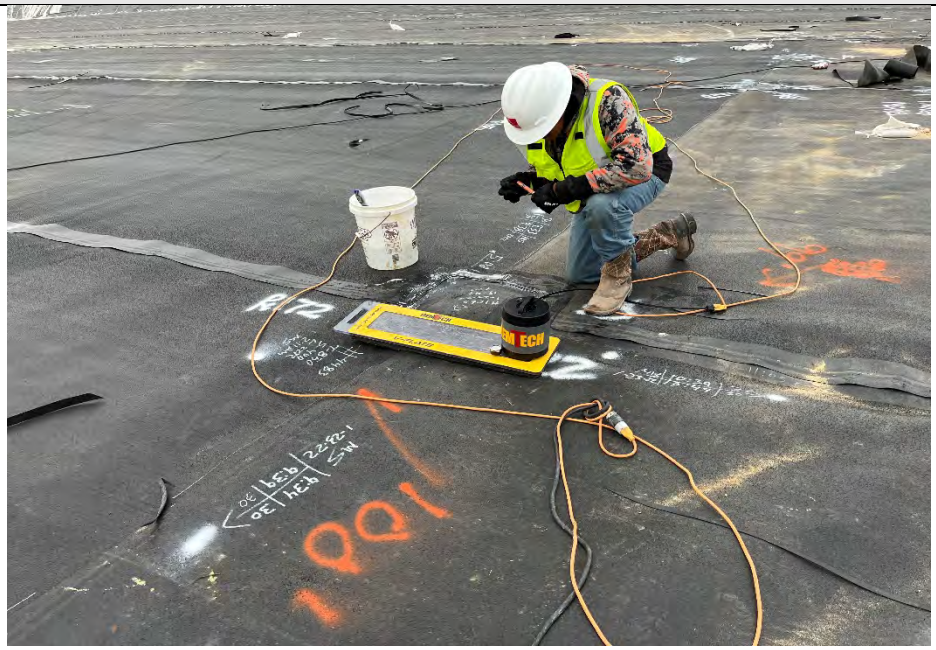
**Surveying Activities:**

- Geomembrane panel survey scheduled for Wednesday, January 26th.

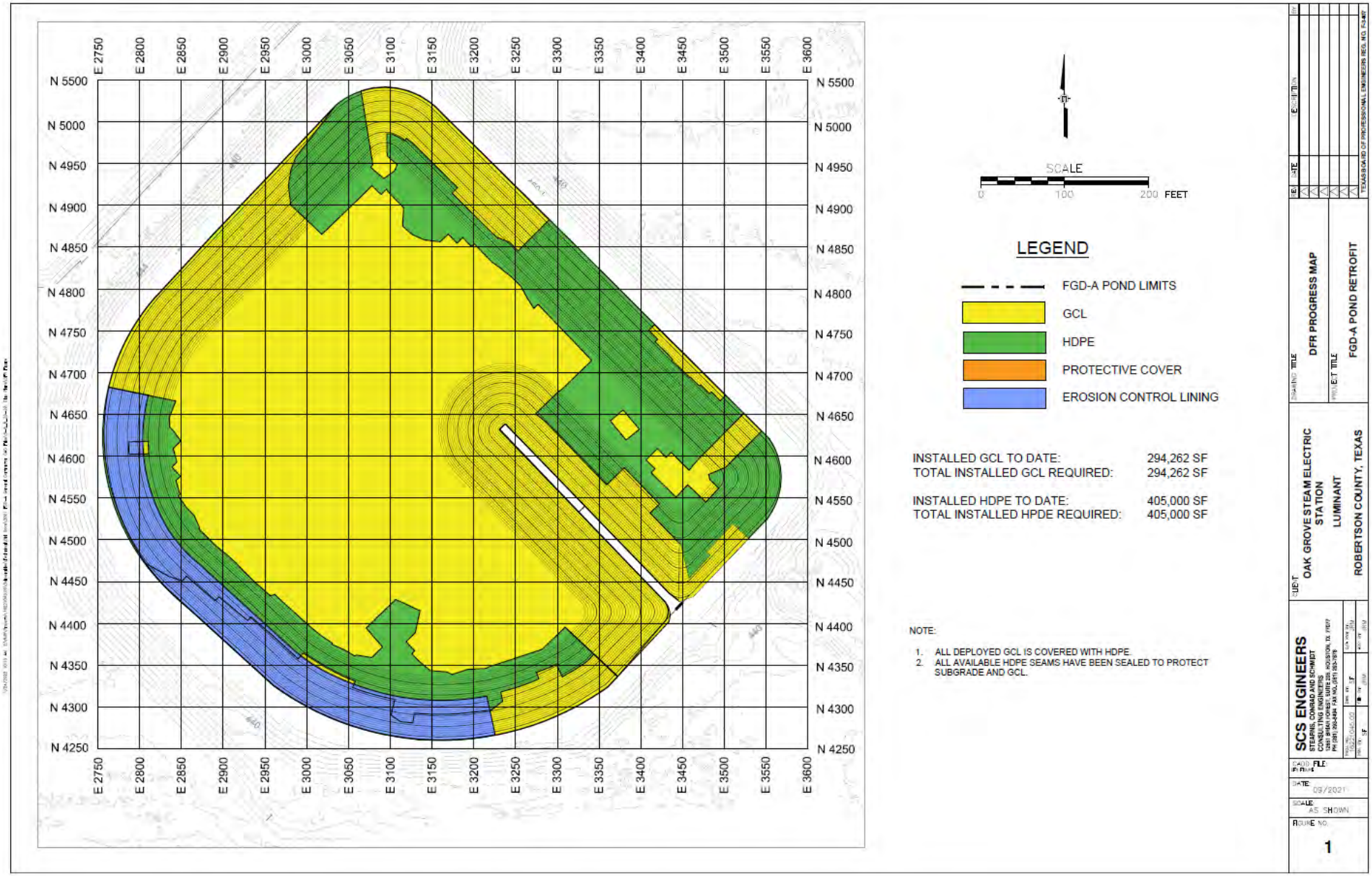
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/24/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/24/2022 |

**Photo 1** – Vacuum testing repairs



*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 70** |
| | | **Date: 01/24/2022** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/25/2022** | **Report No.**: 71 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 34°, cloudy, light winds approx. 5-10 mph<br>PM: 56°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1400 | 7 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Haul Truck | 1 | A45G | Not used today |
| Volvo Haul Truck | 2 | A40G | Temporarily off site |
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Not used today |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) did not perform any work due to wet conditions.
- Lone Star unable to perform work on the pond floor due to water. (See Photo 1)
- Lone Star continued to perform repairs, air tests, and vacuum tests on the side slopes.
- Lone Star unable to perform work on the pond floor due to water.
- MSI continued to pump water out of FGD-A.
- 16 HDPE destructive seams all passed in the lab.
- Final 2 destructive seams were shipped today, January 25th, for delivery and testing on January 26th.
- See Progress Map on page 4 for approximate area and quantities of geosynthetic and revetment installation.

**Surveying Activities:**

- Geomembrane panel survey scheduled for Friday, January 28th.

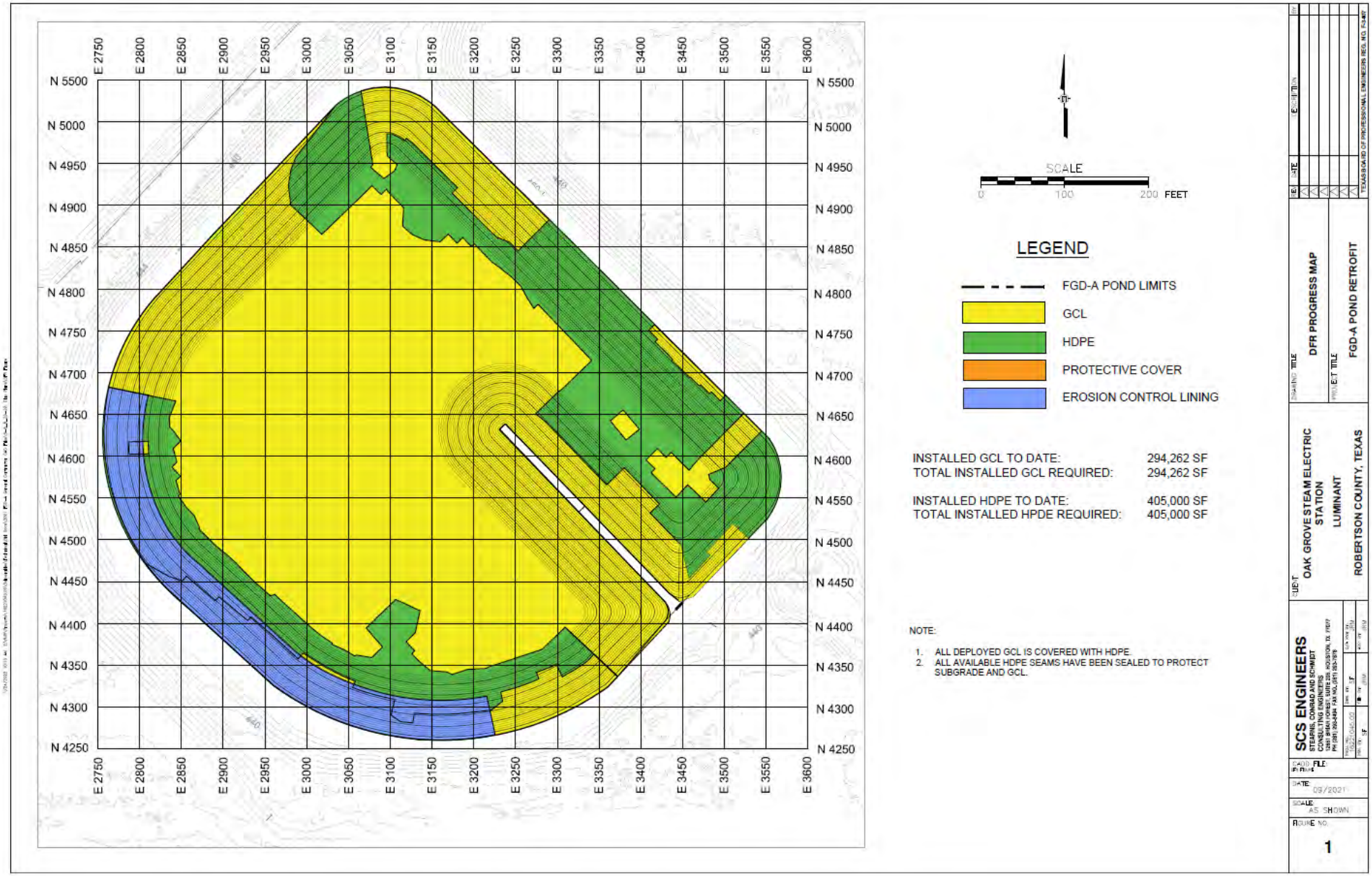
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/25/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/25/2022 |

**Photo 1** – Water in pond after rain event

**Photo 2** – Extrusion welding repairs on side slope

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 71** |
| | | **Date: 01/25/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/26/2022** | **Report No.**: 72 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 35°, clear, light winds approx. 5-10 mph<br>PM: 55°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| Paul Vaillaincourt | CQA Technician | 0700 | 1200 | 5 |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| CAT Mini Excavator | 1 | 304E | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Not used today |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) continued to pump concrete into HYDROTEX fabric forms along the southwestern corner of FGD-A Pond. (See Photo 1)
- MSI continues to pump water out of FGD-A Pond. (See Photo 2)
- Lone Star continued to perform vacuum tests on the side slopes.
- Lone Star disposed of all trash in and around FGD-A Pond.
- MSI continued to pump water out of FGD-A.
- 16 HDPE destructive seams all passed in the lab.
- Final 2 destructive seam samples passed lab testing.
- See Progress Map on page 4 for approximate area and quantities of geosynthetic and revetment installation.

**Surveying Activities:**

- Geomembrane panel survey scheduled for Friday, January 28th.

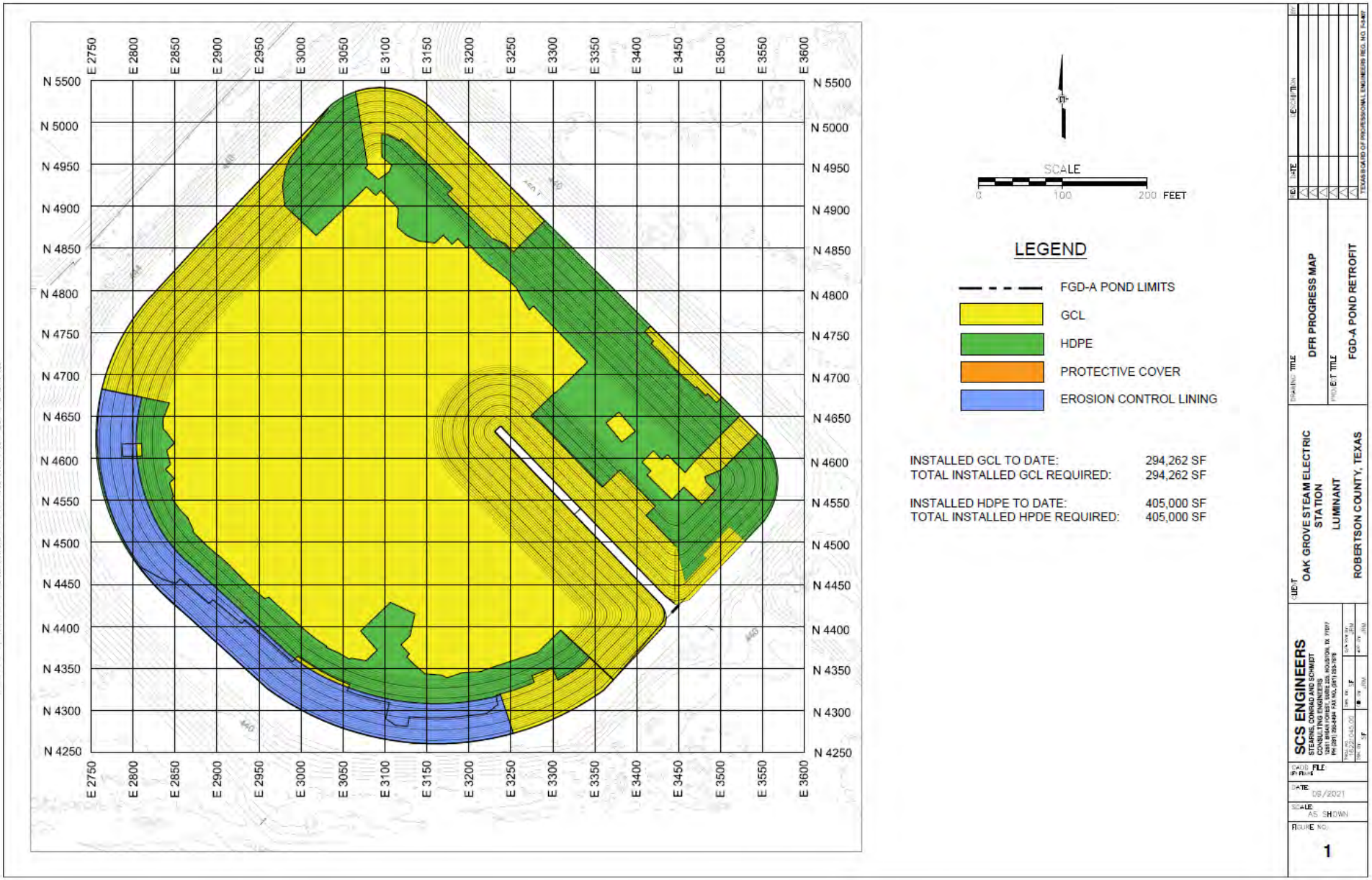
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/26/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/26/2022 |

**Photo 1** – Pumping concrete into HYDROTEX fabric forms along southwestern corner

**Photo 2** – Pumping water out of FGD-A Pond

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 72** |
| | | **Date: 01/26/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/27/2022** | **Report No.**: 73 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 38°, cloudy, light winds approx. 5-10 mph<br>PM: 61°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1730 | 11 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| CAT Mini Excavator | 1 | 304E | De-mobilized from site today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Not used today |
| | | | |
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| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) continued to deploy HYDROTEX fabric forms along the northern slope and southwestern corner of FGD-A Pond.
- MRGeo also continued to pump concrete into the HYDROTEX fabric forms.
- MSI continues to pump water out of FGD-A Pond.
- Lone Star completed all remaining air tests, repairs, and vacuum tests.
- Lone Star placed remaining GCL material into cocoons.
- Lone Star disposed of all trash in and around FGD-A Pond.
- See Progress Map on page 5 for approximate area and quantities of geosynthetic and revetment installation.

**Surveying Activities:**

- Geomembrane panel survey scheduled for Friday, January 28th.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

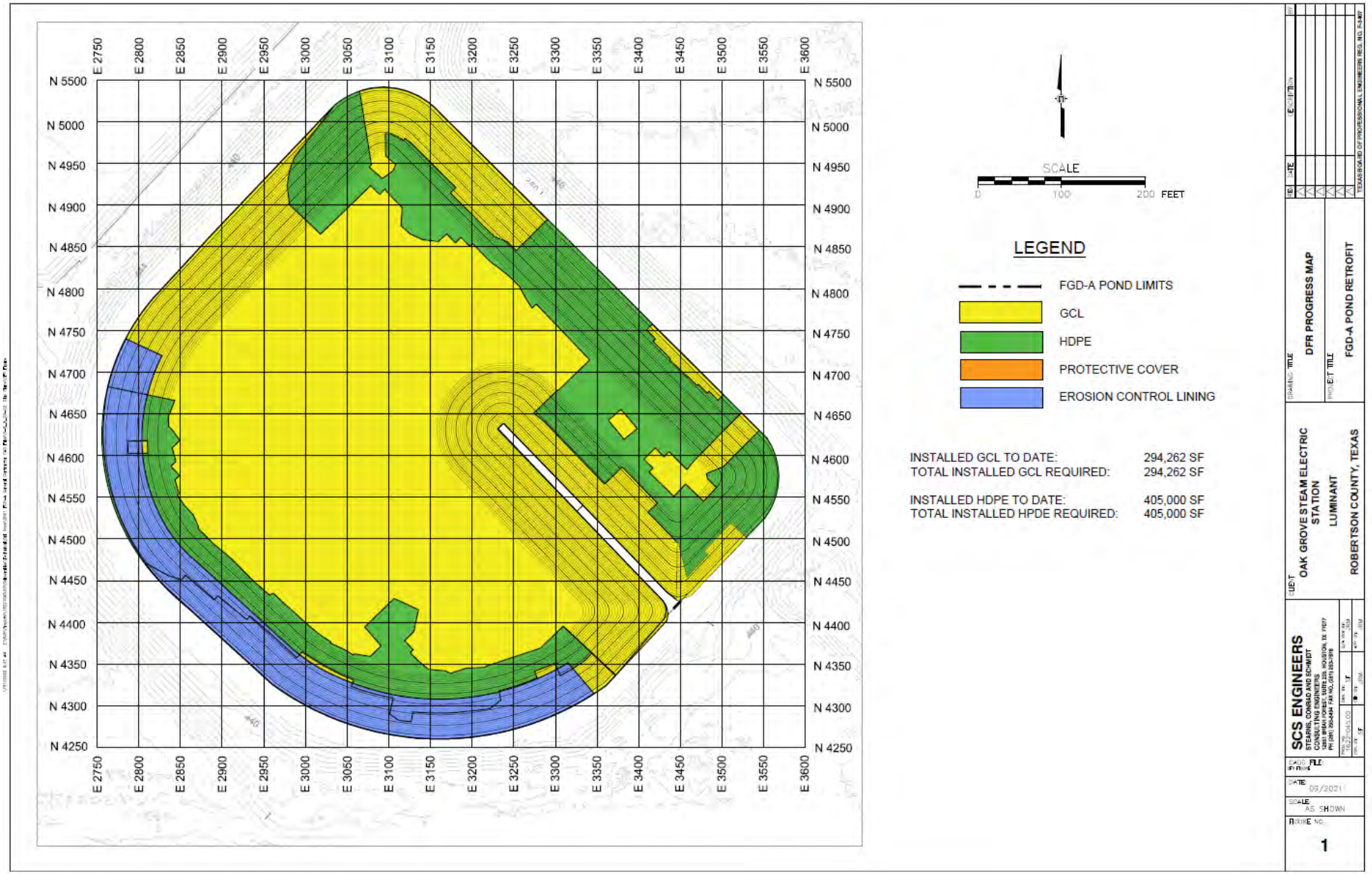
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/27/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/27/2022 |

**Photo 1** – Pumping concrete into HYDROTEX fabric forms along southwestern corner

**Photo 2** – Completing repairs on HDPE

**Photo 3** – Cocoon containing HDPE and GCL rolls

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 73**<br>**Date: 01/27/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/28/2022** | **Report No.**: 74 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 32°, clear, light winds approx. 5-10 mph<br>PM: 57°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1800 | 11.5 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Melvin Mejia | Luminant Project Manager |
| Sam Franco | CQA Project Manager |
| Jeremy Davis | CQA Surveyor |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Not used today |
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| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) continued to deploy HYDROTEX fabric forms along the northern slope of FGD-A Pond.
- MRGeo continued to pump concrete into HYDROTEX fabric forms along the northern slope of FGD-A Pond. (See Photo 1)
- MSI continues to pump water out of FGD-A Pond.
- Luminant and SCS staff on site to complete pond walk down of completed geomembrane installation.
- Lone Star de-mobilized from Oak Grove at 1200.
- See Progress Map on page 4 for approximate area revetment installation and completed geosynthetic installation.

**Surveying Activities:**

- Jeremy Davis on site to complete HDPE panel survey.

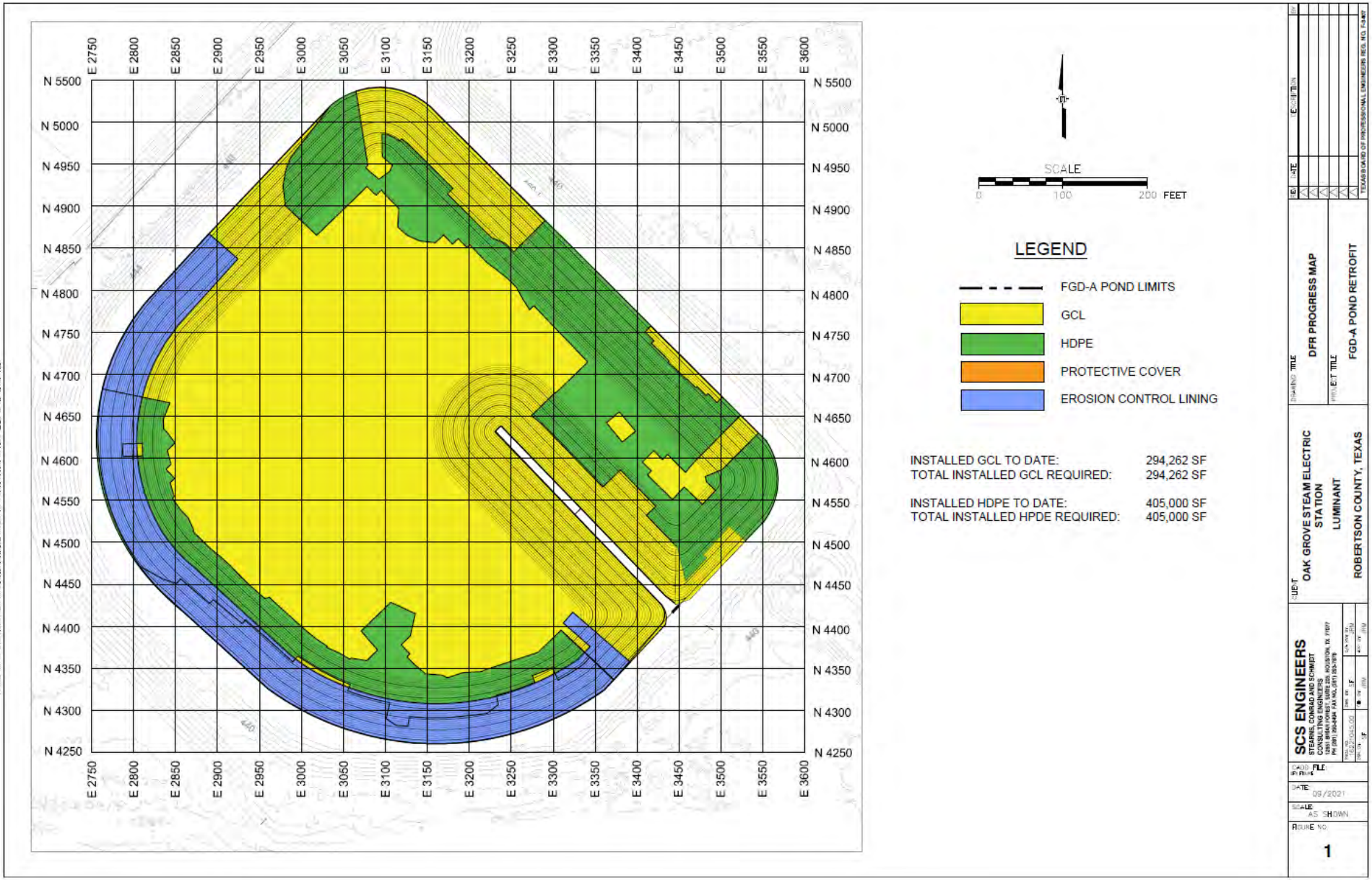
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/28/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/28/2022 |

**Photo 1** – Deploying HYDROTEX fabric forms along northern corner

**Photo 2** – Pumping water out of FGD-A Pond

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 74** |
| | | **Date: 01/28/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/29/2022** | **Report No.**: 75 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 39°, clear, light winds approx. 5-10 mph<br>PM: 66°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Not used today |
| | | | |
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| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) continued to deploy HYDROTEX fabric forms along the northern slope of FGD-A Pond.
- MRGeo continued to pump concrete into HYDROTEX fabric forms along the northern slope of FGD-A Pond.
- Boral began hauling loads of bottom ash to FGD-A Pond to be used as protective cover.
- MSI used the CAD D6 bulldozer to spread the bottom ash on the peninsula ramp.
- Boral hauled 32 loads of bottom ash.
- See Progress Map on page 5 for approximate areas revetment installation and protective cover placement.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | Danny Rennicks | 01/29/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 01/29/2022 |

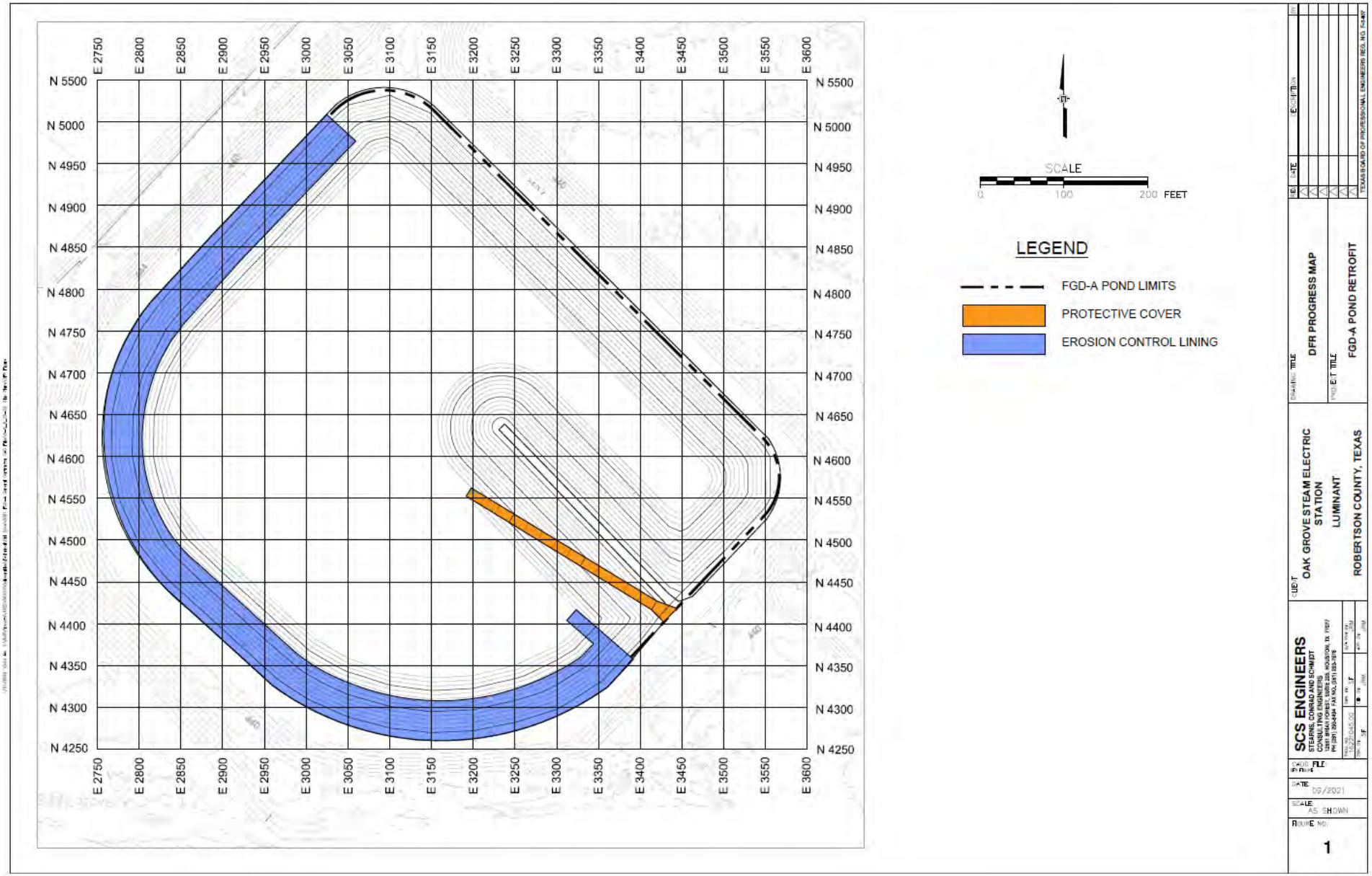
**Photo 1** – Deploying HYDROTEX fabric forms along northern corner

**Photo 2** – Boral hauling bottom ash to FGD-A Pond

**Photo 3** – MSI spreading bottom ash onto the peninsula ramp

**Photo 4** – MSI spreading bottom ash onto the peninsula ramp

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 74** |
| | | **Date: 01/28/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/30/2022** | **Report No.**: 76 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 46°, clear, light winds approx. 5-10 mph<br>PM: 69°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 0900 | 3 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | Scheduled to be de-mobilized |
| | | | |
| | | | |
| | | | |
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| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br>• Lone Star Lining crew also participated in the morning JSA conducted by MSI.<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• MRGeo (revetment installer) not on site today.<br>• Boral haul truck broke down in the morning.<br>• No protective cover was placed today.<br><br>**Surveying Activities:**<br>• No surveying activities today. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/30/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/30/2022 |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 01/31/2022** | **Report No.**: 77 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 55°, cloudy, light winds approx. 5-10 mph<br>PM: 60°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: TBD** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1000 | 4 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Genie Forklift (Lone Star) | 1 | GTH-844 | De-mobilized from site |
| | | | |
| | | | |
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| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- Lone Star Lining crew also participated in the morning JSA conducted by MSI.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MRGeo (revetment installer) continued to deploy HYDROTEX fabric forms on the northern corner and on the eastern slope.
- Boral continued to haul bottom ash to FGD-A Pond.
- 13 loads of bottom ash were hauled today.
- MSI continued to spread the bottom ash on the pond floor with the CAT D6 bulldozer.
- Site rained out at 10:00 AM.
- See progress map on page 4 for approximate areas of revetment installation and protective cover placement.

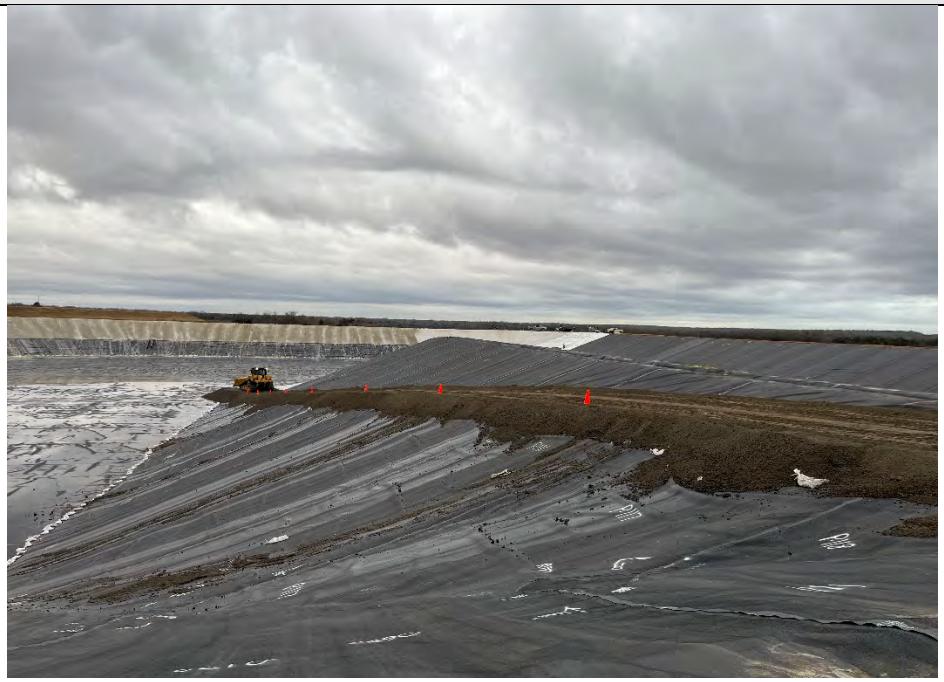
**Surveying Activities:**

- No surveying activities today.

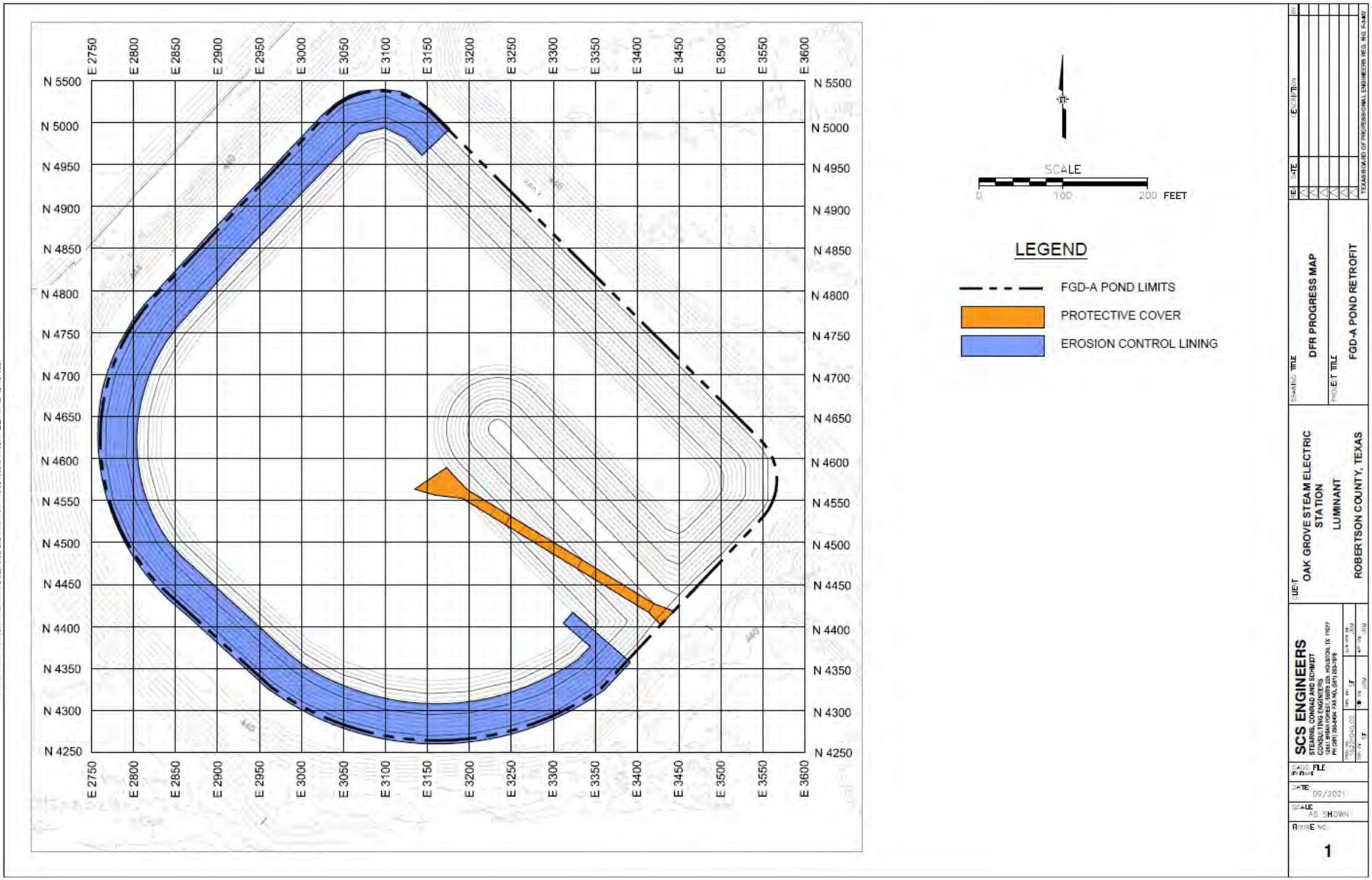
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 01/31/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 01/31/2022 |

**Photo 1** – Spreading of protective cover on pond floor



*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 77** |
| | | **Date: 01/31/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/01/2022** | **Report No.**: 78 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 54°, cloudy, light winds approx. 5-10 mph<br>PM: 66°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: 1.25" on 1/31/22** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 0900 | 3 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
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| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• MRGeo (revetment installer) on site to maintenance equipment. No deployment or pumping of concrete occurred.<br>• FGD-A Pond received 1.25" of rain on January 31st. (See Photos 1 and 2)<br>• MSI continued to pump water out of FGD-A Pond into FGD-B Pond.<br>• No other construction activities took place.<br><br>**Surveying Activities:**<br>• No surveying activities today. |

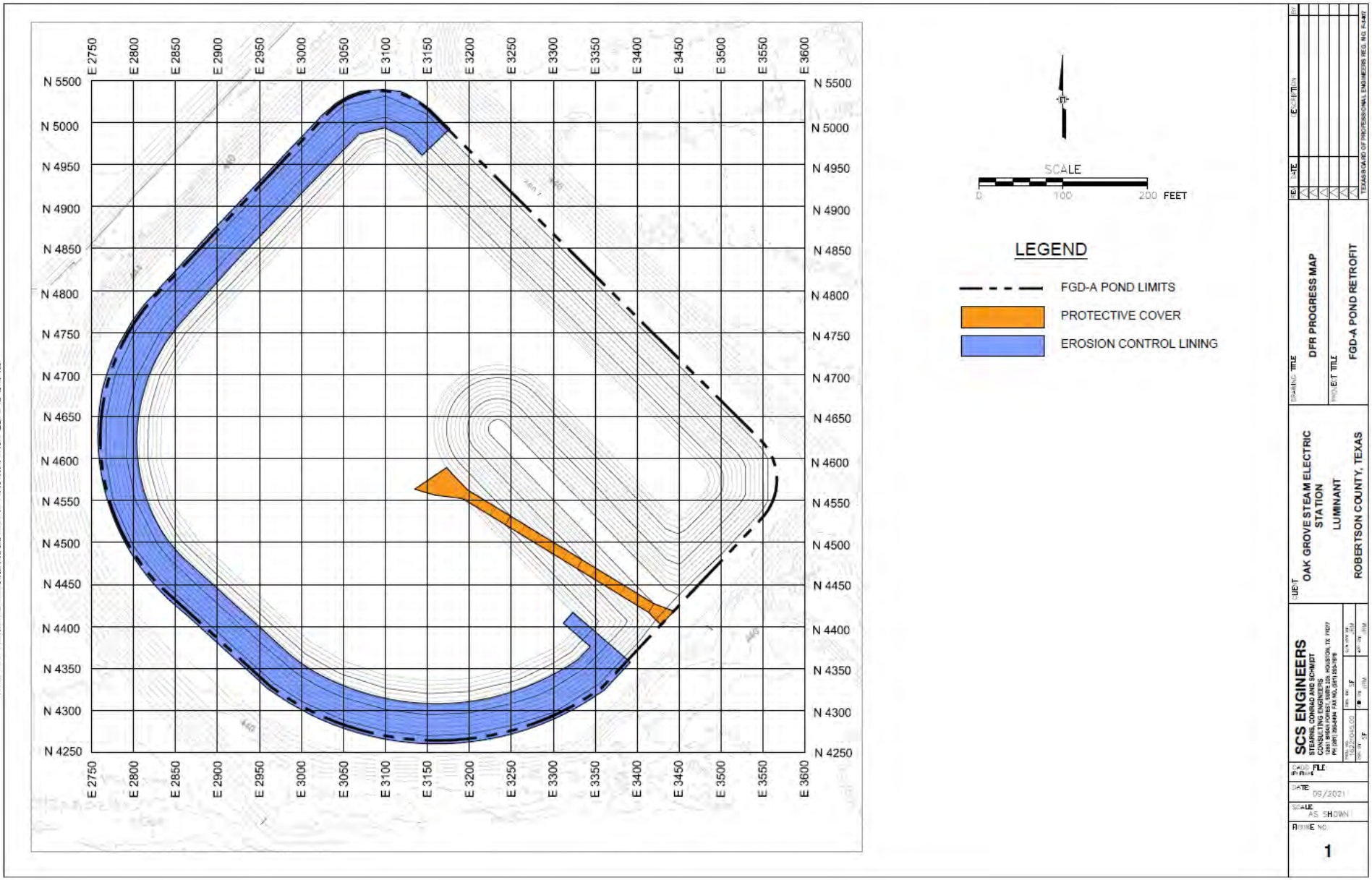
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/01/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/01/2022 |

**Photo 1** – Water in pond after rain event

**Photo 2** – Water in pond after rain event

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 78** |
| | | **Date: 02/01/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/02/2022** | **Report No.**: 79 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 28°, cloudy, light winds approx. 5-10 mph<br>PM: 64°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1000 | 4 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
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## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
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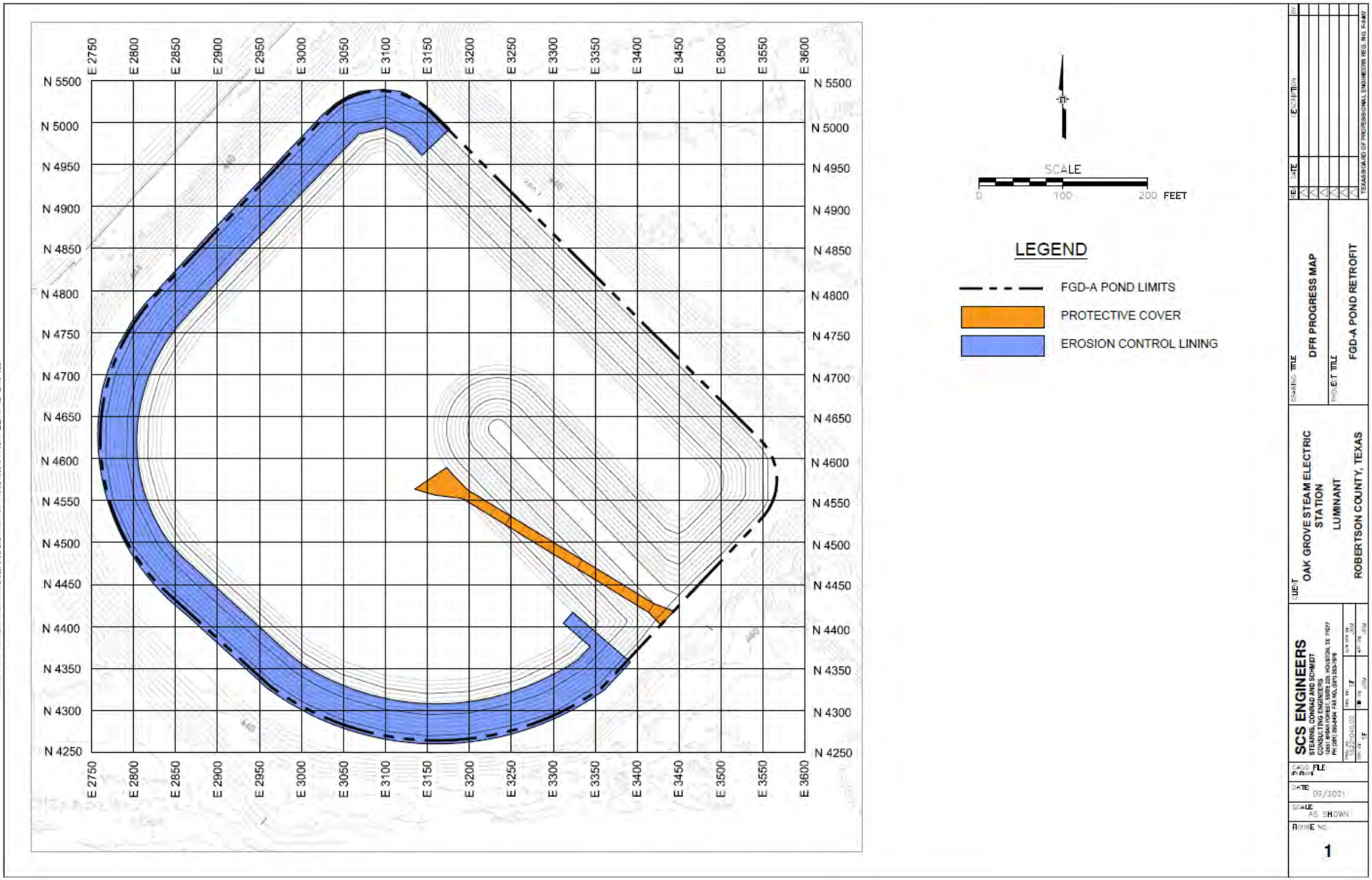
| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• MRGeo (revetment installer) was not able to deploy HYDROTEX panels or pump concrete due to unsafe conditions.<br>• MSI continued to pump water out of FGD-A Pond into FGD-B Pond.<br>• No construction activities took place.<br><br>**Surveying Activities:**<br>• No surveying activities today. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/02/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/02/2022 |

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|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 79**<br>**Date: 02/02/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/03/2022** | **Report No.**: 80 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 19°, cloudy, light winds approx. 5-10 mph<br>PM: 31°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | | | 0 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
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## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
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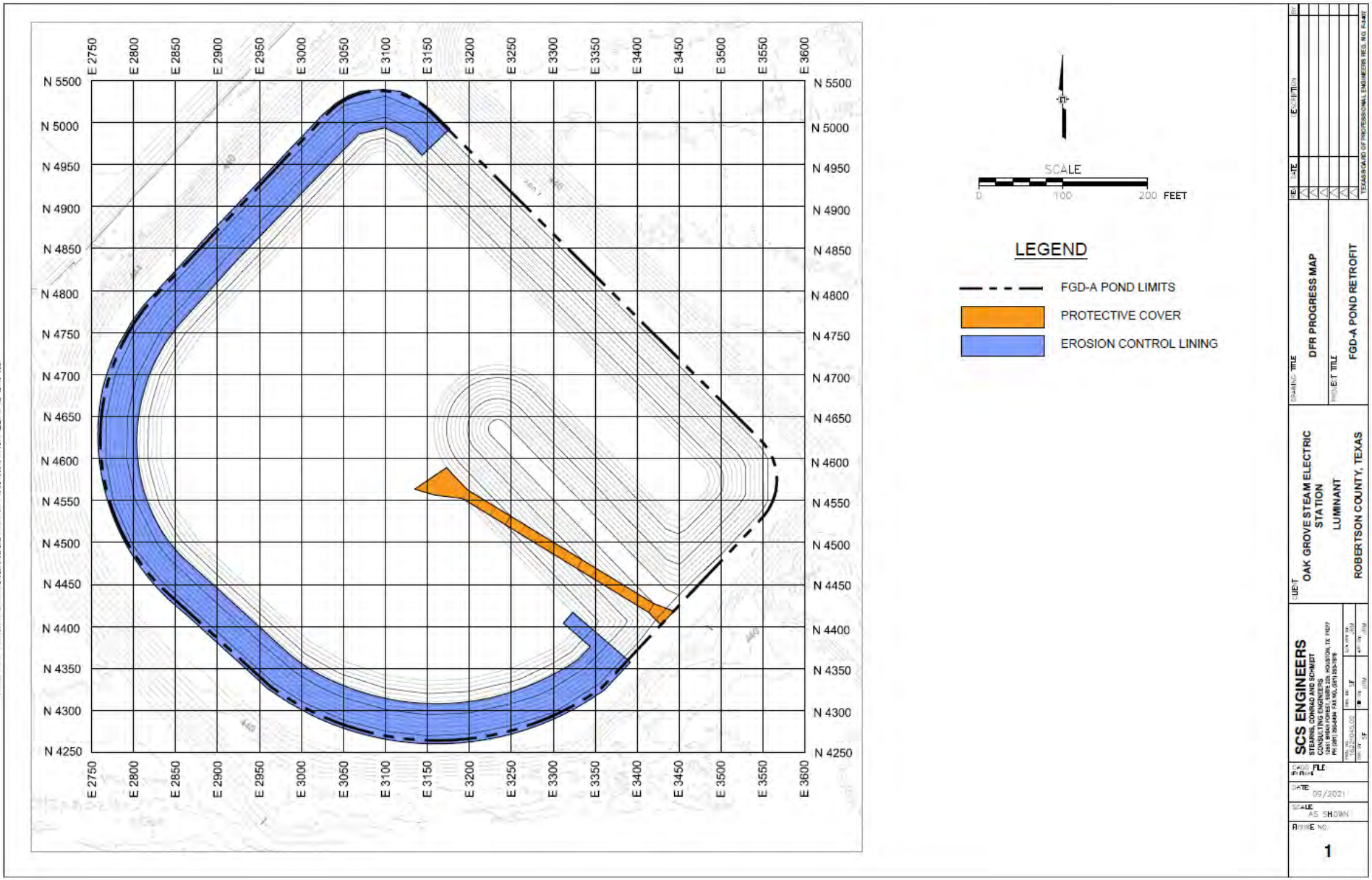
| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• Due to wet and freezing conditions, no construction activities will take place today.<br><br>**Surveying Activities:**<br>• No surveying activities today. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/03/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/03/2022 |

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|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 80**<br>**Date: 02/03/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/04/2022** | **Report No.**: 81 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 11°, cloudy, high winds approx. 20 mph<br>PM: 24°, cloudy, high winds approx. 20 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 0700 | 1 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
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| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
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| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• Due to freezing conditions, no construction activities will take place today. (See Photos 1 and 2)<br><br>**Surveying Activities:**<br>• No surveying activities today. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/04/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/04/2022 |

**Photo 1** – Freezing conditions of FGD-A Pond

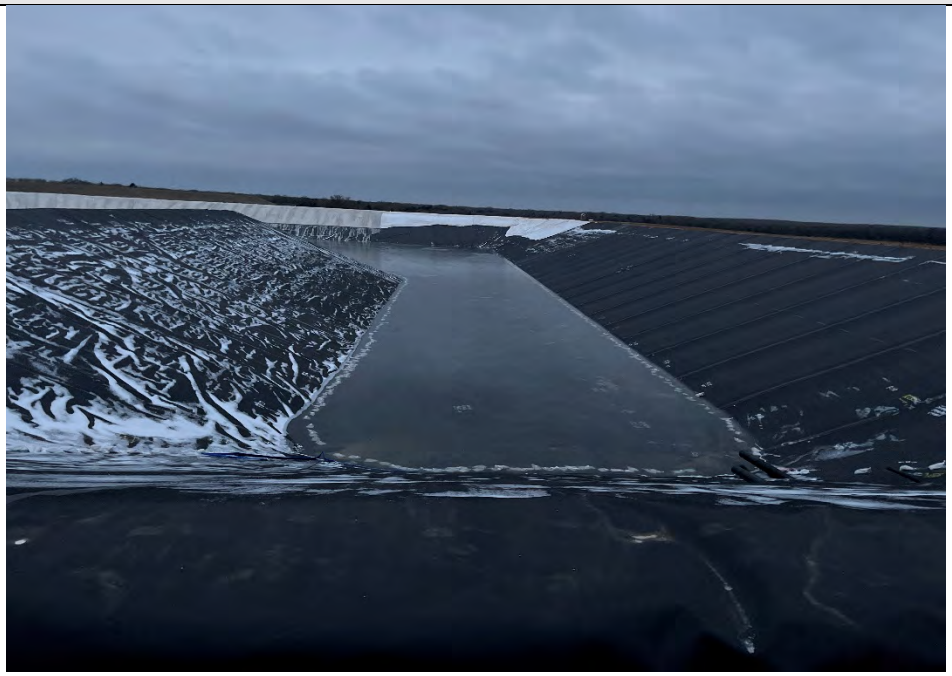
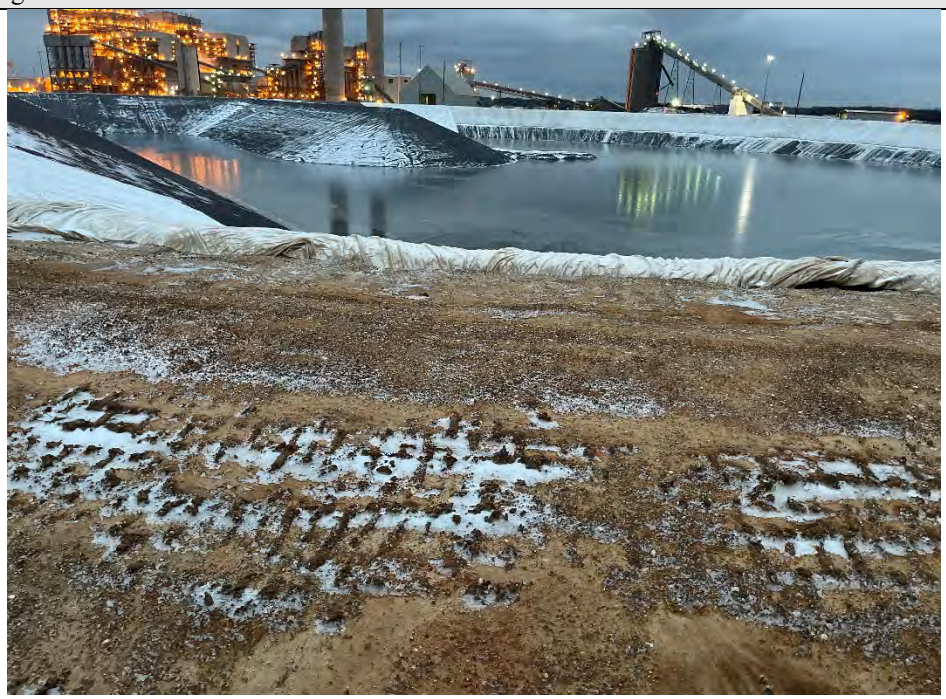
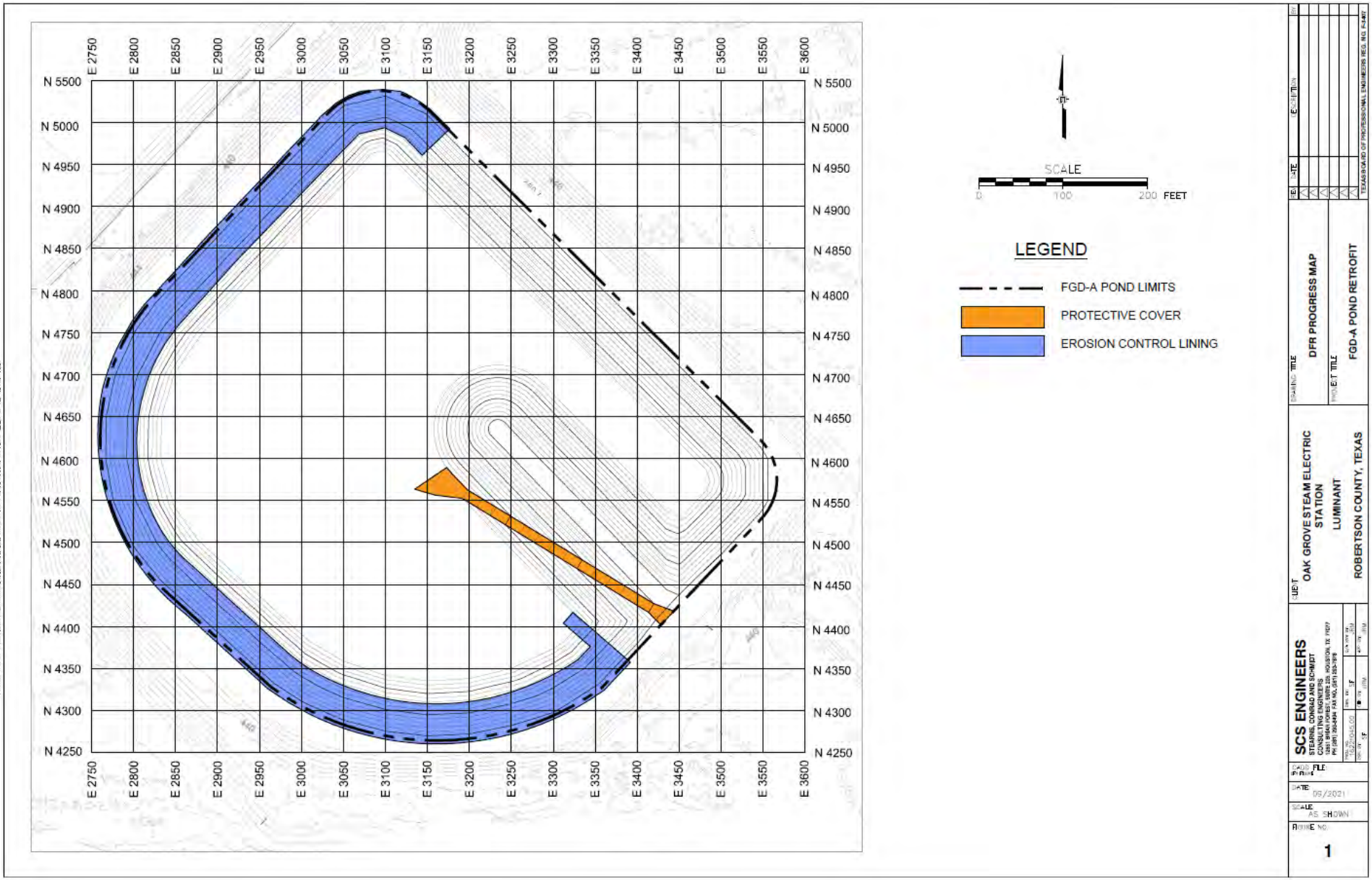


**Photo 2** – Freezing conditions of FGD-A Pond



*Note: Pictures represent work in progress and do not represent work as certified complete.*

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|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 81**<br>**Date: 02/04/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/05/2022** | **Report No.**: 82 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 27°, partly cloudy, light winds approx. 5 mph<br>PM: 48°, partly cloudy, light winds approx. 5 mph | **Rain Gauge Reading: 0** | |
| **Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis | | |

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 0700 | 1 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
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## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
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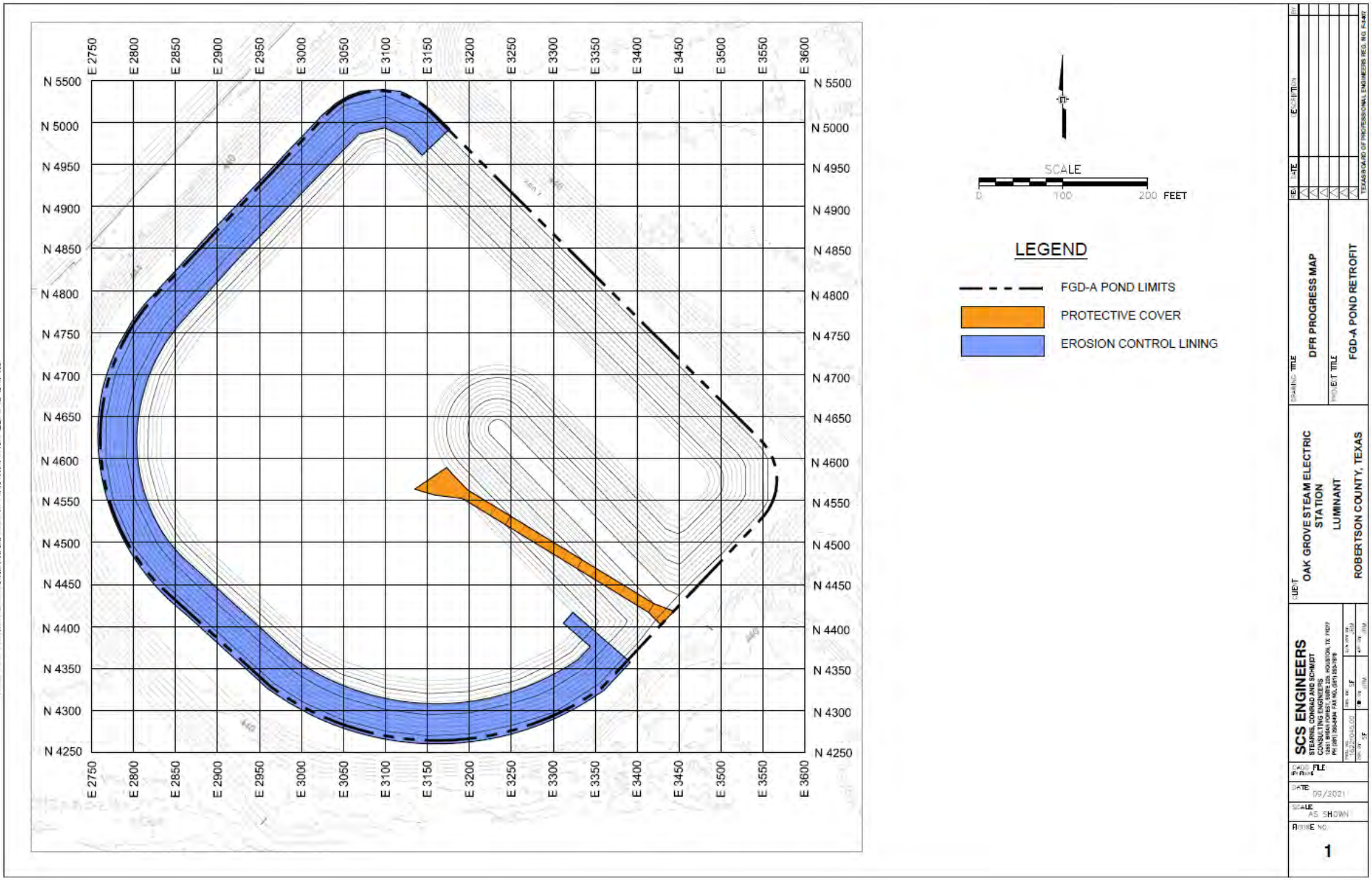
| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• Water in FGD-A Pond still frozen.<br>• MSI not able to pump any water.<br>• No construction activities performed today.<br><br>**Surveying Activities:**<br>• No surveying activities today. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/05/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/05/2022 |

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|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 82**<br>**Date: 02/05/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/06/2022** | **Report No.**: 83 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 31°, clear, light winds approx. 5 mph<br>PM: 56°, clear, light winds approx. 5 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 0900 | 2 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
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| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to grade and clear access roads |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| | | | |
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| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• MSI began pumping water into FGD-B pond. (See Photo 1)<br>• MSI used the CAT D6 Bulldozer to grade and clear the access roads. (See Photo 2)<br>• MR Geo not able to perform construction activities due to unsafe conditions.<br><br>**Surveying Activities:**<br>• No surveying activities today. |

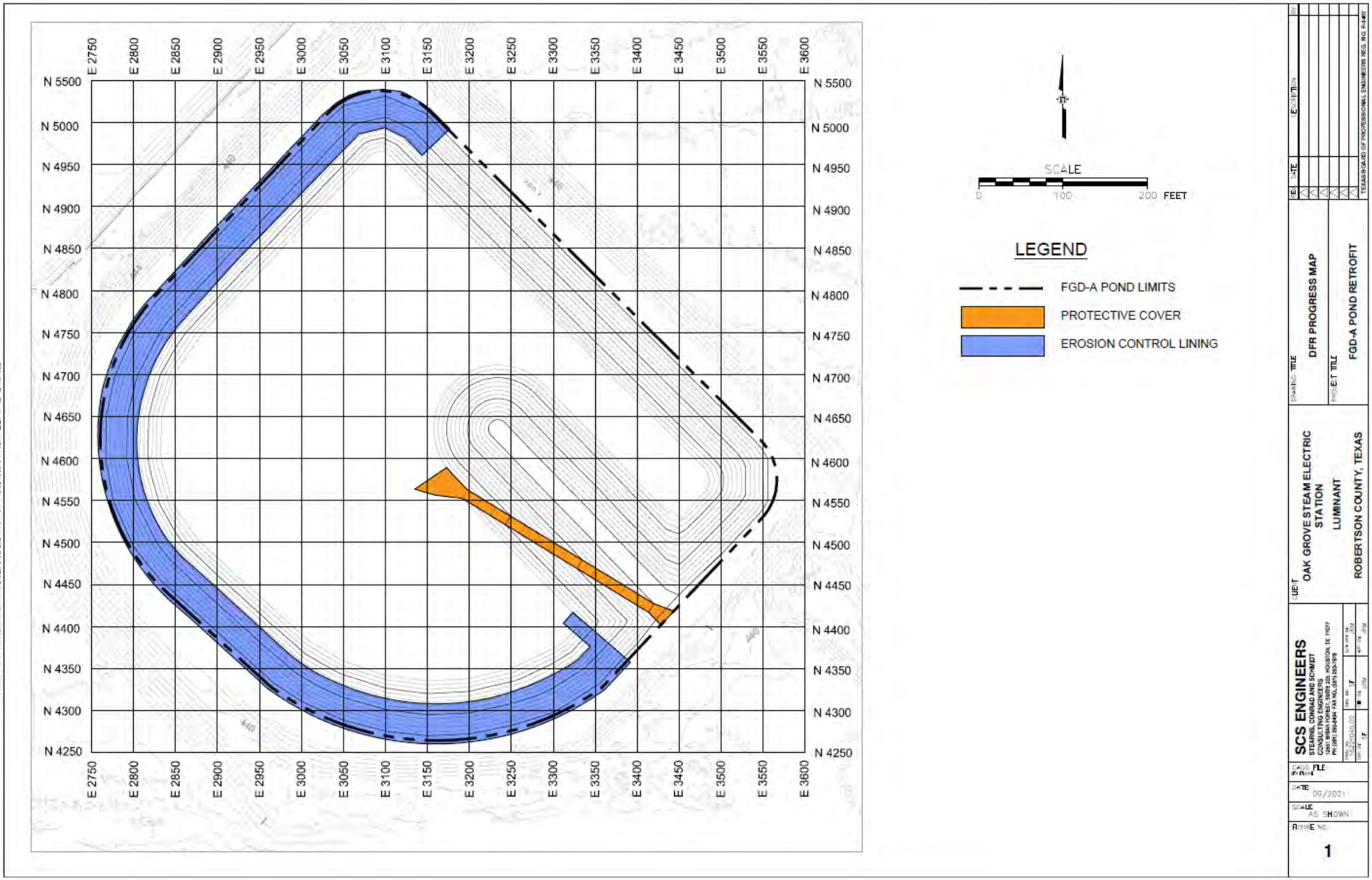
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/06/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/06/2022 |

**Photo 1** – Placing pump in FGD-A Pond

**Photo 2** – Clearing access road around FGD-A Pond

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 83**<br>**Date: 02/06/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/07/2022** | **Report No.**: 84 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 32°, clear, light winds approx. 5 mph<br>PM: 58°, clear, light winds approx. 5 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
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| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Smooth Drum Roller | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
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| Description of Work |
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**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE
- At approximately 0930, a concrete truck got stuck near the entrance ramp to FGD-A Pond. MSI was able to successfully remove the truck. (See Photo 1)
- At approximately 1600, a Boral haul truck got stuck at the bottom of the peninsula ramp. MSI was able to successfully remove the truck from the pond. (See Photo 2)
- Additional JSA's were conducted after each vehicle was removed.
- Luminant engineering and plant personnel was immediately contacted and kept up to date.

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo continued to pump concrete into the HYDROTEX fabric forms on the northern slope. (See Photo 3)
    - 5 concrete trucks were used today.
- Boral continued to haul bottom ash to FGD-A Pond.
    - 1 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

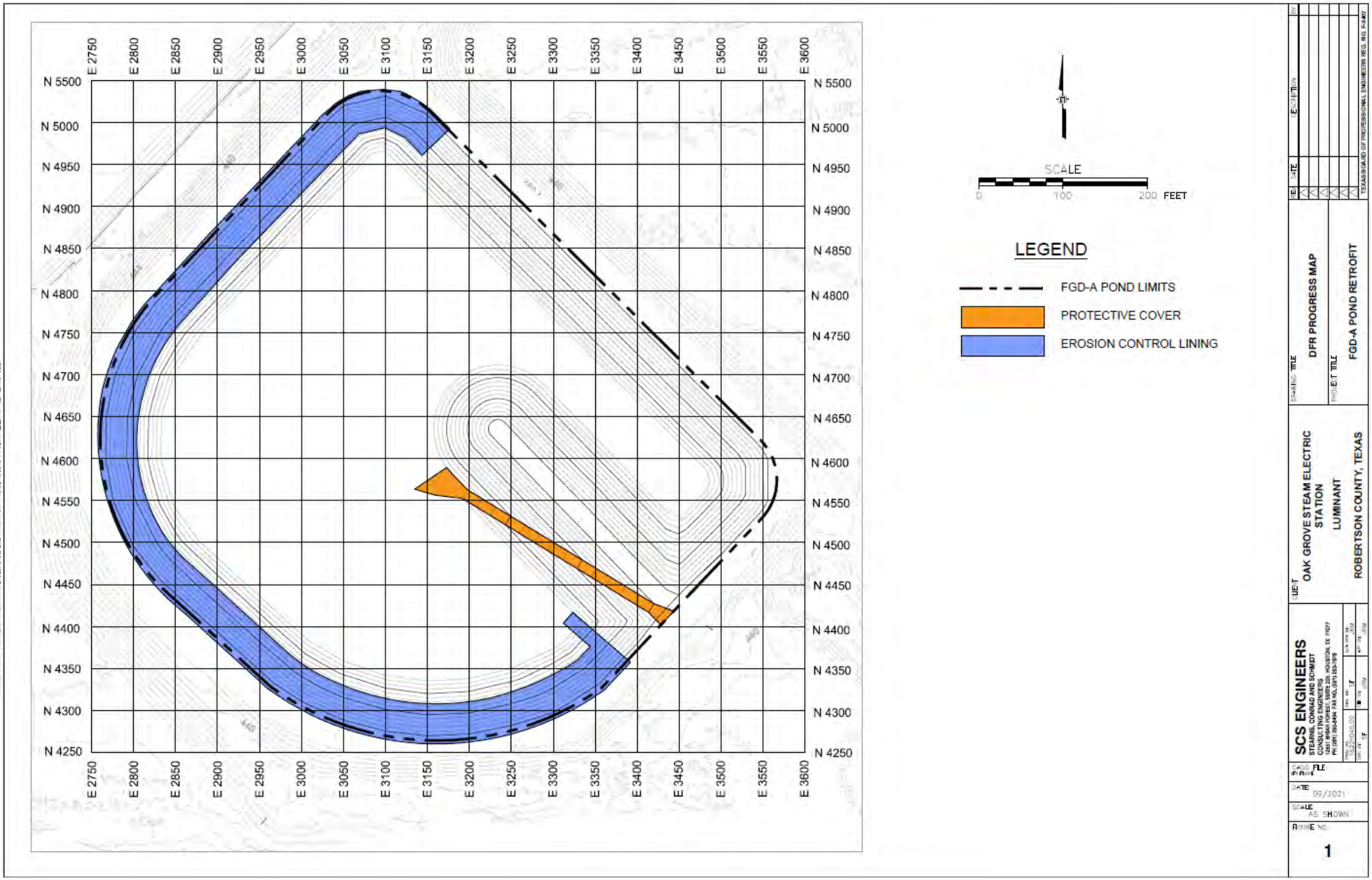
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/07/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/07/2022 |

**Photo 1** – Concrete truck stuck near pond entrance ramp

**Photo 2** – Boral haul truck stuck at the bottom of the peninsula ramp

**Photo 3** – MR Geo pumping concrete into HYDROTEX fabric forms on the northern slope

*Note: Pictures represent work in progress and do not represent work as certified complete.*

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|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 84** |
| | | **Date: 02/07/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/08/2022** | **Report No.**: 85 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 38°, clear, light winds approx. 5 mph<br>PM: 65°, clear, light winds approx. 5 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| | | | |
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| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo continued to deploy HYDROTEX fabric form panels along the eastern slope. (See Photo 1)
- MR Geo continued to pump concrete into the HYDROTEX fabric forms on the northern corner. (See Photo 2)
    - 12 concrete trucks were used today.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 3)
    - 14 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 4)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | Danny Rennicks | 02/08/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 02/08/2022 |

**Photo 1** – MR Geo deploying HYDROTEX fabric panels

**Photo 2** – MR Geo pumping concrete on the northern corner

**Photo 3** – Boral haul truck dumping bottom ash

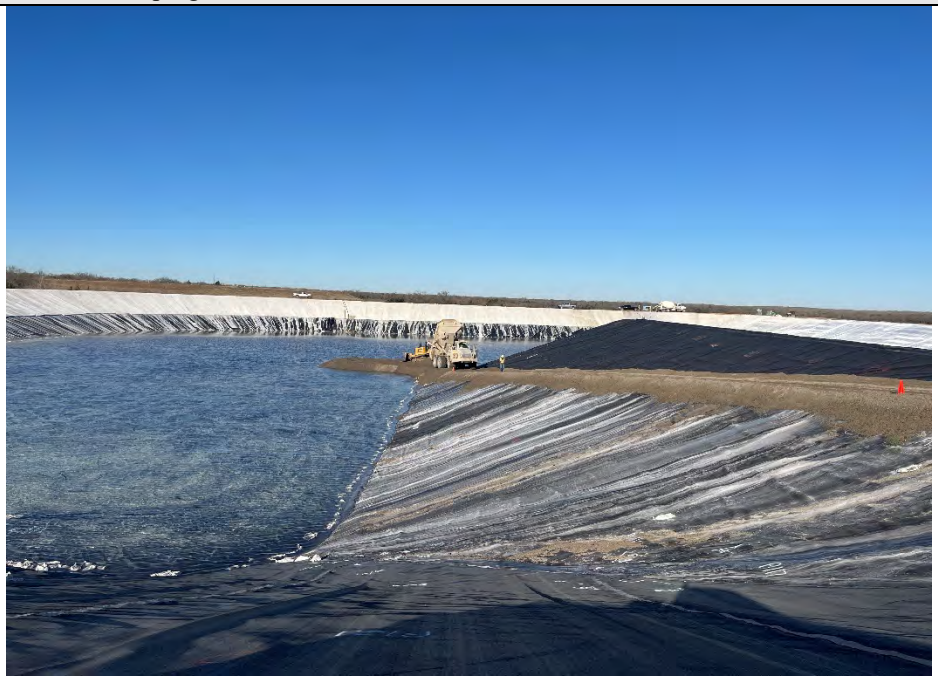
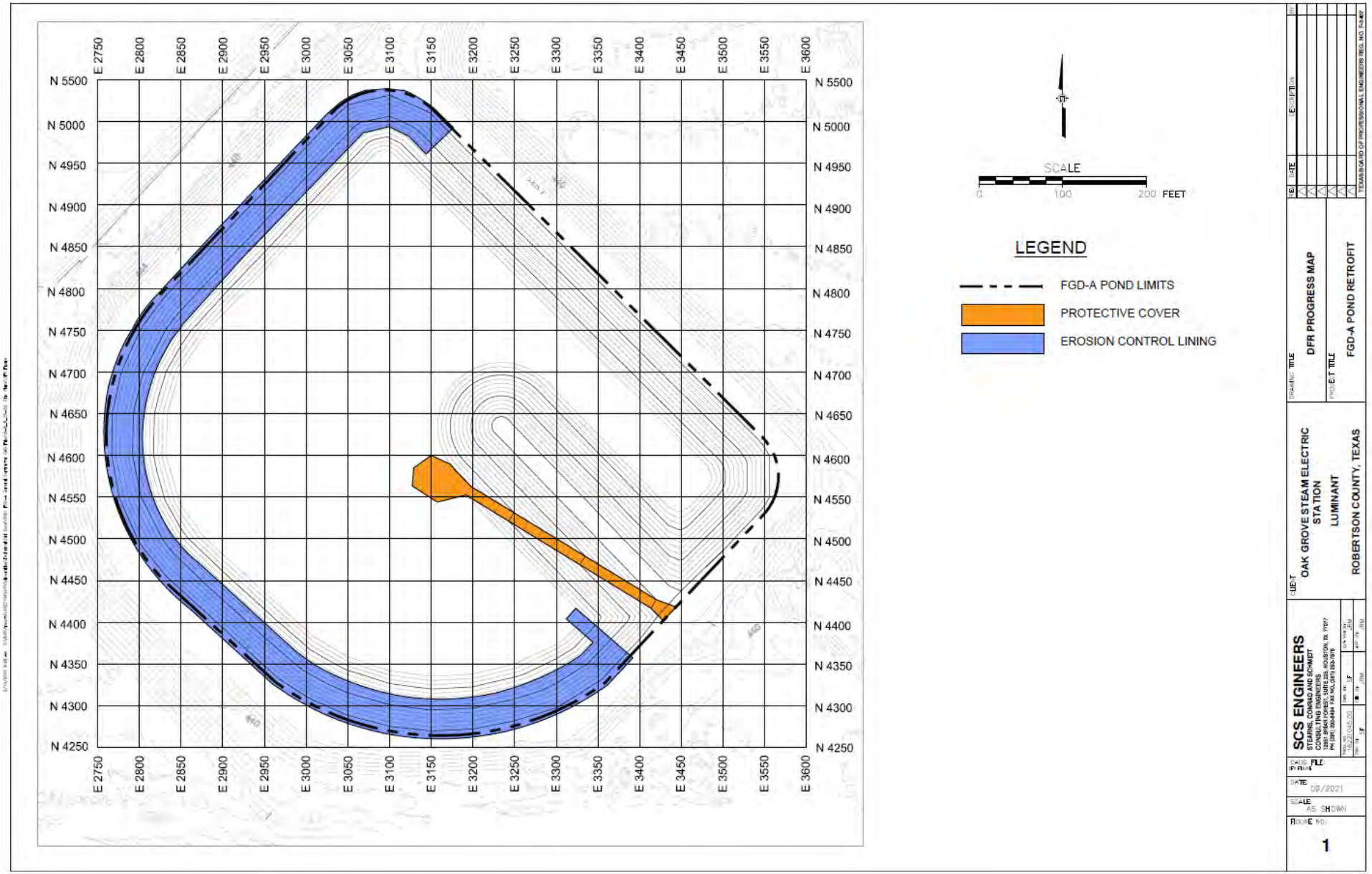


**Photo 4** – MSI spreading bottom ash on pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 85** |
| | | **Date: 02/08/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/09/2022** | **Report No.**: 86 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 38°, clear, light winds approx. 5 mph<br>PM: 70°, clear, light winds approx. 5 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Melvin Mejia | Luminant Project Manager |
| Sam Franco | CQA Project Manager |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
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| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo continued to pump concrete into the HYDROTEX fabric forms on the eastern slope. (See Photo 1)
    - 12 concrete trucks were used today.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 2)
    - 15 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

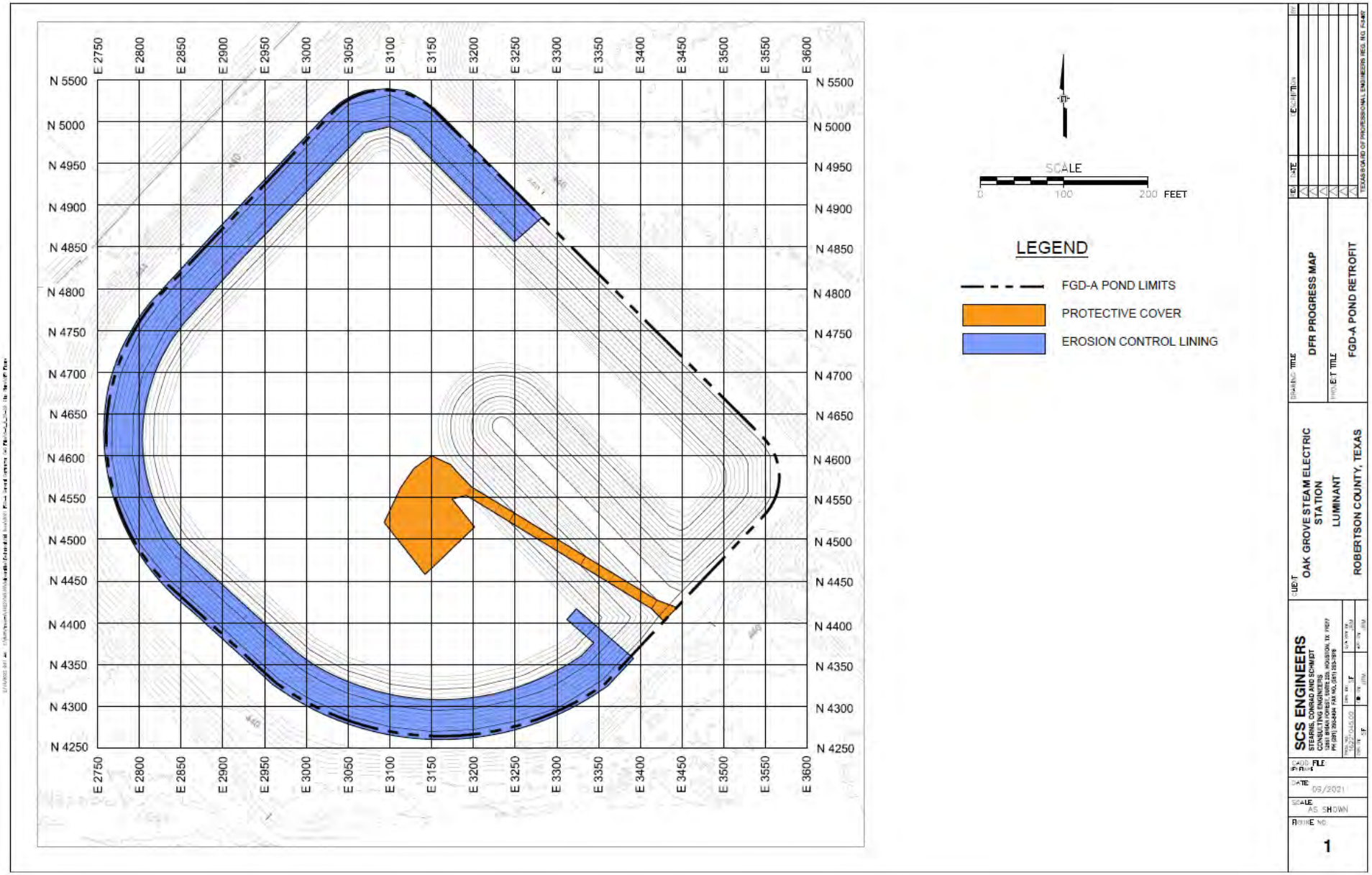
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/09/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/09/2022 |

**Photo 1** – MR Geo pumping concrete on the eastern slope

**Photo 2** – Boral hauling bottom ash onto the pond floor

**Photo 3** – MSI spreading bottom ash onto the pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 86** |
| | | **Date: 02/09/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/10/2022** | **Report No.**: 87 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 45°, clear, light winds approx. 5 mph<br>PM: 75°, clear, light winds approx. 5 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
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| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
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| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo continued to deploy HYDROTEX fabric form panels along the eastern slope. (See Photo 1)
- MR Geo continued to pump concrete into the HYDROTEX fabric forms on the eastern slope. (See Photo 2)
    - 13 concrete trucks were used today.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 3)
    - 30 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 4)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/10/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/10/2022 |

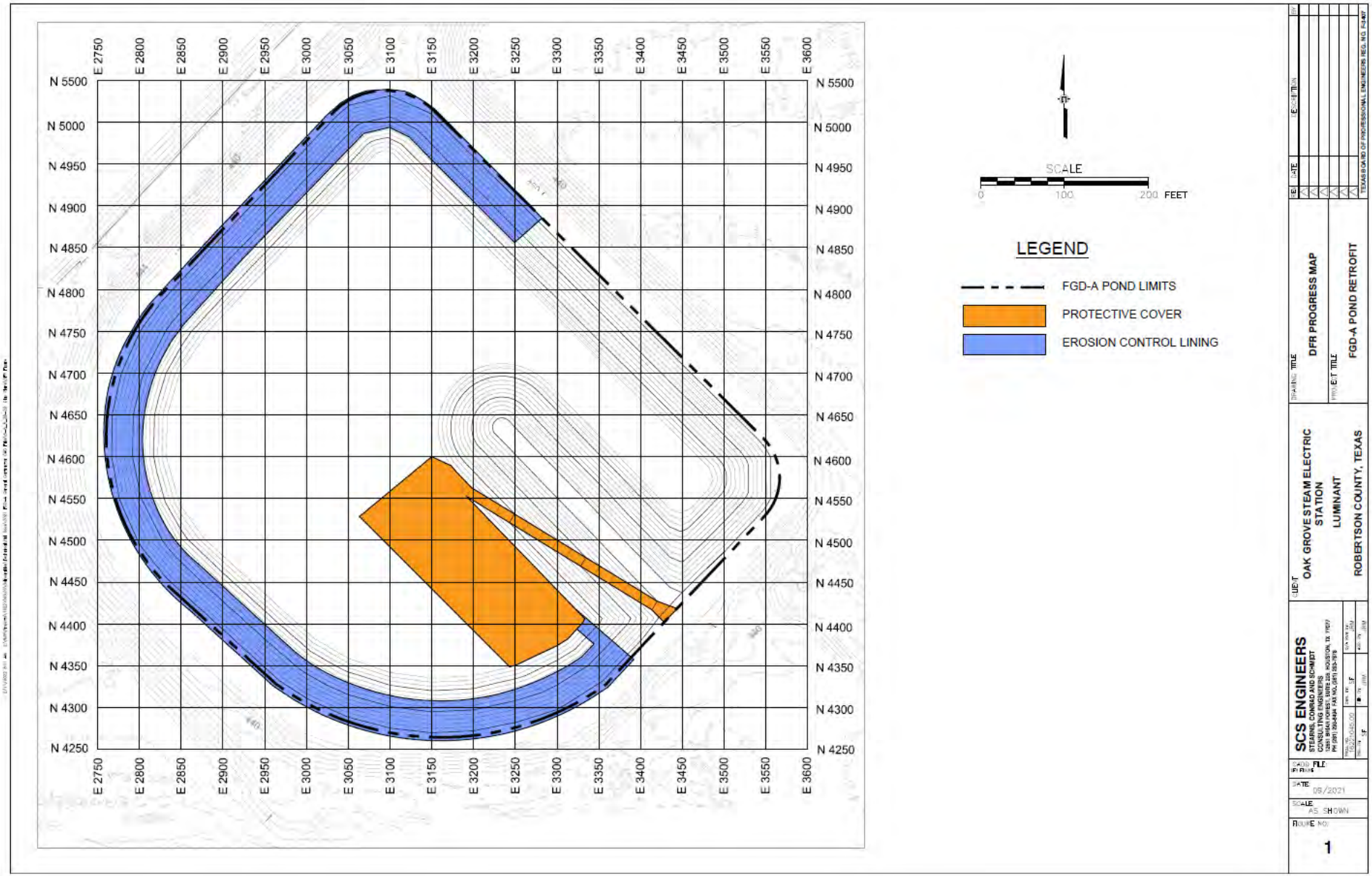
**Photo 1** – MR Geo deploying HYDROTEX fabric panels on the eastern slope

**Photo 2** – MR Geo pumping concrete on the eastern slope

**Photo 3** – Boral haul truck dumping bottom ash

**Photo 4** – MSI spreading bottom ash on pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 87**<br>**Date: 02/10/2022** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/11/2022** | **Report No.**: 88 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 48°, clear, light winds approx. 5-10 mph<br>PM: 75°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Used to stage pipe for welding |
| Bobcat Skid Steer | 1 | 595 | Not used today |
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## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MSI began welding pipes for pond inlet.
- MR Geo continued to deploy HYDROTEX fabric form panels along the eastern slope. (See Photo 1)
- MR Geo continued to pump concrete into the HYDROTEX fabric forms on the eastern slope. (See Photo 2)
    - 12 concrete trucks were used today.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 3)
    - 32 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 4)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | Danny Rennicks | 02/11/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 02/11/2022 |

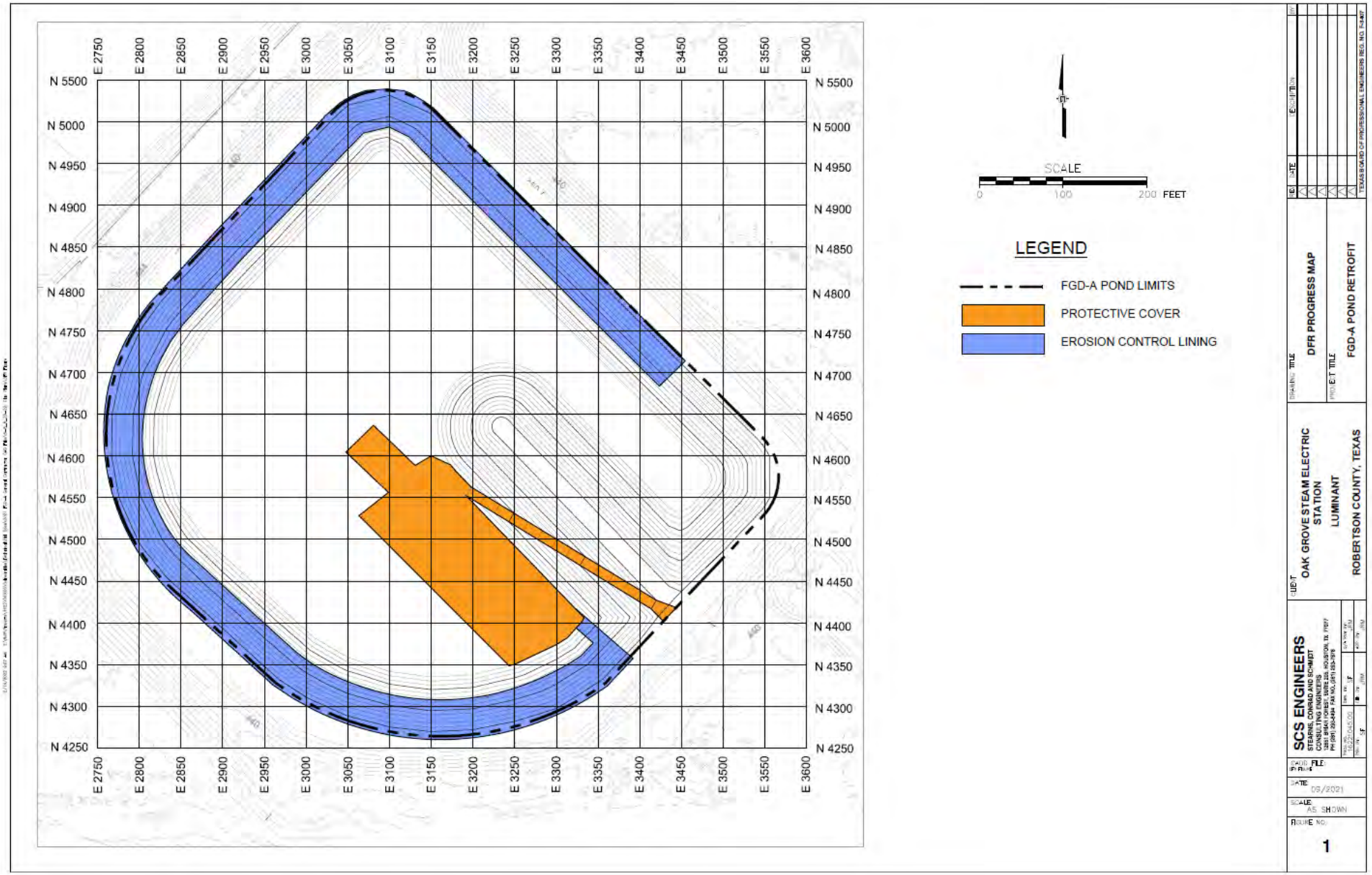
**Photo 1** – MR Geo deploying HYDROTEX fabric panels on the eastern slope

**Photo 2** – MR Geo pumping concrete on the eastern slope

**Photo 3** – Boral haul truck dumping bottom ash

**Photo 4** – MSI spreading bottom ash on pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 88**<br>**Date: 02/11/2022** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/12/2022** | **Report No.**: 89 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 24°, cloudy, high winds approx. 30 mph<br>PM: 54°, cloudy, high winds approx. 30 mph | **Rain Gauge Reading: <0.1"** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1300 | 7 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
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| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| | | | |
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## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MSI continued welding pipes for pond inlets.
- MR Geo continued to pump concrete into the HYDROTEX fabric forms on the southern slope where inlet pipes are to be placed. (See Photo 1)
    - 6 concrete trucks were used today.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 2)
    - 14 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- Due to rain and snow, construction activities stopped at 1300.
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

## Review and Approval

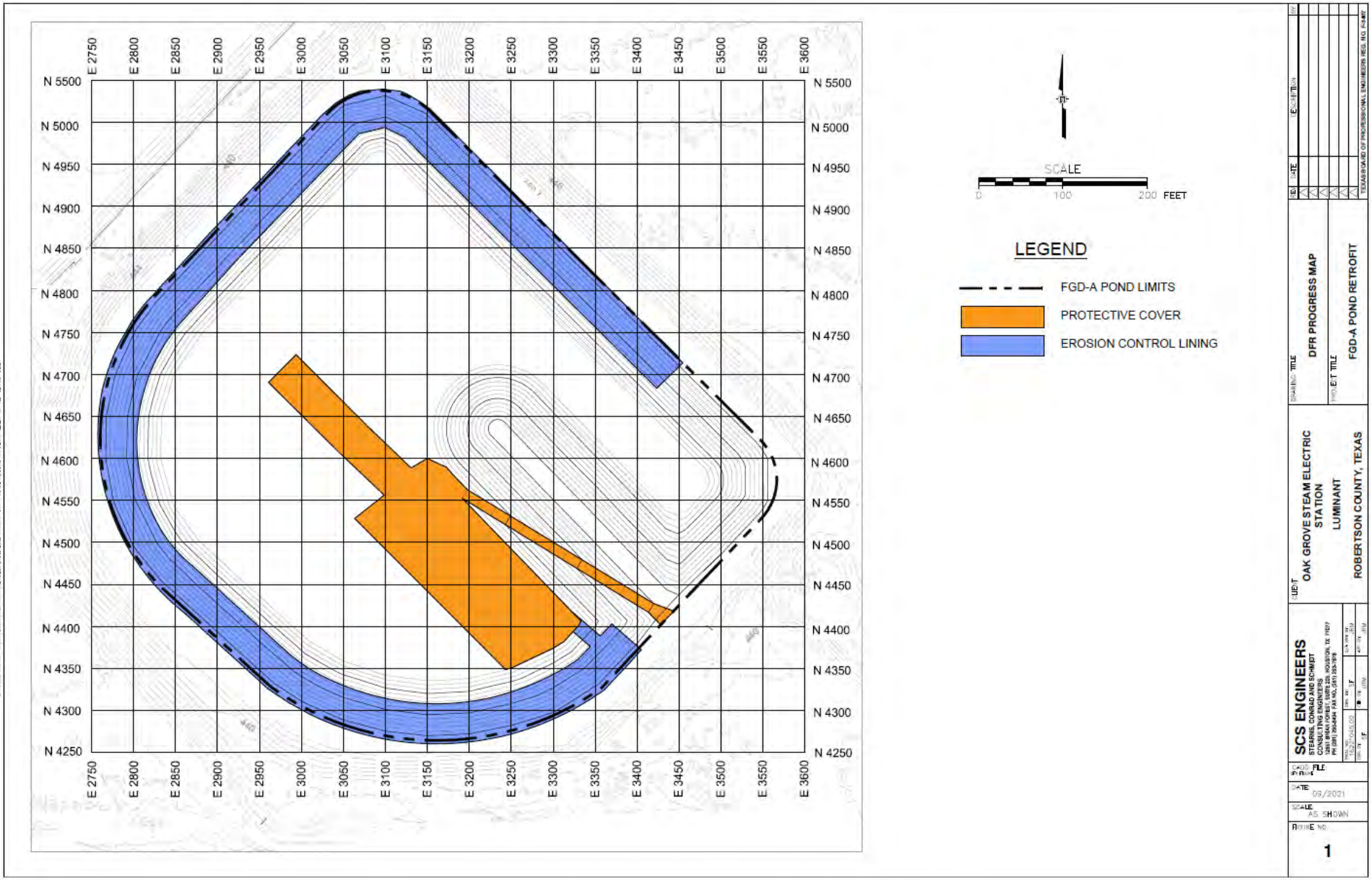
| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | *Danny Rennicks* | 02/12/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/12/2022 |

**Photo 1** – MR Geo pumping concrete on the southern slope where inlet pipes are to be placed

**Photo 2** – Boral haul truck dumping bottom ash on pond floor

**Photo 3** – MSI spreading bottom ash on pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 88** |
| | | **Date: 02/11/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/13/2022** | **Report No.**: 90 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 38°, clear, light winds approx. 5-10 mph<br>PM: 63°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0630 | 1630 | 10 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
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| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to build inlet pipe pad |
| | | | |
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| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MSI built and graded a pad for the inlet pipes..
- MR Geo not on site today.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 1)
    - 26 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 1)
- See Progress Map on page 4 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

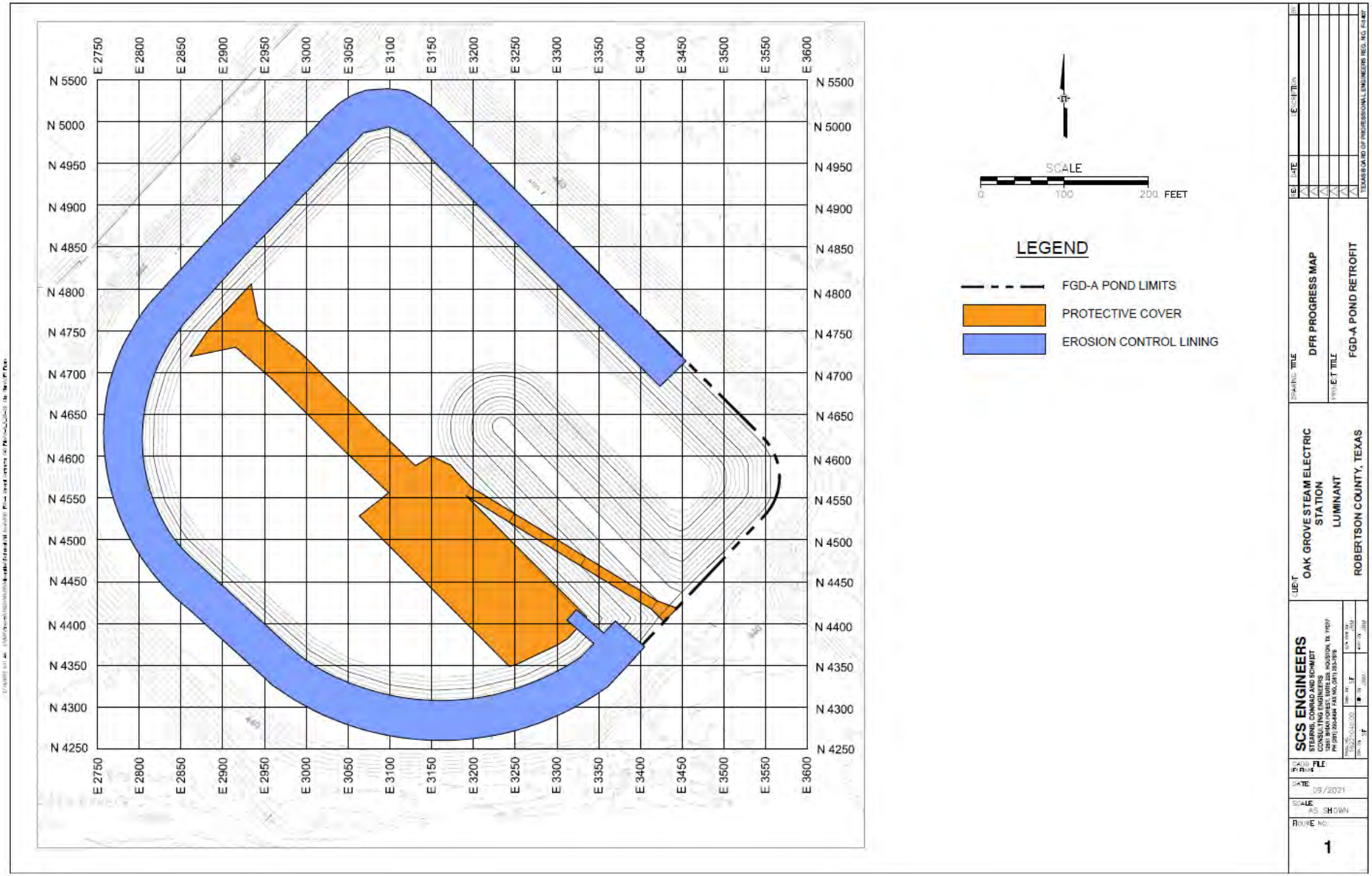
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/13/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/13/2022 |

**Photo 1** – Hauling and spreading of bottom ash on pond floor

**Photo 2** – End of day protective cover placement

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 90**<br>**Date: 02/13/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/14/2022** | **Report No.**: 91 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 44°, clear, light winds approx. 5-10 mph<br>PM: 70°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to build inlet pipe pad |
| | | | |
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| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MSI continues to weld pipes for the pond inlets. (See Photo 1)
- MR Geo continues to deploy HYDROTEX fabric panels on the eastern slope into the southeastern corner. (See Photo 2)
- MR Geo continues to pump concrete into the HYDROTEX fabric panels on the eastern slope.
    - 12 concrete trucks were used today.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 3)
    - 36 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/14/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/14/2022 |

**Photo 1** – MSI welding pipes for pond inlet

**Photo 2** – MR Geo deploying HYDROTEX fabric panels

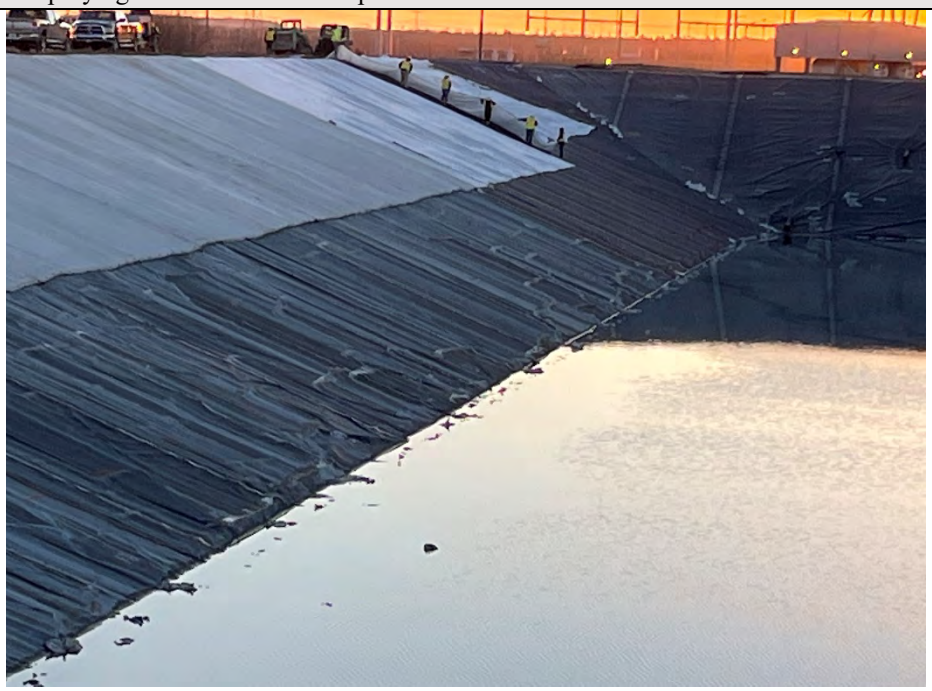
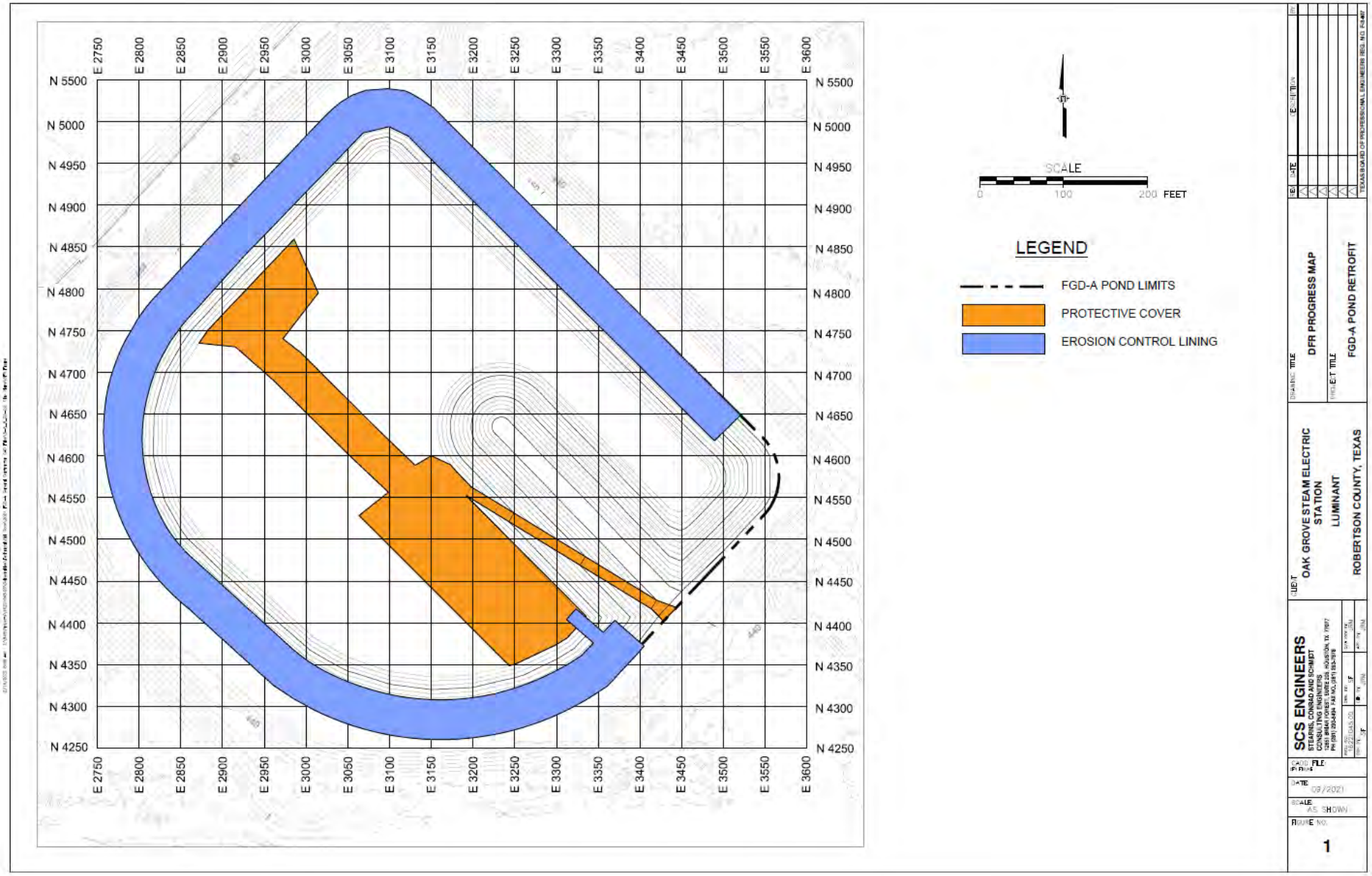


**Photo 3** – Hauling and spreading of bottom ash on pond floor

**Photo 4** – End of day protective cover placement

*Note: Pictures represent work in progress and do not represent work as certified complete.*

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|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 91** |
| | | **Date: 02/14/2022** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/15/2022** | **Report No.**: 92 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 59°, clear, high winds approx. 20-25 mph<br>PM: 71°, clear, high winds approx. 20-25 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
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| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Genie Forklift | 2 | GTH-844 | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to build inlet pipe pad |
| | | | |
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## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MSI continues to place and weld pipes for the pond inlets. (See Photo 1)
- MR Geo continues to deploy HYDROTEX fabric panels on the southern slope, east of the peninsula.
- MR Geo continues to pump concrete into the HYDROTEX fabric panels on the southeastern corner and on the southern slope, east of the peninsula. (See Photo 2)
    - 13 concrete trucks were used today.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 3)
    - 28 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | Danny Rennicks | 02/15/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 02/15/2022 |

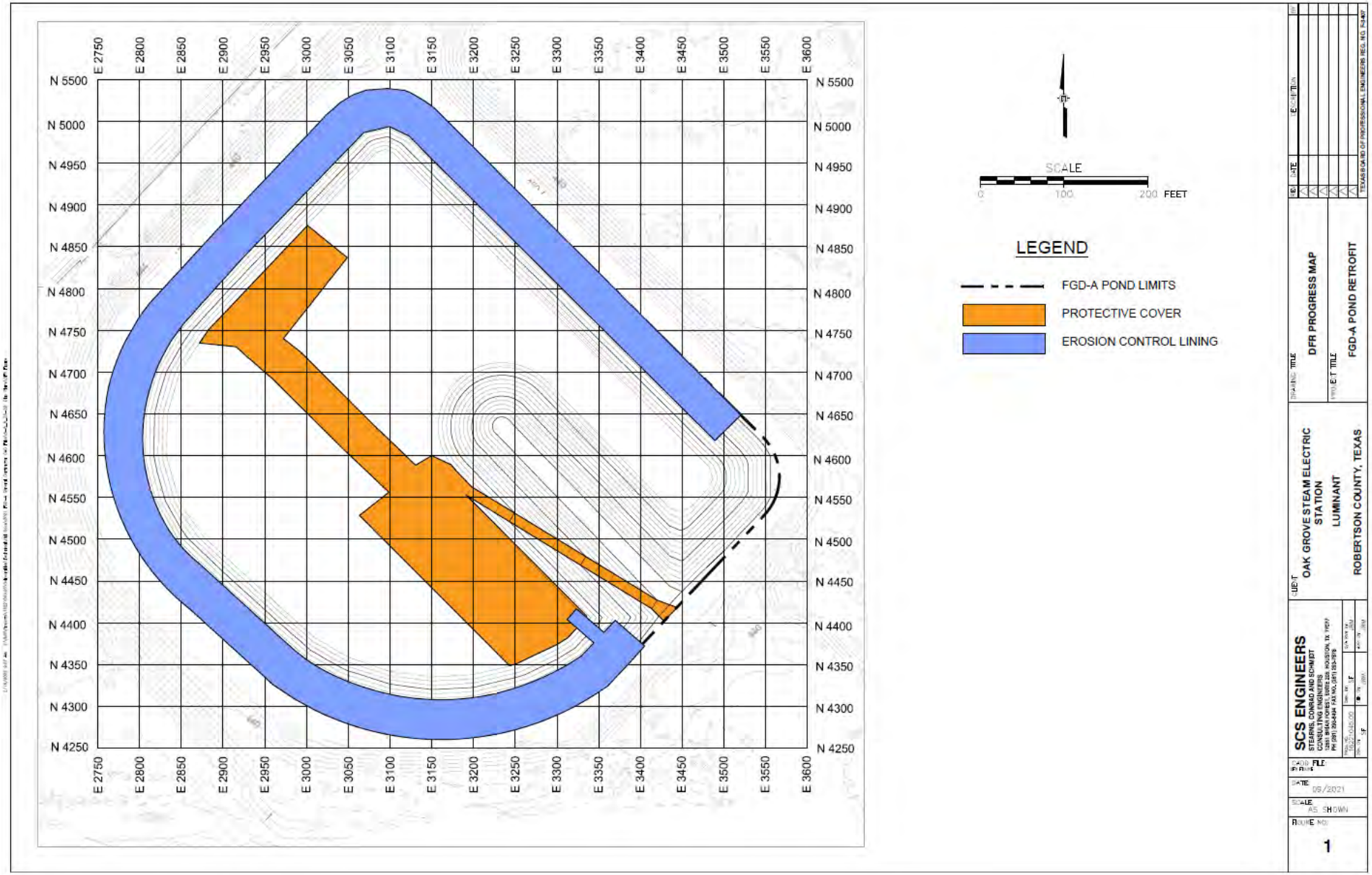
**Photo 1** – MSI welding pipes for pond inlet

**Photo 2** – MR Geo pumping concrete on the southern slope, east of the peninsula

**Photo 3** – Hauling and spreading of bottom ash on pond floor

**Photo 4** – End of day protective cover placement

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 92**<br>**Date: 02/15/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/16/2022** | **Report No.**: 93 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 64°, cloudy, high winds approx. 20-30 mph<br>PM: 73°, cloudy, high winds approx. 20-30 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Genie Forklift | 2 | GTH-844 | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used by railroad tracks |
| Case Excavator | 1 | CX210D | Used to move/list pipe |
| Manitou | 1 | MTA-1055 | Used to move pipe |
| | | | |
| | | | |
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| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MSI continues to place and weld pipes for the pond inlets. (See Photo 1)
- MR Geo continues to deploy HYDROTEX fabric panels on the east slope of the peninsula.
- MR Geo continues to pump concrete into the HYDROTEX fabric panels on the east slope of the peninsula. (See Photo 2)
    - 12 concrete trucks were used today.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 3)
    - 32 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | Danny Rennicks | 02/16/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 02/16/2022 |

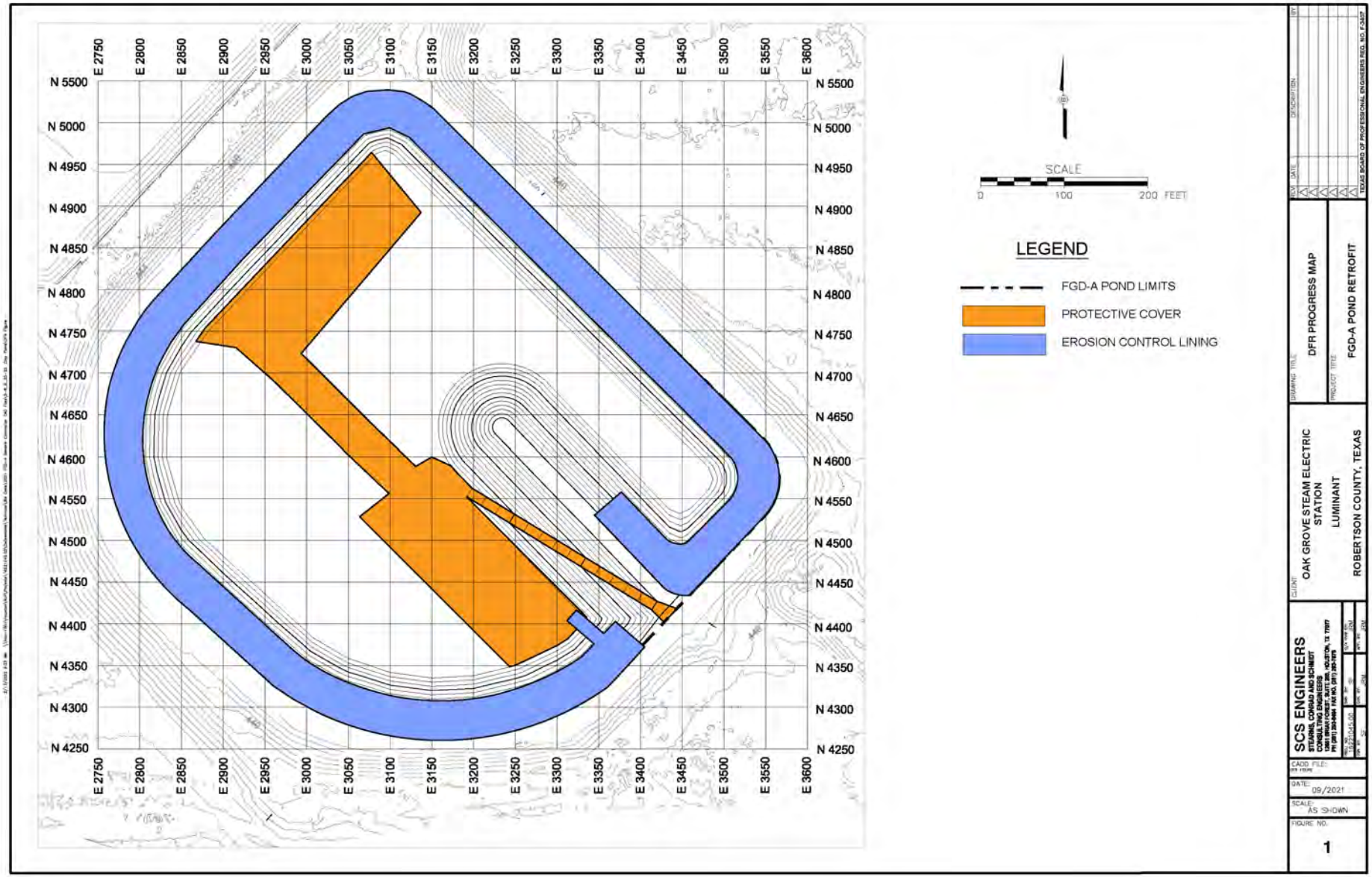
**Photo 1** – MSI welding pipes for pond inlet

**Photo 2** – MR Geo pumping concrete on the east slope of the peninsula

**Photo 3** – Hauling and spreading of bottom ash on pond floor

**Photo 4** – End of day protective cover placement

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 93**<br>**Date: 02/16/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/17/2022** | **Report No.**: 94 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 31°, cloudy, high winds approx. 20-30 mph<br>PM: 70°, cloudy, high winds approx. 20-30 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1700 | 11 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
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| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Genie Forklift | 2 | GTH-844 | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used by railroad tracks |
| Case Excavator | 1 | CX210D | Used to move pipe |
| Manitou | 1 | MTA-1055 | Used to move pipe |
| | | | |
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| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- Found damage liner at top of peninsula ramp by entrance to FGD-A Pond, appear to be track marks from D-6 dozer. Lone star will be on site Friday to repair damage. (See Photo 4)
- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MSI continues to place and weld pipes for the pond inlets. (See Photo 1)
- MR Geo continues to deploy HYDROTEX fabric panels on the east slope of the peninsula.
- MR Geo continues to pump concrete into the HYDROTEX fabric panels on the east slope of the peninsula. (See Photo 2)
    - 12 concrete trucks were used today.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 3)
    - 36 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/17/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/17/2022 |

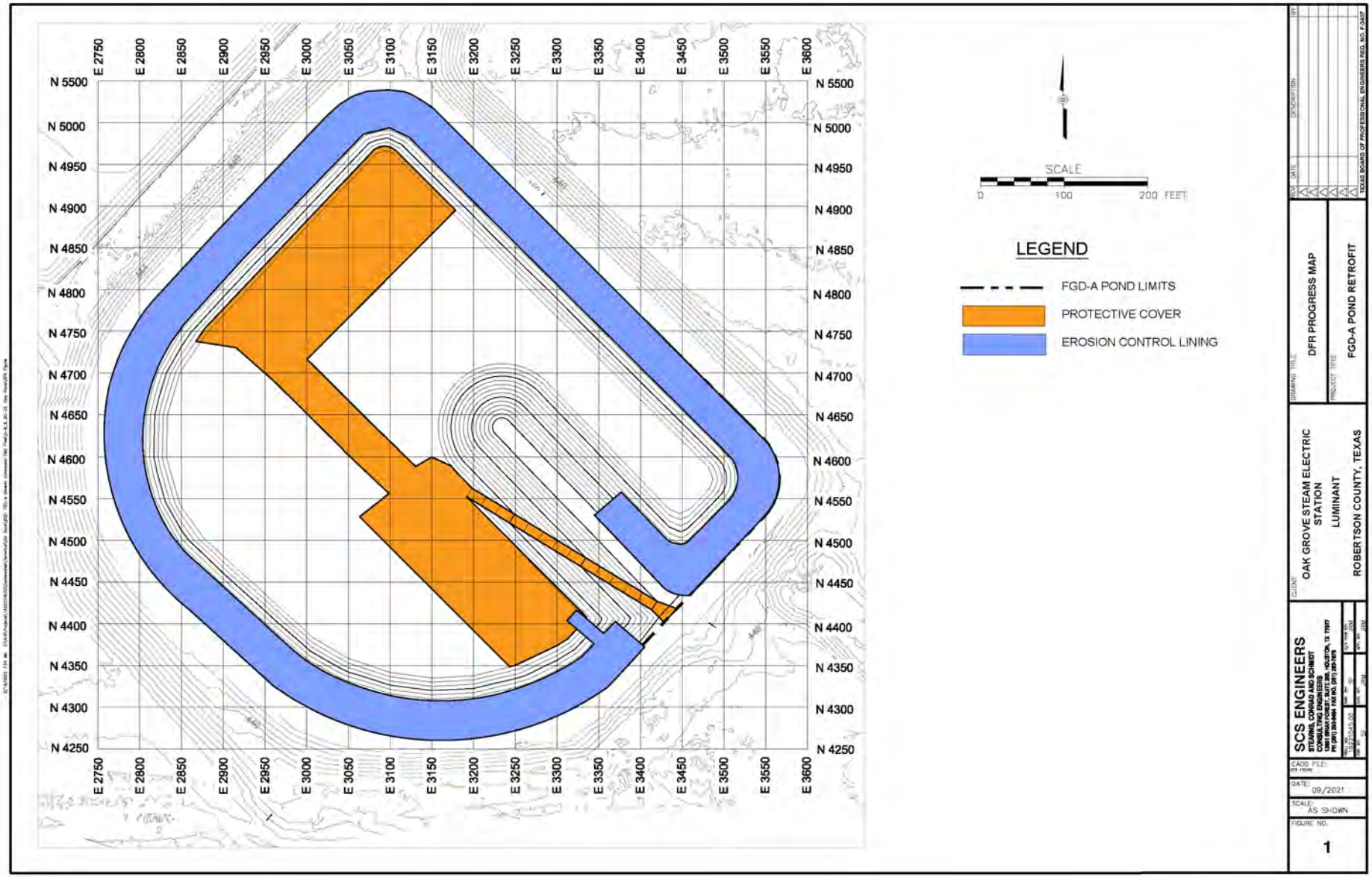
**Photo 1** – MSI welding pipes for pond inlet

**Photo 2** – MR Geo pumping concrete on the west slope of the peninsula

**Photo 3** – Hauling and spreading of bottom ash on pond floor

**Photo 4** – Damaged liner found at top of peninsula ramp entrance

*Note: Pictures represent work in progress and do not represent work as certified complete.*

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|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 94**<br>**Date: 02/17/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/18/2022** | **Report No.**: 95 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 32°, clear, light winds approx. 5-10 mph<br>PM: 56°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1700 | 11 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Case Excavator | 1 | CX210D | Used to move HDPE pipe |
| Manitou | 1 | MTA-1055 | Used to move HDPE pipe |
| | | | |
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| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI cleaned area around damaged liner.
- Lone Star was on site in the morning to repair damaged HDPE. No GCL was damaged. (See Photo 1)
- Lone Star off site by 1200.
- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MSI continues to place and weld pipes for the pond inlets. (See Photo 2)
- MR Geo not on site today.
- Boral continued to haul bottom ash to FGD-A Pond at 1300 hours. (See Photo 3)
    - 3 load of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 4)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | Danny Rennicks | 02/18/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 02/18/2022 |

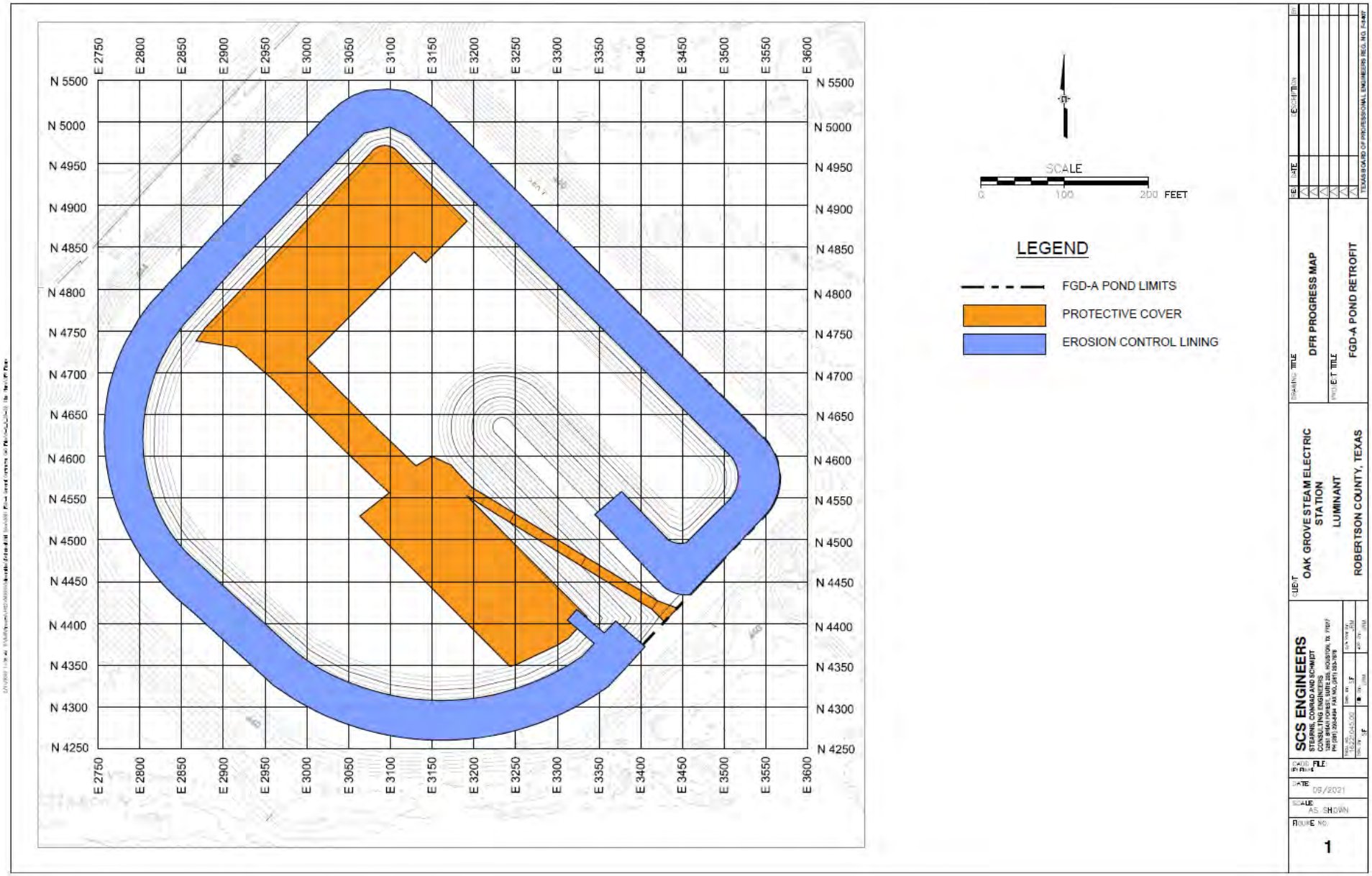
**Photo 1** – Lone Star repairing damaged HDPE

**Photo 2** – MSI placing and welding pond inlet pipes

**Photo 3** – Hauling bottom ash on pond floor

**Photo 4** – MSI spreading bottom ash on pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*

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|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 95**<br>**Date: 02/18/2022** |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/19/2022** | **Report No.**: 96 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 39°, clear, light winds approx. 5-10 mph<br>PM: 65°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
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| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Case Excavator | 1 | CX210D | Not used today |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| | | | |
| | | | |
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| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• MSI continued pumping water out of FGD-A Pond into FGD-B pond.<br>• MR Geo not on site today.<br>• Boral continued to haul bottom ash to FGD-A Pond. (See Photo 1)<br>o 38 loads of bottom ash was hauled and placed in the pond.<br>• MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 2)<br>• See Progress Map on page 4 for approximate areas of protective cover placement and revetment installation.<br><br>**Surveying Activities:**<br>• No surveying activities today. |

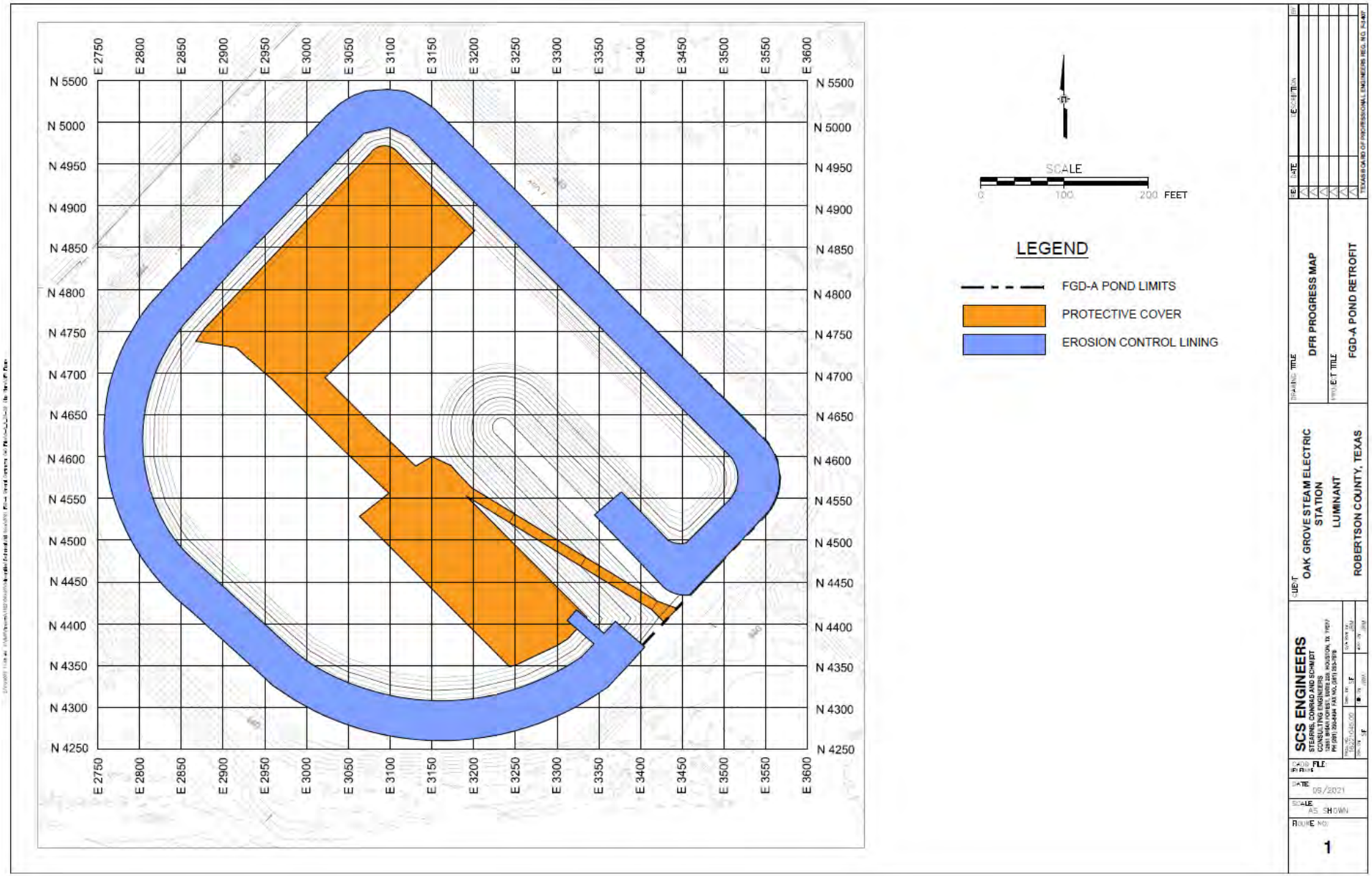
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/19/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/19/2022 |

**Photo 1** – Boral hauling bottom ash to FGD-A Pond

**Photo 2** – MSI spreading bottom ash on pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 96**<br>**Date: 02/19/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/20/2022** | **Report No.**: 97 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 59°, clear, light winds approx. 5-10 mph<br>PM: 70°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
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| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Case Excavator | 1 | CX210D | Not used today |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• MSI continued pumping water out of FGD-A Pond into FGD-B pond.<br>• MR Geo not on site today.<br>• Boral continued to haul bottom ash to FGD-A Pond. (See Photo 1)<br>o 38 loads of bottom ash was hauled and placed in the pond.<br>• MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 2)<br>• See Progress Map on page 4 for approximate areas of protective cover placement and revetment installation.<br><br>**Surveying Activities:**<br>• No surveying activities today. |

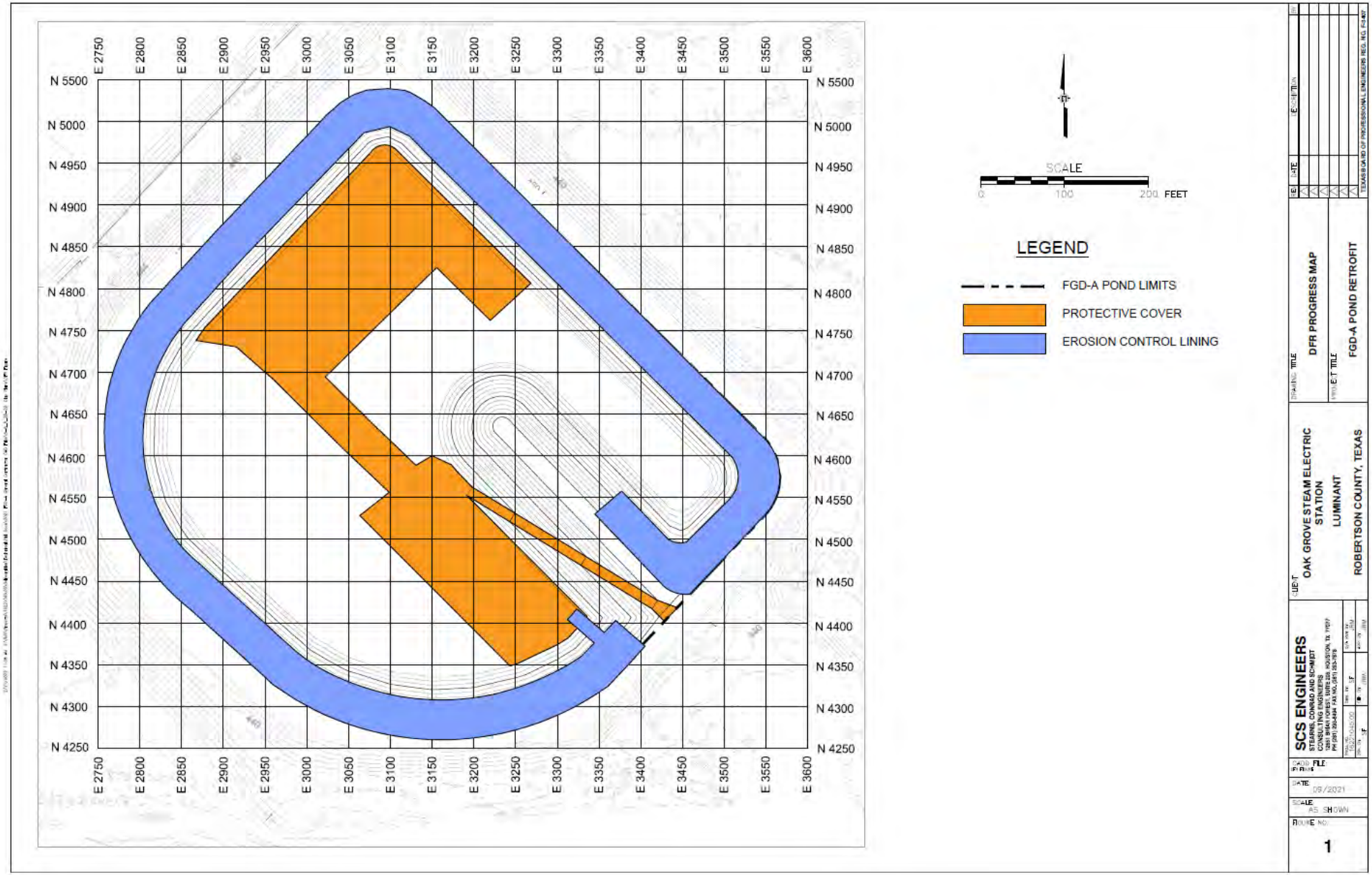
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/20/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/20/2022 |

**Photo 1** – Boral hauling bottom ash to FGD-A Pond

**Photo 2** – MSI spreading bottom ash on pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 97**<br>**Date: 02/20/2022** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/21/2022** | **Report No.**: 98 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 67°, cloudy, medium winds approx. 20 mph<br>PM: 79°, cloudy, medium winds approx. 20 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Case Excavator | 1 | CX210D | Used to move pipe |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| | | | |
| | | | |
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| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo not on site.
- MSI continues to place and weld pond inlet pipes. (See Photo 1)
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 2)
    - 35 loads of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No surveying activities today.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/21/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/21/2022 |

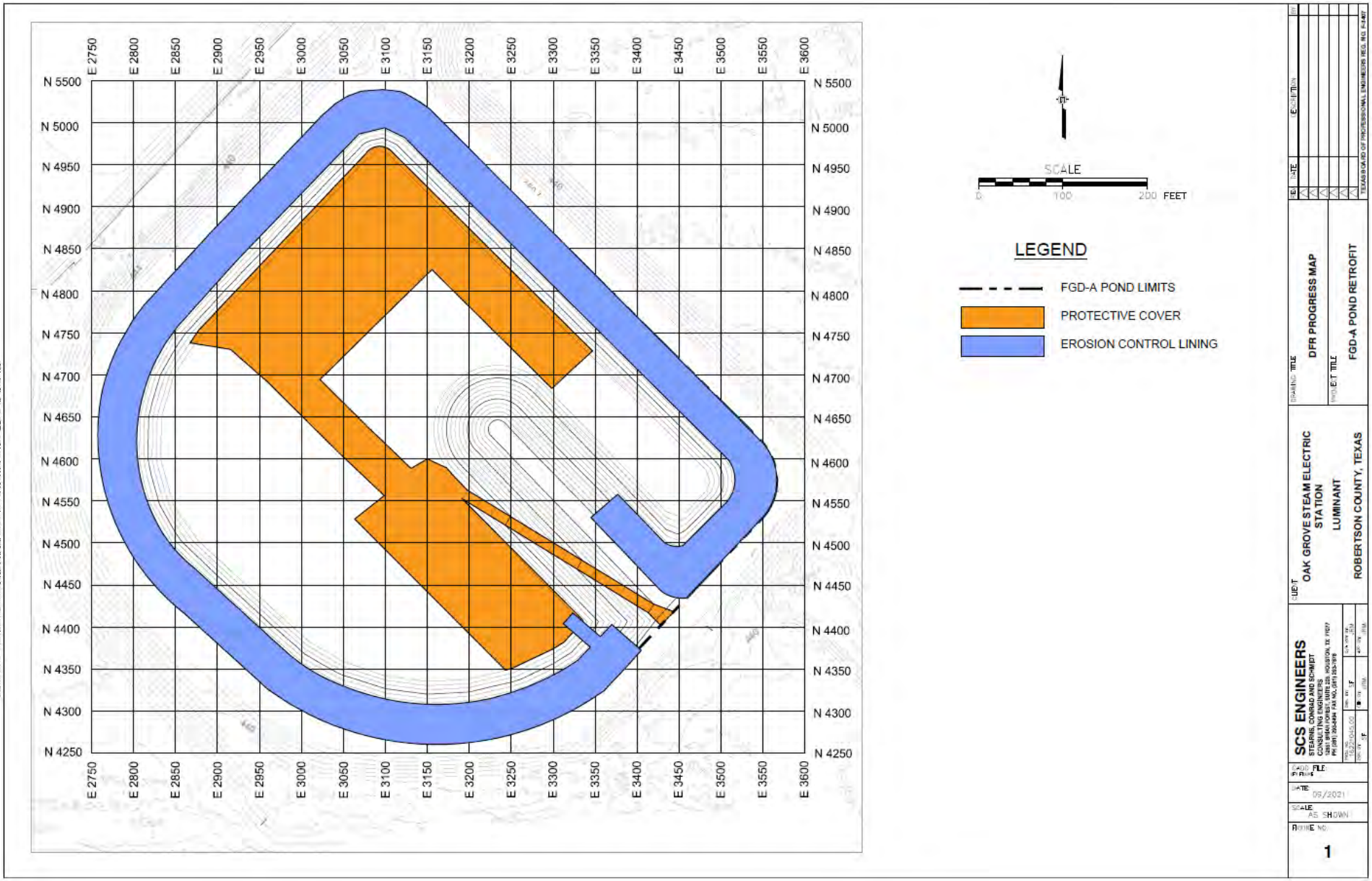
**Photo 1** – FGD-A Pond inlet pipes

**Photo 2** – Boral hauling bottom ash to pond floor

**Photo 3** – MSI spreading bottom ash on pond floor

**Photo 4** – End of day protective cover placement

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 98**<br>**Date: 02/21/2022** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/22/2022** | **Report No.**: 99 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 42°, cloudy, light winds approx. 5-10 mph<br>PM: 79°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Case Excavator | 1 | CX210D | Used to move pipe materials |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Used to move pipe materials |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo on site to deploy HYDROTEX fabric forms on the north end of the peninsula. (See Photo 1)
    - No pumping of concrete took place.
- MSI continues to place and weld pond inlet pipes. (See Photo 2)
- MSI began installation of the FGD-A/B crossover pipeline on the pond floor. (See Photo 3)
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 4)
    - 10 loads of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 4)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points scheduled for Wednesday, March 2nd.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/22/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/22/2022 |

**Photo 1** – MR Geo deploying HYDROTEX fabric forms on east side of peninsula

**Photo 2** – MSI welding FGD-A Pond inlet pipes

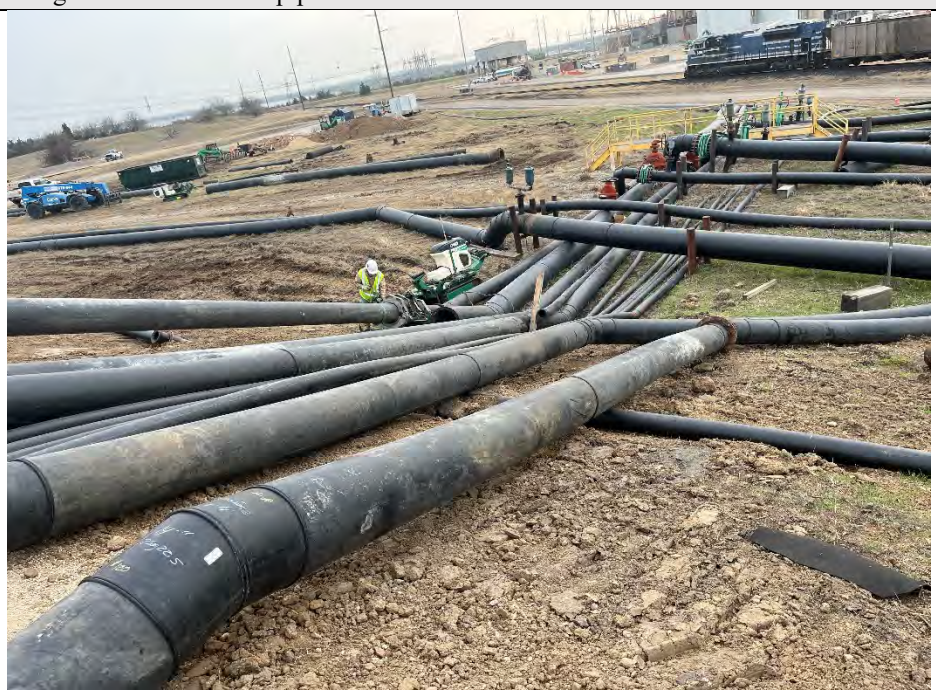
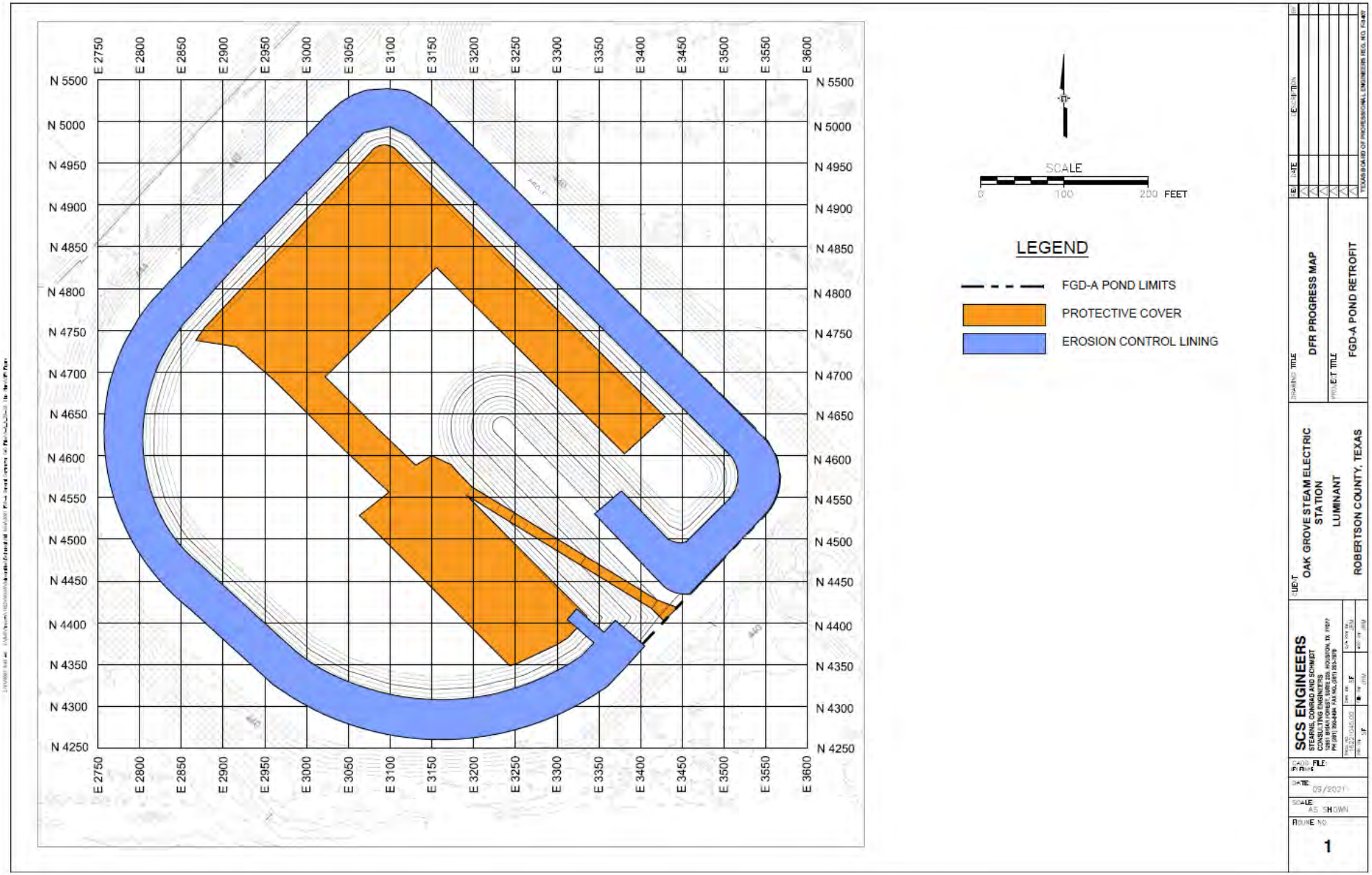


**Photo 3** – MSI preparing for installation of FGD-A/B crossover pipeline on pond floor

**Photo 4** – Hauling and spreading of protective cover

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 99**<br>**Date: 02/22/2022** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/23/2022** | **Report No.**: 100 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 31°, cloudy, medium winds approx. 15 mph<br>PM: 39°, cloudy, medium winds approx. 15 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Case Excavator | 1 | CX210D | Used to move pipe materials |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Used to move pipe materials |
| | | | |
| | | | |
| | | | |
| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo not on site.
- MSI continues to place and weld FGD-A/B crossover pipeline on pond floor. (See Photo 1)
- MSI began installation of the FGD-A/B crossover pipeline on the pond floor. (See Photo 2)
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 4)
    - 12 loads of bottom ash was hauled and placed in the pond.
    - Unit #1 from the plant is offline, decreasing bottom ash availability.
    - Unit #1 is expected to be back online by February 24th.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points scheduled for Wednesday, March 2nd.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | *Danny Rennicks* | 02/23/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/23/2022 |

**Photo 1** – MSI welding FGD-A/B crossover pipeline on pond floor

**Photo 2** – Boral dumping bottom ash on the pond floor

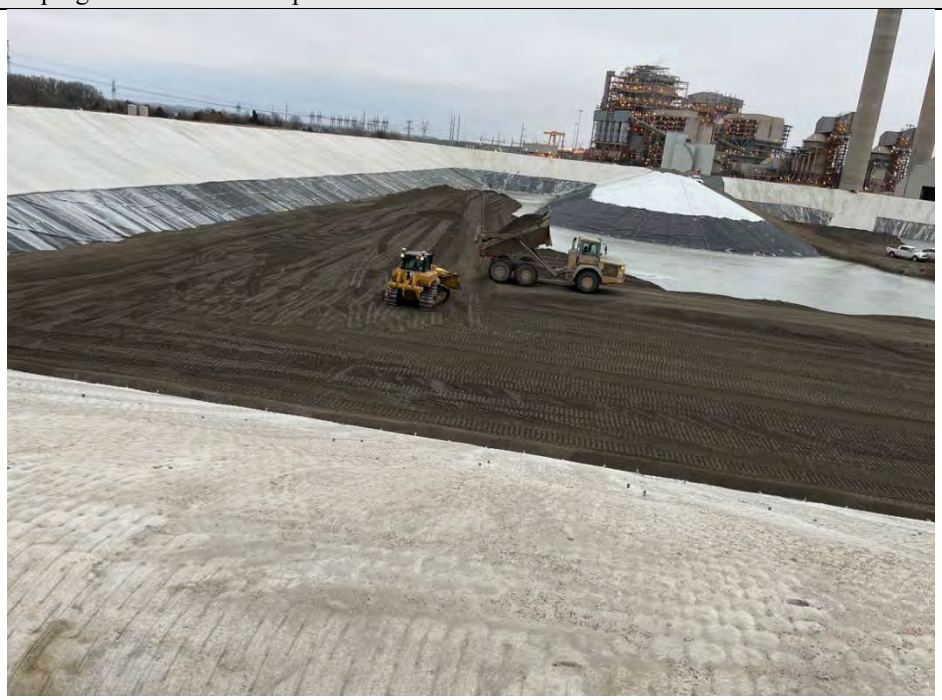
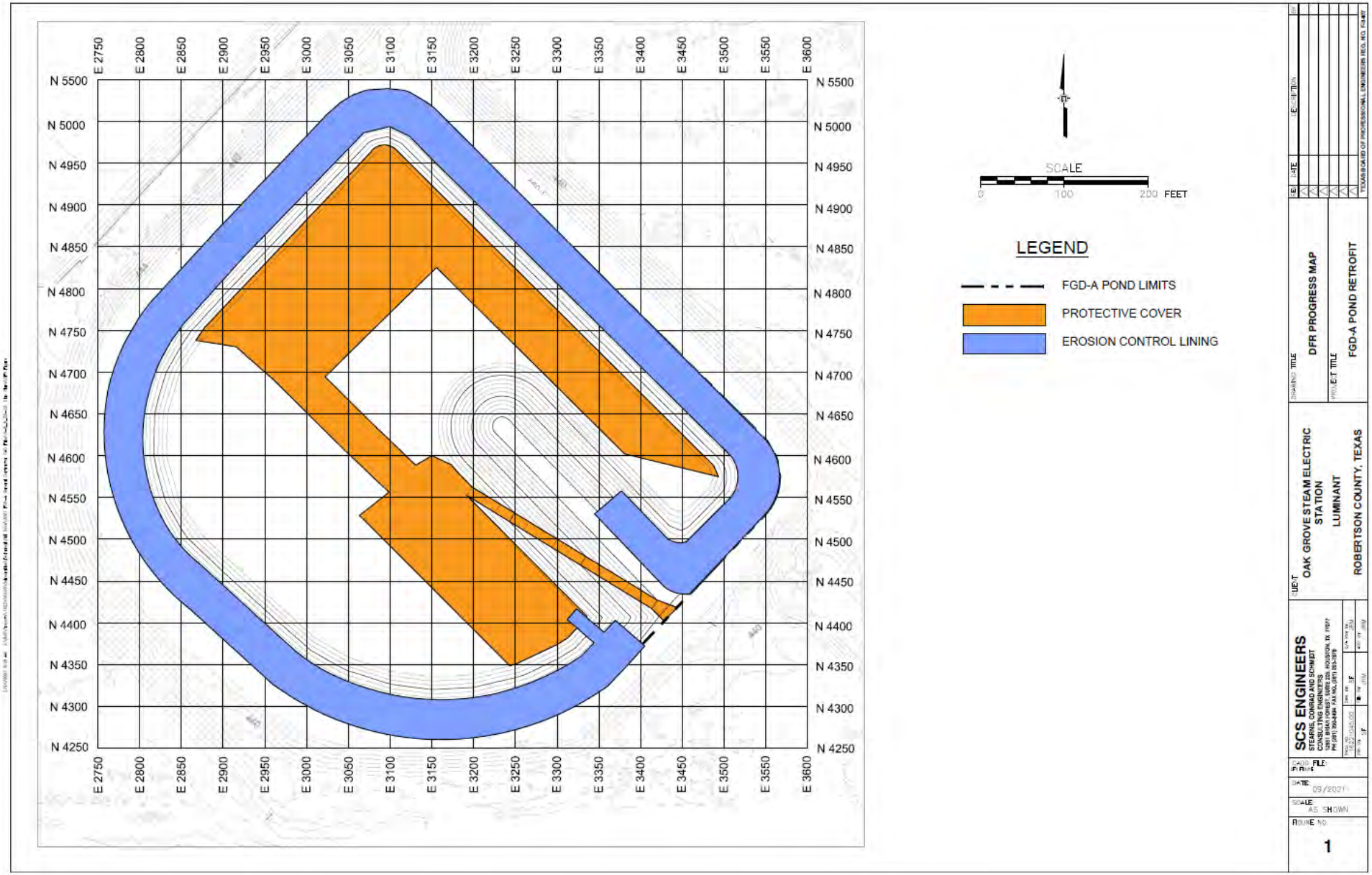


**Photo 3** – MSI spreading protective cover on the pond floor

**Photo 4** – End of day protective cover placement

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 100**<br>**Date: 02/23/2022** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/24/2022** | **Report No.**: 101 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 28°, cloudy, medium winds approx. 15 mph<br>PM: 35°, cloudy, medium winds approx. 15 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Case Excavator | 1 | CX210D | Used to move pipe materials |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Used to move pipe materials |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo not on site.
- MSI continues to place and weld FGD-A/B crossover pipeline on pond floor. (See Photo 1)
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 2)
    - 28 loads of bottom ash was hauled and placed in the pond.
    - Unit #1 from the plant is back online.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points scheduled for Wednesday, March 2nd.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | Danny Rennicks | 02/24/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 02/24/2022 |

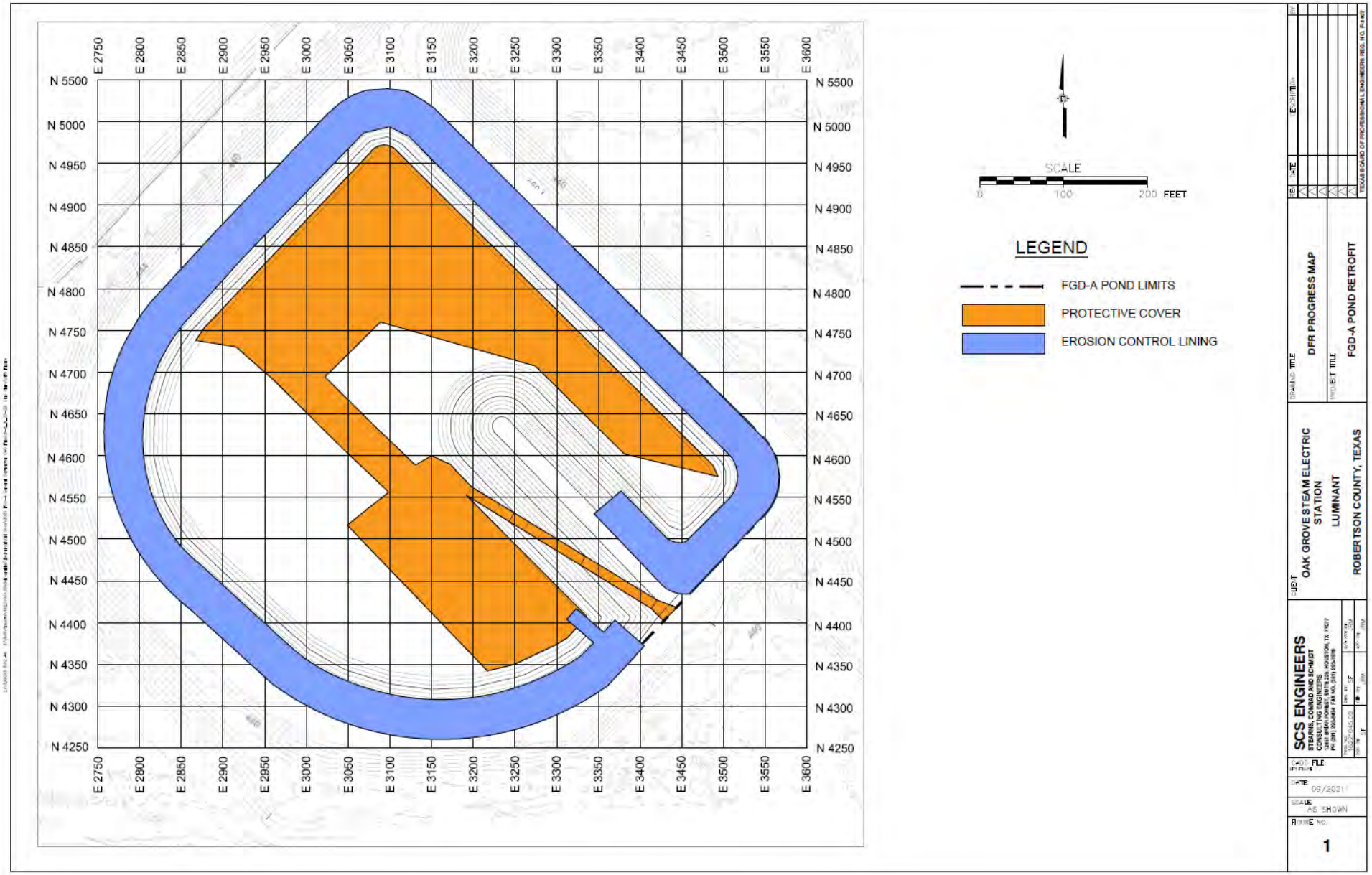
**Photo 1** – MSI welding FGD-A/B crossover pipeline on pond floor

**Photo 2** – Boral hauling bottom ash on the pond floor

**Photo 3** – MSI spreading protective cover on the pond floor

**Photo 4** – End of day protective cover placement

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 101** |
| | | **Date: 02/24/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/25/2022** | **Report No.**: 102 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 36°, cloudy, medium winds approx. 15 mph<br>PM: 43°, cloudy, medium winds approx. 15 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1700 | 11 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Case Excavator | 1 | CX210D | Used to move pipe materials |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Used to move pipe materials |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo not on site.
- MSI continues to place and weld FGD-A/B crossover pipeline on pond floor. (See Photo 1)
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 2)
    - 33 loads of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points scheduled for Wednesday, March 2nd.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

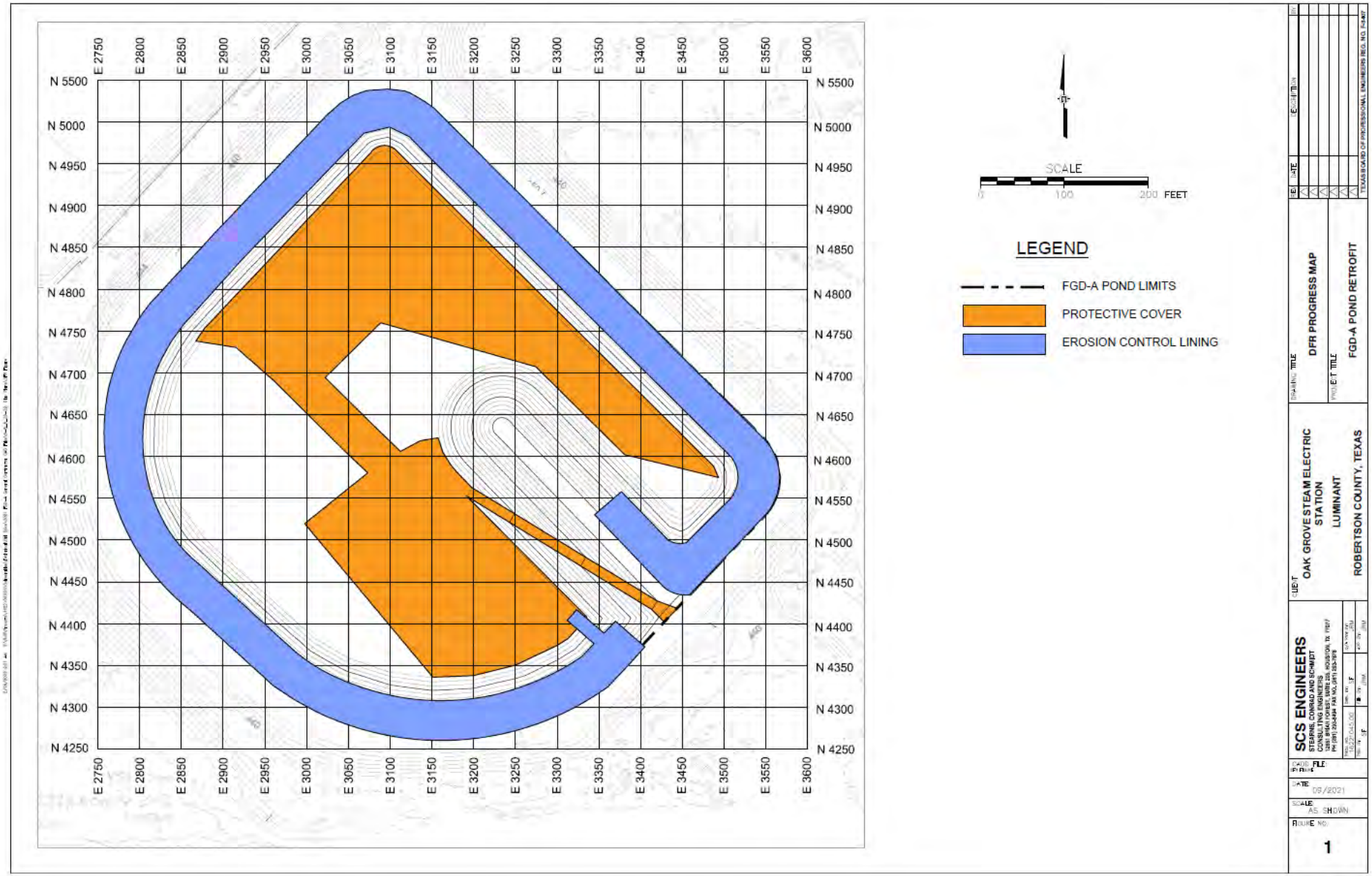
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/25/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/25/2022 |

**Photo 1** – MSI welding FGD-A/B crossover pipeline on pond floor

**Photo 2** – Boral hauling bottom ash on the pond floor

**Photo 3** – MSI spreading protective cover on the pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 102**<br>**Date: 02/25/2022** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/26/2022** | **Report No.**: 103 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 36°, cloudy, light winds approx. 5 mph<br>PM: 40°, cloudy, light winds approx. 5 mph | **Rain Gauge Reading: 0.5"** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1200 | 6 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Case Excavator | 1 | CX210D | Not used today |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| | | | |
| | | | |
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| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo not on site.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 1)
    - 15 loads of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 2)
- At 12:00 PM, rain began and no more construction activities were conducted.
- See Progress Map on page 4 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points scheduled for Wednesday, March 2nd.

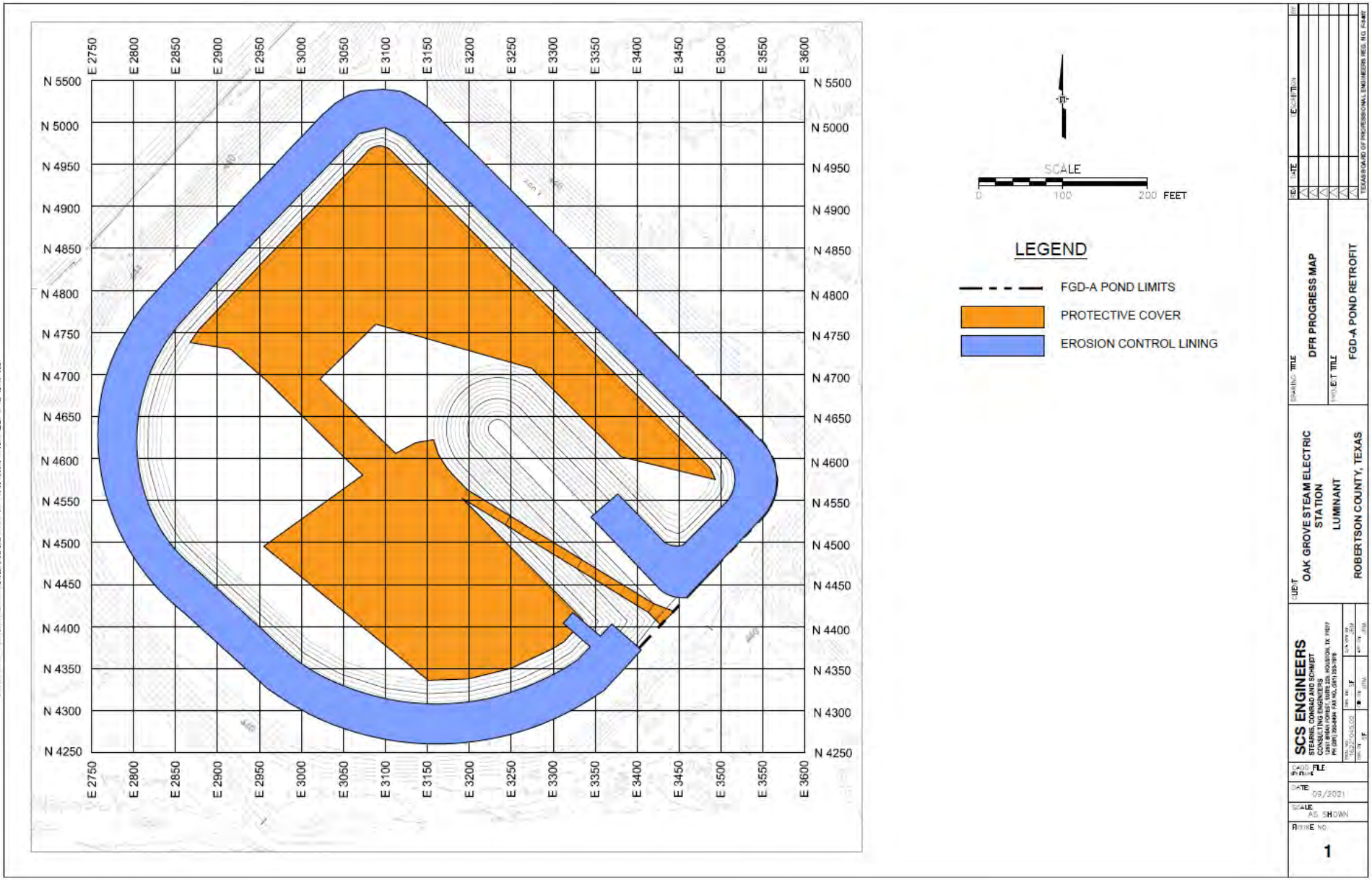
| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/26/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/26/2022 |

**Photo 1** – Boral hauling bottom ash to the pond floor

**Photo 2** – MSI spreading protective cover on the pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 103**<br>**Date: 02/26/2022** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/27/2022** | **Report No.**: 104 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 31°, cloudy, high winds approx. 20-30 mph<br>PM: 58°, cloudy, high winds approx. 20-30 mph | **Rain Gauge Reading: 0.5"** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | | | |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Not used today |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Case Excavator | 1 | CX210D | Not used today |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|
| **Construction Activities:**<br>• Due to wet conditions, no construction activities were performed today.<br><br>**Surveying Activities:**<br>• Survey for protective cover quantities and top of revetment points scheduled for Wednesday, March 2nd. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | Danny Rennicks | 02/27/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 02/27/2022 |

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 02/28/2022** | **Report No.**: 105 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 38°, clear, light winds approx. 5-10 mph<br>PM: 65°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to remove revetment concrete debris |
| Case Excavator | 1 | CX210D | Used to move pipe materials |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Used to move pipe materials |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo on site to remove concrete debris from revetment installation. (See Photo 1)
- MSI began welding the FGD-A Pond to pump station riser pipe and FGD-A drain line. (See Photos 2 & 3)
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 4)
    - 24 loads of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor.
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points has been re-scheduled for Friday, March 4th.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 02/25/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 02/25/2022 |

**Photo 1** – MR Geo removing concrete debris from revetment installation

**Photo 2** – MSI installing FGD-A to pump station riser pipe

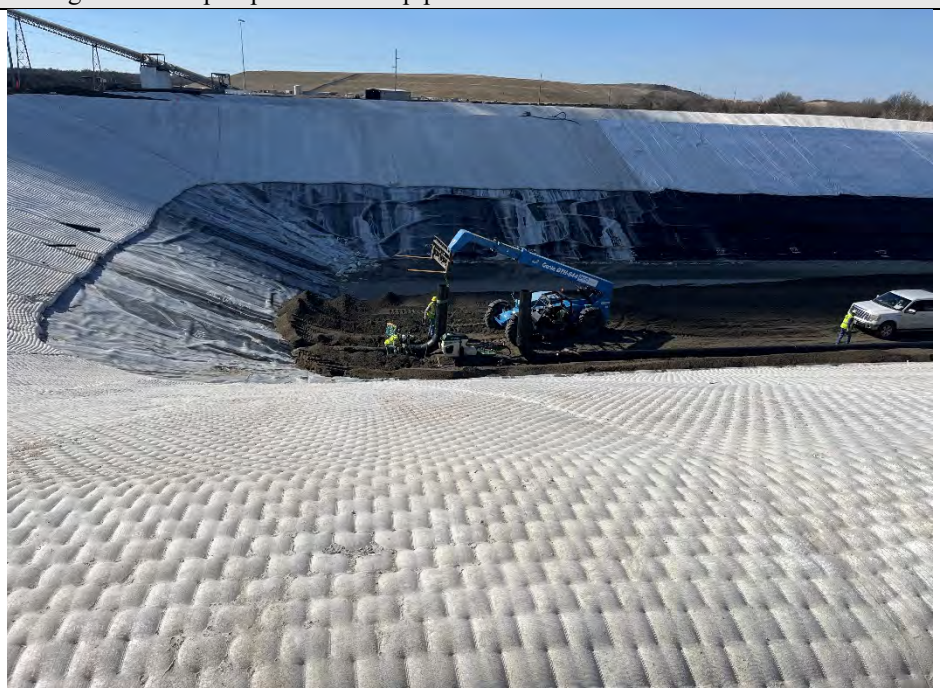
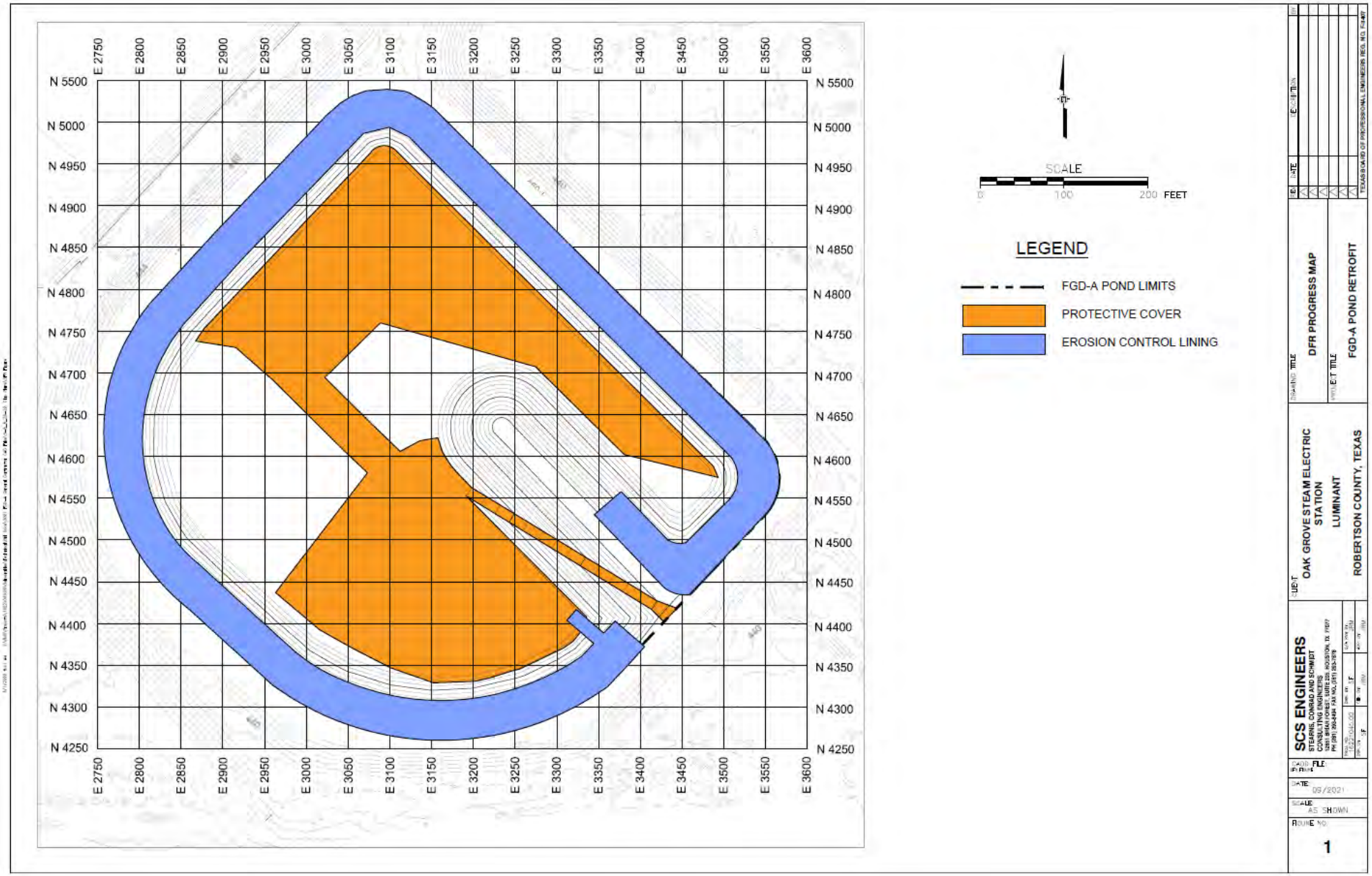


**Photo 3** – MSI placing and welding FGD-A drain line

**Photo 4** – Boral hauling bottom ash on the pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 105**<br>**Date: 02/28/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 03/01/2022** | **Report No.**: 106 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 44°, clear, light winds approx. 5-10 mph<br>PM: 71°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1700 | 11 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to remove revetment concrete debris |
| Case Excavator | 1 | CX210D | Used to move pipe materials |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Used to move pipe materials |
| | | | |
| | | | |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo on site to remove concrete debris from revetment installation. (See Photo 1)
- MSI continued welding FGD-A drain line and inlet pipes. (See Photo 2)
- Concrete forms were installed around the FGD-A to pump station riser and A/B crossover pipe. (See Photo 3)
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 4)
    - 4 loads of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor.
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points has been re-scheduled for Friday, March 4th.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 03/01/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 03/01/2022 |

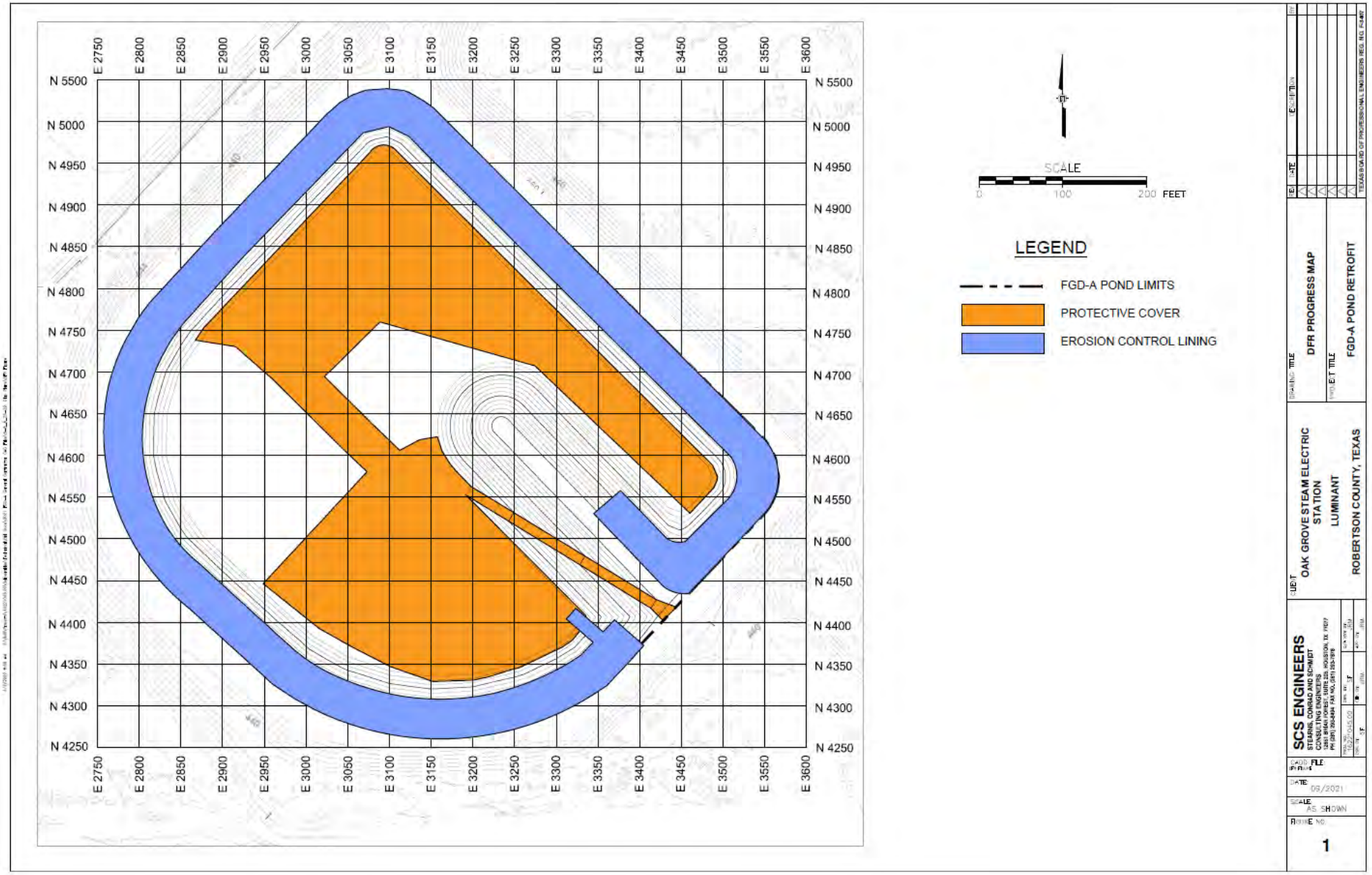
**Photo 1** – MR Geo removing concrete debris from revetment installation

**Photo 2** – MSI welding FGD-A drain line

**Photo 3** – Concrete forms installed around A/B crossover riser pipe

**Photo 4** – Boral hauling bottom ash on the pond floor

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 106**<br>**Date: 03/01/2022** |

SCS ENGINEERS

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# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 03/02/2022** | **Report No.**: 107 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 46°, clear, light winds approx. 5-10 mph<br>PM: 74°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Melvin Mejia | Luminant Project Manager |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to cover A/B crossover pipe |
| Case Excavator | 1 | CX210D | Not used today |
| Manitou Forklift | 1 | MTA-1055 | Used to move pipe materials |
| Genie Forklift | 1 | GTH-844 | Used to move pipe materials |
| John Deere Haul Truck | 1 | 460E | Used to haul bottom ash |
| | | | |
| | | | |
| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo on site to remove concrete debris from revetment installation.
- MSI continued welding FGD-A drain line and inlet pipes. (See Photo 1)
- Concrete forms were installed around the FGD-A to pump station riser and A/B crossover pipe. (See Photo 2)
    - Concrete to be poured Friday, March 4th.
- Boral continued to haul bottom ash to FGD-A Pond.
    - 30 loads of bottom ash was hauled and placed in the pond.
    - MSI mobilized 1 haul truck to assist with bottom ash hauling.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- MSI used the Bobcat skid steer to place bottom ash over the FGD-A/B crossover pipe. (See Photo 4)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points has been re-scheduled for Monday, March 7th.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | *Danny Rennicks* | 03/02/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 03/02/2022 |

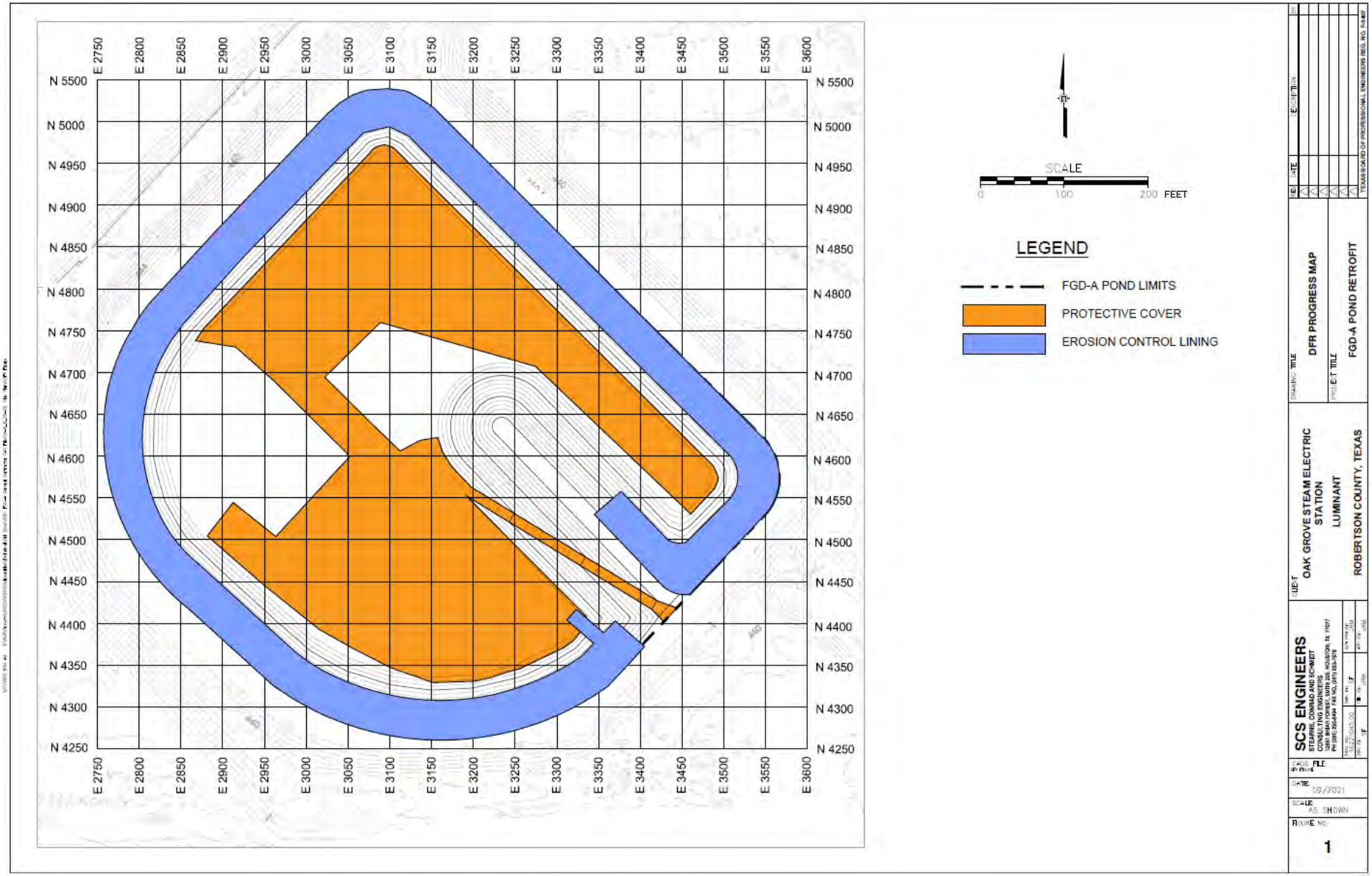
**Photo 1** – Completed welding of FGD-A drain line

**Photo 2** – Completed concrete forms around A/B crossover and pump station risers

**Photo 3** – MSI spreading bottom ash on the pond floor

**Photo 4** – MSI using the Bobcat skid steer to place bottom ash over the A/B crossover pipe

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 107**<br>**Date: 03/02/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 03/03/2022** | **Report No.**: 108 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 51°, clear, light winds approx. 5-10 mph<br>PM: 77°, clear, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to cover A/B crossover pipe |
| Case Excavator | 1 | CX210D | Not used today |
| Manitou Forklift | 1 | MTA-1055 | Used to move pipe materials |
| Genie Forklift | 1 | GTH-844 | Used to move pipe materials |
| John Deere Haul Truck | 1 | 460E | Used to haul bottom ash |
| Water Truck | 1 | 4,000 Gal | Not used today |
| | | | |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- MR Geo removed all concrete debris from revetment installation. (See Photo 1)
    - Liner was inspected and no damage was observed.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 2)
    - 24 loads of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 3)
- MSI used the Bobcat skid steer to place bottom ash over the FGD-A/B crossover pipe. (See Photo 4)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points has been re-scheduled for Monday, March 7th.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | Danny Rennicks | 03/03/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | Samuel Franco | 03/03/2022 |

**Photo 1** – MR Geo removing concrete debris from revetment installation

**Photo 2** – Boral hauling bottom ash to FGD-A Pond

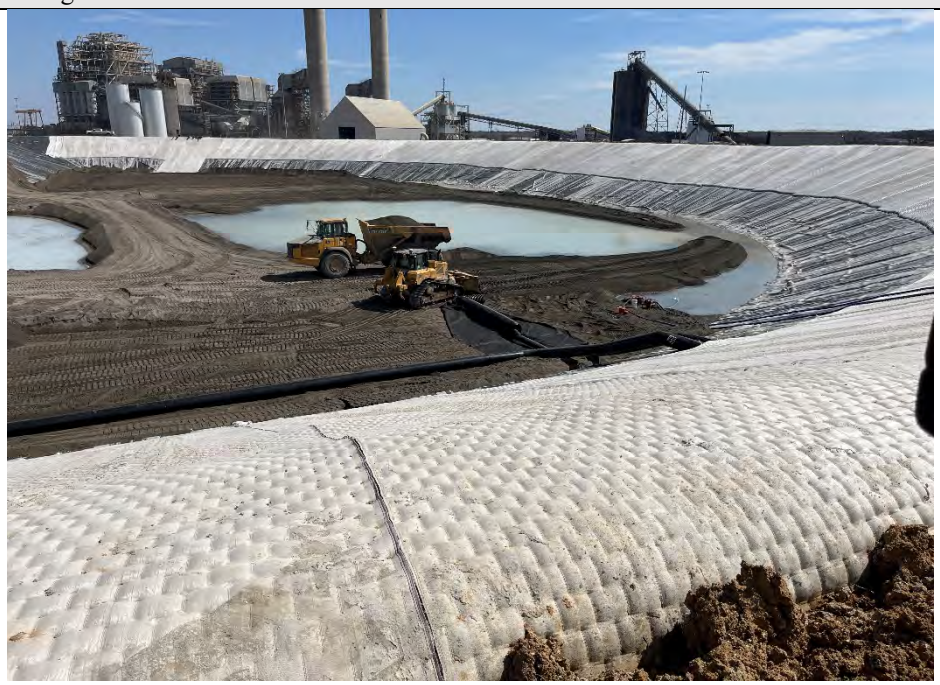
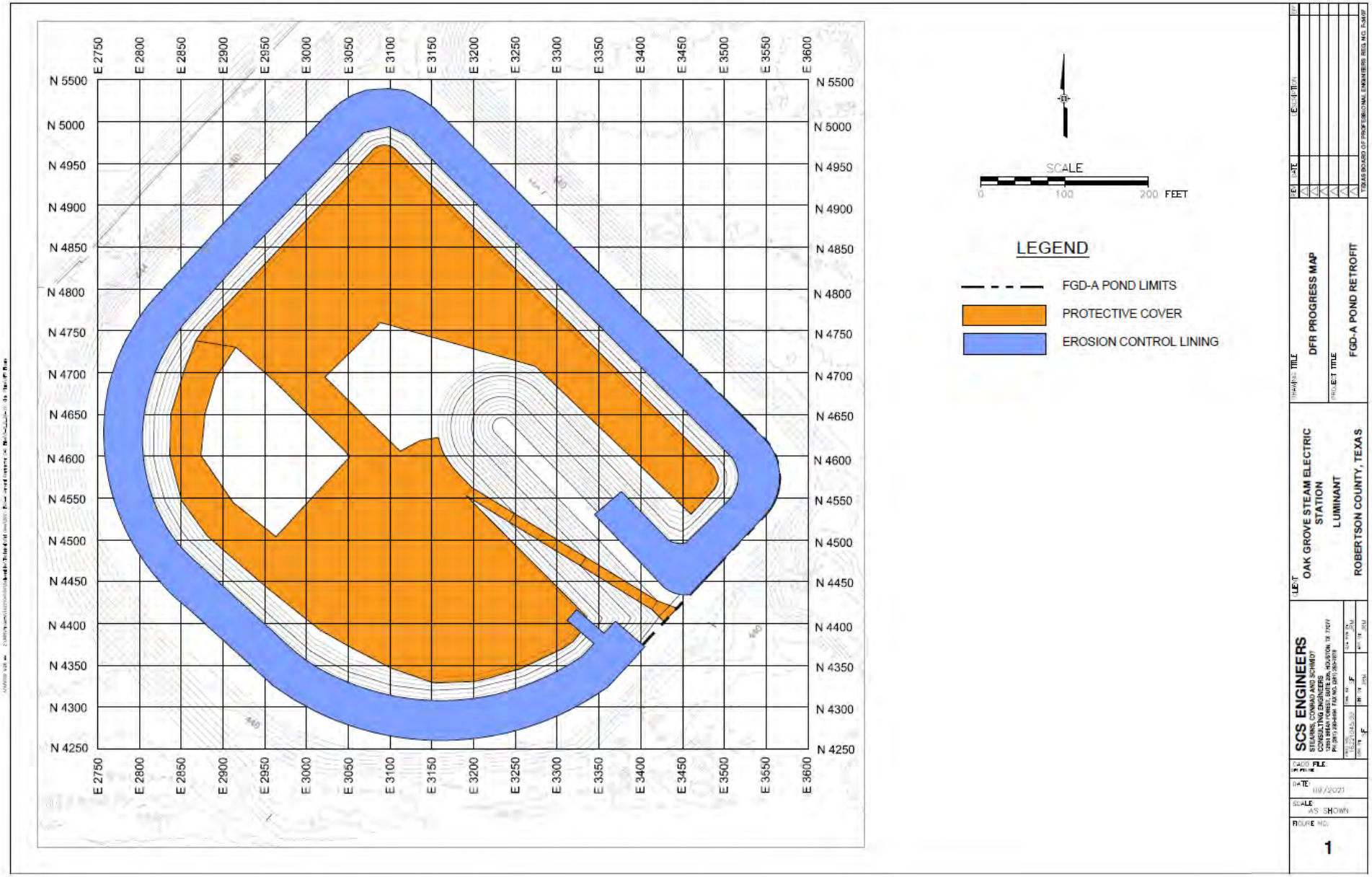


**Photo 3** – MSI spreading bottom ash on the pond floor

**Photo 4** – MSI using the Bobcat skid steer to place bottom ash over the A/B crossover pipe

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 108**<br>**Date: 03/03/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 03/04/2022** | **Report No.**: 109 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 61°, cloudy, light winds approx. 5-10 mph<br>PM: 74°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to cover A/B crossover pipe |
| Case Excavator | 1 | CX210D | Not used today |
| Manitou Forklift | 1 | MTA-1055 | Used to move pipe materials |
| Genie Forklift | 1 | GTH-844 | Used to move pipe materials |
| John Deere Haul Truck | 1 | 460E | Used to haul bottom ash |
| Water Truck | 1 | 4,000 Gal | Not used today |
| CAT Motor Grader | 1 | GTH 844 | Not used today |
| | | | |

## Description of Work

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 1)
    - 51 loads of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 2)
- MSI used the Bobcat skid steer to place bottom ash over the FGD-A/B crossover pipe.
- MSI poured concrete aprons on the A/B crossover and pump station riser pipes. (See Photo 3)
- MSI began placing gravel around the FGD-A drain line. (See Photo 4)
- MSI continued to install the 24" inlet pipe.
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points has been re-scheduled for Monday, March 7th.

## Materials Delivered

| Description | Qty. | Conditions / Comments |
|---|---|---|
| | | |

## Review and Approval

| Report Prepared By | Signature | Date |
|---|---|---|
| Danny Rennicks | *Danny Rennicks* | 03/04/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 03/04/2022 |

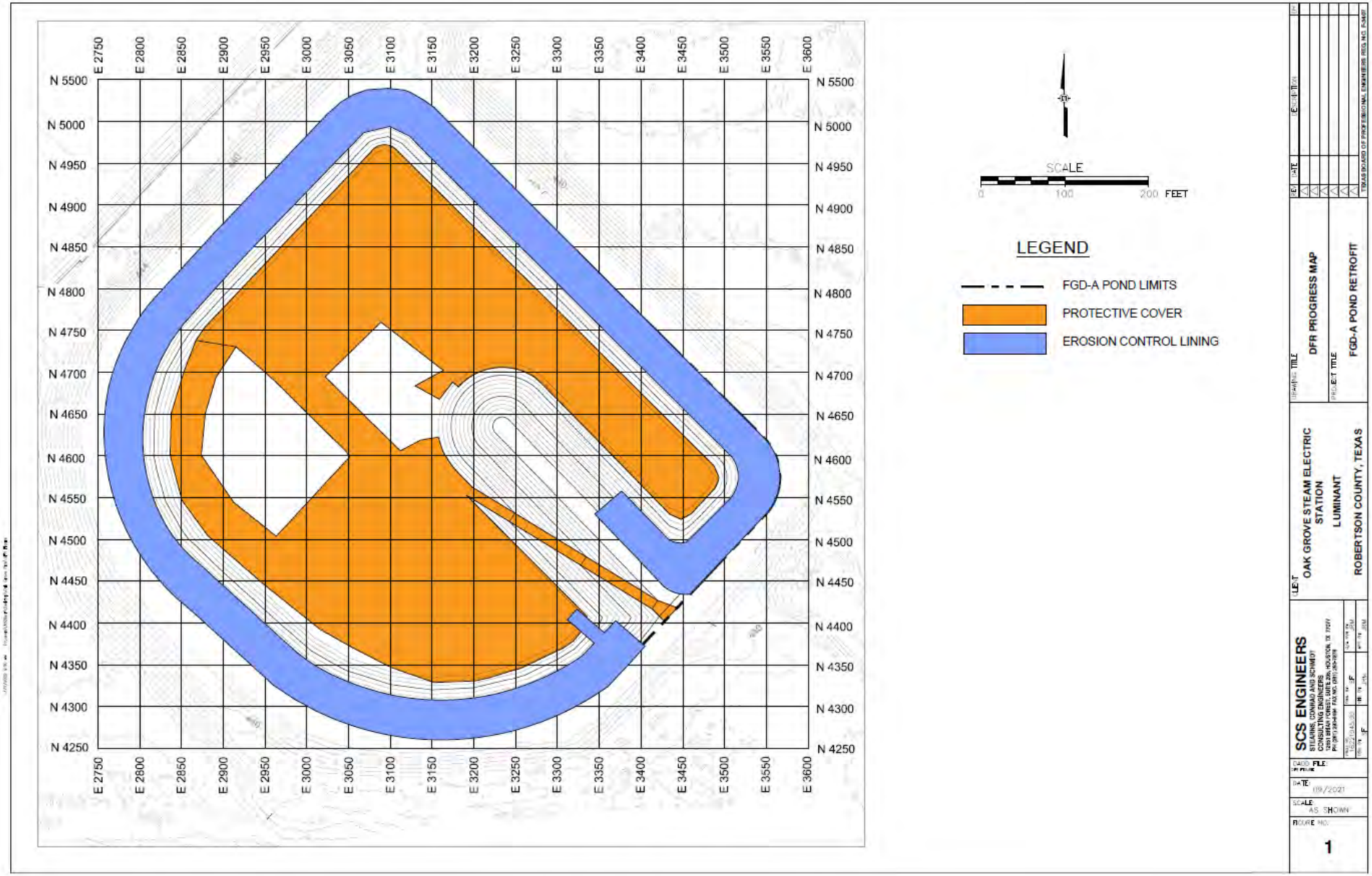
**Photo 1** – Boral hauling bottom ash to FGD-A Pond

**Photo 2** – MSI spreading bottom ash on pond floor

**Photo 3** – MSI pouring concrete aprons around riser pipes

**Photo 4** – Gravel being placed around FGD-A drain line

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 109**<br>**Date: 03/04/2022** |

SCS ENGINEERS

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Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 03/05/2022** | **Report No.**: 110 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 66°, cloudy, light winds approx. 5-10 mph<br>PM: 79°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to place gravel around drain line |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to cover A/B crossover pipe |
| Case Excavator | 1 | CX210D | Used to move pipe material |
| Manitou Forklift | 1 | MTA-1055 | Used to move pipe materials |
| Genie Forklift | 1 | GTH-844 | Used to move pipe materials |
| John Deere Haul Truck | 1 | 460E | Used to haul bottom ash |
| Water Truck | 1 | 4,000 Gal | Not used today |
| CAT Motor Grader | 1 | GTH 844 | Not used today |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continued pumping water out of FGD-A Pond into FGD-B pond.
- Boral continued to haul bottom ash to FGD-A Pond. (See Photo 1)
    - 61 loads of bottom ash was hauled and placed in the pond.
- MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 1)
- MSI removed concrete forms from riser pipes. (See Photo 2)
- MSI began placing gravel around the FGD-A drain line. (See Photo 3)
- MSI continued to install the 24" inlet pipe. (See Photo 4)
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- Survey for protective cover quantities and top of revetment points has been scheduled for Monday, March 7th.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 03/05/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 03/05/2022 |

**Photo 1** – Hauling and spreading of bottom ash on pond floor

**Photo 2** – Concrete forms being removed from riser pipes

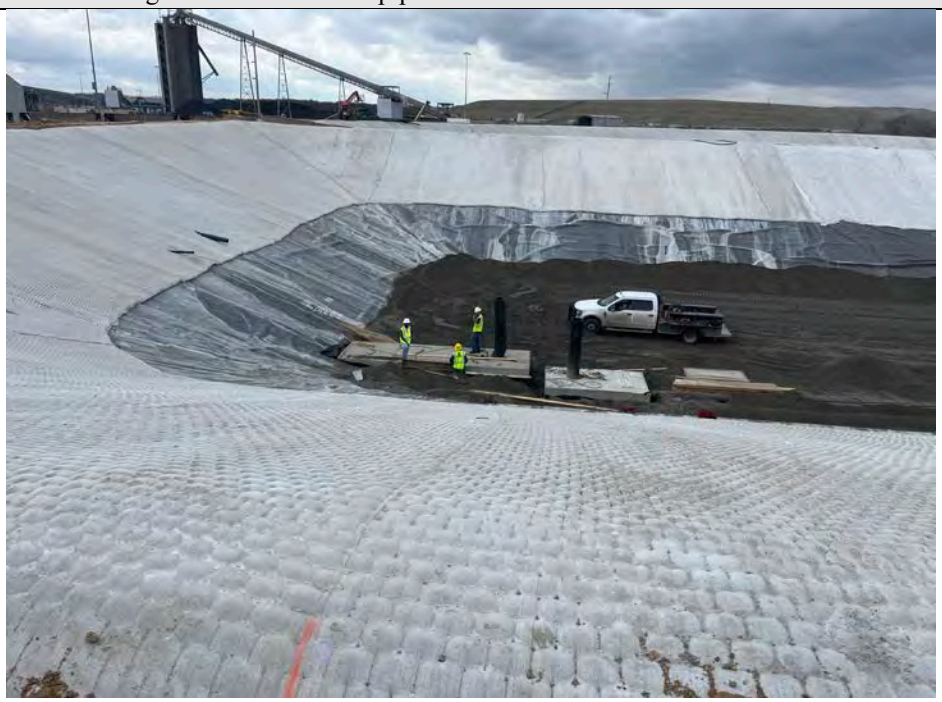
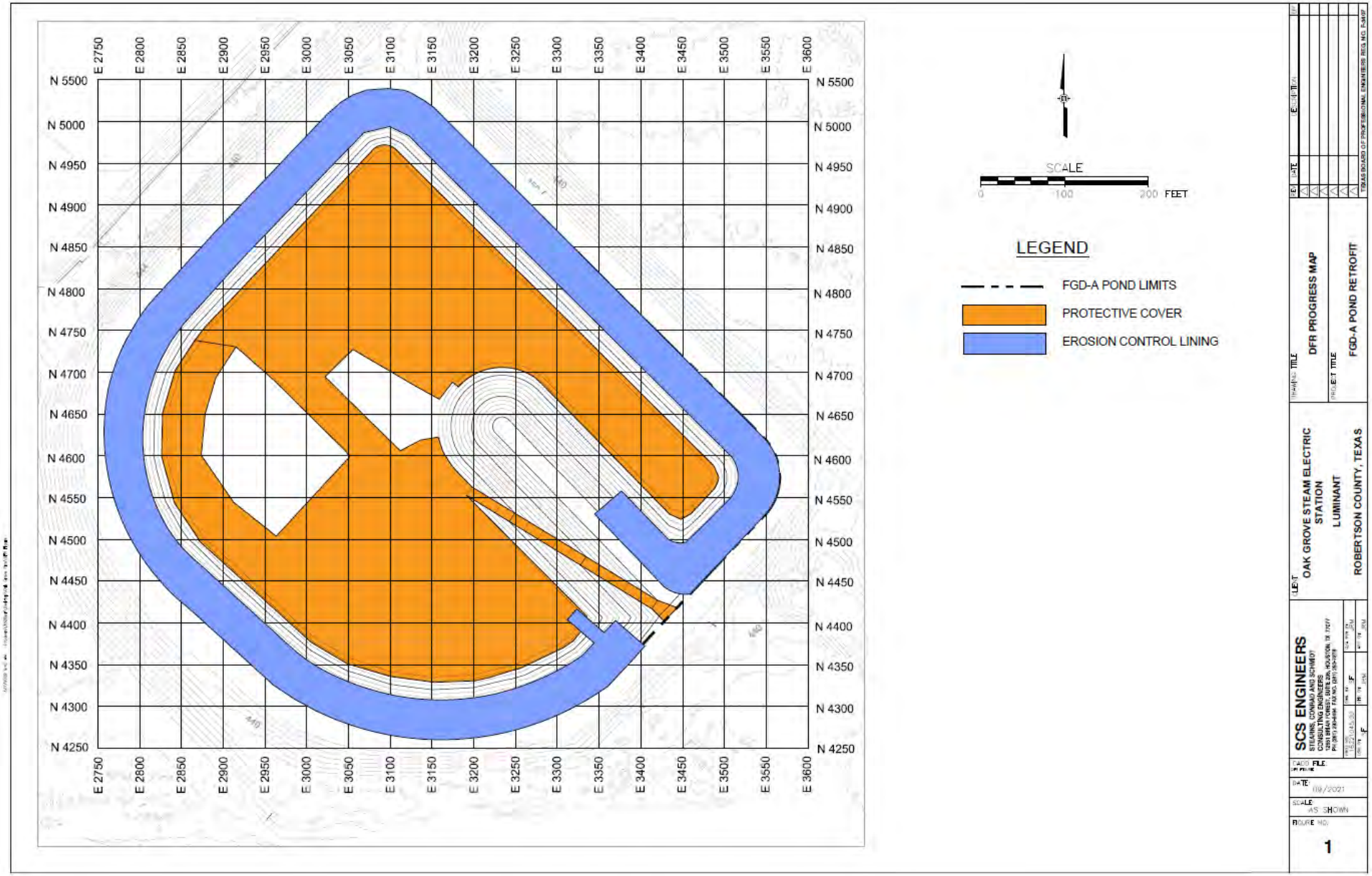


**Photo 3** – MSI placing gravel around drain line

**Photo 4** – MSI installing 24" pond inlet pipe

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 110** |
| | | **Date: 03/05/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 03/06/2022** | **Report No.**: 111 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 46°, cloudy, light winds approx. 5-10 mph<br>PM: 79°, cloudy, light winds approx. 5-10 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1800 | 12 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to spread protective cover |
| Case Excavator | 1 | CX210D | Not used today |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| John Deere Haul Truck | 1 | 460E | Used to haul bottom ash |
| Water Truck | 1 | 4,000 Gal | Not used today |
| CAT Motor Grader | 1 | GTH 844 | Not used today |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• MSI continued pumping water out of FGD-A Pond into FGD-B pond.<br>• Boral continued to haul bottom ash to FGD-A Pond. (See Photo 1)<br>o 29 loads of bottom ash was hauled and placed in the pond.<br>• MSI continued to use the CAT D6 bulldozer to spread the bottom ash on the pond floor. (See Photo 1)<br>• See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.<br><br>**Surveying Activities:**<br>• Survey for protective cover quantities and top of revetment points has been scheduled for Monday, March 7th. |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 03/06/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 03/06/2022 |

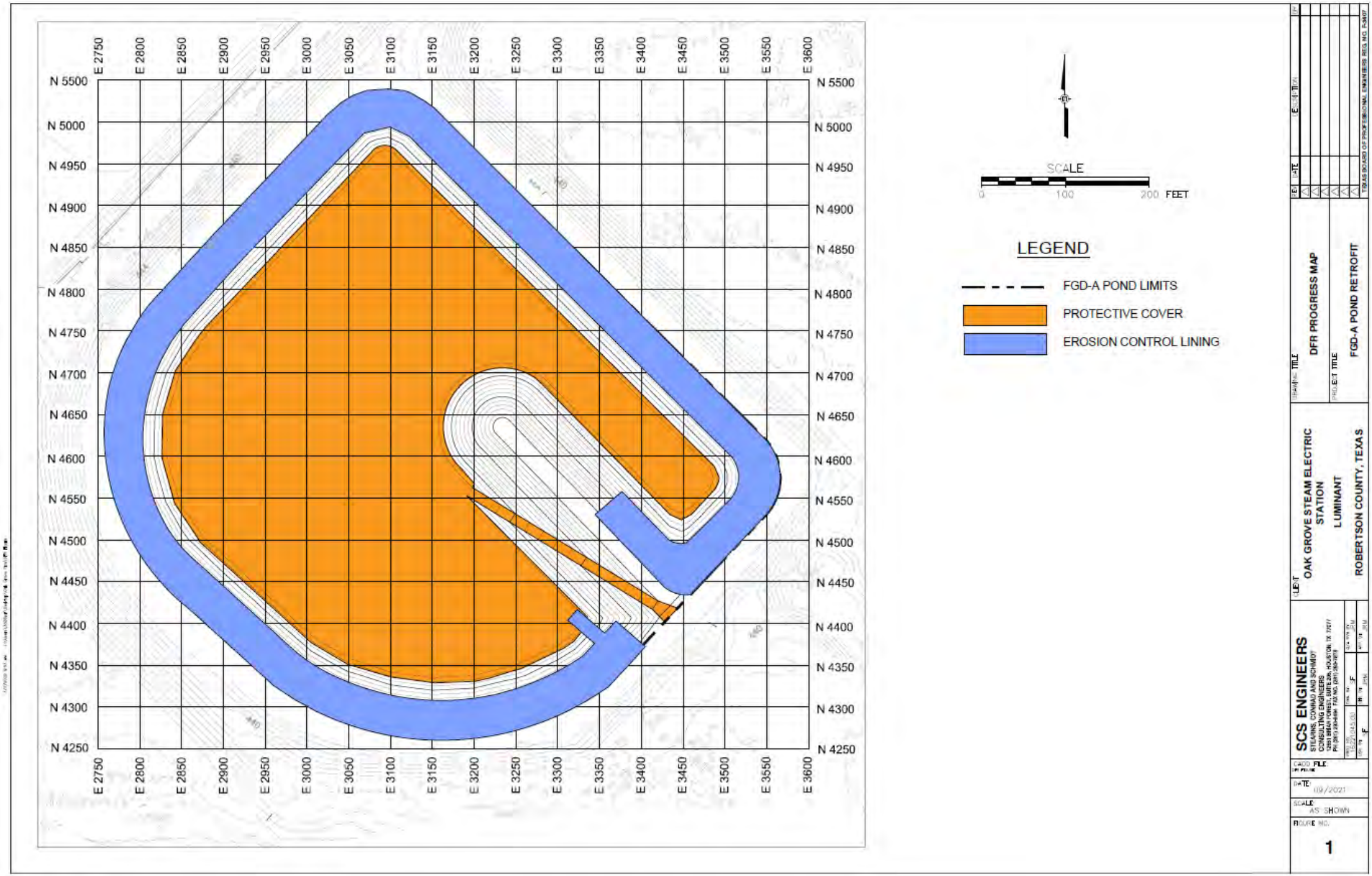
**Photo 1** – MSI spreading of bottom ash on pond floor

**Photo 2** – MSI spreading bottom ash on pond floor

**Photo 3** – Completed protective cover

**Photo 4** – Completed protective cover

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 111**<br>**Date: 03/06/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 03/07/2022** | **Report No.**: 112 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors: MR Geo** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 40°, cloudy, medium winds approx. 20 mph<br>PM: 50°, cloudy, medium winds approx. 20 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Darren Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| Danny Rennicks | CQA Technician | 0600 | 1600 | 10 |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| | |
| | |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| CAT GPS Bulldozer | 1 | D6 | Used to spread protective cover |
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Used to cover crossover pipe |
| Case Excavator | 1 | CX210D | Not used today |
| Manitou Forklift | 1 | MTA-1055 | Not used today |
| Genie Forklift | 1 | GTH-844 | Not used today |
| John Deere Haul Truck | 1 | 460E | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| CAT Motor Grader | 1 | GTH 844 | Used to grade FGD-A perimeter road |
| | | | |

| Description of Work |
|---|
| **Safety:**<br>• Daily safety incidences (total for project): 0 (1)<br>• Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.<br>• The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:<br>1. Work plan for the day<br>2. Equipment to be used.<br>3. Social distancing<br>4. Proper PPE<br><br>**Water Management**<br>• Daily load count for the water truck (4,000 gal): 0<br><br>**Construction Activities:**<br>• MSI completed protective cover on March 6, 2022.<br>• MSI began fine grading protective cover. (See Photo 1)<br>• MSI began using the CAT motor grader to grade the perimeter road. (See Photo 2)<br>• MR Geo continued to pump concrete into the HYDROTEX fabric forms on the peninsula of FGD-A. (See Photo 3)<br>• A final walk through of the pond was conducted by Danny Rennicks (SCS), Casey Hayes (Luminant), Scott Mendoza (MSI), and Jeff Hoffman (MSI).<br>• See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.<br><br>**Surveying Activities:**<br>• Jeremy Davis on site to survey protective cover and top of revetment. (See Photo 4) |

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

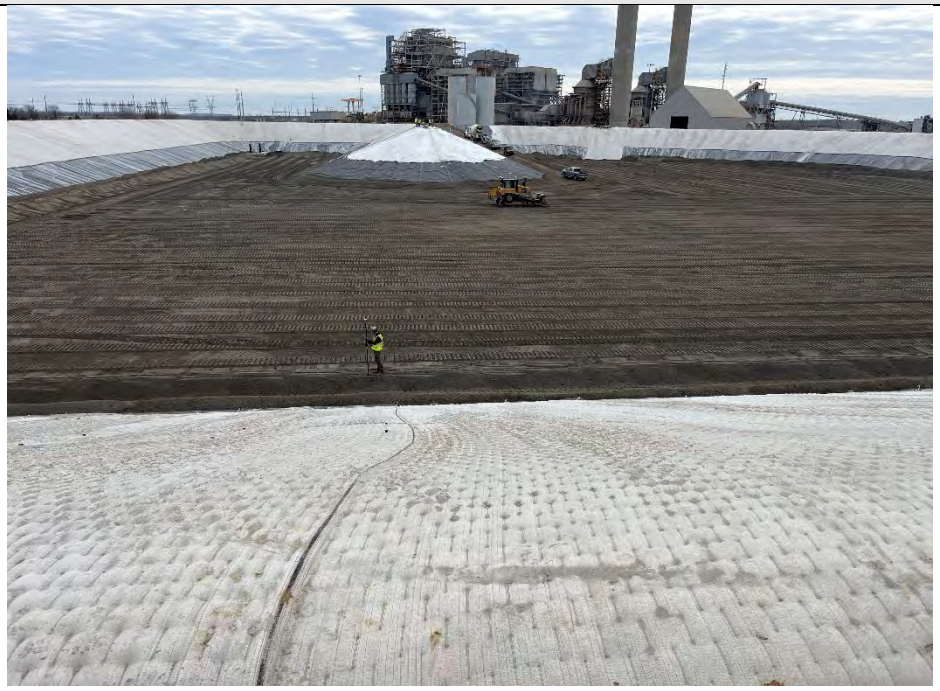
| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Danny Rennicks | *Danny Rennicks* | 03/07/2022 |
| **Report Approved By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 03/07/2022 |

**Photo 1** – MSI fine grading protective cover

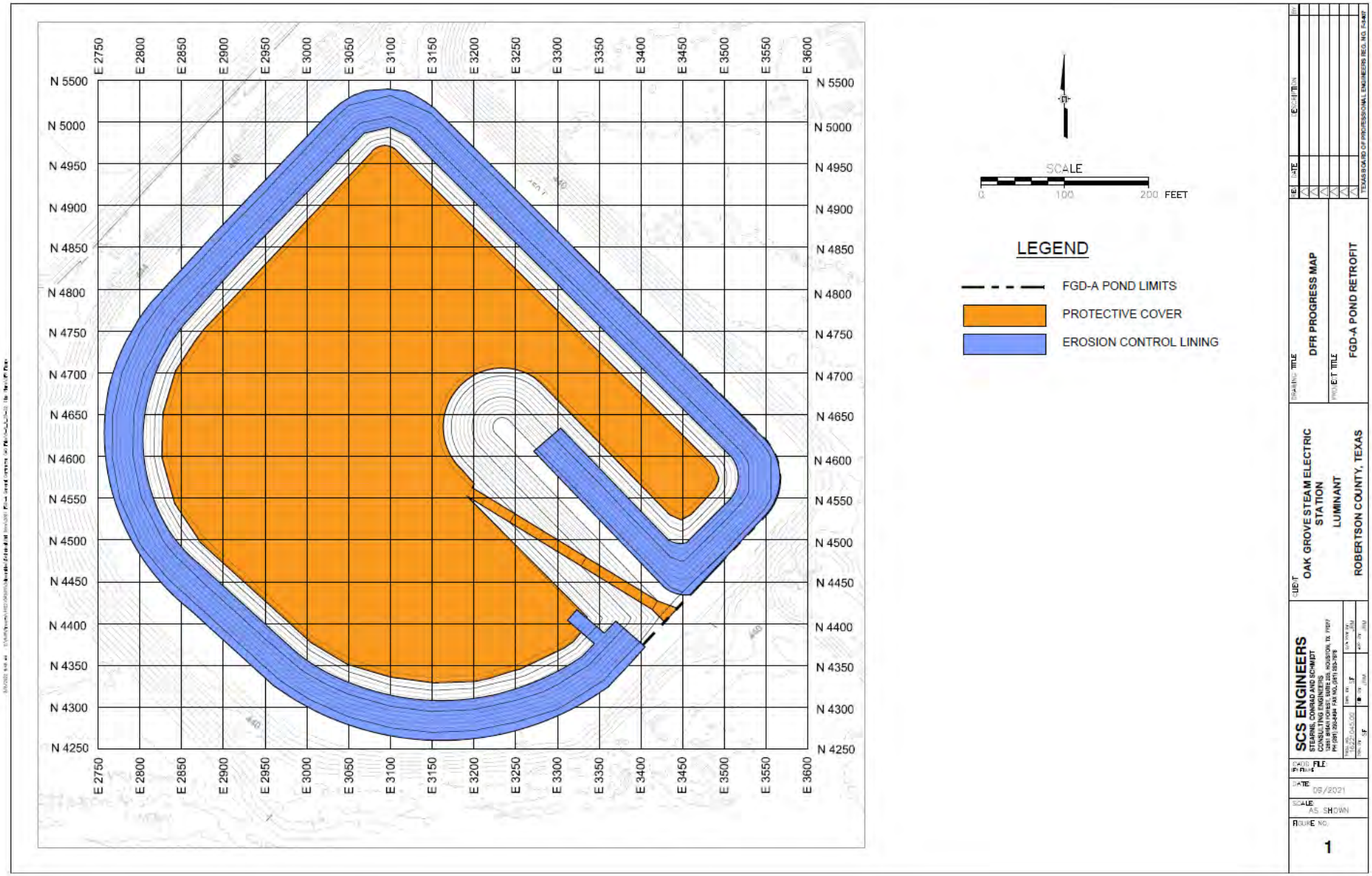
**Photo 2** – MSI grading the pond perimeter access road

**Photo 3** – MR Geo pumping concrete into HYDROTEX fabric forms

**Photo 4** – Surveying of protective cover



*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 112**<br>**Date: 03/07/2022** |

SCS ENGINEERS

12651 Briar Forest Dr, Suite 205
Houston, Texas 77077

# Daily Field Report

## Project and Site Information

| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Date: 03/15/2022** | **Report No.**: 113 |
| | **Project No.:** 16221045.00 | |
| **Client:** Luminant | **Location:** Franklin, TX | |
| **General Contractor (GC):** Mine Service, Inc. | **GC Superintendent:** Jeff Hoffman | |
| **Onsite Specialty Contractors:** | | |
| **CQA Technician:** Danny Rennicks | **Certifying Engineer:** J. Roy Murray, P.E. | |
| **Weather:** AM: 40°, clear, medium winds approx. 20 mph<br>PM: 65°, clear, medium winds approx. 20 mph | **Rain Gauge Reading: 0** | |

**Distribution List:** Luminant: Melvin Mejia, Casey Hayes, Garrett Foreman, Erick Dieperink, Eric Hassell, Razen Thomas, Charles Koudelka, Tim Newman, Eric Chavers, Gary Spicer, Vic Modeer, Matt Ballance, Nick Cambiano, Robert Moeller SCS: J.Roy Murray, Sam Franco, Danny Rennicks Mine Service, Inc.: Eddie Noak; Scott Mendoza, Jeff Hoffman Ray W. Davis Consulting Engineers, Inc.: Jeremy Davis

## Onsite Personnel

| Name | Position | Arrival | Departure | Hours |
|---|---|---|---|---|
| | | | | |
| | | | | |

## Project-Related Visitors *(does not include contractors or subcontractors)*

| Name | Position |
|---|---|
| Melvin Mejia | Luminant Project Manager |
| Sam Franco | CQA Project Manager |
| | |
| | |

## Equipment List

| Description | Qty. | Model No. | Comments |
|---|---|---|---|
| Volvo Sheeps Foot Compactor | 1 | SD115B | Not used today |
| Bobcat Skid Steer | 1 | 595 | Not used today |
| Water Truck | 1 | 4,000 Gal | Not used today |
| CAT Motor Grader | 1 | GTH 844 | Used to grade FGD-A perimeter road |
| | | | |

| Description of Work |
|---|

**Safety:**

- Daily safety incidences (total for project): 0 (1)
- Before accessing the site, per Vistra's on site COVID-19 policy, all on site employees were cleared to work after passing the temperature scan and screening questions.
- The morning Job Safety Analysis (JSA) was conducted by Jeff Hoffman of MSI. Topics discussed included the following:
    1. Work plan for the day
    2. Equipment to be used.
    3. Social distancing
    4. Proper PPE

**Water Management**

- Daily load count for the water truck (4,000 gal): 0

**Construction Activities:**

- MSI continues to used the CAT motor grader to place and grade road base on the perimeter access road.
- MR Geo completed revetment installation on March 12, 2022.
- See attached photos for completed view of FGD-A Pond.
- See Progress Map on page 5 for approximate areas of protective cover placement and revetment installation.

**Surveying Activities:**

- No additional surveying activities required.

| Materials Delivered | | |
|---|---|---|
| **Description** | **Qty.** | **Conditions / Comments** |
| | | |

| Review and Approval | | |
|---|---|---|
| **Report Prepared By** | **Signature** | **Date** |
| Samuel Franco, P.E. | *Samuel Franco* | 03/15/2022 |
| **Report Approved By** | **Signature** | **Date** |
| J.Roy Murry, P.E. | *J. Roy Murray* | 03/15/2022 |

**Photo 1** – Completed FGD-A Pond

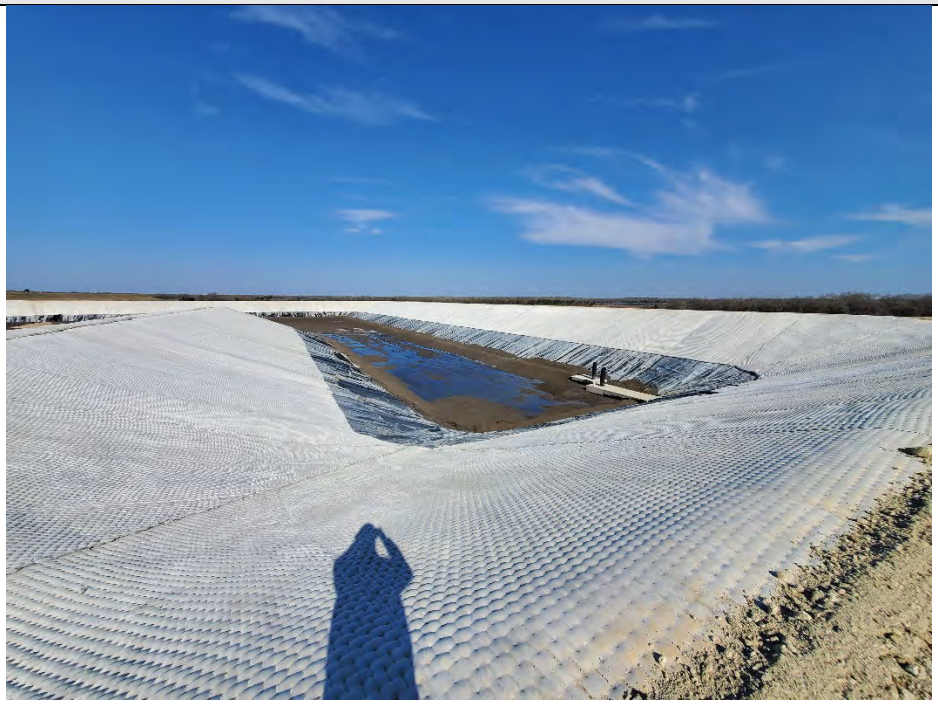
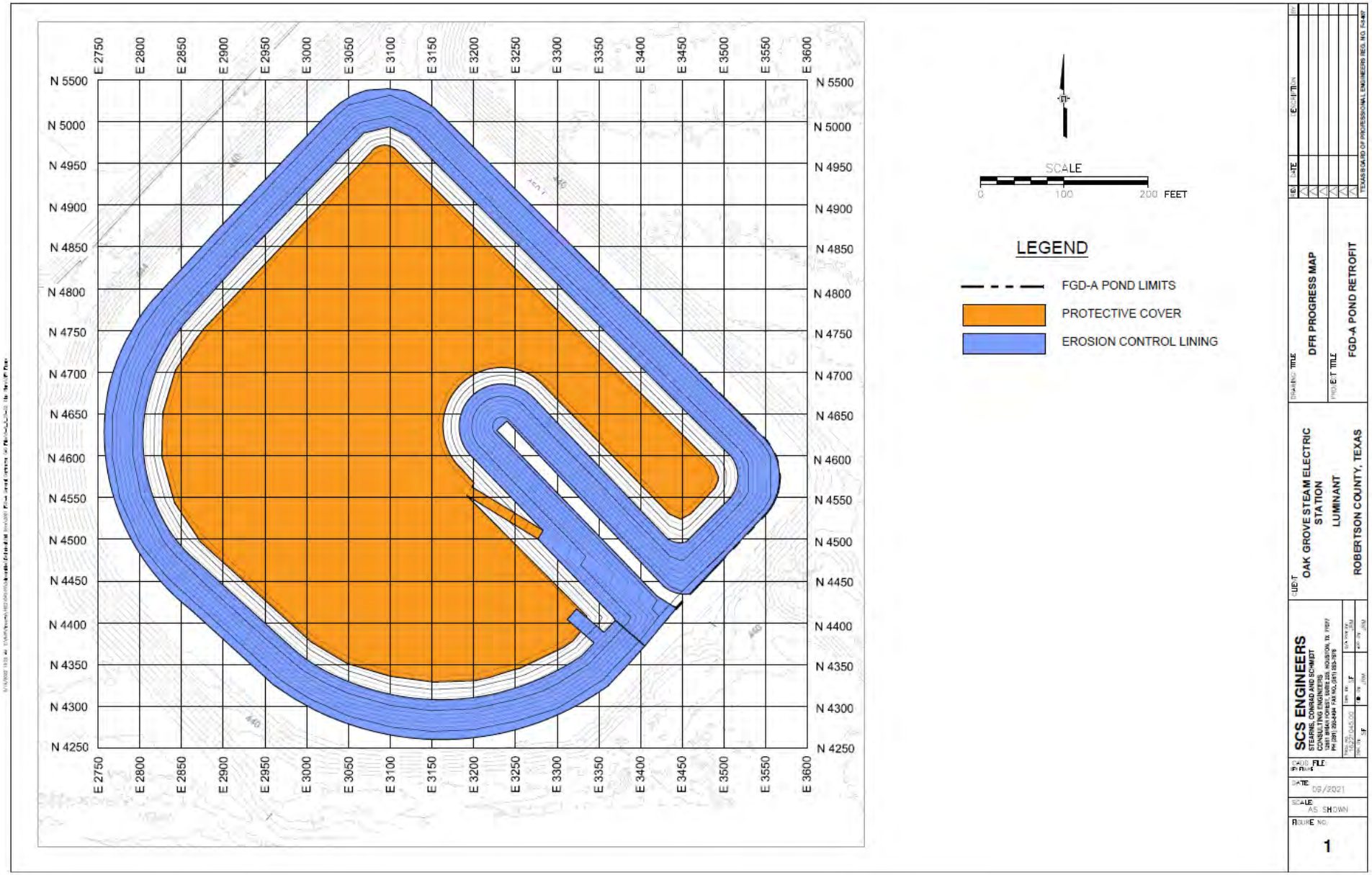


**Photo 2** – Completed FGD-A Pond

**Photo 3** – Completed FGD-A Pond

**Photo 4** – Completed FGD-A Pond

*Note: Pictures represent work in progress and do not represent work as certified complete.*




| | | |
|---|---|---|
| **Project:** Oak Grove Steam Electric Station FGD-A Pond Retrofit | **Project No.:** 16221045.00 | **Report No.: 113** |
| | | **Date: 03/15/2022** |

# APPENDIX – B

## Certificates of Completion

**SCS Engineers**

***Certificate of Completion***

---

**Status of Certificate: Partial** _____ **Final** ✓

Client: Luminant Project Name: FGD-A Pond Retrofit

Date: 3/8/22 Project No. 16221045.00

**Description of Work:** Completion of pond cleanout, structural fill compaction, clay liner compaction, and placement of protective cover

I hereby state the the above identified work is complete and has been installed as per the contract documents and/or the approved CQA plan.

**CONTRACTOR REPRESENTATIVE**

Signature: _____ Date: 03/09/2022

Name (print) Eddie Noak

Title: Vice President - Project Director

Representing: Mine Service, Inc.

I hereby state that the above identified work has been inspected and that it is has been installed as per the contract documents and or/the approved CQA plan. I further state that all required field and laboratory testing has been completed and the results have been deemed acceptable by the CQA Firm. The work described above is suitable for its intended use.

**CQA REPRESENTATIVE**

Signature: Samuel Franco Date: 3/8/22

Name (print) Samuel Franco

Title: Project Professional

Representing: SCS Engineers

**SCS Engineers**

***Certificate of Completion***

**Status of Certificate:** Partial _____ Final ✓

Client: Luminant Project Name: FGD-A Pond Retrofit

Date: 1-28-22 Project No. 16221045.00

**Description of Work:** Installation of GCL and 60-mil textured HDPE

I hereby state the the above identified work is complete and has been installed as per the contract documents and/or the approved CQA plan.

**CONTRACTOR REPRESENTATIVE**

Signature: Patrick Kamesch Date: 1-28-22

Name (print) Patrick Kamesch

Title: Project Manager

Representing: Lone Star Lining Company

I hereby state that the above identified work has been inspected and that it is has been installed as per the contract documents and or/the approved CQA plan. I further state that all required field and laboratory testing has been completed and the results have been deemed acceptable by the CQA Firm. The work described above is suitable for its intended use.

**CQA REPRESENTATIVE**

Signature: Samuel Franco Date: 1-28-22

Name (print) Samuel Franco

Title: Project Professional

Representing: SCS Engineers

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION FGD-A POND

Address: _____

Location: FRANKLIN, TEXAS

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of LONE STAR do hereby accept the soil subgrade surface bounded by (60 MIL) PANEL #1 through PANEL #22 as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| MONICO TELLO | MONICO TELLO | S.P. | 1/10/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| DANNY FRANKLIN | DF | CQA | 1/10/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION FGD-A POND

Address: _____

Location: FRANKLIN, TEXAS

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of LONE STAR do hereby accept the soil subgrade surface bounded by PANELS 23 THROUGH PANELS 42 as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| MARIO TELLO | MARIO TELLO | S.P. | 1/11/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| DANNY KENNICK | | CQA | 1/11/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION FGD. A POND

Address: _____

Location: FRANKLIN, TEXAS

_____

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of LONE STAR do hereby accept the soil subgrade surface bounded by PANELS 43 through PANEL 55 (60 MIL) as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| Mariano Tello | Mariano Tello | S.P. | 1/12/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| Danny Kennedy | DCK | CQA | 1/12/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION FGD-A POND

Address: _____

Location: FRANKLIN, TEXAS

_____

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of LONE STAR do hereby accept the soil subgrade surface bounded by PANELS 56 through PANEL 72 as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| MARIANO TEL | MTEL | Sup. | 1/13/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| DANNY KENNICK | DK | CQA | 1/13/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: Oak Grove Steam Electric Station FGD.A Pond

Address: _____

Location: Franklin, Texas

_____

Owner: Luminant

I, the Undersigned, the duly authorized representative of LONE STAR do hereby accept the soil subgrade surface bounded by Panels 73 through Panel 82 as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| Marcos Tello | Marcos Tello | S.P. | 1/14/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| Danny Kennedy | [signature] | CQA | 1/14/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION FGDA POND

Address: _____

Location: FRANKLIN, TEXAS

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of LONE STAR do hereby accept the soil subgrade surface bounded by PANELS 83 through PANEL 93 (60 mil) as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| Mariano Tello | Mariano Tello | S.P. | 1/16/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| Danny Kennicks | DK | CQA | 1/16/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION EGDA POND

Address: _____

Location: FRANKLIN, TEXAS

_____

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of LONE STAR do hereby accept the soil subgrade surface bounded by PANELS 94 THROUGH PANEL 107 (60MIL) as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| MARIANO TELLO | MARIANO TELLO | S.P. | 1/17/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| DANNY TENNICKS | DT | CQA | 1/17/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION FGD-A POND

Address: _____

Location: FRANKLIN, TEXAS

_____

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of LONE STAR do hereby accept the soil subgrade surface bounded by PANEL 108 through PANEL 114 (60 MIL HDPE) as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| MAXIMO TELLO | Maximo Tello | S.P. | 1/18/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| DANNY KRAWIEC | [signature] | | 1/18/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION

Address: _____

Location: FRANKLIN, TEXAS

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of _____
do hereby accept the soil subgrade surface bounded by _____
60 MIL HDPE PANEL 115 THROUGH PANEL 127
_____ as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| RICARDO TELLO | Ricardo Tello | SUP | 1/19/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| DENNY HENDRICKS | [signature] | CQA | 1/19/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION FGD A Pond

Address: _____

Location: FRANKLIN, TEXAS

_____

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of _____
do hereby accept the soil subgrade surface bounded by _____
PANELS 128 THROUGH PANEL 155
_____ as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| MOHAMMAD TELLO | MOHAMMAD TELLO | SUP | 1/21/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| DANNY KENNEDY | | CQA | 1/21/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION FGDA POND

Address: _____

Location: FRANKLIN, TEXAS

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of LONE STAR do hereby accept the soil subgrade surface bounded by PANELS 156 THROUGH PANEL 175 as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| [illegible] | [illegible] | S.P. | 1/22/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| [illegible] | [illegible] | CQA | 1/22/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

Geosynthetic Installer: LONE STAR

Project: OAK GROVE STEAM ELECTRIC STATION FGD#1 POND

Address: _____

Location: FRANKLIN, TEXAS

Owner: LUMINANT

I, the Undersigned, the duly authorized representative of LONE STAR do hereby accept the soil subgrade surface bounded by PANELS 176 THROUGH PANEL 183 as an acceptable surface on which to install and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| Name | Signature | Title | Date |
|---|---|---|---|
| MOHAMMAD T. | | SUP. | 1/23/2022 |

Certificate accepted by QA/QC Manager:

| Name | Signature | Title | Date |
|---|---|---|---|
| DANNY KENNICKS | | CQA | 1/23/2022 |

Certificate accepted by Owner:

| Name | Signature | Title | Date |
|---|---|---|---|
| | | | |

# APPENDIX – C

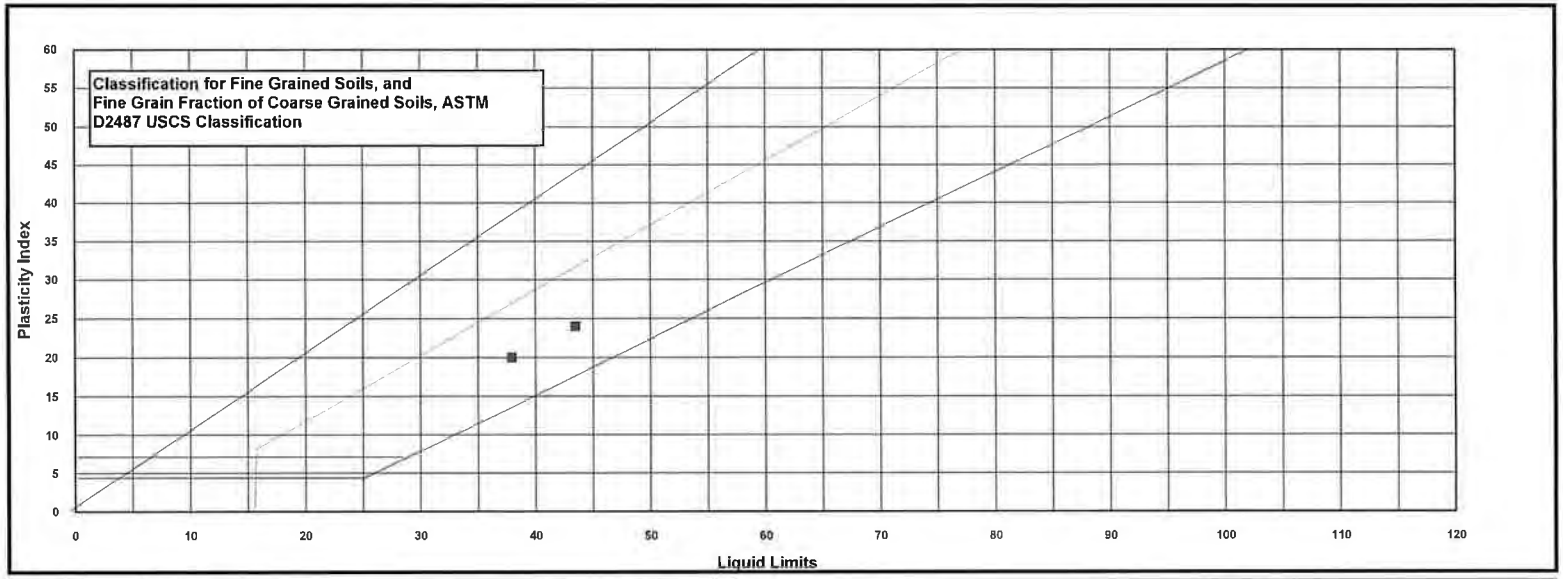
## Preconstruction

# APPENDIX – C.1

## Soils

# *CQA Testing Laboratory*

Lab ID: 05091




| | | | | |
|---|---|---|---|---|
| Project Name: | Oak Grove Landfill | Client's Project No. | N/A | ASTM D2217/AASHTO R-74, Method B, Moist Sample Preparation |
| Project Number: | 2122 | Project Location: | Texas | ASTM D4318, Method A - or - Method B, Liquid and Plastic Limits |
| Client: | SCS Engineers | | ASTM D422/D1140 | - or - D6913/D7928 - or - C136/C117, Grain Size Analysis |

| Project Test Count, This Page | Sample Number and Locations | Liquid Limits | Plasticity Index | Percent Gravel | Percent Fines (Minus #200) | Natural Moisture, % | Sample Description/Classification | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | PC-1 (2021) | 38 | 20 | 0.0 | 63.2 | 5.8 | Tan | CL, lean clay, | sandy |
| 2 | PC-2 | 43 | 24 | 0.2 | 73.0 | 14.7 | Brwn | CL, lean clay, | with sand |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |
| 11 | | | | | | | | | |
| 12 | | | | | | | | | |
| 13 | | | | | | | | | |
| 14 | | | | | | | | | |
| 15 | | | | | | | | | |
| 16 | | | | | | | | | |
| 17 | | | | | | | | | |
| 18 | | | | | | | | | |
| 19 | | | | | | | | | |
| 20 | | | | | | | | | |
| 21 | | | | | | | | | |
| 22 | | | | | | | | | |
| 23 | | | | | | | | | |
| 24 | | | | | | | | | |
| 25 | | | | | | | | | |

Page ID 1 Limits

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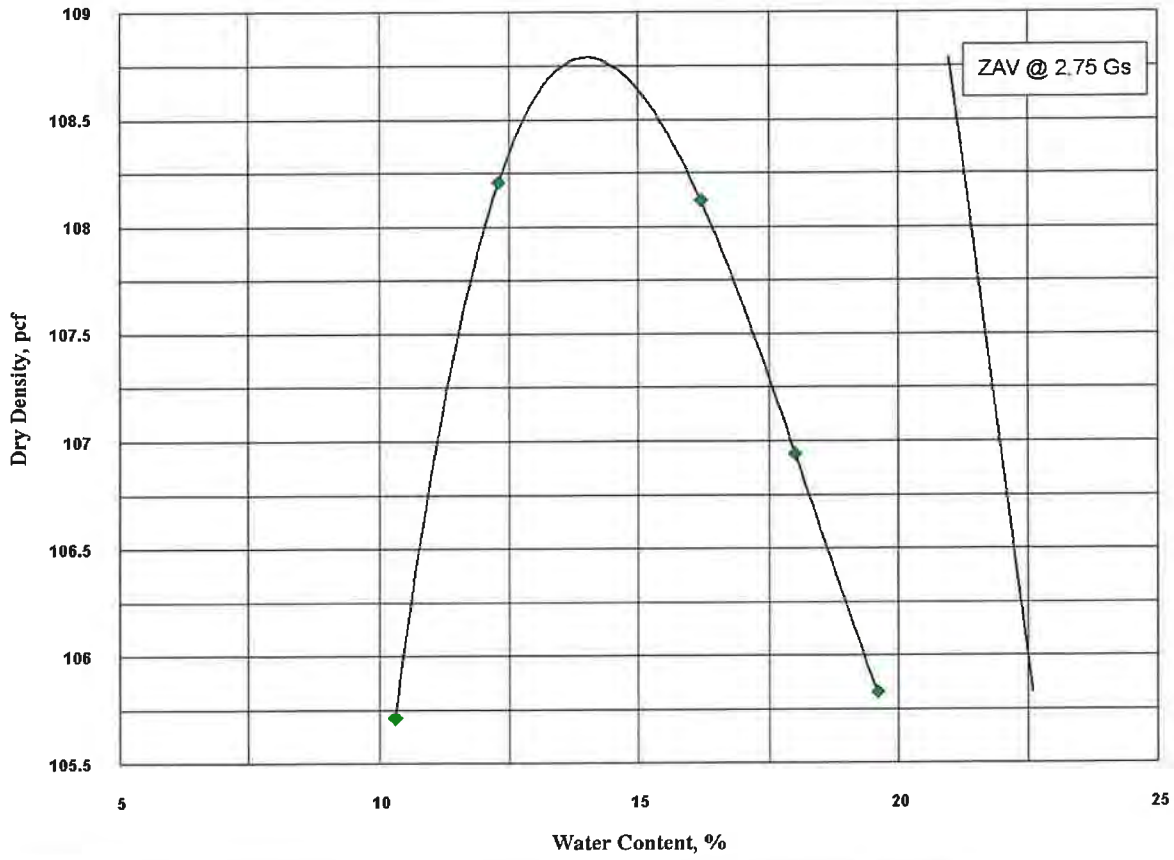
*CQA Testing Laboratory*
14194 Florida - Livingston, LA., 70754 Phone 225-435-0408 Mobile 812-603-6840

Lab ID: 05091

# Laboratory Compaction Test
## ASTM D698, Standard Compaction Test, Manual Rammer
## Method B, Moist Method




| | | | | | |
|---|---|---|---|---|---|
| **Report Date:** 09.29.2021 | **Received Date** | 09.28.2021 | **Ran by:** | JMB | **Checked by:** BMG |
| **Max. Dry Density, pcf:** | 108.8 | | **OMC, %:** | 14.0 | |
| **Corrected for Oversize:** | N/A | | **Corrected:** | N/A | |

| | | | |
|---|---|---|---|
| **Project:** | Oak Grove Landfill | **Client:** | SCS Engineers |
| **Project Number:** | 2122 | **Sample Location:** | PC-1 (2021) |
| **Sample Description:** | Tan CL, lean clay, sandy | | |

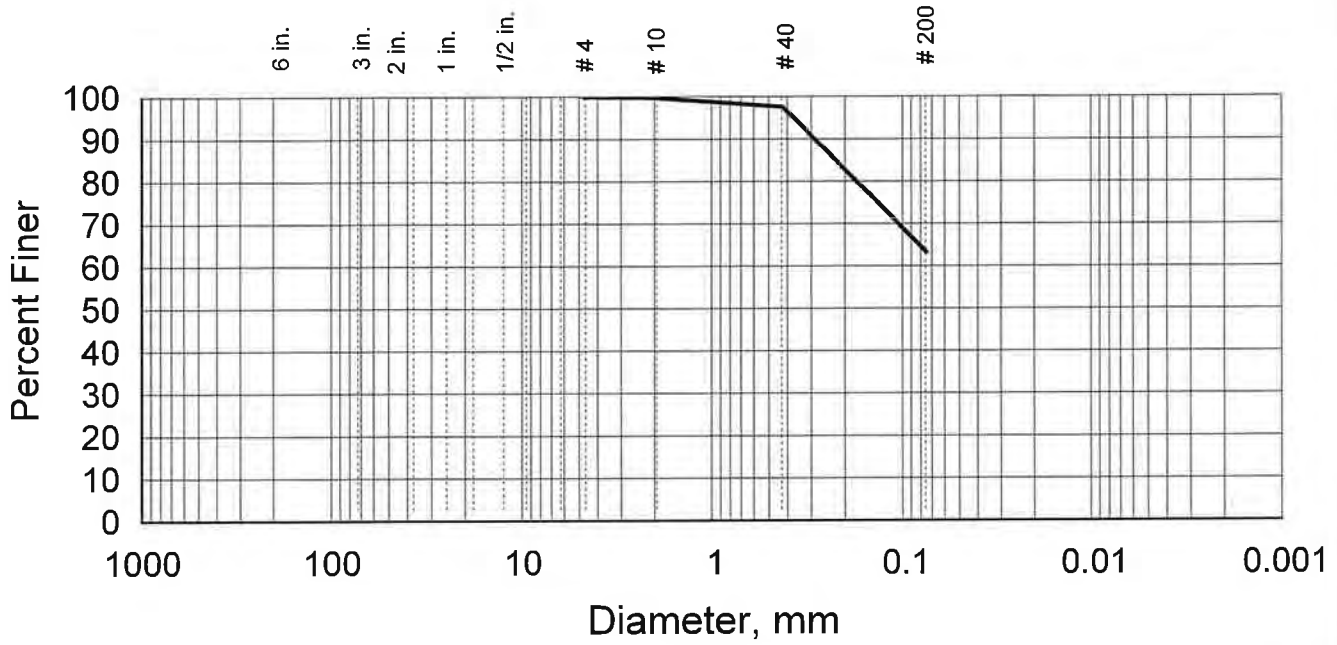
| LL | PL | PI | NMC |
|---|---|---|---|
| 38 | 18 | 20 | 5.8 |

| Gravel, % | Sand, % | Clay, % | P-200 |
|---|---|---|---|
| N/A | 36.8 | N/A | 63.2 |

**Traceability Items**

| Balance ID | Hammer ID | Mold ID | Other |
|---|---|---|---|
| 1 | 1S | A | |
| 2 | **Page ID** | 1 | **Compaction** |

## Particle Distribution Test Result




| Proj. Name: Oak Grove Landfill | Gravel, % | Sand, % | Silt, % | Clay, % | LL | PI |
|---|---|---|---|---|---|---|
| Project No.: 2122 | 0.0 | 36.8 | 0.0 | 0.0 | 38 | 20 |
| Report Date 09.30.2021 Log-in Date 09.28.2021 | **Description and Classification** | | | | | |
| Project Loc. Texas | Tan | CL, lean clay, | sandy | | | |
| | **Standard Sieve Sizes - Percent Passing** | | | | | |
| **Sample Identification - Location - Type** | 6 " | | 2.5 " | | 3/8 " | |
| PC-1 (2021) Bulk Sample | 5 " | | 2 " | | 1/4 " | |
| **Remarks:** **NMC, %** **5.8** | 4.5 " | | 1- 1/2 " | | # 4 | 100.0 |
| **Moist Method, ASTM D422** Bulk | 4 " | | 1 " | | # 10 | 99.8 |
| Sample split on # 40 sieve Sample wt., kg | 3.5 " | | 3/4 " | | # 40 | 97.7 |
| Clay content reported at 0.005mm 17.10 | 3 " | | 1/2 " | | # 200 | 63.2 |

| **Hygroscopic Moisture Content Data** | | Hydrometer Specimen Wet wt. | 0.00 | **Traceability Items** | | |
|---|---|---|---|---|---|---|
| WS+t | 0.00 | Hydrometer Specimen Dry wt. | ERR | Balance ID | 1 | 2 |
| DS+T | 0.00 | Assumed Gs | 2.75 | Therm ID | 58981 | NA |
| Tare wt | 0.00 | Percent <#40 based on complete specimen | 97.65 | Flask ID | 1 | NA |
| Moist Ratio | ERR | Calculated biased weight | ERR | Bulb ID | 1 | 152H |
| | | Composite Correction at 20 deg C | -6 | Sol Mix, ml | 125 | NA |
| | | Meniscus Correction only | 1 | Tested By | JMB | BMG |

| **Hydrometer Reading Data** | | | Temp. | Corrected | | | Effective | Diameter, mm | Percent |
|---|---|---|---|---|---|---|---|---|---|
| Time, min. | Readings | Temp. | Correction, Ct | Reading, Rc | K | Rm | depth | | finer |
| 2 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 5 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 15 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 30 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 120 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 240 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 600 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |



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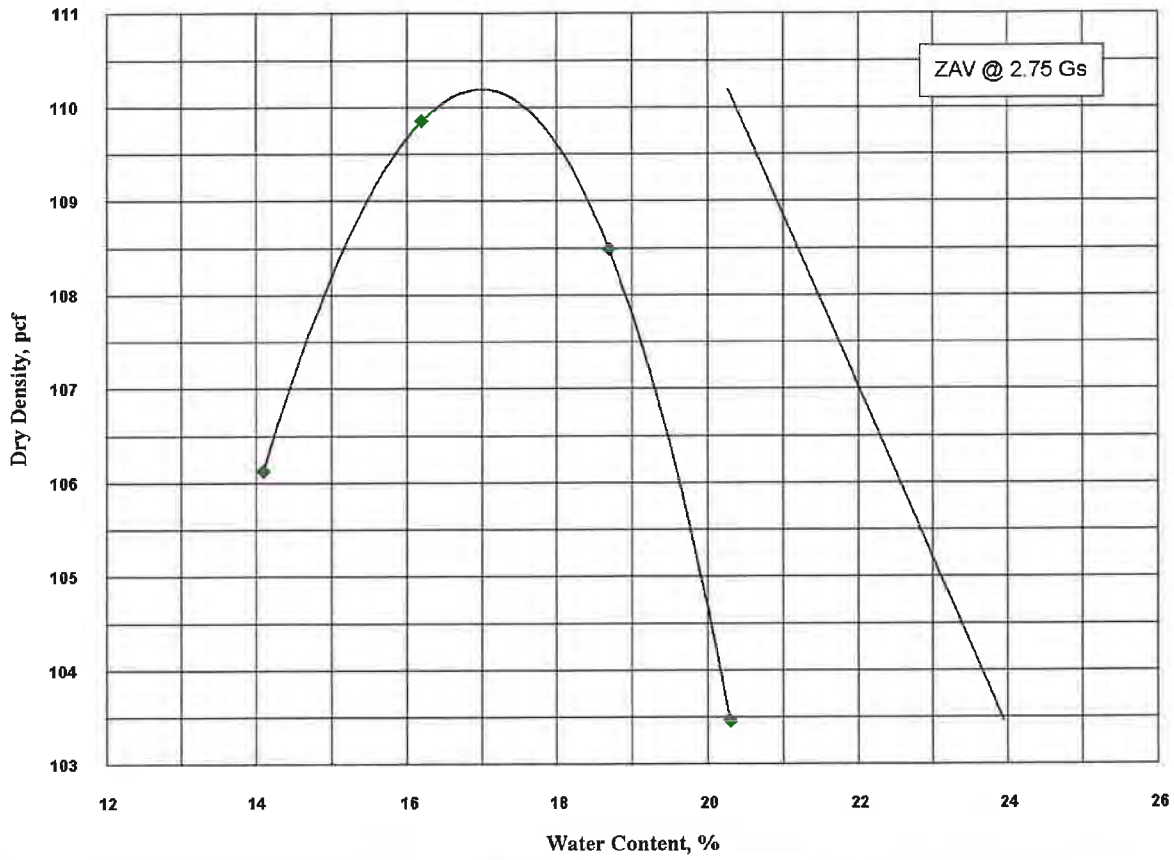
*CQA Testing Laboratory*
14194 Florida - Livingston, LA., 70754 Phone 225-435-0408 Mobile 812-603-6840

Lab ID: 05091

# Laboratory Compaction Test
## ASTM D698, Standard Compaction Test, Manual Rammer
## Method B, Moist Method




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Report Date:** | 12.05.2021 | **Received Date** | 09.28.2021 | **Ran by:** | JMB | **Checked by:** | BMG |
| **Max. Dry Density, pcf:** | 110.2 | | | **OMC, %:** | 17.0 | | |
| **Corrected for Oversize:** | N/A | | | **Corrected:** | N/A | | |

| | | | |
|---|---|---|---|
| **Project:** | Oak Grove Landfill | **Client:** | SCS Engineers |
| **Project Number:** | 2122 | **Sample Location:** | PC-2 |
| **Sample Description:** | Brwn CL, lean clay, with sand | | |

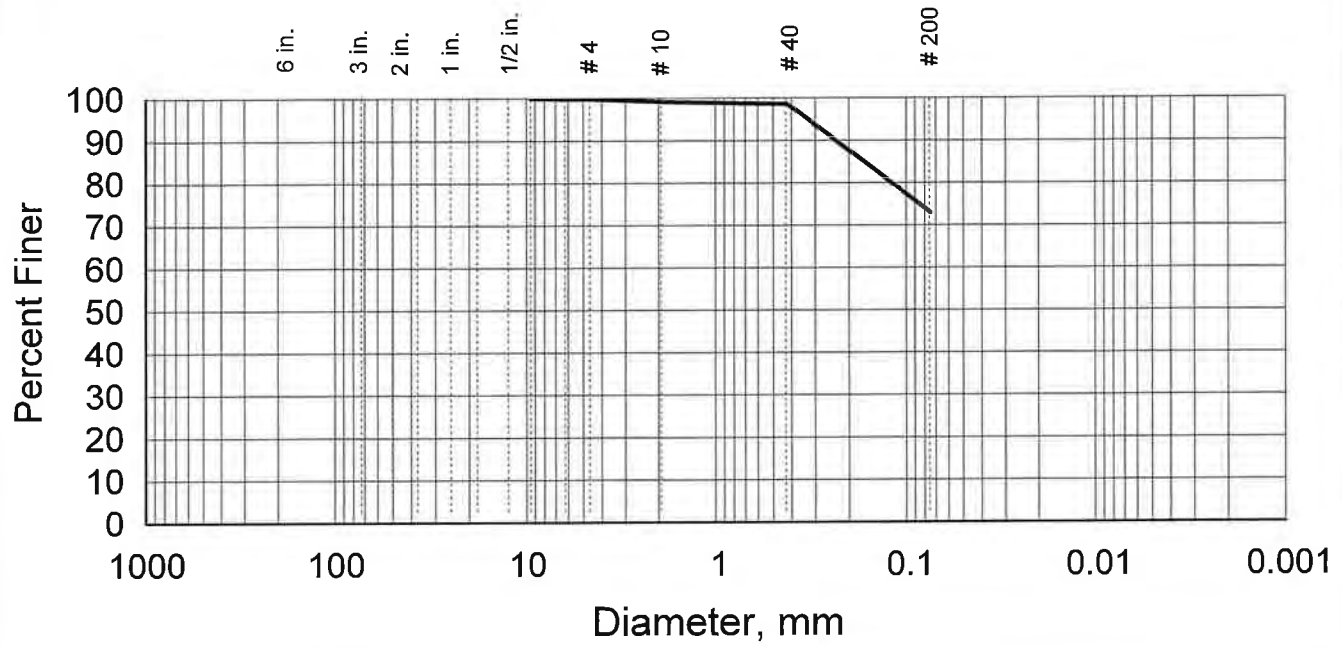
| LL | PL | PI | NMC |
|---|---|---|---|
| 43 | 19 | 24 | 14.7 |

| Gravel, % | Sand, % | Clay, % | P-200 |
|---|---|---|---|
| N/A | 26.8 | N/A | 73.2 |

**Traceability Items**

| Balance ID | Hammer ID | Mold ID | Other |
|---|---|---|---|
| 1 | 1S | A | |
| 2 | **Page ID** | **2** | **Compaction** |

## Particle Distribution Test Result




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Proj. Name: Oak Grove Landfill | | **Gravel, %** | **Sand, %** | **Silt, %** | **Clay, %** | **LL** | **PI** |
| Project No.: 2122 | | 0.2 | 26.8 | 0.0 | 0.0 | 43 | 24 |
| Report Date 12.06.2021 Log-in Date 11.03.2021 | | **Description and Classification** | | | | | |
| Project Loc. Texas | | Brwn | CL, lean clay, | with sand | | | |
| | | **Standard Sieve Sizes - Percent Passing** | | | | | |
| **Sample Identification - Location - Type** | | 6 " | | 2.5 " | | 3/8 " | 100.0 |
| PC-2 Bulk Sample | | 5 " | | 2 " | | 1/4 " | 99.8 |
| **Remarks:** **NMC, %** | **14.7** | 4.5 " | | 1- 1/2 " | | # 4 | 99.8 |
| Moist Method, ASTM D422 | Bulk | 4 " | | 1 " | | # 10 | 99.3 |
| Sample split on # 40 sieve | Sample wt., kg | 3.5 " | | 3/4 " | | # 40 | 98.7 |
| Clay content reported at 0.005mm | 21.10 | 3 " | | 1/2 " | | # 200 | 73.0 |

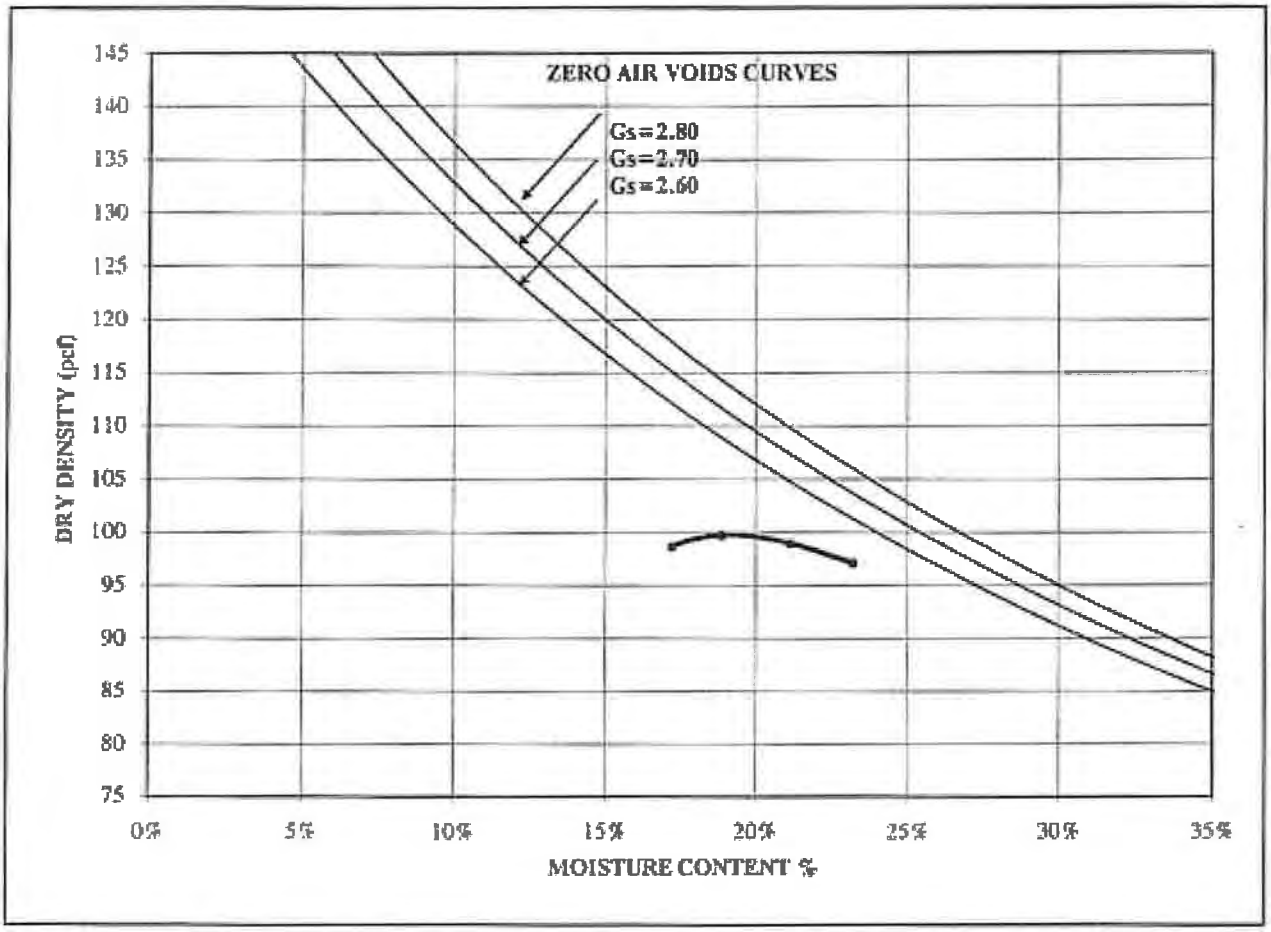
| **Hygroscopic Moisture Content Data** | | Hydrometer Specimen Wet wt. | 0.00 | **Traceability Items** | | |
|---|---|---|---|---|---|---|
| WS+t | 0.00 | Hydrometer Specimen Dry wt. | ERR | Balance ID | 1 | 2 |
| DS+T | 0.00 | Assumed Gs | 2.75 | Therm ID | 58981 | NA |
| Tare wt | 0.00 | Percent <#40 based on complete specimen | 98.66 | Flask ID | 1 | NA |
| Moist Ratio | ERR | Calculated biased weight | ERR | Bulb ID | 1 | 152H |
| | | Composite Correction at 20 deg C | -6 | Sol Mix, ml | 125 | NA |
| | | Meniscus Correction only | 1 | Tested By | JMB | BMG |

| **Hydrometer Reading Data** | | | Temp. | Corrected | | | Effective | Diameter, mm | Percent |
|---|---|---|---|---|---|---|---|---|---|
| Time, min. | Readings | Temp. | Correction, Ct | Reading, Rc | K | Rm | depth | | finer |
| 2 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 5 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 15 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 30 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 120 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 240 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 600 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |

Page ID PC-2 Grain-size

14194 Florida - Livingston, LA. 70754 Phone 225-435-0408 Mobile 812-603-6840

# MOISTURE / DRY DENSITY CURVE
## D 698 METHOD A




| | | |
|---|---|---|
| MAXIMUM DRY DENSITY (pcf) | 99.9 | |
| OPTIMUM MOISTURE (%) | 19.2 | NO CORRECTION REQUIRED |

| | |
|---|---|
| SAMPLE ID | FGD-QCL-001 |
| SAMPLE TYPE | Bulk |
| SAMPLE DEPTH | - |

| | |
|---|---|
| LL | 58 |
| PL | 21 |
| PI | 37 |

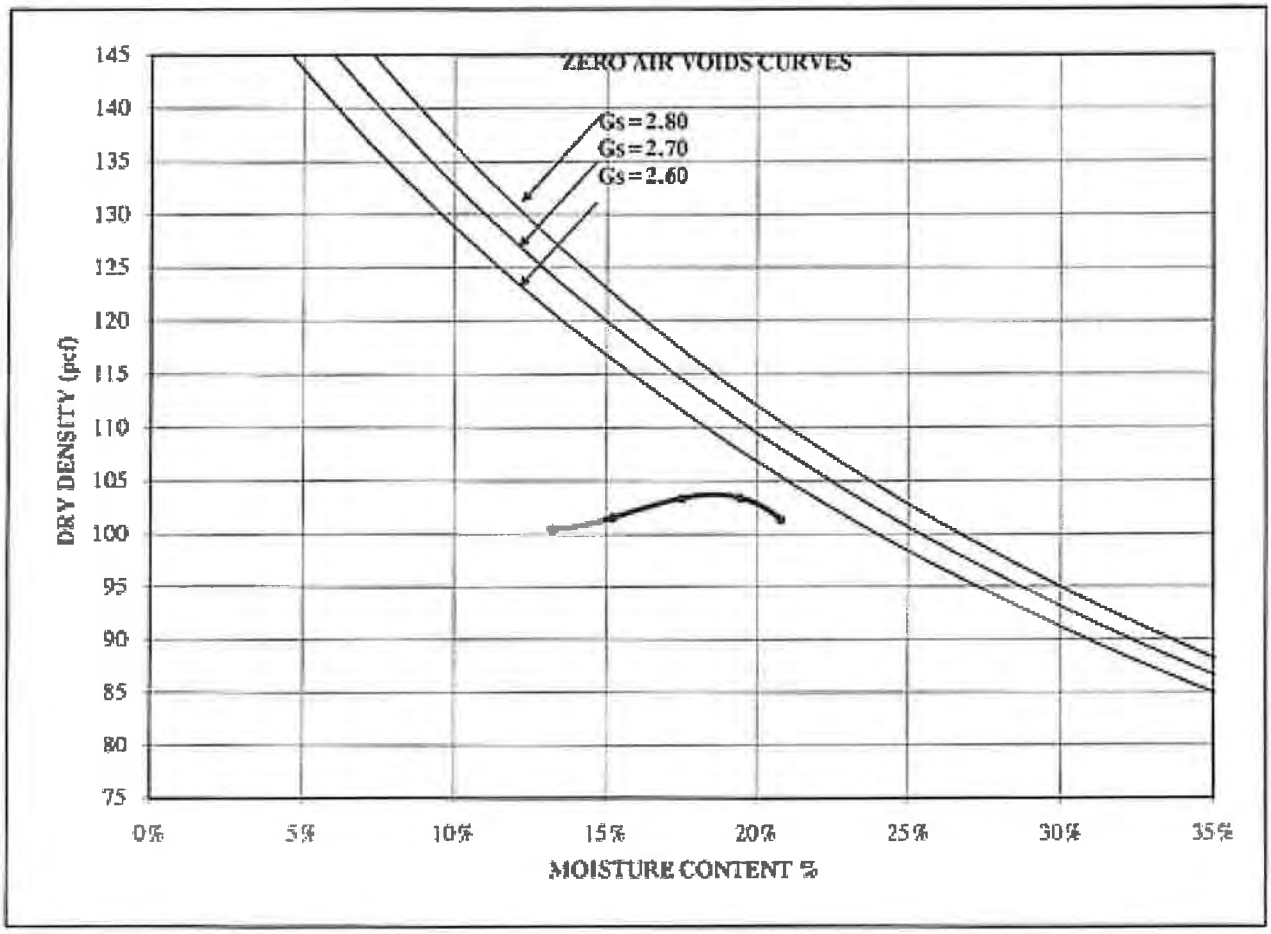
| | |
|---|---|
| DESCRIPTION | Light reddish brown, CLAY |
| USCS | CH |

JAMES CONST / TXU OAK GROVE / TX
083-94281

| | |
|---|---|
| TECH | SR |
| DATE | 07/22/2008 |
| CHECK | |
| REVIEW | |

Golder Associates Inc.

# MOISTURE / DRY DENSITY CURVE
## D 698 METHOD A




| | | |
|---|---|---|
| MAXIMUM DRY DENSITY (pcf) | 103.8 | |
| OPTIMUM MOISTURE (%) | 18.5 | NO CORRECTION REQUIRED |

| | |
|---|---|
| SAMPLE ID | FGD-QCL-002 |
| SAMPLE TYPE | Bulk |
| SAMPLE DEPTH | - |

| | |
|---|---|
| LL | 49 |
| PL | 21 |
| PI | 28 |

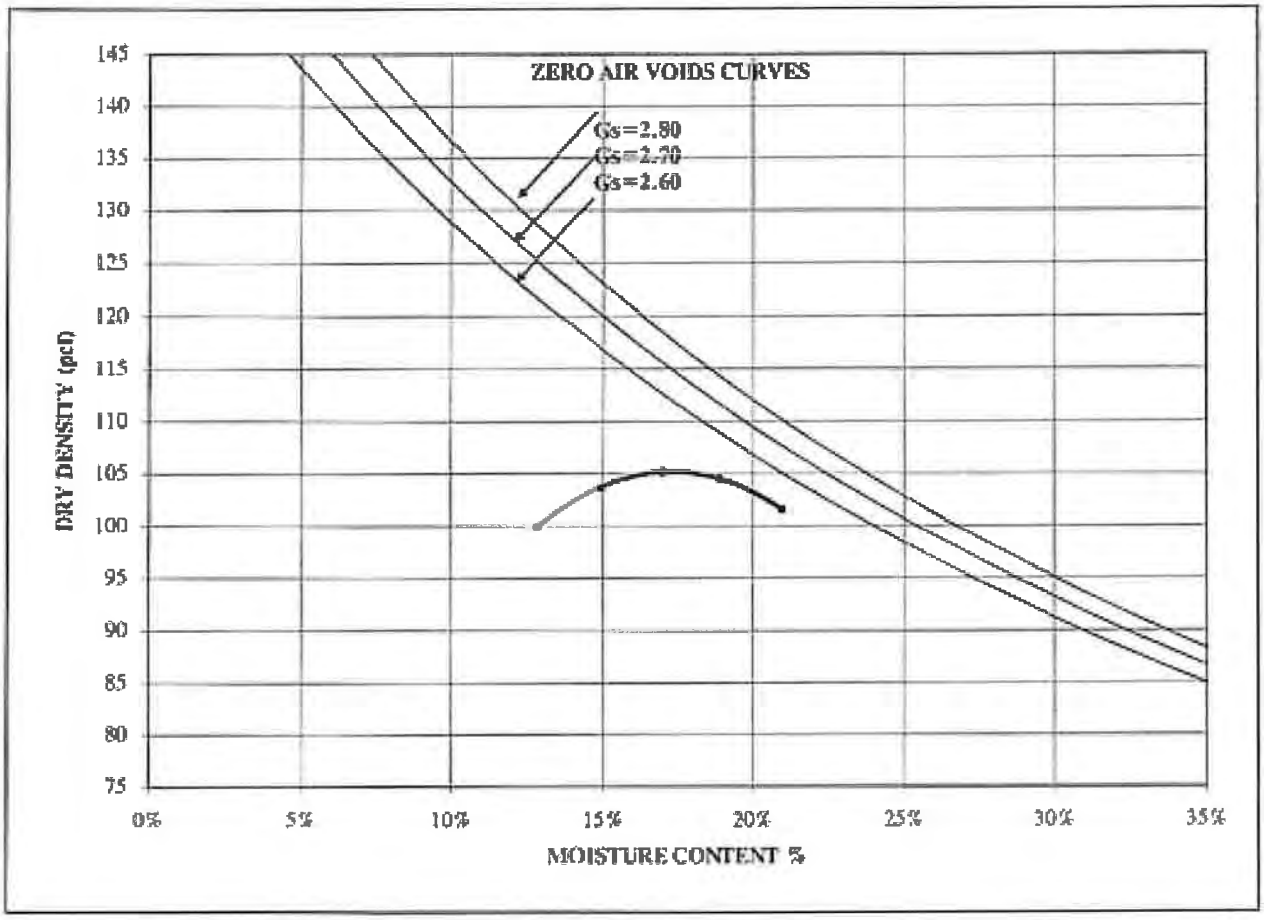
| | |
|---|---|
| DESCRIPTION | Yellowish brown, CLAY |
| USCS | CL |

JAMES CONST / TXU OAK GROVE / TX
083-94281

| | |
|---|---|
| TECH | SR |
| DATE | 07/22/2008 |
| CHECK | QPL |
| REVIEW | [illegible] |

Golder Associates Inc.

# MOISTURE / DRY DENSITY CURVE
## D 698 METHOD A




| | | |
|---|---|---|
| MAXIMUM DRY DENSITY (pcf) | 105.1 | |
| OPTIMUM MOISTURE (%) | 17.0 | NO CORRECTION REQUIRED |

| | |
|---|---|
| SAMPLE ID | QCL-009 |
| SAMPLE TYPE | Bulk |
| SAMPLE DEPTH | 0 |

| | |
|---|---|
| LL | 42 |
| PL | 16 |
| PI | 26 |

| | |
|---|---|
| DESCRIPTION | Olive gray, silty sandy, CLAY |
| USCS | CL |

JAMES CONST / TXU OAK GROVE / TX
083-94281

| | |
|---|---|
| TECH | PN |
| DATE | 10/02/2008 |
| CHECK | |
| REVIEW | |

Golder Associates Inc.

# APPENDIX – C.2

## Geosynthetic Mfg's QA/QC

# GCL

2870 FORBS AVENUE | HOFFMAN ESTATES, ILLINOIS | U.S.A. | TEL 847.851.1860 | FAX 847.851.1899

CETCO **Laboratory Services Report**

| CETCO EP Project Information | |
|---|---|
| Project Name | FGD-C, Oak Grove Steam Electric Station |
| Location | Texas |
| Project Type | 0 |
| Leachate Code Number | BMG/LT-6 |
| Leachate Description | FGD-C, Oak Grove Steam Electric Station |
| Leachate Type | GCL Testing |
| Actual pH | 7.997 |
| Actual EC (uS/cm) | 13,340 |
| **Calculations** | **FGD-C, Oak Grove Steam Electric Station** |
| ICP Estimated EC (uS/cm) (Snoeyink Jenkins) | 17,249 |
| Ionic Strength Estimated by ICP (mol/L) | 0.276 |
| RMD Estimated by ICP (M^0.5) | 0.080 |
| Ratio of SO4/Cl | 0.534 |
| ICP Predicted Bentomat k @ 2 PSI (cm/sec) | 1.4E-06 |
| **Index Test Results (ASTM D5890/D5891)** | **BMG/LT-6** |
| Resistex 200 Fluid Loss (mL) | 24.43 |
| Resistex 200 Free Swell (mL / 2 grams) | 15 |

CETCO Confidential: Limited external distribution. CETCO makes no warranty of any kind and accepts no responsibility for the results obtained through application of this information

2870 FORBES AVENUE | HOFFMAN ESTATES, ILLINOIS | U.S.A. | TEL 847.851.1800 | FAX 847.851.1919

CETCO **Laboratory Services Report**

| Project Name | FGD-C, Oak Grove Steam Electric Station |
|---|---|
| Leachate Description# | FGD-C, Oak Grove Steam Electric Station |
| Leachate Code# | BMG/LT-6 |
| Ion Concentrations | Conc (ppm) |
| $Cl^-$ | 2670.000 |
| As3+ | 0.978 |
| B4O5(OH)4 | 55.26513 |
| Ba2+ | 0.933 |
| $Ca^{2+}$ | 624.665 |
| Cd2+ | 0.258 |
| $Cr^{3+}$ | 1.354 |
| Cu2+ | 0.216 |
| $Fe^{+2}$ | 0.495 |
| K+ | 152.48 |
| $Mg^{2+}$ | 1145.1 |
| $Mn^{2+}$ | 8.301 |
| Mo2+ | |
| $Na^+$ | 372.181 |
| $Ni^{3+}$ | 0.179 |
| P of PO4-3 | 6.539 |
| Pb2+ | 7.188 |
| S | 1289.8 |
| Sb+2 | 3.264 |
| Se2+ | 1.9 |
| Ti4+ | 0.424 |
| $Zn^{2+}$ | 0.367 |
| **H+(Calculated)** | 0.000 |
| **OH- (Calculated)** | 0.017 |

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2870 FORBS AVENUE | HOFFMAN ESTATES, ILLINOIS | U.S.A. | TEL 847.851.1800 | FAX 847.851.1899

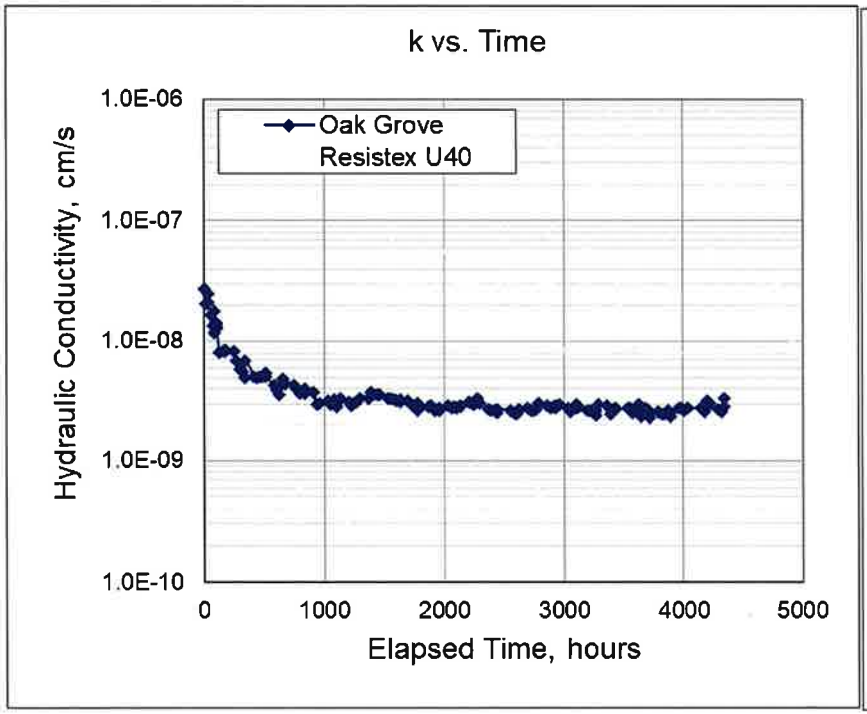
CETCO **Laboratory Services Report**

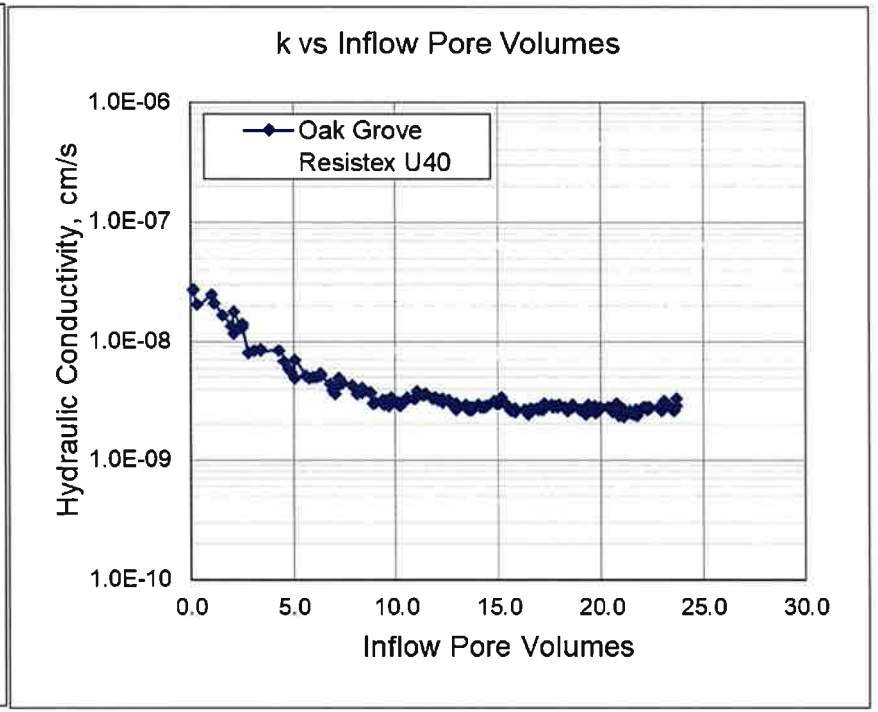
| | |
|---|---|
| CETCO EP Project Information | |
| ASTM D6766 Perm Test Results | |
| Accreditation: GRI-LAP-22-97 | |
| Project | FGD-C, Oak Grove Steam Electric Station |
| Product Tested For Hydraulic Conductivity | Resistex U40 (formerly 350) |
| Product Lot # | 20GCL002-4 roll 2 North |
| Leachate Description | Oak Grove |
| Leachate Code# | LT 20-6 |
| Leachate pH | 8.00 |
| Leachate EC (uS/cm) | 13,340 |
| Ionic Strength Estimated by ICP (mol/L) | 0.276 |
| RMD Estimated by ICP (M^0.5) | 0.080 |
| Sulfate / Chloride Ratio | 0.534 |
| Hydration Liquid | Oak Grove |
| Permeation Liquid | Oak Grove |
| Pressure Difference (PSI) = | 2 |
| Max. Effective Stress (PSI) = | 5 |
| Hydraulic Gradient | 187 |
| Actual Hydraulic Conductivity k (cm/sec) | 2.93E-09 |
| PVF | 23.7 |
| Hydraulic Conductivity Test Duration (hrs) | 4343 |

CETCO Confidential: Limited external distribution. CETCO makes no warranty of any kind and accepts no responsibility for the results obtained through application of this information

2870 FORBS AVENUE | HOFFMAN ESTATES, ILLINOIS | U.S.A. | TEL 847.851.1800 | FAX 847.851.1899

CETCO **Laboratory Services Report**




CETCO Confidential: Limited external distribution. CETCO makes no warranty of any kind and accepts no responsibility for the results obtained through application of this information

CETCO
Colloid Environmental Technologies Company LLC

## PRODUCT CERTIFICATIONS

PROJECT NAME:
CUSTOMER P.O.: 22121-CETCO1
ORDER NUMBER: 55056648
PREPARED FOR: LONE STAR LINING COMPANY

The GCL Manufactured for the above-referenced order number is certified to meet the values listed in the tables below:

### GCL PROPERTY SPECIFICATIONS FOR RESISTEX® U40 DN9

| Test Method | Test Method Property | Test Frequency | Certified Value |
|---|---|---|---|
| ASTM D6243 | GCL Hydrated Internal Shear Strength | 1/Project | 500 - psf |
| ASTM D6496 | GCL Peel Strength | 40,000 sq ft (4,000 sq m) | 5.0 - lbs/in |
| ASTM D5890 | Bentonite Free Swell | 1 per 50 Tons | 24 - ml |
| ASTM D6768 | GCL Grab Strength | 200,000 sq ft (20,000 sq m) | 50 - lbs/in |
| ASTM D5891 | Bentonite Fluid Loss | 1 per 50 Tons | 18 - ml |
| ASTM D5993 | Bentonite Mass/Area | 40,000 sq ft (4,000 sq m) | .75 - lbs/sq ft |
| ASTM D5887 | GCL-Hydraulic Conductivity | 1/Lot | 3x10-9 - cm/s |
| ASTM D5887 | GCL-Index Flux | 1/Lot | 1x10-8 - m3/m2/s |

All tensile testing is in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D 6496. An "*" indicates non-standard testing, frequency, or certified value .

### NEEDLE DETECTION AND REMOVAL PROCEDURE

CETCO® hereby affirms that all Bentomat® geosynthetic clay liner material manufactured for this project is continually passed under a magnet for needle removal and then screened with a metal detection device. CETCO® certifies Bentomat® to be essentially free of broken needless and fragments of needles that would negatively affect the performance of the final product.

Sincerely,

NICHOLLS, RYAN J
Quality Assurance Coordinator
CETCO® Lovell Plant

CETCO
Colloid Environmental Technologies Company LLC

## GCL PACKING LIST AND MQA TRACKING FORM

Listing of finished and raw materials used to produce certification package number 55056648

| GCL | | | | | | | | GEOTEXTILE | | | CLAY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RESISTEX® U40 DN9 | | | | | | | | 01-9517 | 01-8991 | | RESIST U40 TREAT-LBS |
| **Order** | **GCL Lot#** | **GCL Roll#** | **Length** | **Width** | **Weight** | **Sq. ft** | **Roll # Tested** | **Cap1 Roll #** | **Base1 Roll #** | | **Clay Lot #** |
| 55056648 | LL-19-2021 | 1 | 150 | 14.5 | 2700 | 2175 | 1 | 2026356572 | 2026685209 | | L050412A |
| 55056648 | LL-19-2021 | 2 | 150 | 14.5 | 3290 | 2175 | 1 | 2026356572 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 3 | 150 | 14.5 | 3175 | 2175 | 1 | 2026356572 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 4 | 150 | 14.5 | 3125 | 2175 | 1 | 2026356572 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 5 | 150 | 14.5 | 3040 | 2175 | 1 | 2026356572 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 6 | 150 | 14.5 | 2970 | 2175 | 1 | 2026356572 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 7 | 150 | 14.5 | 2950 | 2175 | 1 | 2026356572 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 8 | 150 | 14.5 | 2895 | 2175 | 1 | 2026293530 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 9 | 150 | 14.5 | 2865 | 2175 | 1 | 2026293530 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 10 | 150 | 14.5 | 2855 | 2175 | 1 | 2026293530 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 11 | 150 | 14.5 | 2830 | 2175 | 1 | 2026293530 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 12 | 150 | 14.5 | 2815 | 2175 | 1 | 2026293530 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 13 | 150 | 14.5 | 2850 | 2175 | 1 | 2026293530 | 2026666856 | | L050412A |
| 55056648 | LL-19-2021 | 14 | 150 | 14.5 | 2930 | 2175 | 1 | 2026356579 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 15 | 150 | 14.5 | 2910 | 2175 | 1 | 2026356579 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 16 | 150 | 14.5 | 2950 | 2175 | 1 | 2026356579 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 17 | 150 | 14.5 | 2990 | 2175 | 1 | 2026356579 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 18 | 150 | 14.5 | 3045 | 2175 | 1 | 2026356579 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 19 | 150 | 14.5 | 3055 | 2175 | 19 | 2026356579 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 20 | 150 | 14.5 | 3085 | 2175 | 19 | 2026294260 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 21 | 150 | 14.5 | 3100 | 2175 | 19 | 2026294260 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 22 | 150 | 14.5 | 3010 | 2175 | 19 | 2026294260 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 23 | 150 | 14.5 | 3015 | 2175 | 19 | 2026294260 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 24 | 150 | 14.5 | 3055 | 2175 | 19 | 2026294260 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 25 | 150 | 14.5 | 3055 | 2175 | 19 | 2026293548 | 2026685162 | | L050412A |
| 55056648 | LL-19-2021 | 26 | 150 | 14.5 | 3310 | 2175 | 19 | 2026293548 | 2026685185 | | L050412A |
| 55056648 | LL-19-2021 | 27 | 150 | 14.5 | 3380 | 2175 | 19 | 2026293548 | 2026685185 | | L050412A |
| 55056648 | LL-19-2021 | 28 | 150 | 14.5 | 3400 | 2175 | 19 | 2026293548 | 2026685185 | | L050412A |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 55056648 | LL-19-2021 | 29 | 150 | 14.5 | 3495 | 2175 | 19 | 2026293548 | 2026685185 | | L050412A |
| 55056648 | LL-19-2021 | 30 | 150 | 14.5 | 3505 | 2175 | 19 | 2026293548 | 2026685185 | | L050412A |
| 55056648 | LL-19-2021 | 31 | 150 | 14.5 | 3505 | 2175 | 19 | 2026356560 | 2026685191 | | L050412B |
| 55056648 | LL-19-2021 | 32 | 150 | 14.5 | 3490 | 2175 | 19 | 2026356560 | 2026685191 | | L050412B |
| 55056648 | LL-19-2021 | 33 | 150 | 14.5 | 3435 | 2175 | 19 | 2026356560 | 2026685191 | | L050412B |
| 55056648 | LL-19-2021 | 34 | 150 | 14.5 | 3525 | 2175 | 19 | 2026356560 | 2026685191 | | L050412B |
| 55056648 | LL-19-2021 | 35 | 150 | 14.5 | 3505 | 2175 | 19 | 2026356560 | 2026685191 | | L050412B |
| 55056648 | LL-19-2021 | 36 | 150 | 14.5 | 3430 | 2175 | 19 | 2026356560 | 2026685191 | | L050412B |
| 55056648 | LL-19-2021 | 37 | 150 | 14.5 | 3405 | 2175 | 37 | 2026356577 | 2026685191 | | L050412B |
| 55056648 | LL-19-2021 | 38 | 150 | 14.5 | 3425 | 2175 | 37 | 2026356577 | 2026685191 | | L050412B |
| 55056648 | LL-19-2021 | 39 | 150 | 14.5 | 3415 | 2175 | 37 | 2026356561 | 2026685191 | | L050412B |
| 55056648 | LL-19-2021 | 40 | 150 | 14.5 | 3465 | 2175 | 37 | 2026356561 | 2026685191 | | L050412B |
| 55056648 | LL-19-2021 | 41 | 150 | 14.5 | 3495 | 2175 | 37 | 2026356561 | 2026726382 | | L050412B |
| 55056648 | LL-19-2021 | 42 | 150 | 14.5 | 3395 | 2175 | 37 | 2026356561 | 2026726382 | | L050412B |
| | | | | | Total Sq Ft: | 91350 | | | | Total Number of Rolls Certified: 42 | |

CETCO
Colloid Environmental Technologies Company LLC

## GCL MANUFACTURING QUALITY CONTROL TEST DATA

The following rolls in GCL certification package number 55056648 have been tested in our production facility lab.

| Product | Lot# Tested | Roll# Tested | Mass Area | Grab Strength | Peel Strength | | | |
|---|---|---|---|---|---|---|---|---|
| | | ASTM Test Method: | ASTM D5993 | ASTM D6768 | ASTM D6496 | | | |
| | | Required Value: | .75 - lbs/sq ft | 50 - lbs/in | 5.0 - lbs/in | | | |
| RESISTEX® U40 DN9 | LL-19-2021 | 1 | .92 | 106.8 | 13.3 | | | |
| RESISTEX® U40 DN9 | LL-19-2021 | 19 | .97 | 106.8 | 19 | | | |
| RESISTEX® U40 DN9 | LL-19-2021 | 37 | .96 | 106.8 | 13.5 | | | |

## BENTONITE CLAY CERTIFICATION

The Bentonite Clay used to produce package 55056648 was tested in our production facility lab and yielded the following results.

| Clay Lot # | Moist | Swell | Fluid Loss |
|---|---|---|---|
| ASTM Test Method: | ASTM D2216 | ASTM D5890 | ASTM D5891 |
| Required Value: | 12 - % | 24 - ml | 18 - ml |
| L050421A | 11.27 | 60 | 7.6 |
| L050421B | 11.2 | 64 | 7.4 |

CETCO
Colloid Environmental Technologies Company LLC

GEOTEXTILE TEST RESULTS FROM MATERIAL SUPPLIERS

The GCL in certification package number 55056648 was manufactured with geotextiles which were tested and yielded the following results.

| **BASE GEOTEXTILE** | | | |
|---|---|---|---|
| Material | Roll Number | Mass Area oz/yd2 | Grab Strength lbs |
| 01-8991 | 2026685209 | 6.54 | 211.82 |
| 01-8991 | 2026685162 | 6.17 | 177.18 |
| 01-8991 | 2026685185 | 6.07 | 185.65 |
| 01-8991 | 2026685191 | 6.32 | 195.68 |
| 01-8991 | 2026726382 | 6.96 | 210.47 |
| 01-8991 | 2026666856 | 6.47 | 179.99 |

| **COVER GEOTEXTILE** | | | |
|---|---|---|---|
| Material | Roll Number | Mass Area oz/yd2 | Grab Strength lbs |
| 01-9517 | 2026356579 | 10.02 | 202.63 |
| 01-9517 | 2026294260 | 9.6 | 225.28 |
| 01-9517 | 2026293548 | 9.87 | 225.02 |
| 01-9517 | 2026356560 | 9.71 | 190.75 |
| 01-9517 | 2026356577 | 10.02 | 202.63 |
| 01-9517 | 2026356561 | 9.71 | 190.75 |
| 01-9517 | 2026356572 | 10.21 | 204.36 |
| 01-9517 | 2026293530 | 9.67 | 227.99 |

Certifications from our suppliers are on file at our production facility.

Colloid Environmental Technologies Company LLC

Date:
Purchase Order: 22121-CETCO1
ORDER NUMBER: 55056648

LONE STAR LINING COMPANY
1675 AMERICAN WAY

CEDAR HILL,TX,75104

To Whom it May Concern:

Please find the enclosed index flux/hydraulic conductivity test results for your recent order.

Questions regarding this information should be directed to CETCO Technical Services at eptechservices@cetco.com.

Sincerely,

NICHOLLS, RYAN J
Quality Assurance Coordinator
CETCO Lovell Plant

CETCO
Colloid Environmental Technologies Company LLC

## PRODUCT CERTIFICATIONS

PROJECT NAME:
CUSTOMER P.O.: 22121-CETCO1
ORDER NUMBER: 55056648
PREPARED FOR: LONE STAR LINING COMPANY

The GCL Manufactured for the above-referenced order number is certified to meet the values listed in the tables below:

### GCL PROPERTY SPECIFICATIONS FOR RESISTEX® U40 DN9

| Test Method | Test Method Property | Test Frequency | Certified Value |
|---|---|---|---|
| ASTM D5887 | GCL-Hydraulic Conductivity | 1/Lot | 3x10-9 - cm/s |
| ASTM D5887 | GCL-Index Flux | 1/Lot | 1x10-8 - m3/m2/s |

| Product | Lot# Tested | Roll# Tested | Index Flux | Hydraulic Conductivity | | | | |
|---|---|---|---|---|---|---|---|---|
| | ASTM Test Method: | | ASTM D5887 | ASTM D5887 | | | | |
| | Required Value: | | 1x10-8 m3/m2/s | 3x10-9 cm/s | | | | |
| RESISTEX® U40 DN9 | LL-19-2021 | 1 | 2.0x10-9 | 1.2x10-9 | | | | |

CETCO
Colloid Environmental Technologies Company LLC

## GCL PACKING LIST AND MQA TRACKING FORM

Listing of finished and raw materials used to produce certification package number 55062242

| GCL | | | | | | | | GEOTEXTILE | | | CLAY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RESISTEX® U40 DN9 | | | | | | | | 01-9517 | 01-8991 | | RESIST U40 TREAT-LBS |
| **Order** | **GCL Lot#** | **GCL Roll#** | **Length** | **Width** | **Weight** | **Sq. ft** | **Roll # Tested** | **Cap1 Roll #** | **Base1 Roll #** | | **Clay Lot #** |
| 55062242 | LL-42-2021 | 44 | 150 | 14.5 | 2970 | 2175 | 44 | 2026847103 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 45 | 150 | 14.5 | 2775 | 2175 | 44 | 2026847103 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 46 | 150 | 14.5 | 2670 | 2175 | 44 | 2026847103 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 47 | 150 | 14.5 | 2725 | 2175 | 44 | 2026847103 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 48 | 150 | 14.5 | 2640 | 2175 | 44 | 2026847103 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 49 | 150 | 14.5 | 2590 | 2175 | 44 | 2026847103 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 50 | 150 | 14.5 | 2740 | 2175 | 44 | 2026847121 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 51 | 150 | 14.5 | 2695 | 2175 | 44 | 2026847121 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 52 | 150 | 14.5 | 2760 | 2175 | 44 | 2026847121 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 53 | 150 | 14.5 | 2725 | 2175 | 44 | 2026847121 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 54 | 150 | 14.5 | 2820 | 2175 | 44 | 2026847121 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 55 | 150 | 14.5 | 2785 | 2175 | 44 | 2026847121 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 56 | 150 | 14.5 | 2805 | 2175 | 44 | 2026847121 | 2026796781 | | L050421F |
| 55062242 | LL-42-2021 | 57 | 150 | 14.5 | 2825 | 2175 | 44 | 2026850250 | 2026940360 | | L050421F |
| 55062242 | LL-42-2021 | 58 | 150 | 14.5 | 2790 | 2175 | 44 | 2026850250 | 2026940360 | | L050421F |
| 55062242 | LL-42-2021 | 59 | 150 | 14.5 | 2830 | 2175 | 44 | 2026850250 | 2026940360 | | L050421F |
| 55062242 | LL-42-2021 | 60 | 150 | 14.5 | 2810 | 2175 | 44 | 2026850250 | 2026940360 | | L050421F |
| 55062242 | LL-42-2021 | 61 | 150 | 14.5 | 2805 | 2175 | 61 | 2026850250 | 2026940360 | | L050421F |
| 55062242 | LL-42-2021 | 62 | 150 | 14.5 | 2810 | 2175 | 61 | 2026850250 | 2026940360 | | L050421F |
| 55062242 | LL-42-2021 | 63 | 150 | 14.5 | 2870 | 2175 | 61 | 2026838392 | 2026940360 | | L050421F |
| 55062242 | LL-42-2021 | 64 | 150 | 14.5 | 2870 | 2175 | 61 | 2026838392 | 2026940360 | | L050421F |
| 55062242 | LL-42-2021 | 65 | 150 | 14.5 | 2815 | 2175 | 61 | 2026838392 | 2026940360 | | L050421F |
| | | | | | Total Sq Ft: | 47850 | | Total Number of Rolls Certified: 22 | | | |

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## GCL MANUFACTURING QUALITY CONTROL TEST DATA

The following rolls in GCL certification package number 55062242 have been tested in our production facility lab.

| Product | Lot# Tested | Roll# Tested | Mass Area | Grab Strength | Peel Strength | | | |
|---|---|---|---|---|---|---|---|---|
| | ASTM Test Method: | | ASTM D5993 | ASTM D6768 | ASTM D6496 | | | |
| | Required Value: | | .75 - lbs/sq ft | 50 - lbs/in | 5.0 - lbs/in | | | |
| RESISTEX® U40 DN9 | LL-42-2021 | 44 | .81 | 123 | 11.1 | | | |
| RESISTEX® U40 DN9 | LL-42-2021 | 61 | .85 | 123 | 12.9 | | | |

## BENTONITE CLAY CERTIFICATION

The Bentonite Clay used to produce package 55062242 was tested in our production facility lab and yielded the following results.

| Clay Lot # | Moist | Swell | Fluid Loss |
|---|---|---|---|
| ASTM Test Method: | ASTM D2216 | ASTM D5890 | ASTM D5891 |
| Required Value: | 12 - % | 24 - ml | 18 - ml |
| L050421F | 11.22 | 59 | 7.3 |

CETCO
Colloid Environmental Technologies Company LLC

GEOTEXTILE TEST RESULTS FROM MATERIAL SUPPLIERS

The GCL in certification package number 55062242 was manufactured with geotextiles which were tested and yielded the following results.

| **BASE GEOTEXTILE** | | | |
|---|---|---|---|
| Material | Roll Number | Mass Area oz/yd2 | Grab Strength lbs |
| 01-8991 | 2026796781 | 6.46 | 203.44 |
| 01-8991 | 2026940360 | 6.68 | 191.41 |

| **COVER GEOTEXTILE** | | | |
|---|---|---|---|
| Material | Roll Number | Mass Area oz/yd2 | Grab Strength lbs |
| 01-9517 | 2026847103 | 9.9 | 230.22 |
| 01-9517 | 2026847121 | 10.21 | 224.41 |
| 01-9517 | 2026850250 | 10.28 | 190.02 |
| 01-9517 | 2026838392 | 10.3 | 227.28 |

Certifications from our suppliers are on file at our production facility.

Colloid Environmental Technologies Company LLC

Date:
Purchase Order: 22121-CETCO2
ORDER NUMBER: 55062242

LONE STAR LINING COMPANY
1675 AMERICAN WAY

CEDAR HILL,TX,75104

To Whom it May Concern:

Please find the enclosed index flux/hydraulic conductivity test results for your recent order.

Questions regarding this information should be directed to CETCO Technical Services at eptechservices@cetco.com.

Sincerely,

NICHOLLS, RYAN J
Quality Assurance Coordinator
CETCO Lovell Plant

CETCO
Colloid Environmental Technologies Company LLC

## PRODUCT CERTIFICATIONS

PROJECT NAME:
CUSTOMER P.O.: 22121-CETCO2
ORDER NUMBER: 55062242
PREPARED FOR: LONE STAR LINING COMPANY

The GCL Manufactured for the above-referenced order number is certified to meet the values listed in the tables below:

### GCL PROPERTY SPECIFICATIONS FOR RESISTEX® U40 DN9

| Test Method | Test Method Property | Test Frequency | Certified Value |
|---|---|---|---|
| ASTM D5887 | GCL-Hydraulic Conductivity | 1/Lot | 3x10-9 - cm/s |
| ASTM D5887 | GCL-Index Flux | 1/Lot | 1x10-8 - m3/m2/s |

| Product | Lot# Tested | Roll# Tested | Index Flux | Hydraulic Conductivity | | | | |
|---|---|---|---|---|---|---|---|---|
| | ASTM Test Method: | | ASTM D5887 | ASTM D5887 | | | | |
| | Required Value: | | 1x10-8 m3/m2/s | 3x10-9 cm/s | | | | |
| RESISTEX® U40 DN9 | LL-42-2021 | 44 | 3.1x10-9 | 1.3x10-9 | | | | |

CETCO
Colloid Environmental Technologies Company LLC

## GCL PACKING LIST AND MQA TRACKING FORM

Listing of finished and raw materials used to produce certification package number 55063182

| GCL | | | | | | | | GEOTEXTILE | | | CLAY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RESISTEX® U40 DN9 | | | | | | | | 01-9517 | 01-8991 | | RESIST U40 TREAT-LBS |
| **Order** | **GCL Lot#** | **GCL Roll#** | **Length** | **Width** | **Weight** | **Sq. ft** | **Roll # Tested** | **Cap1 Roll #** | **Base1 Roll #** | | **Clay Lot #** |
| 55063182 | LL-48-2021 | 67 | 150 | 14.5 | 2625 | 2175 | 67 | 2026711395 | 2026972699 | | L113021B |
| 55063182 | LL-48-2021 | 68 | 150 | 14.5 | 2745 | 2175 | 67 | 2026711395 | 2026972699 | | L113021B |
| 55063182 | LL-48-2021 | 69 | 150 | 14.5 | 2755 | 2175 | 67 | 2026711395 | 2026972699 | | L113021B |
| 55063182 | LL-48-2021 | 70 | 150 | 14.5 | 2780 | 2175 | 67 | 2026711395 | 2026972699 | | L113021B |
| 55063182 | LL-48-2021 | 71 | 150 | 14.5 | 2770 | 2175 | 67 | 2026711395 | 2026972699 | | L113021B |
| 55063182 | LL-48-2021 | 72 | 150 | 14.5 | 2760 | 2175 | 67 | 2026711395 | 2026972699 | | L113021B |
| 55063182 | LL-48-2021 | 73 | 150 | 14.5 | 2705 | 2175 | 67 | 2026711395 | 2026972699 | | L113021B |
| 55063182 | LL-48-2021 | 74 | 150 | 14.5 | 2705 | 2175 | 67 | 2026711395 | 2026972699 | | L113021B |
| 55063182 | LL-48-2021 | 75 | 150 | 14.5 | 2620 | 2175 | 67 | 2026809501 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 76 | 150 | 14.5 | 2795 | 2175 | 67 | 2026809501 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 77 | 150 | 14.5 | 2755 | 2175 | 67 | 2026848913 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 78 | 150 | 14.5 | 2745 | 2175 | 67 | 2026848913 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 79 | 150 | 14.5 | 2740 | 2175 | 67 | 2026848913 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 80 | 150 | 14.5 | 2690 | 2175 | 67 | 2026848913 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 81 | 150 | 14.5 | 2720 | 2175 | 67 | 2026848913 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 82 | 150 | 14.5 | 2750 | 2175 | 67 | 2026848913 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 83 | 150 | 14.5 | 2720 | 2175 | 67 | 2026851431 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 84 | 150 | 14.5 | 2695 | 2175 | 67 | 2026851431 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 85 | 150 | 14.5 | 2675 | 2175 | 85 | 2026851431 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 86 | 150 | 14.5 | 2700 | 2175 | 85 | 2026851431 | 2026805602 | | L113021B |
| 55063182 | LL-48-2021 | 87 | 150 | 14.5 | 2680 | 2175 | 85 | 2026851431 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 88 | 150 | 14.5 | 2665 | 2175 | 85 | 2026851431 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 89 | 150 | 14.5 | 2660 | 2175 | 85 | 2026851431 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 90 | 150 | 14.5 | 2685 | 2175 | 85 | 2026809502 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 91 | 150 | 14.5 | 2675 | 2175 | 85 | 2026809502 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 92 | 150 | 14.5 | 2675 | 2175 | 85 | 2026809502 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 93 | 150 | 14.5 | 2655 | 2175 | 85 | 2026809502 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 94 | 150 | 14.5 | 2670 | 2175 | 85 | 2026809502 | 2026972611 | | L113021B |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 55063182 | LL-48-2021 | 95 | 150 | 14.5 | 2740 | 2175 | 85 | 2026809502 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 96 | 150 | 14.5 | 2715 | 2175 | 85 | 2026847102 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 97 | 150 | 14.5 | 2720 | 2175 | 85 | 2026847102 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 98 | 150 | 14.5 | 2715 | 2175 | 85 | 2026847102 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 99 | 150 | 14.5 | 2770 | 2175 | 85 | 2026847102 | 2026972611 | | L113021B |
| 55063182 | LL-48-2021 | 100 | 150 | 14.5 | 2690 | 2175 | 85 | 2026847102 | 2026805606 | | L113021B |
| 55063182 | LL-48-2021 | 101 | 150 | 14.5 | 2665 | 2175 | 85 | 2026847102 | 2026805606 | | L113021B |
| 55063182 | LL-48-2021 | 102 | 150 | 14.5 | 2670 | 2175 | 85 | 2026848910 | 2026805606 | | L113021B |
| 55063182 | LL-48-2021 | 103 | 150 | 14.5 | 2670 | 2175 | 103 | 2026848910 | 2026805606 | | L113021B |
| 55063182 | LL-48-2021 | 104 | 150 | 14.5 | 2610 | 2175 | 103 | 2026848910 | 2026805606 | | L113021B |
| 55063182 | LL-48-2021 | 105 | 150 | 14.5 | 2595 | 2175 | 103 | 2026848910 | 2026805606 | | L113021B |
| 55063182 | LL-48-2021 | 106 | 150 | 14.5 | 2595 | 2175 | 103 | 2026848910 | 2026805606 | | L113021B |
| 55063182 | LL-48-2021 | 107 | 150 | 14.5 | 2535 | 2175 | 103 | 2026848910 | 2026805606 | | L113021C |
| 55063182 | LL-48-2021 | 108 | 150 | 14.5 | 2545 | 2175 | 103 | 2026807898 | 2026805606 | | L113021C |
| 55063182 | LL-48-2021 | 109 | 150 | 14.5 | 2500 | 2175 | 103 | 2026807898 | 2026805606 | | L113021C |
| 55063182 | LL-48-2021 | 110 | 150 | 14.5 | 2495 | 2175 | 103 | 2026807898 | 2026805606 | | L113021C |
| 55063182 | LL-48-2021 | 111 | 150 | 14.5 | 2500 | 2175 | 103 | 2026807898 | 2026805606 | | L113021C |
| 55063182 | LL-48-2021 | 112 | 150 | 14.5 | 2760 | 2175 | 103 | 2026807898 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 113 | 150 | 14.5 | 2795 | 2175 | 103 | 2026807898 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 114 | 150 | 14.5 | 2795 | 2175 | 103 | 2026807890 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 115 | 150 | 14.5 | 2770 | 2175 | 103 | 2026807890 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 116 | 150 | 14.5 | 2760 | 2175 | 103 | 2026807890 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 117 | 150 | 14.5 | 2720 | 2175 | 103 | 2026807890 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 118 | 150 | 14.5 | 2730 | 2175 | 103 | 2026807890 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 119 | 150 | 14.5 | 2730 | 2175 | 103 | 2026839030 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 120 | 150 | 14.5 | 2670 | 2175 | 103 | 2026839030 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 121 | 150 | 14.5 | 2725 | 2175 | 121 | 2026839030 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 122 | 150 | 14.5 | 2690 | 2175 | 121 | 2026839030 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 123 | 150 | 14.5 | 2730 | 2175 | 121 | 2026839030 | 2026972494 | | L113021C |
| 55063182 | LL-48-2021 | 124 | 150 | 14.5 | 2775 | 2175 | 121 | 2026839030 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 125 | 150 | 14.5 | 2795 | 2175 | 121 | 2026839030 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 126 | 150 | 14.5 | 2740 | 2175 | 121 | 2026839030 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 127 | 150 | 14.5 | 2720 | 2175 | 121 | 2026838386 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 128 | 150 | 14.5 | 2745 | 2175 | 121 | 2026838386 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 129 | 150 | 14.5 | 2755 | 2175 | 121 | 2026838386 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 130 | 150 | 14.5 | 2765 | 2175 | 121 | 2026838386 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 131 | 150 | 14.5 | 2755 | 2175 | 121 | 2026838386 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 132 | 150 | 14.5 | 2750 | 2175 | 121 | 2026838386 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 133 | 150 | 14.5 | 2705 | 2175 | 121 | 2026838394 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 134 | 150 | 14.5 | 2755 | 2175 | 121 | 2026838394 | 2026972695 | | L113021C |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 55063182 | LL-48-2021 | 135 | 150 | 14.5 | 2760 | 2175 | 121 | 2026838394 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 136 | 150 | 14.5 | 2735 | 2175 | 121 | 2026838394 | 2026972695 | | L113021C |
| 55063182 | LL-48-2021 | 137 | 150 | 14.5 | 2810 | 2175 | 121 | 2026838394 | 2026972625 | | L113021C |
| 55063182 | LL-48-2021 | 138 | 150 | 14.5 | 2805 | 2175 | 121 | 2026838394 | 2026972625 | | L113021C |
| 55063182 | LL-48-2021 | 139 | 150 | 14.5 | 2785 | 2175 | 139 | 2026839880 | 2026972625 | | L113021C |
| 55063182 | LL-48-2021 | 140 | 150 | 14.5 | 2785 | 2175 | 139 | 2026839880 | 2026972625 | | L113021C |
| 55063182 | LL-48-2021 | 141 | 150 | 14.5 | 2780 | 2175 | 139 | 2026839880 | 2026972625 | | L113021C |
| 55063182 | LL-48-2021 | 142 | 150 | 14.5 | 2770 | 2175 | 139 | 2026839880 | 2026972625 | | L113021C |
| 55063182 | LL-48-2021 | 143 | 150 | 14.5 | 2770 | 2175 | 139 | 2026839880 | 2026972625 | | L113021C |
| 55063182 | LL-48-2021 | 144 | 150 | 14.5 | 2765 | 2175 | 139 | 2026839880 | 2026972625 | | L113021C |
| 55063182 | LL-48-2021 | 145 | 150 | 14.5 | 2750 | 2175 | 139 | 2026840546 | 2026972625 | | L113021C |
| 55063182 | LL-48-2021 | 146 | 150 | 14.5 | 2720 | 2175 | 139 | 2026840546 | 2026972625 | | L113021C |
| 55063182 | LL-48-2021 | 147 | 150 | 14.5 | 2700 | 2175 | 139 | 2026840546 | 2026972625 | | L113021D |
| 55063182 | LL-48-2021 | 148 | 150 | 14.5 | 2730 | 2175 | 139 | 2026840546 | 2026972625 | | L113021D |
| 55063182 | LL-48-2021 | 149 | 150 | 14.5 | 2700 | 2175 | 139 | 2026840546 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 150 | 150 | 14.5 | 2700 | 2175 | 139 | 2026840546 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 151 | 150 | 14.5 | 2835 | 2175 | 139 | 2026847129 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 152 | 150 | 14.5 | 2820 | 2175 | 139 | 2026847129 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 153 | 150 | 14.5 | 2910 | 2175 | 139 | 2026847129 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 154 | 150 | 14.5 | 2750 | 2175 | 139 | 2026847129 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 155 | 150 | 14.5 | 2780 | 2175 | 139 | 2026847129 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 156 | 150 | 14.5 | 2760 | 2175 | 139 | 2026847129 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 157 | 150 | 14.5 | 2735 | 2175 | 157 | 2026847129 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 158 | 150 | 14.5 | 2816 | 2175 | 157 | 2026713751 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 159 | 150 | 14.5 | 2715 | 2175 | 157 | 2026713751 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 160 | 150 | 14.5 | 2700 | 2175 | 157 | 2026713751 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 161 | 150 | 14.5 | 2700 | 2175 | 157 | 2026713751 | 2026972626 | | L113021D |
| 55063182 | LL-48-2021 | 162 | 150 | 14.5 | 2765 | 2175 | 157 | 2026713751 | 2026940348 | | L113021D |
| 55063182 | LL-48-2021 | 163 | 150 | 14.5 | 2705 | 2175 | 157 | 2026713751 | 2026940348 | | L113021D |
| 55063182 | LL-48-2021 | 164 | 150 | 14.5 | 2700 | 2175 | 157 | 2026807894 | 2026940348 | | L113021D |
| 55063182 | LL-48-2021 | 165 | 150 | 14.5 | 2700 | 2175 | 157 | 2026807894 | 2026940348 | | L113021D |
| | | | | | Total Sq Ft: | 21532 5 | | | | Total Number of Rolls Certified: 99 | |

CETCO
Colloid Environmental Technologies Company LLC

## GCL MANUFACTURING QUALITY CONTROL TEST DATA

The following rolls in GCL certification package number 55063182 have been tested in our production facility lab.

| Product | Lot# Tested | Roll# Tested | Mass Area | Grab Strength | Peel Strength | | | |
|---|---|---|---|---|---|---|---|---|
| ASTM Test Method: | | | ASTM D5993 | ASTM D6768 | ASTM D6496 | | | |
| Required Value: | | | .75 - lbs/sq ft | 50 - lbs/in | 5 - lbs/in | | | |
| RESISTEX® U40 DN9 | LL-48-2021 | 67 | .82 | 116.8 | 9.9 | | | |
| RESISTEX® U40 DN9 | LL-48-2021 | 85 | .8 | 116.8 | 7.7 | | | |
| RESISTEX® U40 DN9 | LL-48-2021 | 103 | .85 | 116.8 | 11.6 | | | |
| RESISTEX® U40 DN9 | LL-48-2021 | 121 | .85 | 116.8 | 11 | | | |
| RESISTEX® U40 DN9 | LL-48-2021 | 139 | .9 | 116.8 | 14 | | | |
| RESISTEX® U40 DN9 | LL-48-2021 | 157 | .9 | 135.1 | 12.4 | | | |

## BENTONITE CLAY CERTIFICATION

The Bentonite Clay used to produce package 55063182 was tested in our production facility lab and yielded the following results.

| Clay Lot # | Moist | Swell | Fluid Loss |
|---|---|---|---|
| ASTM Test Method: | ASTM D2216 | ASTM D5890 | ASTM D5891 |
| Required Value: | 12 - % | 24 - ml | 18 - ml |
| L113021B | 9.82 | 62 | 8 |
| L113021C | 10.88 | 64 | 6.8 |
| L113021D | 10.63 | 61 | 7.8 |

CETCO
Colloid Environmental Technologies Company LLC

GEOTEXTILE TEST RESULTS FROM MATERIAL SUPPLIERS

The GCL in certification package number 55063182 was manufactured with geotextiles which were tested and yielded the following results.

| **BASE GEOTEXTILE** | | | |
|---|---|---|---|
| Material | Roll Number | Mass Area oz/yd2 | Grab Strength lbs |
| 01-8991 | 2026805606 | 6.81 | 209.93 |
| 01-8991 | 2026972494 | 7.65 | 213.34 |
| 01-8991 | 2026972695 | 6.63 | 195.23 |
| 01-8991 | 2026972625 | 7.82 | 223.72 |
| 01-8991 | 2026972626 | 7.82 | 223.72 |
| 01-8991 | 2026940348 | 7.02 | 218.31 |
| 01-8991 | 2026972699 | 6.55 | 199.67 |
| 01-8991 | 2026805602 | 6.95 | 225.41 |
| 01-8991 | 2026972611 | 6.11 | 202.22 |

| **COVER GEOTEXTILE** | | | |
|---|---|---|---|
| Material | Roll Number | Mass Area oz/yd2 | Grab Strength lbs |
| 01-9517 | 2026848910 | 9.55 | 201.21 |
| 01-9517 | 2026807898 | 9.58 | 233.62 |
| 01-9517 | 2026807890 | 9.82 | 241.3 |
| 01-9517 | 2026839030 | 9.86 | 219.17 |
| 01-9517 | 2026838386 | 10.82 | 228 |
| 01-9517 | 2026838394 | 9.85 | 214.08 |
| 01-9517 | 2026839880 | 10.13 | 213.47 |
| 01-9517 | 2026840546 | 9.41 | 229.52 |
| 01-9517 | 2026847129 | 9.97 | 236.24 |
| 01-9517 | 2026713751 | 10.74 | 215.67 |
| 01-9517 | 2026807894 | 10.05 | 231.46 |
| 01-9517 | 2026711395 | 9.86 | 194.91 |
| 01-9517 | 2026809501 | 9.58 | 233.62 |

| | | | |
|---|---|---|---|
| 01-9517 | 2026848913 | 9.74 | 219.71 |
| 01-9517 | 2026851431 | 9.41 | 221.86 |
| 01-9517 | 2026809502 | 9.57 | 225.52 |
| 01-9517 | 2026847102 | 9.9 | 230.22 |

Certifications from our suppliers are on file at our production facility.

Date:
Purchase Order: 22121-CETCO3
ORDER NUMBER: 55063182

LONE STAR LINING COMPANY
1675 AMERICAN WAY

CEDAR HILL,TX,75104

To Whom it May Concern:

Please find the enclosed index flux/hydraulic conductivity test results for your recent order.

Questions regarding this information should be directed to CETCO Technical Services at eptechservices@cetco.com.

Sincerely,

NICHOLLS, RYAN J
Quality Assurance Coordinator
CETCO Lovell Plant

CETCO
Colloid Environmental Technologies Company LLC

## PRODUCT CERTIFICATIONS

PROJECT NAME:
CUSTOMER P.O.: 22121-CETCO3
ORDER NUMBER: 55063182
PREPARED FOR: LONE STAR LINING COMPANY

The GCL Manufactured for the above-referenced order number is certified to meet the values listed in the tables below:

### GCL PROPERTY SPECIFICATIONS FOR RESISTEX® U40 DN9

| Test Method | Test Method Property | Test Frequency | Certified Value |
|---|---|---|---|
| ASTM D5887 | GCL-Hydraulic Conductivity | 1/Lot | 3x10-9 - cm/s |
| ASTM D5887 | GCL-Index Flux | 1/Lot | 1x10-8 - m3/m2/s |

| Product | Lot# Tested | Roll# Tested | Index Flux | Hydraulic Conductivity | | | | |
|---|---|---|---|---|---|---|---|---|
| | ASTM Test Method: | | ASTM D5887 | ASTM D5887 | | | | |
| | Required Value: | | 1x10-8 m3/m2/s | 3x10-9 cm/s | | | | |
| RESISTEX® U40 DN9 | LL-48-2021 | 67 | 4.5x10-9 | 2.0x10-9 | | | | |

**From:** Kent Jett
**To:** Franco, Samuel
**Subject:** Fwd: Oak Grove Perm tests
**Date:** Wednesday, June 9, 2021 8:00:00 AM
**Attachments:** image001.gif
image005.jpg
image002.jpg

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Here is what they have.

Kent Jett
Lone Star Lining Company

**From:** Thomas Hauck <Tom.Hauck@northerngeosystems.com>
**Sent:** Wednesday, June 9, 2021 7:58:20 AM
**To:** Kent Jett <kent@lonestarlining.com>
**Subject:** RE: Oak Grove Perm tests

Kent-

Sorry for the delay. I just received this from our Lab:

We have made 4 "lots" of the product during development. Below are the data sets for testing against the standardized leachates. We see perms of <5x10-9 cm/sec, and some <1x10-9 cm/sec.

| Sample ID | Additive | Permeant Type | Permeant pH | Permeant Electrical Conductivity (µS/cm) | Permeant Ionic Strength by ICP (M) | Flux (m3/m2/sec) | Hydraulic Conductivity (cm/sec) |
|---|---|---|---|---|---|---|---|
| 19GCL012-12 | Resistex U40 | 0.03 M CaCl2 | 6.3 | 6150 | 0.09 | 1.46E-09 | 5.66E-10 |
| 19GCL012-12 | Resistex U40 | 0.03 M CaCl2 | 6.3 | 6150 | 0.09 | 1.91E-09 | 7.42E-10 |
| 20GCL007-1 roll 1 | Resistex U40 | 0.03 M CaCl2 | 6.3 | 6120 | 0.09 | 2.73E-09 | 1.31E-09 |
| 20GCL002-4 roll 2 | Resistex U40 | 0.03 M CaCl2 | 6.3 | 6150 | 0.09 | 7.01E-09 | 2.42E-09 |
| | | | | | | | |
| 20GCL002-4 roll 2-1 | Resistex U40 | Confidential | 10.98 | 46800 | 1.05 | 1.88E-09 | 9.40E-10 |
| 20GCL002-4 roll 2- repeat 3 | Resistex U40 | Confidential | 10.98 | 46800 | 1.05 | 1.81E-09 | 9.45E-10 |
| 20GCL002-4 roll 2-1 | Resistex U40 | Confidential | 10.98 | 46800 | 1.05 | 2.07E-09 | 1.18E-09 |
| 20GCL002-4 roll 8A Center | Resistex U40 | Confidential | 10.98 | 46800 | 1.05 | 4.46E-09 | 1.93E-09 |
| 20GCL002-4 roll 2 North | Resistex U40 | Confidential | 10.98 | 46800 | 1.05 | 4.38E-09 | 2.00E-09 |

Regards,

Tom Hauck

Northern GeoSystems, Inc. (Representing CETCO)
248-652-9274
248-318-1102 (cell)
tom.hauck@northerngeosystems.com

**From:** Kent Jett <kent@lonestarlining.com>
**Sent:** Wednesday, June 09, 2021 8:34 AM
**To:** Thomas Hauck <Tom.Hauck@northerngeosystems.com>
**Subject:** Oak Grove Perm tests

Any luck with these?

Kent Jett
Lone Star Lining Company

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immediately and delete it without making a copy, nor disclosing its content, nor taking any action based thereon. Thank you.

**From:** Kent Jett
**Sent:** Monday, June 7, 2021 1:42 PM
**To:** Thomas Hauck <Tom.Hauck@northerngeosystems.com>
**Subject:** RE: [External] FW: Prescan MQA/MQC for Lone Star Lining / Luminant FGD A Pond Retrofit at the Oak Grove Steam Electric Station - 55056648

Can you send all you have on the U40? Thanks

Kent Jett
Lone Star Lining Company

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**From:** Thomas Hauck <Tom.Hauck@northerngeosystems.com>
**Sent:** Monday, June 7, 2021 12:57 PM
**To:** Kent Jett <kent@lonestarlining.com>
**Subject:** RE: [External] FW: Prescan MQA/MQC for Lone Star Lining / Luminant FGD A Pond Retrofit at the Oak Grove Steam Electric Station - 55056648

Kent-

Since the Resistex U40 is a new (latest) generation polymer modified GCL, we don't have 20 previous production week perm tests with this product. We can provide our last 20 perm tests on our standard GCL materials, however, the standard GCLs are specified to have perms values less than 5x10-9 cm/sec not 3x10-9 cm/sec.

Regards,

Tom Hauck

Northern GeoSystems, Inc. (Representing CETCO)
248-652-9274
248-318-1102 (cell)
tom.hauck@northerngeosystems.com

**From:** Kent Jett <kent@lonestarlining.com>
**Sent:** Monday, June 07, 2021 1:02 PM
**To:** Thomas Hauck <Tom.Hauck@northerngeosystems.com>
**Subject:** FW: [External] FW: Prescan MQA/MQC for Lone Star Lining / Luminant FGD A Pond Retrofit at the Oak Grove Steam Electric Station - 55056648

Please see below

Kent Jett
Lone Star Lining Company

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**From:** Franco, Samuel <SFranco@scsengineers.com>
**Sent:** Monday, June 7, 2021 11:55 AM
**To:** Kent Jett <kent@lonestarlining.com>
**Cc:** Murray, JRoy <JMurray@scsengineers.com>
**Subject:** RE: [External] FW: Prescan MQA/MQC for Lone Star Lining / Luminant FGD A Pond Retrofit at the Oak Grove Steam Electric Station - 55056648

Hi Kent,

The perm result for the GCL for Oak Grove meets the required value. However, as stated in the Liner Quality Control Plan, the hydraulic conductivity test results should include the last 20 test values, ending on production date of the supplied GCL, see page 7 of the attached LQCP.

Can you have CETCO include the last 20 perm tests as part of their submittal?

Let me know if you have any comments or questions.

Thanks,

Samuel Franco, P.E.

Project Professional
**SCS ENGINEERS**
12651 Briar Forest Dr., Suite 205
Office (817) 358-6163
Cell (956)693-0232
Fax (281) 293-7878

**From:** Murray, JRoy <JMurray@scsengineers.com>
**Sent:** Monday, June 7, 2021 11:31 AM
**To:** Franco, Samuel <SFranco@scsengineers.com>
**Subject:** FW: [External] FW: Prescan MQA/MQC for Lone Star Lining / Luminant FGD A Pond Retrofit at the Oak Grove Steam Electric Station - 55056648

J. Roy Murray, P.E.

**From:** Kent Jett <kent@lonestarlining.com>
**Sent:** Monday, June 7, 2021 6:54 AM
**To:** Murray, JRoy <JMurray@scsengineers.com>
**Cc:** Eddie Noak <EddieNoak@msirockdale.com>
**Subject:** FW: [External] FW: Prescan MQA/MQC for Lone Star Lining / Luminant FGD A Pond Retrofit at the Oak Grove Steam Electric Station - 55056648

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GCL perm test results

Kent Jett
Lone Star Lining Company

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**From:** Thomas Hauck <Tom.Hauck@northerngeosystems.com>
**Sent:** Monday, June 7, 2021 6:16 AM
**To:** Kent Jett <kent@lonestarlining.com>
**Subject:** FW: [External] FW: Prescan MQA/MQC for Lone Star Lining / Luminant FGD A Pond Retrofit at the Oak Grove Steam Electric Station - 55056648

Kent-

Here's the perm test results.

Regards,

Tom Hauck

Northern GeoSystems, Inc. (Representing CETCO)
248-652-9274
248-318-1102 (cell)
tom.hauck@northerngeosystems.com

**From:** Ryan Nicholls <Ryan.Nicholls@mineralstech.com>
**Sent:** Monday, June 07, 2021 2:38 AM
**To:** Thomas Hauck <Tom.Hauck@northerngeosystems.com>
**Subject:** RE: [External] FW: Prescan MQA/MQC for Lone Star Lining / Luminant FGD A Pond Retrofit at the Oak Grove Steam Electric Station - 55056648

Here are the results.

**From:** Thomas Hauck [mailto:Tom.Hauck@northerngeosystems.com]
**Sent:** Thursday, June 03, 2021 6:09 AM
**To:** Ryan Nicholls <Ryan.Nicholls@mineralstech.com>
**Subject:** [External] FW: Prescan MQA/MQC for Lone Star Lining / Luminant FGD A Pond Retrofit at the Oak Grove Steam Electric Station - 55056648

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# Geomembrane

SOLMAX

# LIST OF GEOMEMBRANE ROLLS

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NUMBER: 22121-SOLMAX1

REFERENCE NUMBER: SO-091746

PACKING SLIP NUMBER: Pre-SO-091746-3

PROJECT NAME : OAK GROVE FGD

| ROLL NUMBER | RESIN LOT NUMBER | MANUFACT. DATE | RESIN MELT INDEX 190/2.16 g/10 min D1238 | RESIN DENSITY g/cc D1505 | OIT min D3895 | HPOIT min D5885 | ESCR SP-NCTL hours D5397 |
|---|---|---|---|---|---|---|---|
| **Product Code : 1101547** | | | | | | | |
| **HDPE 60 mil Black Textured** | | | **1.0** | **> 0.932** | **100** | | **500** |
| 0102-198266 | 20C1308 | 2020-06-18 | 0.07 | 0.938 | 120 | | >500 Certified 0101-200292 |
| 0102-199418 | 20E1328 | 2020-09-08 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199421 | 20E1328 | 2020-09-08 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199423 | 20E1328 | 2020-09-09 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199428 | 20E1328 | 2020-09-09 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199430 | 20E1327 | 2020-09-09 | 0.06 | 0.938 | 120 | | >500 Certified 0102-199432 |
| 0102-199432 | 20E1327 | 2020-09-09 | 0.06 | 0.938 | 120 | | >500 Certified 0102-199432 |
| 0102-200273 | 20J1249 | 2021-04-02 | 0.08 | 0.939 | 120 | | >500 Certified 0102-200286 |
| 0102-200397 | D661L3PL3B | 2021-04-11 | 0.11 | 0.937 | 120 | | >500 Certified 0108-207291 |
| 0102-200647 | 21C1073 | 2021-05-02 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200648 | 21C1073 | 2021-05-02 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200649 | 21C1073 | 2021-05-02 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200650 | 21C1073 | 2021-05-03 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200651 | 21C1073 | 2021-05-03 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200652 | 21C1073 | 2021-05-03 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200654 | 21C1073 | 2021-05-03 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |

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**Solmax Geosynthetics LLC**
19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

**SOLMAX.COM**

SOLMAX

# LIST OF GEOMEMBRANE ROLLS

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NUMBER: 22121-SOLMAX1

REFERENCE NUMBER: SO-091746

PACKING SLIP NUMBER: Pre-SO-091746-3

PROJECT NAME : OAK GROVE FGD

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0102-200655 | 21C1073 | 2021-05-03 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200656 | 21C1073 | 2021-05-03 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200657 | 21C1073 | 2021-05-03 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200658 | 21C1073 | 2021-05-03 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200659 | 21C1073 | 2021-05-03 | 0.09 | 0.938 | 120 | | >500 Certified 0102-200619 |
| 0102-200662 | 20J1245 | 2021-05-03 | 0.10 | 0.938 | 120 | | >500 Certified 0108-207564 |
| 0102-200663 | 20J1245 | 2021-05-04 | 0.10 | 0.938 | 120 | | >500 Certified 0108-207564 |
| 0102-200664 | 20J1245 | 2021-05-04 | 0.10 | 0.938 | 120 | | >500 Certified 0108-207564 |
| 0102-200665 | 20J1245 | 2021-05-04 | 0.10 | 0.938 | 120 | | >500 Certified 0108-207564 |
| 0102-200666 | 20J1245 | 2021-05-04 | 0.10 | 0.938 | 120 | | >500 Certified 0108-207564 |
| 0102-200667 | 20J1245 | 2021-05-04 | 0.10 | 0.938 | 120 | | >500 Certified 0108-207564 |
| 0102-200668 | 20J1245 | 2021-05-04 | 0.10 | 0.938 | 120 | | >500 Certified 0108-207564 |
| 0102-200669 | 20J1245 | 2021-05-04 | 0.10 | 0.938 | 120 | | >500 Certified 0108-207564 |
| 0102-200671 | 20J1245 | 2021-05-04 | 0.10 | 0.938 | 120 | | >500 Certified 0108-207564 |
| 0107-180010 | 20G1366 | 2020-10-22 | 0.07 | 0.938 | 120 | | >500 Certified 0104-199296 |
| 0107-180012 | 20G1366 | 2020-10-22 | 0.07 | 0.938 | 120 | | >500 Certified 0104-199296 |
| 0107-180013 | 20G1344 | 2020-10-27 | 0.08 | 0.938 | 140.0 | | >500 Certified 0104-199441 |
| 0107-180016 | 20G1344 | 2020-10-27 | 0.08 | 0.938 | 140.0 | | >500 Certified 0104-199441 |
| 0107-180017 | 20G1344 | 2020-10-27 | 0.08 | 0.938 | 140.0 | | >500 Certified 0104-199441 |
| 0107-180018 | 20G1344 | 2020-10-27 | 0.08 | 0.938 | 140.0 | | >500 Certified 0104-199441 |
| 102191807 | 18G1300 | 2020-04-17 | 0.08 | 0.938 | 140 | | >500 Certified 101194989 |

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**Solmax Geosynthetics LLC**
19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

SOLMAX

# LIST OF GEOMEMBRANE ROLLS

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NUMBER: 22121-SOLMAX1

REFERENCE NUMBER: SO-091746

PACKING SLIP NUMBER: Pre-SO-091746-3

PROJECT NAME : OAK GROVE FGD

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 104197182 | 19J1008 | 2020-04-17 | 0.06 | 0.938 | 120 | | >500 Certified PASS |
| 105197550 | 19J1007 | 2020-04-17 | 0.07 | 0.939 | 120 | | >500 Certified 103220745 |
| 108203110 | 19G1020 | 2020-04-17 | 0.07 | 0.937 | 140 | | >500 Certified 107176252 |

**QUANTITY (ROLLS): 40**

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**Solmax Geosynthetics LLC**
19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

**SOLMAX.COM**

SOLMAX

# MANUFACTURING QUALITY CONTROL

## TEST RESULTS - ROLLS

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NUMBER: 22121-SOLMAX1

REFERENCE NUMBER: SO-091746

PACKING SLIP NUMBER: Pre-SO-091746-3

**PROJECT NAME :** OAK GROVE FGD

**PRODUCT:** 1101477-04597-1
HDPE 60 mil Black Textured

| Properties | | Thickness ave/min. | GeoM Density | Carbon Black Content | Carbon Black Dispersion | Tensile Yield Strength | Tensile Yield Elong. | Tensile Break Strength | Tensile Break Elong. | Tear Resist. | Puncture Resist. | Dimension Stability | Asperity Height In/Out |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | mils | g/cc | % | Cat 1 and 2 | ppi | % | ppi | % | lbs | lbs | % | mils |
| Test Method | | D5994 | D792 | D4218 | D5596 | D6693 | | | | D1004 | D4833 | D1204 | D7466 |
| Frequency | | Each roll | Every 10 rolls | Every 2 rolls | Every 10 rolls | Every 2 rolls | | | | Every 5 rolls | Every 5 rolls | | Every roll |
| Specification | | 57.0 / 51.0 | ≥ 0.940 | 2.0 - 3.0 | Cat. 1 & Cat. 2 | 132 | 13 | 132 | 150 | 45 | 120 | | 16 / 16 |
| 0102-198266 | MD | 62.2 / 59.0 | 0.947 | 2.62 | 10/10 views | 156.4 | 19.0 | 248 | 610 | 52 | 152 | | 20.2 / 19.6 |
| | XD | | | | | 166.1 | 17.4 | 213 | 553 | 56 | | | |
| 0102-200397 | MD | 62.0 / 59.0 | 0.945 | 2.55 | 10/10 views | 152.6 | 19.9 | 231 | 614 | 54 | 159 | | 23.3 / 19.6 |
| | XD | | | | | 166.6 | 16.9 | 212 | 602 | 51 | | | |
| 102191807 | MD | 67.0 / 62.9 | 0.948 | 2.26 | 10/10 views | 181.0 | 17.7 | 194 | 406 | 62 | 161 | | 23.6 / 20.1 |
| | XD | | | | | 181.0 | 17.4 | 197 | 513 | 58 | | | |
| 104197182 | MD | 67.2 / 62.1 | 0.942 | 2.25 | 10/10 views | 171.0 | 17.8 | 206 | 507 | 60 | 157 | | 32.2 / 34.6 |
| | XD | | | | | 175.0 | 17.5 | 196 | 516 | 59 | | | |
| 105197550 | MD | 64.0 / 62.0 | 0.943 | 2.34 | 10/10 views | 162.0 | 17.3 | 220 | 594 | 58 | 156 | | 21.3 / 26.8 |
| | XD | | | | | 161.0 | 17.2 | 181 | 485 | 55 | | | |
| 108203110 | MD | 61.8 / 56.8 | 0.948 | 2.68 | 10/10 views | 158.0 | 17.2 | 185 | 473 | 57 | 153 | | 28.9 / 28.0 |
| | XD | | | | | 167.0 | 17.6 | 154 | 421 | 53 | | | |

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**Solmax Geosynthetics LLC**
19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

**SOLMAX.COM**

SOLMAX

# MANUFACTURING QUALITY CONTROL

## TEST RESULTS - ROLLS

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NUMBER: 22121-SOLMAX1

REFERENCE NUMBER: SO-091746

PACKING SLIP NUMBER: Pre-SO-091746-3

**PROJECT NAME :** OAK GROVE FGD

**PRODUCT:** 1101547
HDPE 60 mil Black Textured

| Properties | Thickness ave/min. | GeoM Density | Carbon Black Content | Carbon Black Dispersion | Tensile Yield Strength | Tensile Yield Elong. | Tensile Break Strength | Tensile Break Elong. | Tear Resist. | Puncture Resist. | Dimension Stability | Asperity Height In/Out |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | mils | g/cc | % | Cat 1 and 2 | ppi | % | ppi | % | lbs | lbs | % | mils |
| Test Method | D5994 | D792 | D4218 | D5596 | D6693 | | | | D1004 | D4833 | D1204 | D7466 |
| Frequency | Each roll | Every 10 rolls | Every 2 rolls | Every 10 rolls | Every 2 rolls | | | | Every 5 rolls | Every 5 rolls | | Every roll |
| Specification | 57.0 / 51.0 | ≥ 0.940 | 2.0 - 3.0 | Cat. 1 & Cat. 2 | 132 | 13 | 132 | 150 | 45 | 120 | | 16 / 16 |
| 0102-198266 MD | 62.2 / 59.0 | 0.947 | 2.62 | 10/10 views | 156.4 | 19.0 | 248 | 610 | 52 | 152 | | 20.2 / 19.6 |
| XD | | | | | 166.1 | 17.4 | 213 | 553 | 56 | | | |
| 0102-199418 MD | 58.2 / 56.0 | 0.948 | 2.23 | 10/10 views | 150.5 | 19.0 | 225 | 582 | 52 | 147 | | 21.2 / 24.8 |
| XD | | | | | 167.3 | 16.1 | 183 | 466 | 56 | | | |
| 0102-199421 MD | 60.6 / 58.5 | 0.948 | 2.32 | 10/10 views | 157.0 | 17.8 | 191 | 490 | 53 | 149 | | 24.6 / 22.7 |
| XD | | | | | 170.3 | 15.3 | 180 | 451 | 56 | | | |
| 0102-199423 MD | 61.3 / 58.0 | 0.948 | 2.29 | 10/10 views | 164.8 | 17.7 | 231 | 590 | 53 | 149 | | 19.7 / 20.9 |
| XD | | | | | 172.3 | 15.8 | 195 | 522 | 56 | | | |
| 0102-199428 MD | 58.8 / 56.5 | 0.946 | 2.26 | 10/10 views | 155.6 | 17.8 | 212 | 556 | 55 | 149 | | 18.9 / 20.6 |
| XD | | | | | 166.8 | 15.7 | 190 | 531 | 52 | | | |
| 0102-199430 MD | 57.0 / 54.0 | 0.946 | 2.41 | 10/10 views | 156.1 | 18.4 | 231 | 610 | 55 | 149 | | 22.0 / 22.8 |
| XD | | | | | 157.5 | 16.6 | 181 | 433 | 52 | | | |
| 0102-199432 MD | 58.7 / 55.0 | 0.946 | 2.29 | 10/10 views | 161.0 | 18.1 | 204 | 503 | 51 | 144 | | 22.6 / 22.0 |
| XD | | | | | 170.3 | 16.3 | 189 | 487 | 56 | | | |
| 0102-200273 MD | 59.3 / 56.5 | 0.948 | 2.27 | 10/10 views | 157.7 | 18.0 | 218 | 571 | 54 | 150 | | 20.8 / 24.1 |
| XD | | | | | 170.0 | 15.8 | 201 | 564 | 50 | | | |
| 0102-200397 MD | 62.0 / 59.0 | 0.945 | 2.55 | 10/10 views | 152.6 | 19.9 | 231 | 614 | 54 | 159 | | 23.3 / 19.6 |
| XD | | | | | 166.6 | 16.9 | 212 | 602 | 51 | | | |
| 0102-200647 MD | 61.3 / 59.0 | 0.943 | 2.51 | 10/10 views | 156.4 | 18.3 | 257 | 673 | 55 | 152 | | 20.0 / 21.1 |
| XD | | | | | 169.3 | 16.7 | 211 | 546 | 55 | | | |
| 0102-200648 MD | 59.8 / 57.5 | 0.943 | 2.51 | 10/10 views | 156.4 | 18.3 | 257 | 673 | 55 | 152 | | 20.4 / 21.6 |
| XD | | | | | 169.3 | 16.7 | 211 | 546 | 55 | | | |
| 0102-200649 MD | 59.8 / 57.0 | 0.943 | 2.51 | 10/10 views | 152.8 | 19.4 | 237 | 578 | 55 | 152 | | 20.3 / 21.3 |
| XD | | | | | 160.8 | 18.7 | 246 | 604 | 55 | | | |
| 0102-200650 MD | 61.2 / 57.5 | 0.943 | 2.51 | 10/10 views | 152.8 | 19.4 | 237 | 578 | 55 | 152 | | 17.6 / 20.6 |
| XD | | | | | 160.8 | 18.7 | 246 | 604 | 55 | | | |
| 0102-200651 MD | 60.7 / 56.0 | 0.943 | 2.48 | 10/10 views | 159.8 | 17.7 | 240 | 615 | 55 | 152 | | 25.4 / 21.5 |
| XD | | | | | 165.3 | 16.4 | 202 | 538 | 55 | | | |
| 0102-200652 MD | 61.2 / 59.0 | 0.943 | 2.48 | 10/10 views | 159.8 | 17.7 | 240 | 615 | 54 | 146 | | 20.8 / 21.2 |
| XD | | | | | 165.3 | 16.4 | 202 | 538 | 51 | | | |

Solmax is not a design professional and has not performed any design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation or specification.

**Solmax Geosynthetics LLC**
19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

**SOLMAX.COM**

SOLMAX

# MANUFACTURING QUALITY CONTROL

SOLMAX APPROVED QUALITY ASSURANCE

## TEST RESULTS - ROLLS

PROJECT NUMBER: 22121-SOLMAX1

REFERENCE NUMBER: SO-091746

PACKING SLIP NUMBER: Pre-SO-091746-3

**PROJECT NAME :** OAK GROVE FGD

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0102-200654 | MD | 62.2 / 58.5 | 0.943 | 2.49 | 10/10 views | 160.8 | 17.2 | 228 | 575 | 54 | 146 | | 21.2 / 23.5 |
| | XD | | | | | 164.8 | 16.2 | 204 | 521 | 51 | | | |
| 0102-200655 | MD | 60.6 / 57.0 | 0.943 | 2.46 | 10/10 views | 156.7 | 18.0 | 217 | 552 | 54 | 146 | | 23.1 / 22.4 |
| | XD | | | | | 178.3 | 15.2 | 191 | 452 | 51 | | | |
| 0102-200656 | MD | 60.5 / 56.5 | 0.943 | 2.46 | 10/10 views | 156.7 | 18.0 | 217 | 552 | 54 | 146 | | 23.2 / 22.5 |
| | XD | | | | | 178.3 | 15.2 | 191 | 452 | 51 | | | |
| 0102-200657 | MD | 60.9 / 57.0 | 0.946 | 2.50 | 10/10 views | 156.4 | 17.7 | 224 | 571 | 55 | 150 | | 22.4 / 23.8 |
| | XD | | | | | 171.2 | 16.2 | 189 | 477 | 53 | | | |
| 0102-200658 | MD | 59.3 / 56.5 | 0.946 | 2.50 | 10/10 views | 156.4 | 17.7 | 224 | 571 | 55 | 150 | | 21.7 / 22.4 |
| | XD | | | | | 171.2 | 16.2 | 189 | 477 | 53 | | | |
| 0102-200659 | MD | 60.1 / 56.5 | 0.946 | 2.53 | 10/10 views | 149.3 | 19.0 | 225 | 597 | 55 | 150 | | 20.2 / 22.3 |
| | XD | | | | | 163.1 | 16.2 | 193 | 511 | 53 | | | |
| 0102-200662 | MD | 62.5 / 60.5 | 0.946 | 2.53 | 10/10 views | 149.3 | 19.0 | 225 | 597 | 55 | 150 | | 20.4 / 21.7 |
| | XD | | | | | 163.1 | 16.2 | 193 | 511 | 53 | | | |
| 0102-200663 | MD | 60.5 / 57.0 | 0.946 | 2.41 | 10/10 views | 155.0 | 19.1 | 220 | 571 | 55 | 150 | | 23.6 / 23.4 |
| | XD | | | | | 168.6 | 15.6 | 201 | 556 | 53 | | | |
| 0102-200664 | MD | 61.7 / 58.5 | 0.946 | 2.41 | 10/10 views | 155.0 | 19.1 | 220 | 571 | 55 | 160 | | 21.4 / 23.9 |
| | XD | | | | | 168.6 | 15.6 | 201 | 556 | 52 | | | |
| 0102-200665 | MD | 61.4 / 58.0 | 0.946 | 2.51 | 10/10 views | 157.4 | 17.4 | 222 | 578 | 55 | 160 | | 21.9 / 23.5 |
| | XD | | | | | 171.5 | 15.8 | 202 | 544 | 52 | | | |
| 0102-200666 | MD | 60.3 / 58.0 | 0.946 | 2.51 | 10/10 views | 157.4 | 17.4 | 222 | 578 | 55 | 160 | | 21.9 / 21.6 |
| | XD | | | | | 171.5 | 15.8 | 202 | 544 | 52 | | | |
| 0102-200667 | MD | 60.5 / 58.5 | 0.946 | 2.49 | 10/10 views | 155.2 | 16.1 | 217 | 559 | 55 | 160 | | 23.0 / 22.3 |
| | XD | | | | | 166.7 | 15.5 | 192 | 513 | 52 | | | |
| 0102-200668 | MD | 60.7 / 59.5 | 0.946 | 2.49 | 10/10 views | 155.2 | 16.1 | 217 | 559 | 55 | 160 | | 22.9 / 21.9 |
| | XD | | | | | 166.7 | 15.5 | 192 | 513 | 52 | | | |
| 0102-200669 | MD | 61.7 / 58.5 | 0.946 | 2.57 | 10/10 views | 156.4 | 17.8 | 216 | 559 | 54 | 156 | | 24.5 / 23.1 |
| | XD | | | | | 170.3 | 16.1 | 206 | 541 | 51 | | | |
| 0102-200671 | MD | 61.5 / 58.0 | 0.946 | 2.53 | 10/10 views | 150.1 | 18.5 | 231 | 592 | 54 | 156 | | 21.7 / 20.6 |
| | XD | | | | | 171.4 | 16.7 | 200 | 540 | 51 | | | |
| 0107-180010 | MD | 62.4 / 60.0 | 0.944 | 2.88 | 10/10 views | 154.0 | 18.7 | 224 | 572 | 54 | 157 | | 24.4 / 29.3 |
| | XD | | | | | 160.6 | 17.4 | 200 | 533 | 56 | | | |
| 0107-180012 | MD | 62.3 / 55.5 | 0.944 | 2.88 | 10/10 views | 154.0 | 18.7 | 224 | 572 | 54 | 157 | | 22.7 / 23.2 |
| | XD | | | | | 160.6 | 17.4 | 200 | 533 | 56 | | | |
| 0107-180013 | MD | 59.2 / 54.0 | 0.944 | 2.88 | 10/10 views | 154.0 | 18.7 | 224 | 572 | 54 | 157 | | 20.9 / 21.8 |
| | XD | | | | | 160.6 | 17.4 | 200 | 533 | 56 | | | |
| 0107-180016 | MD | 58.2 / 56.0 | 0.944 | 2.71 | 10/10 views | 153.9 | 18.6 | 224 | 588 | 54 | 157 | | 19.9 / 22.2 |
| | XD | | | | | 154.8 | 17.2 | 195 | 547 | 56 | | | |
| 0107-180017 | MD | 57.8 / 55.5 | 0.944 | 2.71 | 10/10 views | 153.9 | 18.6 | 224 | 588 | 54 | 157 | | 24.3 / 23.5 |
| | XD | | | | | 154.8 | 17.2 | 195 | 547 | 56 | | | |
| 0107-180018 | MD | 58.4 / 54.5 | 0.944 | 2.66 | 10/10 views | 148.4 | 18.4 | 219 | 586 | 50 | 151 | | 21.0 / 24.1 |

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# MANUFACTURING QUALITY CONTROL

## TEST RESULTS - ROLLS

PROJECT NUMBER: 22121-SOLMAX1

REFERENCE NUMBER: SO-091746

PACKING SLIP NUMBER: Pre-SO-091746-3

**PROJECT NAME :** OAK GROVE FGD

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | XD | | | | | 154.2 | 17.3 | 188 | 527 | 53 | | | |
| 102191807 | MD | 67.0 / 62.9 | 0.948 | 2.26 | 10/10 views | 181.0 | 17.7 | 194 | 406 | 62 | 161 | | 23.6 / 20.1 |
| | XD | | | | | 181.0 | 17.4 | 197 | 513 | 58 | | | |
| 104197182 | MD | 67.2 / 62.1 | 0.942 | 2.25 | 10/10 views | 171.0 | 17.8 | 206 | 507 | 60 | 157 | | 32.2 / 34.6 |
| | XD | | | | | 175.0 | 17.5 | 196 | 516 | 59 | | | |
| 105197550 | MD | 64.0 / 62.0 | 0.943 | 2.34 | 10/10 views | 162.0 | 17.3 | 220 | 594 | 58 | 156 | | 21.3 / 26.8 |
| | XD | | | | | 161.0 | 17.2 | 181 | 485 | 55 | | | |
| 108203110 | MD | 61.8 / 56.8 | 0.948 | 2.68 | 10/10 views | 158.0 | 17.2 | 185 | 473 | 57 | 153 | | 28.9 / 28.0 |
| | XD | | | | | 167.0 | 17.6 | 154 | 421 | 53 | | | |

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# MANUFACTURING QUALITY CONTROL

## TEST RESULTS - ROLLS

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NUMBER: 22121-SOLMAX1

REFERENCE NUMBER: SO-091746

PACKING SLIP NUMBER: Pre-SO-091746-3

**PROJECT NAME :** OAK GROVE FGD

**PRODUCT:** 1101548-15841-2
HDPE 60 mil Black Textured

| Properties | | Thickness ave/min. | GeoM Density | Carbon Black Content | Carbon Black Dispersion | Tensile Yield Strength | Tensile Yield Elong. | Tensile Break Strength | Tensile Break Elong. | Tear Resist. | Puncture Resist. | Dimension Stability | Asperity Height In/Out |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | mils | g/cc | % | Cat 1 and 2 | ppi | % | ppi | % | lbs | lbs | % | mils |
| Test Method | | D5994 | D792 | D4218 | D5596 | D6693 | | | | D1004 | D4833 | D1204 | D7466 |
| Frequency | | Each roll | Every 10 rolls | Every 2 rolls | Every 10 rolls | Every 2 rolls | | | | Every 5 rolls | Every 5 rolls | | Every roll |
| Specification | | 57.0 / 51.0 | ≥ 0.940 | 2.0 - 3.0 | Cat. 1 & Cat. 2 | 132 | 13 | 132 | 150 | 45 | 120 | | 16 / 16 |
| 0102-198266 | MD | 62.2 / 59.0 | 0.947 | 2.62 | 10/10 views | 156.4 | 19.0 | 248 | 610 | 52 | 152 | | 20.2 / 19.6 |
| | XD | | | | | 166.1 | 17.4 | 213 | 553 | 56 | | | |
| 0102-200397 | MD | 62.0 / 59.0 | 0.945 | 2.55 | 10/10 views | 152.6 | 19.9 | 231 | 614 | 54 | 159 | | 23.3 / 19.6 |
| | XD | | | | | 166.6 | 16.9 | 212 | 602 | 51 | | | |
| 102191807 | MD | 67.0 / 62.9 | 0.948 | 2.26 | 10/10 views | 181.0 | 17.7 | 194 | 406 | 62 | 161 | | 23.6 / 20.1 |
| | XD | | | | | 181.0 | 17.4 | 197 | 513 | 58 | | | |
| 104197182 | MD | 67.2 / 62.1 | 0.942 | 2.25 | 10/10 views | 171.0 | 17.8 | 206 | 507 | 60 | 157 | | 32.2 / 34.6 |
| | XD | | | | | 175.0 | 17.5 | 196 | 516 | 59 | | | |
| 105197550 | MD | 64.0 / 62.0 | 0.943 | 2.34 | 10/10 views | 162.0 | 17.3 | 220 | 594 | 58 | 156 | | 21.3 / 26.8 |
| | XD | | | | | 161.0 | 17.2 | 181 | 485 | 55 | | | |
| 108203110 | MD | 61.8 / 56.8 | 0.948 | 2.68 | 10/10 views | 158.0 | 17.2 | 185 | 473 | 57 | 153 | | 28.9 / 28.0 |
| | XD | | | | | 167.0 | 17.6 | 154 | 421 | 53 | | | |

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Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

2 FORMOSA DRIVE
P BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
19103 GUNDLE RD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR FPAX214516
CLEANING/INSPECTION NO: 214516032520

S/O NO : EV4B173
CUSTOMER PO : 03-518760
DATE SHIPPED: 5/21/20
LOT NO : 20C1308
WEIGHT (LB) : 197,800.00
CUSTID:FT03112 SPIDE3

DATE OF PROD: 3/27/20

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .074 |
| HLMI, g/10 min. | ASTM D1238 | 11.0 |
| Density, g/cm3 | ASTM D1505 | .9375 |

Notes:
t OIT (>120 min. ) and HP-OIT (>1000 min.) Values are based on the l
ot having the Minimum Additive Levels ( Antioxidants and UV) in the HL
3812 specification. OIT and HP-OIT values are not tested for every lo
t.

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS


201 FORMOSA DRIVE
PO BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3


## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
19103 GUNDLE RD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR TCLX058039
CLEANING/INSPECTION NO: 058039052720

S/O NO : EV6A187
CUSTOMER PO : 03-519089
DATE SHIPPED: 6/30/20
LOT NO : 20E1328
WEIGHT (LB) : 187,850.00
CUSTID:FT03112 SPIDE3

DATE OF PROD: 5/28/20

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .066 |
| HLMI, g/10 min. | ASTM D1238 | 10.1 |
| Density, g/cm3 | ASTM D1505 | .9378 |

Notes:
The OIT (>120 min. ) and HP-OIT (>1000 min.) Values are based on the 1 lot having the Minimum Additive Levels ( Antioxidants and UV) in the HL 3812 specification. OIT and HP-OIT values are not tested for every lot.

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

201 FORMOSA DRIVE
PO BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
19103 GUNDLE RD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR GACX054691
CLEANING/INSPECTION NO: 054691052720

S/O NO : EV6A186
CUSTOMER PO : 03-519089
DATE SHIPPED: 6/30/20
LOT NO : 20E1327
WEIGHT (LB) : 196,650.00
CUSTID:FT03112 SPIDE3

DATE OF PROD: 5/28/20

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .063 |
| HLMI, g/10 min. | ASTM D1238 | 9.65 |
| Density, g/cm3 | ASTM D1505 | .9378 |

Notes:
The OIT (>120 min. ) and HP-OIT (>1000 min.) Values are based on the lot having the Minimum Additive Levels ( Antioxidants and UV) in the HL 3812 specification. OIT and HP-OIT values are not tested for every lot.

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

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POINT COMFORT TX 77978

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## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
19103 GUNDLE RD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR FPAX980221

S/O NO : EW3A119
CUSTOMER PO : 602395
DATE SHIPPED: 3/15/21
LOT NO : 20J1249
WEIGHT (LB) : 195,400.00
CUSTID:FT03112 SPIDM6
DATE OF PROD: 10/26/20

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .075 |
| HLMI, g/10 min. | ASTM D1238 | 12.2 |
| Density, g/cm3 | ASTM D1505 | .9385 |

Notes:
the OIT (>120 min. ) and HP-OIT (>1000 min.) Values are based on the l
c having the Minimum Additive Levels ( Antioxidants and UV) in the HL
3812 specification. OIT and HP-OIT values are not tested for every lo
t.

Linda Kao

QC SUPERVISOR: LINDA KAO

THE DOW CHEMICAL COMPANY

GSE ENVIRONMENTAL LLC
19103 GUNDLE RD.
HOUSTON TX 77073-3515

Ship From: SEADRIFT
Texas, United States

## Certificate of Analysis

Product Name

DOW™ DGDA-5310 NT MDPE GMB Resin

| | |
|---|---|
| Delivery No. | 820678658 / 000010 |
| Order Number | 112310527 |
| Shipping Units | 193449.999 LB |
| Date Shipped | 2021-03-29 (YYYY-MM-DD) |
| Shipment No. | 38587213 |

## Customer Information

| | |
|---|---|
| Customer Name | GSE ENVIRONMENTAL LLC |
| Customer PO number | 602533-4 |
| Container ID | DOWX060185 |
| Specification Number | 000000456148 |

| | |
|---|---|
| Batch Number | D661L3PL3B |
| Manufacturing Date | 2021-03-25 (YYYY-MM-DD) |
| Net Weight | 193449.999 LB / 87747.372 KG |

| Test | Unit | Lower Limit | Upper Limit | Value | Method |
|---|---|---|---|---|---|
| **Melt Flow Rate** @190degC/21.6kg | dg/min | 9.0 | 12.0 | 10.5 | ASTM D1238 |
| **Melt Flow Ratio** I21.6/I5.0 | | 20.0 | 40.0 | 27.7 | ASTM D1238 |
| **Density** ASTM D4703, A1 Proc C, Test within 1 hr | g/cm3 | 0.9350 | 0.9390 | 0.9375 | ASTM D792 |

For inquiries please contact Customer Service or local sales

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P BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:SOLMAX GEOSYNTHETICS LLC
19103 GUNDLE ROAD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR FPAX219843

S/O NO : EW4A173
CUSTOMER PO : 602819
DATE SHIPPED: 4/16/21
LOT NO : 21C1073
WEIGHT (LB) : 195,750.00
CUSTID:FT03112 SPIDM6

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .085 |
| HLMI, g/10 min. | ASTM D1238 | 11.4 |
| Density, g/cm3 | ASTM D1505 | .9376 |

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

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PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
19103 GUNDLE RD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR UTCX051496
CLEANING/INSPECTION NO: 051496102220

S/O NO : EW3A121
CUSTOMER PO : 602395
DATE SHIPPED: 3/16/21
LOT NO : 20J1245
WEIGHT (LB) : 196,350.00
CUSTID:FT03112 SPIDM6

DATE OF PROD: 10/23/20

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .096 |
| HLMI, g/10 min. | ASTM D1238 | 13.5 |
| Density, g/cm3 | ASTM D1505 | .9382 |

Notes:
t OIT (>120 min. ) and HP-OIT (>1000 min.) Values are based on the l
ot having the Minimum Additive Levels ( Antioxidants and UV) in the HL
3812 specification. OIT and HP-OIT values are not tested for every lo
t.

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

2 FORMOSA DRIVE
P BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

# Certificate of Analysis

(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
19103 GUNDLE RD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR FPAX980552
CLEANING/INSPECTION NO: 980552073120

S/O NO : EV8A183
CUSTOMER PO : 03-519604
DATE SHIPPED: 8/31/20
LOT NO : 20G1366
WEIGHT (LB) : 196,250.00
CUSTID:FT03112 SPIDE3

DATE OF PROD: 7/31/20

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .070 |
| HLMI, g/10 min. | ASTM D1238 | 10.5 |
| Density, g/cm3 | ASTM D1505 | .9379 |

Notes:
t OIT (>120 min. ) and HP-OIT (>1000 min.) Values are based on the l
ot having the Minimum Additive Levels ( Antioxidants and UV) in the HL
3812 specification. OIT and HP-OIT values are not tested for every lo
t.

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

2 FORMOSA DRIVE
P. BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
19103 GUNDLE RD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR FPAX200799
CLEANING/INSPECTION NO: 200799072920

S/O NO : EV6B239
CUSTOMER PO : 03-519268
DATE SHIPPED: 7/31/20
LOT NO : 20G1344
WEIGHT (LB) : 196,350.00
CUSTID:FT03112 SPIDE3

DATE OF PROD: 7/30/20

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .083 |
| HLMI, g/10 min. | ASTM D1238 | 10.7 |
| Density, g/cm3 | ASTM D1505 | .9376 |

Notes:
t OIT (>120 min. ) and HP-OIT (>1000 min.) Values are based on the 1
ot having the Minimum Additive Levels ( Antioxidants and UV) in the HL
3812 specification. OIT and HP-OIT values are not tested for every lo
t.

Linda Kao

QC SUPERVISOR: LINDA KAO

# Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS
2[illegible] FORMOSA DRIVE
P[illegible] BOX 700
POINT COMFORT TX 77978
PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
UP TRACK 14732 WESTFIELD
19103 GUNDLE ROAD
HOUSTON TX 77070
PRODUCT :HL3812
RAILCAR FPAX200846
CLEANING/INSPECTION NO: 200846070119

S/O NO : EU6A803
CUSTOMER PO : 03-516335
DATE SHIPPED: 7/23/19
LOT NO : 19G1020
WEIGHT (LB) : 196,450.00
CUSTID:FT03112 SPIDE3

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .070 |
| HLMI, g/10 min. | ASTM D1238 | 10.3 |
| Density, g/cm3 | ASTM D1505 | .9374 |

Notes:
N[illegible]s: Additive levels were tested and meet the min specification for this lot As a result Standard OIT (by ASTM D3895) is greater than 120 mins ( nominal values not tested on every lot). As a result, High Pressure OI T (by ASTM D5885) is greater than 1000 mins.

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

2 FORMOSA DRIVE
P BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
19103 GUNDLE ROAD
UP TRACK 14732 WESTFIELD
HOUSTON TX 77070
PRODUCT :HL3812
RAILCAR FPAX200952
CLEANING/INSPECTION NO: 200952100119

S/O NO : EUAA469
CUSTOMER PO : 03-517199
DATE SHIPPED: 10/25/19
LOT NO : 19J1007
WEIGHT (LB) : 199,150.00
CUSTID:FT03112 SPIDE3

DATE OF PROD: 10/02/19

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .073 |
| HLMI, g/10 min. | ASTM D1238 | 11.9 |
| Density, g/cm3 | ASTM D1505 | .9385 |

Notes:
t OIT (>120 min. ) and HP-OIT (>1000 min.) Values are based on the l
ot having the Minimum Additive Levels ( Antioxidants and UV) in the HL
3812 specification. OIT and HP-OIT values are not tested for every lo
t.

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

2[illegible] FORMOSA DRIVE
P[illegible] BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
19103 GUNDLE ROAD
UP TRACK 14732 WESTFIELD
HOUSTON TX 77070
PRODUCT :HL3812
RAILCAR FPAX218121
CLEANING/INSPECTION NO: 218121100119

S/O NO : EUAA471
CUSTOMER PO : 03-517199
DATE SHIPPED: 10/25/19
LOT NO : 19J1008
WEIGHT (LB) : 198,300.00
CUSTID:FT03112 SPIDE3

DATE OF PROD: 10/02/19

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .075 |
| HLMI, g/10 min. | ASTM D1238 | 11.6 |
| Density, g/cm3 | ASTM D1505 | .9382 |

Notes:
t[illegible]OIT (>120 min. ) and HP-OIT (>1000 min.) Values are based on the l
o[illegible]having the Minimum Additive Levels ( Antioxidants and UV) in the HL
3812 specification. OIT and HP-OIT values are not tested for every lo
t.

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

2[illegible] FORMOSA DRIVE
P[illegible] BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

# Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
UP TRACK 14732 WESTFIELD
19103 GUNDLE ROAD
HOUSTON TX 77070
PRODUCT :HL3812
RAILCAR GACX074338
CLEANING/INSPECTION NO: 074338072618

S/O NO : ETAA043
CUSTOMER PO : 03-513918
DATE SHIPPED: 10/25/18
LOT NO : 18G1300
WEIGHT (LB) : 188,950.00
CUSTID:FT03112 SPIDE3

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .080 |
| HLMI, g/10 min. | ASTM D1238 | 12.0 |
| Density, g/cm3 | ASTM D1505 | .9378 |

Notes:
N[illegible]s: Additive levels were tested and meet the min specification for th[illegible]s lot As a result Standard OIT (by ASTM D3895) is greater than 120 mins ( nominal values not tested on every lot). As a result, High Pres sure OI T (by ASTM D5885) is greater than 1000 mins.

Linda Kao

QC SUPERVISOR: LINDA KAO

SOLMAX

USA, June 9th, 2021

| | |
|---|---|
| **Project Name:** | OAK GROVE FGD |
| **Customer PO:** | 22121-SOLMAX1 |
| **Solmax Order:** | SO-091746 |
| **ATTN:** | Lone Star Lining Company<br>Mr. Samuel Franco |

To whom it may concern,

Solmax International hereby certifies that 1101547 (HDPE 60 mil Black Textured) geomembranes supplied for the above-mentioned project complies with the following project's specifications.

| Roll Number Tested | Start Date | End Date | Specification | Pass/Fail |
|---|---|---|---|---|
| 0102-200619 | 5/25/2021 | 6/21/2021 | 500 hrs | PASS |
| 0108-207564 | 4/20/2021 | 5/21/2021 | 500 hrs | PASS |
| 0104-199296 | 11/02/2020 | 12/03/2020 | 500 hrs | PASS |
| 0104-199441 | 10/30/2020 | 11/26/2020 | 500 hrs | PASS |
| 101194989 | 12/18/2018 | 01/29/2019 | 500 hrs | PASS |
| 103220745 | 12/19/2018 | 01/30/2019 | 500 hrs | PASS |
| 107176252 | 8/27/2019 | 10/08/2021 | 500 hrs | PASS |
| 104197182 | 12/19/2018 | 01/30/2019 | 500 hrs | PASS |

Hoping the above information is satisfactory. Please, do not hesitate to contact us if you require any additional information.

Sincerely,

Jeremy Stephenson

**Jeremy Stephenson**
*Lab Supervisor*

T +1 800 435-2008

SOLMAX GEOSYNTHETICS, LLC
19105 GUNDLE ROAD, HOUSTON, TX 77073, USA

SOLMAX

# LIST OF GEOMEMBRANE ROLLS

PROJECT NUMBER: 2210

REFERENCE NUMBER: SO-091323

PACKING SLIP NUMBER: Pre-SO-091323-2

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NAME : US ECOLOGY CELL 51 PHASE II LSLC

| ROLL NUMBER | RESIN LOT NUMBER | MANUFACT. DATE | RESIN MELT INDEX 190/2.16 g/10 min D1238 | RESIN DENSITY g/cc D1505 | OIT min D3895 | HPOIT min D5885 | ESCR SP-NCTL hours D5397 |
|---|---|---|---|---|---|---|---|
| **Product Code : 1101547** | | | | | | | |
| **HDPE 60 mil Black Textured** | | | **1.0** | **> 0.932** | **100** | | **500** |
| 0102-199383 | 20E1328 | 2020-09-06 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199384 | 20E1328 | 2020-09-06 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199385 | 20E1328 | 2020-09-06 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199386 | 20E1328 | 2020-09-06 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199387 | 20E1328 | 2020-09-06 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199388 | 20E1328 | 2020-09-06 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199389 | 20E1328 | 2020-09-06 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199390 | 20E1328 | 2020-09-06 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199391 | 20E1328 | 2020-09-06 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199392 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199393 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199394 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199395 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199396 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199397 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199398 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |

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**Solmax Geosynthetics LLC**
19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

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# LIST OF GEOMEMBRANE ROLLS

PROJECT NUMBER: 2210

REFERENCE NUMBER: SO-091323

PACKING SLIP NUMBER: Pre-SO-091323-2

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NAME : US ECOLOGY CELL 51 PHASE II LSLC

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0102-199399 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199400 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199401 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199402 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |
| 0102-199403 | 20E1328 | 2020-09-07 | 0.07 | 0.938 | 120 | | >500 Certified 0102-199394 |

**QUANTITY (ROLLS): 21**

Solmax is not a design professional and has not performed any design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation or specification.

**Solmax Geosynthetics LLC**
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**SOLMAX.COM**

# MANUFACTURING QUALITY CONTROL

## TEST RESULTS - ROLLS

PROJECT NUMBER: 2210

REFERENCE NUMBER: SO-091323

PACKING SLIP NUMBER: Pre-SO-091323-2

**PROJECT NAME :** US ECOLOGY CELL 51 PHASE II LSLC

**PRODUCT:** 1101547
HDPE 60 mil Black Textured

| Properties | Thickness ave/min. | GeoM Density | Carbon Black Content | Carbon Black Dispersion | Tensile Yield Strength | Tensile Yield Elong. | Tensile Break Strength | Tensile Break Elong. | Tear Resist. | Puncture Resist. | Dimension Stability | Asperity Height In/Out |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | mils | g/cc | % | Cat 1 and 2 | ppi | % | ppi | % | lbs | lbs | % | mils |
| Test Method | D5994 | D792 | D4218 | D5596 | D6693 | | | | D1004 | D4833 | D1204 | D7466 |
| Frequency | Each roll | Every 10 rolls | Every 2 rolls | Every 10 rolls | Every 2 rolls | | | | Every 5 rolls | Every 5 rolls | | Every roll |
| Specification | 57.0 / 51.0 | ≥ 0.940 | 2.0 - 3.0 | Cat 1 & Cat. 2 | 132 | 13 | 132 | 150 | 45 | 120 | | 16 / 16 |
| 0102-199383 MD | 57.5 / 54.0 | 0.945 | 2.35 | 10/10 views | 153.4 | 18.2 | 216 | 566 | 51 | 140 | | 19.9 / 19.2 |
| XD | | | | | 158.3 | 16.6 | 196 | 549 | 55 | | | |
| 0102-199384 MD | 58.4 / 54.0 | 0.945 | 2.33 | 10/10 views | 152.5 | 18.1 | 215 | 559 | 51 | 140 | | 20.1 / 22.0 |
| XD | | | | | 152.1 | 17.0 | 185 | 509 | 55 | | | |
| 0102-199385 MD | 57.5 / 55.0 | 0.945 | 2.33 | 10/10 views | 152.5 | 18.1 | 215 | 559 | 51 | 140 | | 19.4 / 22.6 |
| XD | | | | | 152.1 | 17.0 | 185 | 509 | 55 | | | |
| 0102-199386 MD | 58.0 / 53.5 | 0.946 | 2.27 | 10/10 views | 155.0 | 18.9 | 241 | 626 | 51 | 151 | | 22.4 / 22.8 |
| XD | | | | | 163.1 | 16.2 | 188 | 517 | 56 | | | |
| 0102-199387 MD | 57.9 / 55.0 | 0.946 | 2.27 | 10/10 views | 155.0 | 18.9 | 241 | 626 | 51 | 151 | | 19.9 / 22.1 |
| XD | | | | | 163.1 | 16.2 | 188 | 517 | 56 | | | |
| 0102-199388 MD | 58.9 / 55.0 | 0.946 | 2.22 | 10/10 views | 152.1 | 19.6 | 226 | 570 | 51 | 151 | | 19.9 / 21.4 |
| XD | | | | | 165.3 | 16.0 | 190 | 512 | 56 | | | |
| 0102-199389 MD | 58.6 / 56.0 | 0.946 | 2.22 | 10/10 views | 152.1 | 19.6 | 226 | 570 | 51 | 151 | | 19.9 / 22.5 |
| XD | | | | | 165.3 | 16.0 | 190 | 512 | 56 | | | |
| 0102-199390 MD | 58.7 / 55.0 | 0.946 | 2.26 | 10/10 views | 150.9 | 20.1 | 240 | 615 | 51 | 151 | | 19.6 / 19.4 |
| XD | | | | | 169.2 | 16.6 | 201 | 537 | 56 | | | |
| 0102-199391 MD | 60.6 / 57.5 | 0.946 | 2.26 | 10/10 views | 150.9 | 20.1 | 240 | 615 | 52 | 134 | | 19.2 / 20.1 |
| XD | | | | | 169.2 | 16.6 | 201 | 537 | 54 | | | |
| 0102-199392 MD | 59.2 / 57.0 | 0.946 | 2.33 | 10/10 views | 151.6 | 19.0 | 221 | 571 | 52 | 134 | | 20.1 / 22.5 |
| XD | | | | | 167.6 | 15.8 | 185 | 411 | 54 | | | |
| 0102-199393 MD | 58.3 / 56.0 | 0.946 | 2.33 | 10/10 views | 151.6 | 19.0 | 221 | 571 | 52 | 134 | | 17.6 / 21.0 |
| XD | | | | | 167.6 | 15.8 | 185 | 411 | 54 | | | |
| 0102-199394 MD | 58.3 / 56.0 | 0.946 | 2.29 | 10/10 views | 164.7 | 17.5 | 215 | 566 | 52 | 134 | | 19.9 / 20.7 |
| XD | | | | | 163.7 | 15.8 | 193 | 511 | 54 | | | |
| 0102-199395 MD | 57.5 / 54.5 | 0.946 | 2.29 | 10/10 views | 164.7 | 17.5 | 215 | 566 | 52 | 134 | | 21.9 / 22.5 |
| XD | | | | | 163.7 | 15.8 | 193 | 511 | 54 | | | |
| 0102-199396 MD | 57.9 / 55.5 | 0.945 | 2.28 | 10/10 views | 150.5 | 18.5 | 230 | 597 | 50 | 139 | | 19.3 / 24.0 |
| XD | | | | | 161.4 | 16.2 | 185 | 497 | 54 | | | |

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**Solmax Geosynthetics LLC**
19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

**SOLMAX.COM**

23 Feb 2021

SOLMAX

# MANUFACTURING QUALITY CONTROL

## TEST RESULTS - ROLLS

PROJECT NUMBER: 2210

REFERENCE NUMBER: SO-091323

PACKING SLIP NUMBER: Pre-SO-091323-2

**PROJECT NAME :** US ECOLOGY CELL 51 PHASE II LSLC

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0102-199397 | MD | 57.6 / 53.5 | 0.945 | 2.28 | 10/10 views | 150.5 | 18.5 | 230 | 597 | 50 | 139 | | 22.2 / 23.7 |
| | XD | | | | | 161.4 | 16.2 | 185 | 497 | 54 | | | |
| 0102-199398 | MD | 60.2 / 56.5 | 0.945 | 2.33 | 10/10 views | 156.9 | 19.2 | 231 | 594 | 50 | 139 | | 20.2 / 20.4 |
| | XD | | | | | 165.4 | 16.2 | 193 | 527 | 54 | | | |
| 0102-199399 | MD | 58.3 / 55.0 | 0.945 | 2.33 | 10/10 views | 156.9 | 19.2 | 231 | 594 | 50 | 139 | | 21.1 / 21.0 |
| | XD | | | | | 165.4 | 16.2 | 193 | 527 | 54 | | | |
| 0102-199400 | MD | 58.5 / 57.0 | 0.945 | 2.34 | 10/10 views | 153.9 | 19.3 | 221 | 581 | 50 | 139 | | 20.7 / 20.5 |
| | XD | | | | | 161.7 | 16.1 | 183 | 503 | 54 | | | |
| 0102-199401 | MD | 59.0 / 55.0 | 0.945 | 2.34 | 10/10 views | 153.9 | 19.3 | 221 | 581 | 51 | 152 | | 19.6 / 21.5 |
| | XD | | | | | 161.7 | 16.1 | 183 | 503 | 55 | | | |
| 0102-199402 | MD | 58.9 / 56.5 | 0.945 | 2.24 | 10/10 views | 153.5 | 18.9 | 213 | 530 | 51 | 152 | | 18.7 / 19.6 |
| | XD | | | | | 165.4 | 16.8 | 189 | 496 | 55 | | | |
| 0102-199403 | MD | 59.1 / 55.5 | 0.945 | 2.24 | 10/10 views | 153.5 | 18.9 | 213 | 530 | 51 | 152 | | 20.6 / 20.6 |
| | XD | | | | | 165.4 | 16.8 | 189 | 496 | 55 | | | |

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**Solmax Geosynthetics LLC**

19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

**SOLMAX.COM**

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

201 FORMOSA DRIVE
PO BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
19103 GUNDLE RD

HOUSTON TX 77073

PRODUCT :HL3812
RAILCAR TCLX058039
CLEANING/INSPECTION NO: 058039052720

S/O NO : EV6A187
CUSTOMER PO : 03-519089
DATE SHIPPED: 6/30/20
LOT NO : 20E1328
WEIGHT (LB) : 187,850.00
CUSTID:FT03112 SPIDE3

DATE OF PROD: 5/28/20

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .066 |
| HLMI, g/10 min. | ASTM D1238 | 10.1 |
| Density, g/cm3 | ASTM D1505 | .9378 |

Notes:
The OIT (>120 min. ) and HP-OIT (>1000 min.) Values are based on the 1 lot having the Minimum Additive Levels ( Antioxidants and UV) in the HL 3812 specification. OIT and HP-OIT values are not tested for every lot.

Linda Kao

QC SUPERVISOR: LINDA KAO

# LIST OF GEOMEMBRANE ROLLS

PROJECT NUMBER: 22131-solmax1

SALES ORDER: SO-092189

PACKING SLIP NUMBER: Pre-SO-092189-1

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NAME : MARTIN LAKE WEST POND

| ROLL NUMBER | RESIN LOT NUMBER | MANUFACT. DATE | RESIN MELT INDEX 190/2.16 g/10 min D1238 | RESIN DENSITY g/cc D1505 | OIT min D3895 | HPOIT min D5885 | ESCR SP-NCTL hours D5397 |
|---|---|---|---|---|---|---|---|
| **Product Code : 1101547-16537-2** | | | | | | | |
| **HDPE 60 mil Black Textured** | | | **1.0** | **> 0.932** | **100** | | **500** |
| 0105-204689 | 21G1198 | 2021-09-04 | 0.07 | 0.938 | 178 | | >500 Certified 0101-203259 |
| 0105-204690 | 21G1198 | 2021-09-04 | 0.07 | 0.938 | 178 | | >500 Certified 0101-203259 |
| 0105-204691 | 21G1198 | 2021-09-04 | 0.07 | 0.938 | 178 | | >500 Certified 0101-203259 |
| 0105-204692 | 21G1198 | 2021-09-04 | 0.07 | 0.938 | 178 | | >500 Certified 0101-203259 |
| 0105-204693 | 21G1198 | 2021-09-04 | 0.07 | 0.938 | 178 | | >500 Certified 0101-203259 |
| 0105-204694 | 21G1198 | 2021-09-04 | 0.07 | 0.938 | 178 | | >500 Certified 0101-203259 |
| 0105-204695 | 21G1198 | 2021-09-04 | 0.07 | 0.938 | 178 | | >500 Certified 0101-203259 |
| 0105-204696 | 21G1198 | 2021-09-04 | 0.07 | 0.938 | 178 | | >500 Certified 0101-203259 |
| 0105-204697 | 21G1198 | 2021-09-05 | 0.07 | 0.938 | 178 | | >500 Certified 0101-203259 |
| 0105-204698 | 21G1198 | 2021-09-05 | 0.07 | 0.938 | 178 | | >500 Certified 0101-203259 |
| 0105-204699 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204700 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204701 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204702 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204703 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204704 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |

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**Solmax Geosynthetics LLC**
19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

**SOLMAX.COM**

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# LIST OF GEOMEMBRANE ROLLS

PROJECT NUMBER: 22131-solmax1

SALES ORDER: SO-092189

PACKING SLIP NUMBER: Pre-SO-092189-1

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NAME : MARTIN LAKE WEST POND

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0105-204705 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204706 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204707 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204708 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204709 | 21G1200 | 2021-09-05 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204710 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204711 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204712 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204713 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204714 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204715 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204716 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204717 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204718 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204719 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204721 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204722 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204723 | 21G1200 | 2021-09-06 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204724 | 21G1200 | 2021-09-07 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204725 | 21G1200 | 2021-09-07 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204726 | 21G1200 | 2021-09-07 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |

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19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

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# LIST OF GEOMEMBRANE ROLLS

PROJECT NUMBER: 22131-solmax1

SALES ORDER: SO-092189

PACKING SLIP NUMBER: Pre-SO-092189-1

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NAME : MARTIN LAKE WEST POND

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0105-204727 | 21G1200 | 2021-09-07 | 0.07 | 0.938 | 167 | | >500 Certified 0103-228623 |
| 0105-204728 | 21G1201 | 2021-09-07 | 0.07 | 0.938 | 175 | | >500 Certified 0101-203307 |
| 0105-204729 | 21G1201 | 2021-09-07 | 0.07 | 0.938 | 175 | | >500 Certified 0101-203307 |
| 0105-204730 | 21G1201 | 2021-09-07 | 0.07 | 0.938 | 175 | | >500 Certified 0101-203307 |
| 0105-204731 | 21G1201 | 2021-09-07 | 0.07 | 0.938 | 175 | | >500 Certified 0101-203307 |
| 0105-204732 | 21G1201 | 2021-09-07 | 0.07 | 0.938 | 175 | | >500 Certified 0101-203307 |
| 0105-204733 | 21G1201 | 2021-09-07 | 0.07 | 0.938 | 175 | | >500 Certified 0101-203307 |
| 0105-204734 | D661L84L3E | 2021-09-07 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204735 | D661L84L3E | 2021-09-07 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204736 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204737 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204738 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204739 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204740 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204741 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204742 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204743 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204744 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204745 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204746 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204747 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |

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# LIST OF GEOMEMBRANE ROLLS

PROJECT NUMBER: 22131-solmax1

SALES ORDER: SO-092189

PACKING SLIP NUMBER: Pre-SO-092189-1

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NAME : MARTIN LAKE WEST POND

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0105-204748 | D661L84L3E | 2021-09-08 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204749 | D661L84L3E | 2021-09-09 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204750 | D661L84L3E | 2021-09-09 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204751 | D661L84L3E | 2021-09-09 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204752 | D661L84L3E | 2021-09-09 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204753 | D661L84L3E | 2021-09-09 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204754 | D661L84L3E | 2021-09-09 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |
| 0105-204755 | D661L84L3E | 2021-09-09 | 0.12 | 0.937 | 115.55 | | >500 Certified 0104-202283 |

**QUANTITY (ROLLS): 66**

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# MANUFACTURING QUALITY CONTROL

## TEST RESULTS - ROLLS

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NUMBER: 22131-solmax1

SALES ORDER: SO-092189

PACKING SLIP NUMBER: Pre-SO-092189-1

**PROJECT NAME :** MARTIN LAKE WEST POND

**PRODUCT:** 1101547-16537-2
HDPE 60 mil Black Textured

| Properties | Thickness ave/min. | GeoM Density | Carbon Black Content | Carbon Black Dispersion | Tensile Yield Strength | Tensile Yield Elong. | Tensile Break Strength | Tensile Break Elong. | Tear Resist. | Puncture Resist. | Dimension Stability | Asperity Height In/Out |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | mils | g/cc | % | Cat 1 and 2 | ppi | % | ppi | % | lbs | lbs | % | mils |
| Test Method | D5994 | D792 | D4218 | D5596 | D6693 | | | | D1004 | D4833 | D1204 | D7466 |
| Frequency | Each roll | Every 10 rolls | Every 2 rolls | Every 10 rolls | Every 2 rolls | | | | Every 5 rolls | Every 5 rolls | | Every roll |
| Specification | 57.0 / 51.0 | ≥ 0.940 | 2.0 - 3.0 | Cat 1 & Cat 2 | 132 | 13 | 132 | 150 | 45 | 120 | | 16 / 16 |
| 0105-204689 MD | 60.5 / 56.0 | 0.945 | 2.40 | 10/10 views | 162.3 | 19.3 | 216 | 555 | 55 | 148 | | 20.1 / 19.9 |
| XD | | | | | 169.1 | 16.6 | 203 | 547 | 54 | | | |
| 0105-204690 MD | 59.7 / 57.5 | 0.945 | 2.40 | 10/10 views | 162.3 | 19.3 | 216 | 555 | 55 | 148 | | 20.1 / 21.5 |
| XD | | | | | 169.1 | 16.6 | 203 | 547 | 54 | | | |
| 0105-204691 MD | 61.6 / 59.5 | 0.945 | 2.39 | 10/10 views | 165.5 | 19.9 | 221 | 567 | 55 | 148 | | 20.4 / 21.5 |
| XD | | | | | 173.1 | 17.4 | 209 | 553 | 54 | | | |
| 0105-204692 MD | 60.1 / 58.0 | 0.945 | 2.39 | 10/10 views | 165.5 | 19.9 | 221 | 567 | 55 | 148 | | 20.4 / 21.6 |
| XD | | | | | 173.1 | 17.4 | 209 | 553 | 54 | | | |
| 0105-204693 MD | 60.2 / 58.5 | 0.945 | 2.32 | 10/10 views | 155.0 | 19.7 | 221 | 586 | 55 | 148 | | 20.4 / 21.5 |
| XD | | | | | 167.9 | 16.9 | 211 | 593 | 54 | | | |
| 0105-204694 MD | 60.2 / 58.5 | 0.945 | 2.32 | 10/10 views | 155.0 | 19.7 | 221 | 586 | 57 | 150 | | 19.9 / 21.5 |
| XD | | | | | 167.9 | 16.9 | 211 | 593 | 56 | | | |
| 0105-204695 MD | 61.3 / 58.0 | 0.945 | 2.43 | 10/10 views | 153.8 | 19.4 | 216 | 579 | 57 | 150 | | 20.3 / 21.9 |
| XD | | | | | 165.2 | 16.0 | 203 | 582 | 56 | | | |
| 0105-204696 MD | 60.6 / 59.0 | 0.945 | 2.43 | 10/10 views | 153.8 | 19.4 | 216 | 579 | 57 | 150 | | 21.0 / 21.5 |
| XD | | | | | 165.2 | 16.0 | 203 | 582 | 56 | | | |
| 0105-204697 MD | 60.4 / 59.0 | 0.945 | 2.05 | 10/10 views | 168.2 | 18.0 | 207 | 473 | 57 | 150 | | 19.9 / 26.4 |
| XD | | | | | 173.8 | 16.8 | 209 | 545 | 56 | | | |
| 0105-204698 MD | 60.2 / 57.0 | 0.945 | 2.51 | 10/10 views | 168.2 | 18.0 | 207 | 473 | 57 | 150 | | 19.4 / 25.7 |
| XD | | | | | 173.8 | 16.8 | 209 | 545 | 56 | | | |
| 0105-204699 MD | 59.4 / 56.5 | 0.947 | 2.37 | 10/10 views | 162.9 | 18.1 | 201 | 527 | 51 | 140 | | 20.6 / 24.3 |
| XD | | | | | 165.4 | 16.8 | 204 | 566 | 53 | | | |
| 0105-204700 MD | 57.3 / 55.0 | 0.947 | 2.37 | 10/10 views | 162.9 | 18.1 | 201 | 527 | 51 | 140 | | 17.9 / 21.4 |
| XD | | | | | 165.4 | 16.8 | 204 | 566 | 53 | | | |
| 0105-204701 MD | 58.2 / 54.0 | 0.947 | 2.42 | 10/10 views | 158.6 | 18.6 | 207 | 546 | 51 | 140 | | 19.1 / 21.2 |
| XD | | | | | 160.2 | 17.0 | 191 | 532 | 53 | | | |
| 0105-204702 MD | 57.6 / 54.0 | 0.947 | 2.42 | 10/10 views | 158.6 | 18.6 | 207 | 546 | 51 | 140 | | 20.5 / 22.6 |
| XD | | | | | 160.2 | 17.0 | 191 | 532 | 53 | | | |

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# SOLMAX MANUFACTURING QUALITY CONTROL

## TEST RESULTS - ROLLS

SOLMAX APPROVED QUALITY ASSURANCE

PROJECT NUMBER: 22131-solmax1

SALES ORDER: SO-092189

PACKING SLIP NUMBER: Pre-SO-092189-1

**PROJECT NAME :** MARTIN LAKE WEST POND

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0105-204703 | MD | 59.4 / 55.5 | 0.947 | 2.54 | 10/10 views | 168.3 | 18.9 | 208 | 529 | 51 | 140 | | 20.2 / 21.4 |
| | XD | | | | | 177.0 | 15.6 | 203 | 557 | 53 | | | |
| 0105-204704 | MD | 61.6 / 57.5 | 0.947 | 2.54 | 10/10 views | 168.3 | 18.9 | 208 | 529 | 50 | 143 | | 20.6 / 22.1 |
| | XD | | | | | 177.0 | 15.6 | 203 | 557 | 52 | | | |
| 0105-204705 | MD | 64.1 / 62.0 | 0.947 | 2.55 | 10/10 views | 172.6 | 19.6 | 219 | 541 | 50 | 143 | | 23.2 / 24.5 |
| | XD | | | | | 183.4 | 16.4 | 212 | 568 | 52 | | | |
| 0105-204706 | MD | 61.4 / 56.5 | 0.947 | 2.55 | 10/10 views | 172.6 | 19.6 | 219 | 541 | 50 | 143 | | 19.7 / 21.0 |
| | XD | | | | | 183.4 | 16.4 | 212 | 568 | 52 | | | |
| 0105-204707 | MD | 62.4 / 58.5 | 0.947 | 2.25 | 10/10 views | 166.5 | 20.5 | 290 | 603 | 50 | 143 | | 20.5 / 21.9 |
| | XD | | | | | 212.9 | 18.1 | 301 | 654 | 52 | | | |
| 0105-204708 | MD | 60.1 / 57.5 | 0.947 | 2.25 | 10/10 views | 166.5 | 20.5 | 290 | 603 | 51 | 144 | | 20.1 / 21.0 |
| | XD | | | | | 212.9 | 18.1 | 301 | 654 | 53 | | | |
| 0105-204709 | MD | 59.8 / 57.0 | 0.947 | 2.46 | 10/10 views | 166.1 | 18.1 | 217 | 562 | 51 | 144 | | 18.5 / 19.6 |
| | XD | | | | | 173.2 | 17.3 | 199 | 454 | 53 | | | |
| 0105-204710 | MD | 59.9 / 57.5 | 0.947 | 2.46 | 10/10 views | 166.1 | 18.1 | 217 | 562 | 51 | 144 | | 17.7 / 25.1 |
| | XD | | | | | 173.2 | 17.3 | 199 | 454 | 53 | | | |
| 0105-204711 | MD | 60.5 / 56.5 | 0.947 | 2.56 | 10/10 views | 168.6 | 18.2 | 220 | 566 | 51 | 144 | | 22.7 / 19.2 |
| | XD | | | | | 172.3 | 17.2 | 223 | 602 | 53 | | | |
| 0105-204712 | MD | 60.0 / 58.0 | 0.947 | 2.56 | 10/10 views | 168.6 | 18.2 | 220 | 566 | 51 | 144 | | 21.2 / 18.6 |
| | XD | | | | | 172.3 | 17.2 | 223 | 602 | 53 | | | |
| 0105-204713 | MD | 58.9 / 52.0 | 0.948 | 2.66 | 10/10 views | 168.1 | 18.8 | 215 | 549 | 50 | 149 | | 24.3 / 19.7 |
| | XD | | | | | 170.6 | 16.6 | 199 | 461 | 52 | | | |
| 0105-204714 | MD | 59.3 / 56.0 | 0.948 | 2.66 | 10/10 views | 168.1 | 18.8 | 215 | 549 | 50 | 149 | | 18.0 / 24.3 |
| | XD | | | | | 170.6 | 16.6 | 199 | 461 | 52 | | | |
| 0105-204715 | MD | 61.0 / 55.5 | 0.948 | 2.41 | 10/10 views | 167.6 | 17.9 | 215 | 554 | 50 | 149 | | 20.5 / 21.9 |
| | XD | | | | | 172.4 | 17.1 | 215 | 582 | 52 | | | |
| 0105-204716 | MD | 60.2 / 58.5 | 0.948 | 2.42 | 10/10 views | 171.5 | 18.6 | 220 | 564 | 50 | 149 | | 20.1 / 21.6 |
| | XD | | | | | 177.1 | 17.9 | 221 | 591 | 52 | | | |
| 0105-204717 | MD | 60.4 / 58.0 | 0.948 | 2.42 | 10/10 views | 171.5 | 18.6 | 220 | 564 | 50 | 149 | | 20.5 / 21.2 |
| | XD | | | | | 177.1 | 17.9 | 221 | 591 | 52 | | | |
| 0105-204718 | MD | 60.2 / 58.5 | 0.948 | 2.22 | 10/10 views | 162.5 | 19.0 | 218 | 553 | 50 | 149 | | 22.0 / 22.5 |
| | XD | | | | | 166.5 | 17.6 | 206 | 560 | 52 | | | |
| 0105-204719 | MD | 60.1 / 59.0 | 0.948 | 2.22 | 10/10 views | 162.5 | 19.0 | 218 | 553 | 51 | 150 | | 19.8 / 21.0 |
| | XD | | | | | 166.5 | 17.6 | 206 | 560 | 53 | | | |
| 0105-204721 | MD | 61.2 / 58.0 | 0.948 | 2.42 | 10/10 views | 167.6 | 19.8 | 229 | 569 | 51 | 150 | | 23.2 / 24.1 |
| | XD | | | | | 172.3 | 18.4 | 217 | 576 | 53 | | | |
| 0105-204722 | MD | 60.4 / 58.5 | 0.948 | 2.42 | 10/10 views | 167.6 | 19.8 | 229 | 569 | 51 | 150 | | 21.8 / 22.3 |
| | XD | | | | | 172.3 | 18.4 | 217 | 576 | 53 | | | |
| 0105-204723 | MD | 59.0 / 54.5 | 0.948 | 2.26 | 10/10 views | 167.5 | 18.2 | 203 | 524 | 51 | 150 | | 18.4 / 23.8 |
| | XD | | | | | 168.4 | 16.6 | 195 | 542 | 53 | | | |
| 0105-204724 | MD | 59.9 / 55.5 | 0.948 | 2.26 | 10/10 views | 167.5 | 18.2 | 203 | 524 | 51 | 150 | | 18.8 / 24.9 |

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# MANUFACTURING QUALITY CONTROL

## TEST RESULTS - ROLLS

PROJECT NUMBER: 22131-solmax1

SALES ORDER: SO-092189

PACKING SLIP NUMBER: Pre-SO-092189-1

**PROJECT NAME :** MARTIN LAKE WEST POND

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | XD | | | | | 168.4 | 16.6 | 195 | 542 | 53 | | | |
| 0105-204725 | MD | 58.9 / 56.0 | 0.947 | 2.54 | 10/10 views | 170.0 | 17.7 | 211 | 539 | 51 | 139 | | 18.5 / 20.3 |
| | XD | | | | | 167.9 | 17.1 | 185 | 494 | 52 | | | |
| 0105-204726 | MD | 58.5 / 56.5 | 0.947 | 2.54 | 10/10 views | 170.0 | 17.7 | 211 | 539 | 51 | 139 | | 19.4 / 23.4 |
| | XD | | | | | 167.9 | 17.1 | 185 | 494 | 52 | | | |
| 0105-204727 | MD | 58.7 / 57.0 | 0.947 | 2.60 | 10/10 views | 163.8 | 18.4 | 203 | 534 | 51 | 139 | | 18.3 / 24.6 |
| | XD | | | | | 165.8 | 16.9 | 194 | 540 | 52 | | | |
| 0105-204728 | MD | 57.6 / 53.5 | 0.947 | 2.60 | 10/10 views | 163.8 | 18.4 | 203 | 534 | 51 | 139 | | 22.3 / 18.5 |
| | XD | | | | | 165.8 | 16.9 | 194 | 540 | 52 | | | |
| 0105-204729 | MD | 58.0 / 54.5 | 0.947 | 2.36 | 10/10 views | 171.1 | 16.7 | 205 | 528 | 51 | 139 | | 21.5 / 23.4 |
| | XD | | | | | 165.4 | 16.3 | 206 | 572 | 52 | | | |
| 0105-204730 | MD | 58.0 / 54.5 | 0.947 | 2.36 | 10/10 views | 171.1 | 16.7 | 205 | 528 | 51 | 145 | | 22.1 / 21.3 |
| | XD | | | | | 165.4 | 16.3 | 206 | 572 | 50 | | | |
| 0105-204731 | MD | 59.3 / 58.0 | 0.947 | 2.51 | 10/10 views | 160.1 | 18.7 | 215 | 565 | 51 | 145 | | 21.7 / 22.9 |
| | XD | | | | | 165.4 | 16.3 | 206 | 572 | 50 | | | |
| 0105-204732 | MD | 58.0 / 56.0 | 0.947 | 2.51 | 10/10 views | 160.1 | 18.7 | 215 | 565 | 51 | 145 | | 21.1 / 20.9 |
| | XD | | | | | 165.4 | 16.3 | 206 | 572 | 50 | | | |
| 0105-204733 | MD | 58.4 / 54.0 | 0.947 | 2.52 | 10/10 views | 155.1 | 19.2 | 188 | 480 | 51 | 145 | | 19.6 / 21.8 |
| | XD | | | | | 167.1 | 17.5 | 196 | 544 | 50 | | | |
| 0105-204734 | MD | 57.9 / 55.5 | 0.947 | 2.52 | 10/10 views | 155.1 | 19.2 | 188 | 480 | 51 | 145 | | 20.6 / 21.3 |
| | XD | | | | | 167.1 | 17.5 | 196 | 544 | 50 | | | |
| 0105-204735 | MD | 60.3 / 54.5 | 0.943 | 2.35 | 10/10 views | 151.2 | 20.9 | 208 | 576 | 50 | 131 | | 19.5 / 20.7 |
| | XD | | | | | 164.8 | 16.9 | 191 | 554 | 50 | | | |
| 0105-204736 | MD | 60.9 / 58.0 | 0.943 | 2.35 | 10/10 views | 151.2 | 20.9 | 208 | 576 | 50 | 131 | | 18.4 / 19.9 |
| | XD | | | | | 164.8 | 16.9 | 191 | 554 | 50 | | | |
| 0105-204737 | MD | 60.3 / 57.0 | 0.943 | 2.50 | 10/10 views | 160.8 | 19.7 | 211 | 570 | 50 | 131 | | 17.8 / 20.5 |
| | XD | | | | | 163.2 | 17.6 | 177 | 450 | 50 | | | |
| 0105-204738 | MD | 59.4 / 55.0 | 0.943 | 2.50 | 10/10 views | 160.8 | 19.7 | 211 | 570 | 50 | 131 | | 20.7 / 21.5 |
| | XD | | | | | 163.2 | 17.6 | 177 | 450 | 50 | | | |
| 0105-204739 | MD | 58.9 / 56.0 | 0.943 | 2.46 | 10/10 views | 158.6 | 19.7 | 207 | 553 | 50 | 131 | | 21.1 / 23.2 |
| | XD | | | | | 157.9 | 17.8 | 180 | 519 | 50 | | | |
| 0105-204740 | MD | 57.9 / 53.5 | 0.943 | 2.46 | 10/10 views | 158.6 | 19.7 | 207 | 553 | 50 | 142 | | 20.3 / 21.8 |
| | XD | | | | | 157.9 | 17.8 | 180 | 519 | 58 | | | |
| 0105-204741 | MD | 59.4 / 56.5 | 0.943 | 2.42 | 10/10 views | 155.2 | 18.4 | 207 | 566 | 50 | 142 | | 20.8 / 22.1 |
| | XD | | | | | 158.8 | 17.4 | 189 | 521 | 58 | | | |
| 0105-204742 | MD | 57.5 / 55.0 | 0.943 | 2.42 | 10/10 views | 155.2 | 18.4 | 207 | 566 | 50 | 142 | | 21.1 / 21.3 |
| | XD | | | | | 158.8 | 17.4 | 189 | 521 | 58 | | | |
| 0105-204743 | MD | 57.7 / 55.5 | 0.943 | 2.37 | 10/10 views | 148.5 | 18.5 | 212 | 592 | 50 | 142 | | 21.1 / 21.0 |
| | XD | | | | | 160.9 | 16.8 | 192 | 559 | 58 | | | |
| 0105-204744 | MD | 57.7 / 54.0 | 0.943 | 2.37 | 10/10 views | 148.5 | 18.5 | 212 | 592 | 50 | 142 | | 24.4 / 24.9 |
| | XD | | | | | 160.9 | 16.8 | 192 | 559 | 58 | | | |

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19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

SOLMAX

# MANUFACTURING QUALITY CONTROL

SOLMAX APPROVED QUALITY ASSURANCE

## TEST RESULTS - ROLLS

PROJECT NUMBER: 22131-solmax1

SALES ORDER: SO-092189

PACKING SLIP NUMBER: Pre-SO-092189-1

**PROJECT NAME :** MARTIN LAKE WEST POND

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0105-204745 | MD | 58.6 / 56.0 | 0.942 | 2.33 | 10/10 views | 156.1 | 19.2 | 197 | 531 | 50 | 146 | | 21.2 / 20.8 |
| | XD | | | | | 160.7 | 16.7 | 184 | 531 | 49 | | | |
| 0105-204746 | MD | 58.0 / 55.0 | 0.942 | 2.33 | 10/10 views | 156.1 | 19.2 | 197 | 531 | 50 | 146 | | 20.8 / 23.1 |
| | XD | | | | | 160.7 | 16.7 | 184 | 531 | 49 | | | |
| 0105-204747 | MD | 58.6 / 56.0 | 0.942 | 2.40 | 10/10 views | 149.9 | 20.4 | 207 | 574 | 50 | 146 | | 21.0 / 20.9 |
| | XD | | | | | 161.6 | 19.9 | 194 | 569 | 49 | | | |
| 0105-204748 | MD | 58.9 / 56.0 | 0.942 | 2.40 | 10/10 views | 149.9 | 20.4 | 207 | 574 | 50 | 146 | | 21.0 / 20.5 |
| | XD | | | | | 161.6 | 19.9 | 194 | 569 | 49 | | | |
| 0105-204749 | MD | 59.0 / 56.0 | 0.942 | 2.48 | 10/10 views | 150.9 | 20.1 | 195 | 556 | 50 | 146 | | 19.6 / 21.8 |
| | XD | | | | | 158.3 | 17.9 | 176 | 453 | 49 | | | |
| 0105-204750 | MD | 57.3 / 55.5 | 0.942 | 2.48 | 10/10 views | 150.9 | 20.1 | 195 | 556 | 52 | 138 | | 17.9 / 20.6 |
| | XD | | | | | 158.3 | 17.9 | 176 | 453 | 46 | | | |
| 0105-204751 | MD | 57.1 / 54.0 | 0.942 | 2.32 | 10/10 views | 149.8 | 19.9 | 179 | 487 | 52 | 138 | | 19.6 / 20.8 |
| | XD | | | | | 158.0 | 17.0 | 170 | 423 | 46 | | | |
| 0105-204752 | MD | 59.6 / 57.5 | 0.942 | 2.32 | 10/10 views | 149.8 | 19.9 | 179 | 487 | 52 | 138 | | 19.9 / 20.2 |
| | XD | | | | | 158.0 | 17.0 | 170 | 423 | 46 | | | |
| 0105-204753 | MD | 59.7 / 57.5 | 0.942 | 2.52 | 10/10 views | 156.1 | 19.2 | 198 | 534 | 52 | 138 | | 20.3 / 20.5 |
| | XD | | | | | 163.0 | 16.8 | 171 | 470 | 46 | | | |
| 0105-204754 | MD | 60.3 / 55.5 | 0.942 | 2.52 | 10/10 views | 156.1 | 19.2 | 198 | 534 | 52 | 138 | | 19.5 / 24.0 |
| | XD | | | | | 163.0 | 16.8 | 171 | 470 | 46 | | | |
| 0105-204755 | MD | 58.4 / 57.0 | 0.942 | 2.49 | 10/10 views | 148.1 | 18.5 | 191 | 503 | 48 | 138 | | 20.4 / 23.7 |
| | XD | | | | | 159.0 | 16.2 | 170 | 440 | 49 | | | |

Solmax is not a design professional and has not performed any design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation or specification.

**Solmax Geosynthetics LLC**
19103 GUNDLE RD,, HOUSTON, TX, UNITED STATES, 77073

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

2[illegible] FORMOSA DRIVE
P[illegible] BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:SOLMAX GEOSYNTHETICS LLC
19103 GUNDLE ROAD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR FPAX200897

S/O NO : EW8A105
CUSTOMER PO : PO-603571
DATE SHIPPED: 8/08/21
LOT NO : 21G1198
WEIGHT (LB) : 197,650.00
CUSTID:FT03112 SPIDM6

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .069 |
| HLMI, g/10 min. | ASTM D1238 | 11.8 |
| Density, g/cm3 | ASTM D1505 | .9382 |

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

2[illegible] FORMOSA DRIVE
P[illegible] BOX 700
POINT COMFORT TX 77978

PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:SOLMAX GEOSYNTHETICS LLC
19103 GUNDLE ROAD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR FPAX201100

S/O NO : EW8A106
CUSTOMER PO : PO-603571
DATE SHIPPED: 8/08/21
LOT NO : 21G1200
WEIGHT (LB) : 197,650.00
CUSTID:FT03112 SPIDM6

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .072 |
| HLMI, g/10 min. | ASTM D1238 | 11.3 |
| Density, g/cm3 | ASTM D1505 | .9381 |

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS

2 FORMOSA DRIVE
P BOX 700
POINT COMFORT TX 77978
PHONE:( 888 )FPCUSA3

## Certificate of Analysis
(CONFIDENTIAL)

CUSTOMER:SOLMAX GEOSYNTHETICS LLC
19103 GUNDLE ROAD

HOUSTON TX 77073
PRODUCT :HL3812
RAILCAR FPAX201144
CLEANING/INSPECTION NO: 201144072021

S/O NO : EW8A107
CUSTOMER PO : PO-603571
DATE SHIPPED: 8/08/21
LOT NO : 21G1201
WEIGHT (LB) : 198,300.00
CUSTID:FT03112 SPIDM6

| TEST ITEM | REFERENCE METHOD | TEST VALUE |
|---|---|---|
| Melt Index,g/10min | ASTM D1238 | .069 |
| HLMI, g/10 min. | ASTM D1238 | 11.4 |
| Density, g/cm3 | ASTM D1505 | .9378 |

Linda Kao

QC SUPERVISOR: LINDA KAO

THE DOW CHEMICAL COMPANY

GSE ENVIRONMENTAL LLC
19103 GUNDLE RD.
HOUSTON TX 77073-3515

Ship From: SEADRIFT
Texas, United States

## Certificate of Analysis

Product Name

DOW™ DGDA-5310 NT MDPE GMB Resin

| | |
|---|---|
| Delivery No. | 821595423 / 000010 |
| Order Number | 112617580 |
| Shipping Units | 192049.999 LB |
| Date Shipped | 2021-08-06 (YYYY-MM-DD) |
| Shipment No. | 39304482 |

## Customer Information

| | |
|---|---|
| Customer Name | GSE ENVIRONMENTAL LLC |
| Customer PO number | 602951-7 |
| Container ID | CCBX058190 |
| Specification Number | 000000456148 |

| | |
|---|---|
| Batch Number | D661L84L3E |
| Manufacturing Date | 2021-08-05 (YYYY-MM-DD) |
| Net Weight | 192049.999 LB / 87112.343 KG |

| Test | Unit | Lower Limit | Upper Limit | Value | Method |
|---|---|---|---|---|---|
| **Melt Flow Rate** @190degC/21.6kg | dg/min | 9.0 | 12.0 | 11.7 | ASTM D1238 |
| **Melt Flow Ratio** I21.6/I5.0 | | 20.0 | 40.0 | 25.9 | ASTM D1238 |
| **Density** ASTM D4703, A1 Proc C, Test within 1 hr | g/cm3 | 0.9350 | 0.9390 | 0.9374 | ASTM D792 |

For inquiries please contact Customer Service or local sales

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# APPENDIX – C.3

## Geosynthetic Conformance

# GCL

TRI ENVIRONMENTAL

# TESTING, RESEARCH, CONSULTING AND FIELD SERVICES

Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

## MANUFACTURING QA IN-PLANT SAMPLING/INSPECTION REPORT

**Project Name:** Oak Grove Steam Electric Station **TYPE OF MQA:** LEVEL (2) **QA by:** Maria Espitia

**Material:** Resistex U40 DN9 GCL **SAMPLING FREQUENCY:** 1/100,000 sq.ft.

**Manufacturer:** CETCO

**Location:** WY

| No. | Roll # | Lot # | Length (ft.) | Width (ft.) | Area ($ft^2$) | Date Manufactured | Sampled by | Date Sampled | Date Received | Reference Job No/ Control No |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 2 | 2 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | TRI-CA | 5/21/2021 | 5/26/2021 | G210469 C#156082 |
| 3 | 3 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 4 | 4 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 5 | 5 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 6 | 6 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 7 | 7 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 8 | 8 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 9 | 9 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 10 | 10 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 11 | 11 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 12 | 12 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 13 | 13 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 14 | 14 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 15 | 15 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 16 | 16 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 17 | 17 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 18 | 18 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 19 | 19 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 20 | 20 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 21 | 21 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 22 | 22 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 23 | 23 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 24 | 24 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 25 | 25 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 26 | 26 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 27 | 27 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 28 | 28 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |

TRI ENVIRONMENTAL

TESTING, RESEARCH, CONSULTING AND FIELD SERVICES

Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

## MANUFACTURING QA IN-PLANT SAMPLING/INSPECTION REPORT

**Project Name:** Oak Grove Steam Electric Station  **TYPE OF MQA:** LEVEL (2)  **QA by:** Maria Espitia

**Material:** Resistex U40 DN9 GCL  **SAMPLING FREQUENCY:** 1/100,000 sq.ft.

**Manufacturer:** CETCO

**Location:** WY

| No. | Roll # | Lot # | Length (ft.) | Width (ft.) | Area ($ft^2$) | Date Manufactured | Sampled by | Date Sampled | Date Received | Reference Job No/ Control No |
|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 29 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 30 | 30 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 31 | 31 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 32 | 32 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 33 | 33 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 34 | 34 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 35 | 35 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 36 | 36 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 37 | 37 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 38 | 38 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 39 | 39 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 40 | 40 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 41 | 41 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 42 | 42 | LL-19-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| | | | | Sub Total $ft^2$ = | 91,350 | | | | | |
| 43 | 44 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 44 | 45 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | TRI-CA | 11/3/2021 | 11/4/2021 | G211181 C#160008 |
| 45 | 46 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 46 | 47 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 47 | 48 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 48 | 49 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 49 | 50 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 50 | 51 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 51 | 52 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 52 | 53 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 53 | 54 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 54 | 55 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 55 | 56 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |

TRI ENVIRONMENTAL

TESTING, RESEARCH, CONSULTING AND FIELD SERVICES

Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

## MANUFACTURING QA IN-PLANT SAMPLING/INSPECTION REPORT

**Project Name:** Oak Grove Steam Electric Station **TYPE OF MQA:** LEVEL (2) **QA by:** Maria Espitia

**Material:** Resistex U40 DN9 GCL **SAMPLING FREQUENCY:** 1/100,000 sq.ft.

**Manufacturer:** CETCO

**Location:** WY

| No. | Roll # | Lot # | Length (ft.) | Width (ft.) | Area ($ft^2$) | Date Manufactured | Sampled by | Date Sampled | Date Received | Reference Job No/ Control No |
|---|---|---|---|---|---|---|---|---|---|---|
| 56 | 57 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 57 | 58 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 58 | 59 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 59 | 60 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 60 | 61 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 61 | 62 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 62 | 63 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 63 | 64 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 64 | 65 | LL-42-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| | | | | Sub Total $ft^2$ = | 47850 | | | | | |
| 65 | 67 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 66 | 68 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | TRI-CA | 12/4/2021 | 12/13/2021 | G211299 C#160804 |
| 67 | 69 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 68 | 70 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 69 | 71 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 70 | 72 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 71 | 73 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 72 | 74 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 73 | 75 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 74 | 76 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 75 | 77 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 76 | 78 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 77 | 79 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 78 | 80 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 79 | 81 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 80 | 82 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 81 | 83 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 82 | 84 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |

TRI ENVIRONMENTAL

# TESTING, RESEARCH, CONSULTING AND FIELD SERVICES

Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

## MANUFACTURING QA IN-PLANT SAMPLING/INSPECTION REPORT

**Project Name:** Oak Grove Steam Electric Station
**TYPE OF MQA:** LEVEL (2)
**QA by:** Maria Espitia
**Material:** Resistex U40 DN9 GCL
**SAMPLING FREQUENCY:** 1/100,000 sq.ft.
**Manufacturer:** CETCO
**Location:** WY

| No. | Roll # | Lot # | Length (ft.) | Width (ft.) | Area ($ft^2$) | Date Manufactured | Sampled by | Date Sampled | Date Received | Reference Job No/ Control No |
|---|---|---|---|---|---|---|---|---|---|---|
| 83 | 85 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 84 | 86 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 85 | 87 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 86 | 88 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 87 | 89 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 88 | 90 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 89 | 91 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 90 | 92 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 91 | 93 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 92 | 94 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 93 | 95 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 94 | 96 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 95 | 97 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 96 | 98 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 97 | 99 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 98 | 100 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 99 | 101 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 100 | 102 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 101 | 103 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 102 | 104 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 103 | 105 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 104 | 106 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 105 | 107 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 106 | 108 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 107 | 109 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 108 | 110 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 109 | 111 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 110 | 112 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |

TRI ENVIRONMENTAL

# TESTING, RESEARCH, CONSULTING AND FIELD SERVICES

Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

## MANUFACTURING QA IN-PLANT SAMPLING/INSPECTION REPORT

**Project Name:** Oak Grove Steam Electric Station **TYPE OF MQA:** LEVEL (2) **QA by:** Maria Espitia

**Material:** Resistex U40 DN9 GCL **SAMPLING FREQUENCY:** 1/100,000 sq.ft.

**Manufacturer:** CETCO

**Location:** WY

| No. | Roll # | Lot # | Length (ft.) | Width (ft.) | Area ($ft^2$) | Date Manufactured | Sampled by | Date Sampled | Date Received | Reference Job No/ Control No |
|---|---|---|---|---|---|---|---|---|---|---|
| 111 | 113 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | TRI-CA | 12/4/2021 | 12/13/2021 | G211299 C#160805 |
| 112 | 114 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 113 | 115 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 114 | 116 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 115 | 117 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 116 | 118 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 117 | 119 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 118 | 120 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 119 | 121 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 120 | 122 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 121 | 123 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 122 | 124 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 123 | 125 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 124 | 126 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 125 | 127 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 126 | 128 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 127 | 129 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 128 | 130 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 129 | 131 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 130 | 132 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 131 | 133 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 132 | 134 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 133 | 135 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 134 | 136 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 135 | 137 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 136 | 138 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 137 | 139 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 138 | 140 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |

TRI ENVIRONMENTAL

# TESTING, RESEARCH, CONSULTING AND FIELD SERVICES

Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

## MANUFACTURING QA IN-PLANT SAMPLING/INSPECTION REPORT

**Project Name:** Oak Grove Steam Electric Station  **TYPE OF MQA:** LEVEL (2)  **QA by:** Maria Espitia

**Material:** Resistex U40 DN9 GCL  **SAMPLING FREQUENCY:** 1/100,000 sq.ft.

**Manufacturer:** CETCO

**Location:** WY

| No. | Roll # | Lot # | Length (ft.) | Width (ft.) | Area ($ft^2$) | Date Manufactured | Sampled by | Date Sampled | Date Received | Reference Job No/ Control No |
|---|---|---|---|---|---|---|---|---|---|---|
| 139 | 141 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 140 | 142 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 141 | 143 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 142 | 144 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 143 | 145 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 144 | 146 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 145 | 147 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 146 | 148 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 147 | 149 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 148 | 150 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 149 | 151 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 150 | 152 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 151 | 153 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 152 | 154 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 153 | 155 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 154 | 156 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 155 | 157 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 156 | 158 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | TRI-CA | 12/4/2021 | 12/13/2021 | G211299 C#160806 |
| 157 | 159 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 158 | 160 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 159 | 161 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 160 | 162 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 161 | 163 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 162 | 164 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| 163 | 165 | LL-48-2021 | 150 | 14.5 | 2175 | N/A | | | | |
| | | | | Sub Total $ft^2$ = | 215325 | | | | | |
| | | | | TOTAL $ft^2$ = | 354,525 | | | | | |

June 7, 2021

GAI-LAP
Initial: CVZ #:0.13
DATE: 06/07/2021

Samuel Franco
***SCS ENGINEERS***
12651 Briar Forest Dr., Suite 205
Houston, TX 770077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the ***final*** laboratory report for the Conformance testing of one (1) Resistex U40 DN9 GCL sample.

**PROJECT NAME:** Oak Grove Steam Electric Station DATE REPORTED: **June 7, 2021**

**REFERENCE TRI JOB NO.:** G210469

**DATE RECEIVED:** May 26, 2021

**SAMPLED BY:** TRI-CA at CETCO, WY

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI CONTROL NUMBER* |
|---|---|
| R#2 L#LL-19-2021 | 156082 |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D5993 | Mass Per Unit Area |
| 2. ASTM D5084 | Hydraulic Conductivity |

**TEST RESULTS:** The test results are summarized in the attached Table 1.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,
**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Retained conformance samples are disposed of after one (1) month.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**2 Pages Total** *(including this sheet)*

TRI ENVIRONMENTAL
TESTING, RESEARCH, CONSULTING AND FIELD SERVICES
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GAI-LAP

# TABLE 1.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/26/2021**
Date Reported: **6/7/2021**
Client Sample ID: **R#2 L#LL-19-2021**
Material Description: **Resistex U40 DN9 GCL**

QC'd By: Maria Espitia
TRI Job No.: **G210469**
TRI Control No.: **156082**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5084 | Hydraulic Conductivity (cm./ sec.) | | | | | | | | | | | | | | | |
| | *Effective Consolidation Stress: 5 psi* | | | | | | | | | | | | | | | |
| | | **1.2E-09** | | | | | | | | | | **1.2E-09** | N/A | | | **$3x10^{-9}$ max.** |
| ASTM D5993 | Mass per Unit Area of the dried Clay component of the GCL (lbs/ $ft^2$) | | | | | | | | *Specimen Size: 4"x 8" Die cut* | | | | | | | |
| | *Drying Time/ Temp: 110+/- 5° C for 16 hrs using thermostatically controlled oven.* | | | | | | | | | | | | | | | |
| | | **1.14** | **1.12** | **1.12** | **1.09** | **1.11** | | | | | | **1.12** | **0.02** | **1.09** | **1.14** | **0.75 min.** |

(End of Table 1)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit

November 15, 2021

GAI-LAP
Initial: GVZ #:0.13
DATE: 11/15/2021

Samuel Franco
***SCS ENGINEERS***
12651 Briar Forest Dr., Suite 205
Houston, TX 770077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the ***final*** laboratory report for the Conformance testing of one (1) Resistex U40 DN9 GCL sample.

**PROJECT NAME:** Oak Grove Steam Electric Station DATE REPORTED: **November 15, 2021**

**REFERENCE TRI JOB NO.:** G211181

**DATE RECEIVED:** November 4, 2021

**SAMPLED BY:** TRI-CA at CETCO, WY

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI CONTROL NUMBER* |
|---|---|
| R#45 L#LL-42-2021 | 160008 |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D5993 | Mass Per Unit Area |
| 2. ASTM D5084 | Hydraulic Conductivity |

**TEST RESULTS:** The test results are summarized in the attached Table 1.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,
**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Retained conformance samples are disposed of after one (1) month.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**2 Pages Total** *(including this sheet)*

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GAI-LAP

# TABLE 1.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **11/4/2021**
Date Reported: **11/15/2021**
Client Sample ID: **R#45 L#LL-42-2021**
Material Description: **Resistex U40 DN9 GCL**

QC'd By: Maria Espitia
TRI Job No.: **G211181**
TRI Control No.: **160008**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5084 | Hydraulic Conductivity (cm./ sec.) | | | | | | | | | | | | | | | |
| | *Effective Consolidation Stress: 5 psi* | | | | | | | | | | | | | | | |
| | | 6.6E-10 | | | | | | | | | | 6.6E-10 | N/A | | | $3x10^{-9}$ max. |
| ASTM D5993 | Mass per Unit Area of the dried Clay component of the GCL (lbs/ $ft^2$) *Specimen Size: 4"x 8" Die cut* | | | | | | | | | | | | | | | |
| | *Drying Time/ Temp: 110+/- 5 $^0$C for 16 hrs using thermostatically controlled oven.* | | | | | | | | | | | | | | | |
| | | 1.11 | 1.07 | 1.11 | 1.12 | 1.10 | | | | | | 1.10 | 0.02 | 1.07 | 1.12 | 0.75 min. |

(End of Table 1)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit.

LEGENDS:
MD- MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

December 20, 2021

GAI-LAP
Initial: CVZ #:0.13
DATE: 12/20/2021

Samuel Franco
***SCS ENGINEERS***
12651 Briar Forest Dr., Suite 205
Houston, TX 770077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the ***final*** laboratory report for the Conformance testing of three (3) Resistex U40 DN9 GCL samples.

**PROJECT NAME:** Oak Grove Steam Electric Station DATE REPORTED: **December 20, 2021**

**REFERENCE TRI JOB NO.:** G211299

**DATE RECEIVED:** December 13, 2021

**SAMPLED BY:** TRI-CA at CETCO, WY

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI CONTROL NUMBER* |
|---|---|
| R#68 L#LL-48-2021 | 160804 |
| R#113 L#ll-48-2021 | 160805 |
| R#158 L#ll-48-2021 | 160806 |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D5993 | Mass Per Unit Area |
| 2. ASTM D5084 | Hydraulic Conductivity |

**TEST RESULTS:** The test results are summarized in the attached Table 1 to 3.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,
**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Retained conformance samples are disposed of after one (1) month.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**4 Pages Total** *(including this sheet)*

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GAI-LAP

# TABLE 1.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **1213/21**
Date Reported: **12/20/2021**
Client Sample ID: **R#68 L#LL-48-2021**
Material Description: **Resistex U40 DN9 GCL**

QC'd By: Maria Espitia
TRI Job No.: **G211299**
TRI Control No.: **160804**

| | | SPECIMENS | | | | | | | | | | | | | | Proj. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Specs. |
| **METHOD** | **DESCRIPTION** | | | | | | | | | | | | | | | |
| ASTM D5084 | Hydraulic Conductivity (cm./ sec.) | | | | | | | | | | | | | | | |
| | *Effective Consolidation Stress: 5 psi* | | | | | | | | | | | | | | | |
| | | **6.7E-10** | | | | | | | | | | **6.7E-10** | N/A | | | **$3x10^{-9}$ max.** |
| ASTM D5993 | Mass per Unit Area of the dried Clay component of the GCL (lbs/ $ft^2$) | | | | | | | | *Specimen Size: 4"x 8" Die cut* | | | | | | | |
| | *Drying Time/ Temp: 110+/- 5° C for 16 hrs using thermostatically controlled oven.* | | | | | | | | | | | | | | | |
| | | **1.05** | **1.09** | **1.06** | **1.04** | **1.08** | | | | | | **1.06** | **0.02** | **1.04** | **1.09** | **0.75 min.** |

(End of Table 1)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit.

LEGENDS:
MD- MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

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## TABLE 2.

**MATERIAL PROPERTIES**

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **1213/21**
Date Reported: **12/20/2021**
Client Sample ID: **R#113 L#LL-48-2021**
Material Description: **Resistex U40 DN9 GCL**

QC'd By: Maria Espitia
TRI Job No.: **G211299**
TRI Control No.: **160805**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5084 | Hydraulic Conductivity (cm./ sec.) | | | | | | | | | | | | | | | |
| | *Effective Consolidation Stress: 5 psi* | | | | | | | | | | | | | | | |
| | | **6.9E-10** | | | | | | | | | | **6.9E-10** | N/A | | | $3x10^{-9}$ **max.** |
| ASTM D5993 | Mass per Unit Area of the dried Clay component of the GCL (lbs/ $ft^2$) | | | | | | | | *Specimen Size: 4"x 8" Die cut* | | | | | | | |
| | *Drying Time/ Temp: 110+/- 5° C for 16 hrs using thermostatically controlled oven.* | | | | | | | | | | | | | | | |
| | | **1.04** | **1.05** | **1.05** | **1.05** | **1.06** | | | | | | **1.05** | **0.01** | **1.04** | **1.06** | **0.75 min.** |

(End of Table 2)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit.

LEGENDS:
MD- MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

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## TABLE 3.

**MATERIAL PROPERTIES**

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **1213/21**
Date Reported: **12/20/2021**
Client Sample ID: **R#158 L#LL-48-2021**
Material Description: **Resistex U40 DN9 GCL**

QC'd By: Maria Cipitia
TRI Job No.: **G211299**
TRI Control No.: **160806**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5084 | Hydraulic Conductivity (cm./ sec.) | | | | | | | | | | | | | | | |
| | *Effective Consolidation Stress: 5 psi* | | | | | | | | | | | | | | | |
| | | **6.7E-10** | | | | | | | | | | **6.7E-10** | N/A | | | **$3x10^{-9}$ max.** |
| ASTM D5993 | Mass per Unit Area of the dried Clay component of the GCL (lbs/ $ft^2$) | | | | | | | | *Specimen Size: 4"x 8" Die cut* | | | | | | | |
| | *Drying Time/ Temp: 110+/- 5° C for 16 hrs using thermostatically controlled oven.* | | | | | | | | | | | | | | | |
| | | **1.04** | **1.05** | **1.07** | **1.07** | **1.07** | | | | | | **1.06** | **0.01** | 1.04 | 1.07 | **0.75 min.** |

(End of Table 3)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit.

LEGENDS:
MD- MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

# Geomembrane

TRI ENVIRONMENTAL

TESTING, RESEARCH, CONSULTING AND FIELD SERVICES

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## MANUFACTURING QA IN-PLANT SAMPLING/INSPECTION REPORT

**Project Name:** Oak Grove Steam Electric Station
**Material:** 60mil HDPE Double Sided Textured
**Manufacturer:** SOLMAX
**Location:** TX

**TYPE OF MQA:** LEVEL (2)
**SAMPLING FREQUENCY:** Minimum 1/100,000 sq.ft. or 1/lot

**QA by:** Maria Espitia

| No. | Roll # | Lot # | Length (ft.) | Width (ft.) | Area ($ft^2$) | Date Manufactured | Sampled by | Date Sampled | Date Received | Reference Job No/ Control No |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0102-198266 | 20C1308 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/24/2021 | 5/26/2021 | G210467 C#156074 |
| | | | | Sub Total $ft^2$ = | 11700 | | | | | |
| 2 | 0102-199418 | 20E1328 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/24/2021 | 5/26/2021 | G210467 C#156075 |
| 3 | 0102-199421 | 20E1328 | 520 | 22.5 | 11700 | N/A | | | | |
| 4 | 0102-199423 | 20E1328 | 520 | 22.5 | 11700 | N/A | | | | |
| 5 | 0102-199428 | 20E1328 | 520 | 22.5 | 11700 | N/A | | | | |
| | | | | Sub Total $ft^2$ = | 46800 | | | | | |
| 6 | 0102-199430 | 20E1327 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/24/2021 | 5/26/2021 | G210467 C#156076 |
| 7 | 0102-199432 | 20E1327 | 520 | 22.5 | 11700 | N/A | | | | |
| | | | | Sub Total $ft^2$ = | 23400 | | | | | |
| 8 | 0102-200273 | 20J1249 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/24/2021 | 5/26/2021 | G210467 C#156077 |
| | | | | Sub Total $ft^2$ = | 11700 | | | | | |
| 9 | 0102-200397 | D661L3PL3B | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/24/2021 | 5/26/2021 | G210468 C#156078 |
| | | | | Sub Total $ft^2$ = | 11700 | | | | | |
| 10 | 0102-200647 | 21C1073 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/24/2021 | 5/26/2021 | G210468 C#156079 |
| 11 | 0102-200648 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| 12 | 0102-200649 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| 13 | 0102-200650 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| 14 | 0102-200651 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| 15 | 0102-200652 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| 16 | 0102-200654 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| 17 | 0102-200655 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| 18 | 0102-200656 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| 19 | 0102-200657 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| 20 | 0102-200658 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| 21 | 0102-200659 | 21C1073 | 520 | 22.5 | 11700 | N/A | | | | |
| | | | | Sub Total $ft^2$ = | 140400 | | | | | |
| 22 | 0102-200662 | 20J1245 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/24/2021 | 5/26/2021 | G210468 C#156081 |
| 23 | 0102-200663 | 20J1245 | 520 | 22.5 | 11700 | N/A | | | | |

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## MANUFACTURING QA IN-PLANT SAMPLING/INSPECTION REPORT

**Project Name:** Oak Grove Steam Electric Station
**Material:** 60mil HDPE Double Sided Textured
**Manufacturer:** SOLMAX
**Location:** TX

**TYPE OF MQA:** LEVEL (2)
**QA by:** Maria Espitia
**SAMPLING FREQUENCY:** Minimum 1/100,000 sq.ft. or 1/lot

| No. | Roll # | Lot # | Length (ft.) | Width (ft.) | Area ($ft^2$) | Date Manufactured | Sampled by | Date Sampled | Date Received | Reference Job No/ Control No |
|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 0102-200664 | 20J1245 | 520 | 22.5 | 11700 | N/A | | | | |
| 25 | 0102-200665 | 20J1245 | 520 | 22.5 | 11700 | N/A | | | | |
| 26 | 0102-200666 | 20J1245 | 520 | 22.5 | 11700 | N/A | | | | |
| 27 | 0102-200667 | 20J1245 | 520 | 22.5 | 11700 | N/A | | | | |
| 28 | 0102-200668 | 20J1245 | 520 | 22.5 | 11700 | N/A | | | | |
| 29 | 0102-200669 | 20J1245 | 520 | 22.5 | 11700 | N/A | | | | |
| 30 | 0102-200671 | 20J1245 | 520 | 22.5 | 11700 | N/A | | | | |
| | | | | Sub Total $ft^2$ = | 105300 | | | | | |
| 31 | 0107-180010 | 20G1366 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/25/2021 | 5/27/2021 | G210476 C#156110 |
| 32 | 0107-180012 | 20G1366 | 520 | 22.5 | 11700 | N/A | | | | |
| | | | | Sub Total $ft^2$ = | 23400 | | | | | |
| 33 | 0107-180013 | 20G1344 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/25/2021 | 5/27/2021 | G210476 C#156111 |
| 34 | 0107-180016 | 20G1344 | 520 | 22.5 | 11700 | N/A | | | | |
| 35 | 0107-180017 | 20G1344 | 520 | 22.5 | 11700 | N/A | | | | |
| 36 | 0107-180018 | 20G1344 | 520 | 22.5 | 11700 | N/A | | | | |
| | | | | Sub Total $ft^2$ = | 46800 | | | | | |
| 37 | 102191807 | 18G1300 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/25/2021 | 5/27/2021 | G210476 C#156112 |
| | | | | Sub Total $ft^2$ = | 11700 | | | | | |
| 38 | 104197182 | 19J1008 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/25/2021 | 5/27/2021 | G210477 C#156113 |
| | | | | Sub Total $ft^2$ = | 11700 | | | | | |
| 39 | 105197550 | 19J1007 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/25/2021 | 5/27/2021 | G210477 C#156114 |
| | | | | Sub Total $ft^2$ = | 11700 | | | | | |
| 40 | 108203110 | 19G1020 | 520 | 22.5 | 11700 | N/A | TRI-CA | 5/25/2021 | 5/27/2021 | G210477 C#156115 |
| | | | | Sub Total $ft^2$ = | 11700 | | | | | |
| | | | | TOTAL $ft^2$ = | 468,000 | | | | | |

June 3, 2021

GAI-LAP
Initial: CVZ #:0.13
DATE: 06/03/2021

Samuel Franco
***SCS ENGINEERS***
12651 Briar Forest Dr., Suite 205
Houston, TX 770077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the ***final*** laboratory report for the Conformance testing of three (3) 60mil HDPE Double Sided Textured geomembrane samples.

**PROJECT NAME:** Oak Grove Steam Electric Station

DATE REPORTED: **June 3, 2021**

**REFERENCE TRI JOB NO.:** G210468

**DATE RECEIVED:** May 26, 2021

**SAMPLED BY:** TRI-CA at SOLMAX, TX

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI CONTROL NUMBER* |
|---|---|
| R#0102-200397 L#D661L3PL3B | 156078 |
| R#0102-200647 L#21C1073 | 156079 |
| R#0102-200662 L#20J1245 | 156081 |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D5994 | Thickness |
| 2. ASTM D1505 | Density |
| 3. ASTM D6693 (Type IV) | Tensile Strength |
| 4. ASTM D4218 | Carbon Content Muffle |
| 5. ASTM D5596 | Carbon Black Dispersion |

**TEST RESULTS:** The test results are summarized in the attached Tables 1 to 3.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,
**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Retained conformance samples are disposed of after one (1) month.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**4 Pages Total** *(including this sheet)*

TRI ENVIRONMENTAL
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# TABLE 1.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/26/2021**
Date Reported: **6/3/2021**
Client Sample ID: **R#0102-200397 L#D661L3PL3B**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210468**
TRI Control No.: **156078**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | 57 min. ave. |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 54min. (8 out of 10) |
| | | 61 | 63 | 61 | 63 | 62 | 62 | 61 | 61 | 61 | 62 | 62 | 1 | 61 | 63 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ $cm.^3$) | | | | | | | | | | | | | | | |
| | | 0.9479 | 0.9479 | 0.9479 | | | | | | | | 0.9479 | 0.0000 | 0.9479 | 0.9479 | 0.940 min. ave. |
| ASTM D6693 Type IV | Tensile Properties: | | | | | | | | | | | | | | | |
| | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 159 | 160 | 167 | 162 | 164 | | | | | | 163 | 3 | 159 | 167 | 126 min. ave. |
| | *TD* | 175 | 168 | 182 | 162 | 166 | | | | | | 171 | 8 | 162 | 182 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 183 | 174 | 216 | 194 | 186 | | | | | | 191 | 16 | 174 | 216 | 90 min. ave. |
| | *TD* | 189 | 180 | 211 | 172 | 176 | | | | | | 185 | 16 | 172 | 211 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 19 | 18 | 20 | 17 | 17 | | | | | | 18 | 1 | 17 | 20 | 12 min. ave. |
| | *TD* | 18 | 16 | 16 | 15 | 17 | | | | | | 16 | 1 | 15 | 18 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 513 | 475 | 583 | 519 | 496 | | | | | | 517 | 41 | 475 | 583 | 100 min. ave. |
| | *TD* | 496 | 507 | 554 | 457 | 472 | | | | | | 497 | 37 | 457 | 554 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.50 | 2.47 | | | | | | | | | 2.48 | 0.02 | 2.47 | 2.50 | 2.0 - 3.0 |

(End of Table 1)

(Sheet 1 of 1)

By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

LEGENDS:
MD - MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

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# TABLE 2.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/26/2021**
Date Reported: **6/3/2021**
Client Sample ID: **R#0102-200647 L#21C1073**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210468**
TRI Control No.: **156079**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | 57 min. ave. |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 54min. (8 out of 10) |
| | | 61 | 61 | 63 | 61 | 60 | 63 | 63 | 61 | 60 | 62 | 61 | 1 | 60 | 63 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ $cm.^3$) | | | | | | | | | | | | | | | |
| | | 0.9474 | 0.9474 | 0.9474 | | | | | | | | 0.9474 | 0.0000 | 0.9474 | 0.9474 | 0.940 min. ave. |
| ASTM D6693 Type IV | Tensile Properties: | | | | | | | | | | | | | | | |
| | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 158 | 175 | 163 | 166 | 167 | | | | | | 166 | 6 | 158 | 175 | 126 min. ave. |
| | *TD* | 173 | 180 | 158 | 162 | 182 | | | | | | 171 | 11 | 158 | 182 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 186 | 185 | 179 | 171 | 188 | | | | | | 182 | 7 | 171 | 188 | 90 min. ave. |
| | *TD* | 178 | 192 | 172 | 181 | 197 | | | | | | 184 | 10 | 172 | 197 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 17 | 16 | 17 | 16 | 18 | | | | | | 17 | 1 | 16 | 18 | 12 min. ave. |
| | *TD* | 18 | 16 | 17 | 16 | 16 | | | | | | 17 | 1 | 16 | 18 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 534 | 501 | 499 | 471 | 526 | | | | | | 506 | 25 | 471 | 534 | 100 min. ave. |
| | *TD* | 482 | 528 | 500 | 513 | 531 | | | | | | 511 | 20 | 482 | 531 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.44 | 2.48 | | | | | | | | | 2.46 | 0.03 | 2.44 | 2.48 | 2.0 - 3.0 |

(End of Table 2)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit

LEGENDS:
MD - MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

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# TABLE 3.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/26/2021**
Date Reported: **6/3/2021**
Client Sample ID: **R#0102-200662 L#20J1245**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210468**
TRI Control No.: **156081**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz) Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 57 min. ave. 54min. (8 out of 10) |
| | | 62 | 63 | 60 | 62 | 62 | 61 | 61 | 60 | 61 | 60 | 61 | 1 | 60 | 63 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ cm.$^3$) | | | | | | | | | | | | | | | |
| | | 0.9484 | 0.9484 | 0.9484 | | | | | | | | 0.9484 | 0.0000 | 0.9484 | 0.9484 | 0.940 min. ave. |
| ASTM D6693 Type IV | Tensile Properties: | | | | | | | | | | | | | | | |
| | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1 3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 154 | 159 | 159 | 159 | 151 | | | | | | 156 | 4 | 151 | 159 | 126 min. ave. |
| | *TD* | 181 | 172 | 170 | 170 | 184 | | | | | | 175 | 7 | 170 | 184 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 170 | 215 | 181 | 205 | 190 | | | | | | 192 | 18 | 170 | 215 | 90 min. ave. |
| | *TD* | 191 | 188 | 188 | 185 | 197 | | | | | | 190 | 5 | 185 | 197 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 18 | 18 | 18 | 17 | 17 | | | | | | 17 | 1 | 17 | 18 | 12 min. ave. |
| | *TD* | 16 | 17 | 17 | 14 | 17 | | | | | | 16 | 1 | 14 | 17 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 457 | 580 | 494 | 542 | 489 | | | | | | 513 | 49 | 457 | 580 | 100 min. ave. |
| | *TD* | 536 | 511 | 509 | 507 | 508 | | | | | | 514 | 12 | 507 | 536 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.41 | 2.38 | | | | | | | | | 2.39 | 0.02 | 2.38 | 2.41 | 2.0 - 3.0 |

(End of Table 3)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit.

LEGENDS:
MD - MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

June 4, 2021

GAI-LAP
Initial: CVZ #:0.13
DATE: 06/04/2021

Samuel Franco
***SCS ENGINEERS***
12651 Briar Forest Dr., Suite 205
Houston, TX 770077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the ***final*** laboratory report for the Conformance testing of three (3) 60mil HDPE Double Sided Textured geomembrane samples.

**PROJECT NAME:** Oak Grove Steam Electric Station DATE REPORTED: **June 4, 2021**

**REFERENCE TRI JOB NO.:** G210476

**DATE RECEIVED:** May 27, 2021

**SAMPLED BY:** TRI-CA at SOLMAX, TX

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI CONTROL NUMBER* |
|---|---|
| R#0107-180010 L#20G1366 | 156110 |
| R#0107-180013 L#20G1344 | 156111 |
| R#102191807 L#18G1300 | 156112 |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D5994 | Thickness |
| 2. ASTM D1505 | Density |
| 3. ASTM D6693 (Type IV) | Tensile Strength |
| 4. ASTM D4218 | Carbon Content Muffle |
| 5. ASTM D5596 | Carbon Black Dispersion |

**TEST RESULTS:** The test results are summarized in the attached Tables 1 to 3.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,
**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Retained conformance samples are disposed of after one (1) month.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**4 Pages Total** *(including this sheet)*

APPENDIX E-Revision 1 November 21, 2022

# TABLE 1.
## MATERIAL PROPERTIES
**CLIENT: SCS Engineers**
**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/27/2021**
Date Reported: **6/4/2021**
Client Sample ID: **R#0107-180010 L#20G1366**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210476**
TRI Control No.: **156110**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | 57 min. ave. |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 54min. (8 out of 10) |
| | | 60 | 61 | 61 | 60 | 62 | 62 | 60 | 60 | 63 | 60 | 61 | 1 | 60 | 63 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ $cm.^3$) | | | | | | | | | | | | | | | |
| | | 0.9484 | 0.9484 | 0.9484 | | | | | | | | 0.9484 | 0.0000 | 0.9484 | 0.9484 | 0.940 min. ave. |
| ASTM D6693 Type IV | Tensile Properties: | | | | | | | | | | | | | | | |
| | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 167 | 180 | 167 | 171 | 165 | | | | | | 170 | 6 | 165 | 180 | 126 min. ave. |
| | *TD* | 163 | 169 | 177 | 165 | 167 | | | | | | 168 | 5 | 163 | 177 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 179 | 208 | 177 | 215 | 206 | | | | | | 197 | 18 | 177 | 215 | 90 min. ave. |
| | *TD* | 188 | 173 | 189 | 198 | 180 | | | | | | 186 | 9 | 173 | 198 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 17 | 19 | 18 | 17 | 16 | | | | | | 18 | 1 | 16 | 19 | 12 min. ave. |
| | *TD* | 14 | 18 | 17 | 15 | 16 | | | | | | 16 | 2 | 14 | 18 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 470 | 502 | 515 | 544 | 562 | | | | | | 519 | 36 | 470 | 562 | 100 min. ave. |
| | *TD* | 522 | 503 | 528 | 564 | 490 | | | | | | 521 | 28 | 490 | 564 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.37 | 2.31 | | | | | | | | | 2.34 | 0.04 | 2.31 | 2.37 | 2.0 - 3.0 |

(End of Table 1)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

LEGENDS:
MD - MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

TRI ENVIRONMENTAL
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# TABLE 2.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/27/2021**
Date Reported: **6/4/2021**
Client Sample ID: **R#0107-180013 L#20G1344**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210476**
TRI Control No.: **156111**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | 57 min. ave. |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 54min. (8 out of 10) |
| | | 60 | 62 | 60 | 62 | 62 | 61 | 62 | 60 | 62 | 62 | 61 | 1 | 60 | 62 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ cm.$^3$) | | | | | | | | | | | | | | | |
| | | 0.9479 | 0.9479 | 0.9479 | | | | | | | | 0.9479 | 0.0000 | 0.9479 | 0.9479 | 0.940 min. ave. |
| ASTM D6693 Type IV | Tensile Properties: | | | | | | | | | | | | | | | |
| | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 153 | 164 | 159 | 159 | 165 | | | | | | 160 | 5 | 153 | 165 | 126 min. ave. |
| | *TD* | 168 | 175 | 173 | 175 | 167 | | | | | | 172 | 4 | 167 | 175 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 190 | 191 | 180 | 217 | 178 | | | | | | 191 | 15 | 178 | 217 | 90 min. ave. |
| | *TD* | 187 | 187 | 184 | 190 | 182 | | | | | | 186 | 3 | 182 | 190 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 18 | 19 | 17 | 18 | 18 | | | | | | 18 | 1 | 17 | 19 | 12 min. ave. |
| | *TD* | 18 | 16 | 17 | 18 | 15 | | | | | | 17 | 1 | 15 | 18 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 533 | 509 | 454 | 583 | 490 | | | | | | 514 | 48 | 454 | 583 | 100 min. ave. |
| | *TD* | 521 | 537 | 515 | 522 | 511 | | | | | | 521 | 10 | 511 | 537 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.47 | 2.40 | | | | | | | | | 2.43 | 0.05 | 2.40 | 2.47 | 2.0 - 3.0 |

(End of Table 2)

(Sheet 1 of 1)

By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

LEGENDS:
MD - MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

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# TABLE 3.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/27/2021**
Date Reported: **6/4/2021**
Client Sample ID: **R#102191807 L#18G1300**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210476**
TRI Control No.: **156112**

| | | SPECIMENS | | | | | | | | | | | | | | Proj. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Specs. |
| **METHOD** | **DESCRIPTION** | | | | | | | | | | | | | | | |
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | 57 min. ave. |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 54min. (8 out of 10) |
| | | **62** | **62** | **60** | **64** | **62** | **62** | **61** | **62** | **63** | **61** | **62** | **1** | **60** | **64** | **51min. (for any 10)** |
| ASTM D1505 | Density (grams/ cm.$^3$) | | | | | | | | | | | | | | | |
| | | **0.9468** | **0.9468** | **0.9468** | | | | | | | | **0.9468** | **0.0000** | **0.9468** | **0.9468** | **0.940 min. ave.** |
| ASTM D6693 | Tensile Properties: | | | | | | | | | | | | | | | |
| Type IV | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | **161** | **158** | **151** | **161** | **157** | | | | | | **157** | **4** | **151** | **161** | **126 min. ave.** |
| | *TD* | **156** | **168** | **165** | **164** | **170** | | | | | | **165** | **5** | **156** | **170** | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | **208** | **188** | **168** | **226** | **199** | | | | | | **198** | **22** | **168** | **226** | **90 min. ave.** |
| | *TD* | **181** | **203** | **188** | **189** | **219** | | | | | | **196** | **15** | **181** | **219** | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | **19** | **17** | **17** | **17** | **16** | | | | | | **17** | **1** | **16** | **19** | **12 min. ave.** |
| | *TD* | **17** | **17** | **17** | **18** | **16** | | | | | | **17** | **1** | **16** | **18** | |
| | Elongation at Break (percent, %) | | | | | *Gauge Length = 2.0 in.* | | | | | | | | | | |
| | *MD* | **524** | **494** | **505** | **604** | **547** | | | | | | **535** | **43** | **494** | **604** | **100 min. ave.** |
| | *TD* | **496** | **544** | **523** | **507** | **589** | | | | | | **532** | **37** | **496** | **589** | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | **9 in Cat. 1 or 2** |
| | | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **10 out of 10 in Category 1** | | | | **1 in Cat. 3** |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | **2.41** | **2.39** | | | | | | | | | **2.40** | **0.01** | **2.39** | **2.41** | **2.0 - 3.0** |

(End of Table 3)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

LEGENDS:
MD - MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

June 4, 2021

GAI-LAP
Initial: CVZ #:0.13
DATE: 06/04/2021

Samuel Franco
***SCS ENGINEERS***
12651 Briar Forest Dr., Suite 205
Houston, TX 770077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the ***final*** laboratory report for the Conformance testing of three (3) 60mil HDPE Double Sided Textured geomembrane samples.

**PROJECT NAME:** Oak Grove Steam Electric Station DATE REPORTED: **June 4, 2021**

**REFERENCE TRI JOB NO.:** G210477

**DATE RECEIVED:** May 27, 2021

**SAMPLED BY:** TRI-CA at SOLMAX, TX

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI CONTROL NUMBER* |
|---|---|
| R#104197182 L#19J1008 | 156113 |
| R#105197550 L#19J1007 | 156114 |
| R#108203110 L#19G1020 | 156115 |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D5994 | Thickness |
| 2. ASTM D1505 | Density |
| 3. ASTM D6693 (Type IV) | Tensile Strength |
| 4. ASTM D4218 | Carbon Content Muffle |
| 5. ASTM D5596 | Carbon Black Dispersion |

**TEST RESULTS:** The test results are summarized in the attached Tables 1 to 3.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,
**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Retained conformance samples are disposed of after one (1) month.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**4 Pages Total** *(including this sheet)*

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# TABLE 1.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/27/2021**
Date Reported: **6/4/2021**
Client Sample ID: **R#104197182 L#19J1008**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210477**
TRI Control No.: **156113**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | 57 min. ave. |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 54min. (8 out of 10) |
| | | 63 | 61 | 61 | 61 | 60 | 64 | 61 | 60 | 61 | 62 | 61 | 1 | 60 | 64 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ $cm.^3$) | | | | | | | | | | | | | | | |
| | | 0.9484 | 0.9484 | 0.9484 | | | | | | | | 0.9484 | 0.0000 | 0.9484 | 0.9484 | 0.940 min. ave. |
| ASTM D6693 | Tensile Properties: | | | | | | | | | | | | | | | |
| Type IV | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 158 | 171 | 168 | 164 | 169 | | | | | | 166 | 5 | 158 | 171 | 126 min. ave. |
| | *TD* | 158 | 168 | 159 | 164 | 163 | | | | | | 162 | 4 | 158 | 168 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 201 | 176 | 184 | 207 | 192 | | | | | | 192 | 13 | 176 | 207 | 90 min. ave. |
| | *TD* | 180 | 175 | 174 | 173 | 169 | | | | | | 174 | 4 | 169 | 180 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 18 | 18 | 18 | 16 | 19 | | | | | | 18 | 1 | 16 | 19 | 12 min. ave. |
| | *TD* | 18 | 20 | 16 | 16 | 15 | | | | | | 17 | 2 | 15 | 20 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 557 | 488 | 469 | 555 | 508 | | | | | | 515 | 40 | 469 | 557 | 100 min. ave. |
| | *TD* | 522 | 506 | 486 | 505 | 441 | | | | | | 492 | 31 | 441 | 522 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.34 | 2.37 | | | | | | | | | 2.35 | 0.02 | 2.34 | 2.37 | 2.0 - 3.0 |

(End of Table 1)



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# TABLE 2.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/27/2021**
Date Reported: **6/4/2021**
Client Sample ID: **R#105197550 L#19J1007**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210477**
TRI Control No.: **156114**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | 57 min. ave. |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 54min. (8 out of 10) |
| | | 63 | 61 | 62 | 60 | 61 | 62 | 60 | 60 | 60 | 61 | 61 | 1 | 60 | 63 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ cm.$^3$) | | | | | | | | | | | | | | | |
| | | 0.9479 | 0.9479 | 0.9479 | | | | | | | | 0.9479 | 0.0000 | 0.9479 | 0.9479 | 0.940 min. ave. |
| ASTM D6693 | Tensile Properties: | | | | | | | | | | | | | | | |
| Type IV | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 162 | 159 | 160 | 159 | 159 | | | | | | 160 | 1 | 159 | 162 | 126 min. ave. |
| | *TD* | 172 | 175 | 170 | 171 | 165 | | | | | | 171 | 4 | 165 | 175 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 181 | 164 | 190 | 189 | 167 | | | | | | 178 | 12 | 164 | 190 | 90 min. ave. |
| | *TD* | 164 | 175 | 186 | 159 | 179 | | | | | | 173 | 11 | 159 | 186 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 16 | 18 | 18 | 16 | 17 | | | | | | 17 | 1 | 16 | 18 | 12 min. ave. |
| | *TD* | 17 | 18 | 17 | 17 | 14 | | | | | | 17 | 1 | 14 | 18 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 481 | 469 | 519 | 502 | 465 | | | | | | 487 | 23 | 465 | 519 | 100 min. ave. |
| | *TD* | 476 | 516 | 520 | 470 | 488 | | | | | | 494 | 23 | 470 | 520 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.50 | 2.47 | | | | | | | | | 2.48 | 0.02 | 2.47 | 2.50 | 2.0 - 3.0 |

(End of Table 2)



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# TABLE 3.
## MATERIAL PROPERTIES
**CLIENT: SCS Engineers**
**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/27/2021**
Date Reported: **6/4/2021**
Client Sample ID: **R#108203110 L#19G1020**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210477**
TRI Control No.: **156115**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | **57 min. ave.** |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | **54min. (8 out of 10)** |
| | | **63** | **60** | **61** | **61** | **60** | **62** | **62** | **61** | **62** | **60** | **61** | **1** | **60** | **63** | **51min. (for any 10)** |
| ASTM D1505 | Density (grams/ $cm.^3$) | | | | | | | | | | | | | | | |
| | | **0.9474** | **0.9474** | **0.9474** | | | | | | | | **0.9474** | **0.0000** | **0.9474** | **0.9474** | **0.940 min. ave.** |
| ASTM D6693 Type IV | Tensile Properties: | | | | | | | | | | | | | | | |
| | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | **165** | **167** | **164** | **163** | **168** | | | | | | **166** | **2** | **163** | **168** | **126 min. ave.** |
| | *TD* | **174** | **173** | **176** | **176** | **178** | | | | | | **175** | **2** | **173** | **178** | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | **189** | **229** | **198** | **177** | **200** | | | | | | **198** | **19** | **177** | **229** | **90 min. ave.** |
| | *TD* | **178** | **176** | **185** | **180** | **183** | | | | | | **180** | **4** | **176** | **185** | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | **18** | **19** | **19** | **17** | **17** | | | | | | **18** | **1** | **17** | **19** | **12 min. ave.** |
| | *TD* | **15** | **16** | **17** | **16** | **17** | | | | | | **16** | **1** | **15** | **17** | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | **510** | **599** | **559** | **482** | **528** | | | | | | **535** | **45** | **482** | **599** | **100 min. ave.** |
| | *TD* | **504** | **493** | **521** | **534** | **482** | | | | | | **507** | **21** | **482** | **534** | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | **9 In Cat. 1 or 2** |
| | | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **10 out of 10 In Category 1** | | | | **1 in Cat. 3** |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | **2.43** | **2.33** | | | | | | | | | **2.38** | **0.07** | **2.33** | **2.43** | **2.0 - 3.0** |

(End of Table 3)



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June 3, 2021

GAI-LAP
Initial: CVZ #:0.13
DATE: 06/03/2021

Samuel Franco
***SCS ENGINEERS***
12651 Briar Forest Dr., Suite 205
Houston, TX 770077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the ***final*** laboratory report for the Conformance testing of four (4) 60mil HDPE Double Sided Textured geomembrane samples.

**PROJECT NAME:** Oak Grove Steam Electric Station DATE REPORTED: **June 3, 2021**

**REFERENCE TRI JOB NO.:** G210467

**DATE RECEIVED:** May 26, 2021

**SAMPLED BY:** TRI-CA at SOLMAX, TX

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI CONTROL NUMBER* |
|---|---|
| R#0102-198266 L#20C1308 | 156074 |
| R#0102-199418 L#20E1328 | 156075 |
| R#0102-199430 L#20E1327 | 156076 |
| R#0102-200273 L#20J1249 | 156077 |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D5994 | Thickness |
| 2. ASTM D1505 | Density |
| 3. ASTM D6693 (Type IV) | Tensile Strength |
| 4. ASTM D4218 | Carbon Content Muffle |
| 5. ASTM D5596 | Carbon Black Dispersion |

**TEST RESULTS:** The test results are summarized in the attached Tables 1 to 4.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,
**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Retained conformance samples are disposed of after one (1) month.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**5 Pages Total** *(including this sheet)*

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# TABLE 1.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/26/2021**
Date Reported: **6/3/2021**
Client Sample ID: **R#0102-198266 L#20C1308**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210467**
TRI Control No.: **156074**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | 57 min. ave. |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 54min. (8 out of 10) |
| | | 60 | 62 | 61 | 61 | 62 | 62 | 64 | 61 | 62 | 61 | 62 | 1 | 60 | 64 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ cm.$^3$) | | | | | | | | | | | | | | | |
| | | 0.9493 | 0.9493 | 0.9493 | | | | | | | | 0.9493 | 0.0000 | 0.9493 | 0.9493 | 0.940 min. ave. |
| ASTM D6693 Type IV | Tensile Properties: | | | | | | | | | | | | | | | |
| | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 149 | 153 | 152 | 149 | 158 | | | | | | 152 | 4 | 149 | 158 | 126 min. ave. |
| | *TD* | 154 | 152 | 159 | 152 | 158 | | | | | | 155 | 3 | 152 | 159 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 185 | 215 | 225 | 188 | 205 | | | | | | 204 | 17 | 185 | 225 | 90 min. ave. |
| | *TD* | 177 | 168 | 190 | 162 | 181 | | | | | | 176 | 11 | 162 | 190 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 18 | 18 | 18 | 18 | 18 | | | | | | 18 | 0 | 18 | 18 | 12 min. ave. |
| | *TD* | 16 | 17 | 17 | 15 | 16 | | | | | | 16 | 1 | 15 | 17 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 496 | 615 | 598 | 528 | 543 | | | | | | 556 | 49 | 496 | 615 | 100 min. ave. |
| | *TD* | 512 | 462 | 528 | 464 | 478 | | | | | | 489 | 29 | 462 | 528 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.38 | 2.37 | | | | | | | | | 2.37 | 0.01 | 2.37 | 2.38 | 2.0 - 3.0 |

(End of Table 1)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit

LEGENDS:
MD - MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

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# TABLE 2.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/26/2021**
Date Reported: **6/3/2021**
Client Sample ID: **R#0102-199418 L#20E1328**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210467**
TRI Control No.: **156075**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz) Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 57 min. ave. 54min. (8 out of 10) |
| | | 61 | 61 | 60 | 61 | 63 | 61 | 61 | 62 | 60 | 61 | 61 | 1 | 60 | 63 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ cm.$^3$) | | | | | | | | | | | | | | | |
| | | 0.9492 | 0.9492 | 0.9492 | | | | | | | | 0.9492 | 0.0000 | 0.9492 | 0.9492 | 0.940 min. ave. |
| ASTM D6693 Type IV | Tensile Properties: | | | | | | | | | | | | | | | |
| | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 160 | 169 | 163 | 160 | 167 | | | | | | 164 | 4 | 160 | 169 | 126 min. ave. |
| | *TD* | 159 | 167 | 167 | 166 | 157 | | | | | | 163 | 5 | 157 | 167 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 171 | 195 | 204 | 201 | 212 | | | | | | 197 | 16 | 171 | 212 | 90 min. ave. |
| | *TD* | 194 | 188 | 180 | 174 | 161 | | | | | | 179 | 13 | 161 | 194 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 18 | 18 | 18 | 17 | 17 | | | | | | 18 | 1 | 17 | 18 | 12 min. ave. |
| | *TD* | 18 | 16 | 17 | 16 | 18 | | | | | | 17 | 1 | 16 | 18 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 497 | 500 | 554 | 545 | 570 | | | | | | 533 | 33 | 497 | 570 | 100 min. ave. |
| | *TD* | 546 | 513 | 492 | 486 | 481 | | | | | | 504 | 27 | 481 | 546 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.45 | 2.37 | | | | | | | | | 2.41 | 0.06 | 2.37 | 2.45 | 2.0 - 3.0 |

(End of Table 2)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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# TABLE 3.
## MATERIAL PROPERTIES
**CLIENT: SCS Engineers**
**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/26/2021**
Date Reported: **6/3/2021**
Client Sample ID: **R#0102-199430 L#20E1327**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210467**
TRI Control No.: **156076**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | 57 min. ave. |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 54min. (8 out of 10) |
| | | 61 | 60 | 60 | 60 | 61 | 62 | 61 | 63 | 60 | 61 | 61 | 1 | 60 | 63 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ cm.$^3$) | | | | | | | | | | | | | | | |
| | | 0.9489 | 0.9489 | 0.9489 | | | | | | | | 0.9489 | 0.0000 | 0.9489 | 0.9489 | 0.940 min. ave. |
| ASTM D6693 Type IV | Tensile Properties: | | | | | | | | | | | | | | | |
| | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 156 | 152 | 160 | 154 | 154 | | | | | | 155 | 3 | 152 | 160 | 126 min. ave. |
| | *TD* | 165 | 164 | 172 | 176 | 172 | | | | | | 170 | 5 | 164 | 176 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 204 | 204 | 204 | 175 | 178 | | | | | | 193 | 15 | 175 | 204 | 90 min. ave. |
| | *TD* | 182 | 173 | 176 | 178 | 181 | | | | | | 178 | 4 | 173 | 182 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 18 | 17 | 18 | 19 | 18 | | | | | | 18 | 1 | 17 | 19 | 12 min. ave. |
| | *TD* | 17 | 16 | 16 | 17 | 15 | | | | | | 16 | 1 | 15 | 17 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 537 | 567 | 558 | 469 | 552 | | | | | | 536 | 39 | 469 | 567 | 100 min. ave. |
| | *TD* | 494 | 475 | 491 | 499 | 517 | | | | | | 495 | 15 | 475 | 517 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.42 | 2.42 | | | | | | | | | 2.42 | 0.00 | 2.42 | 2.42 | 2.0 - 3.0 |

(End of Table 3)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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# TABLE 4.

## MATERIAL PROPERTIES

**CLIENT: SCS Engineers**

**PROJECT: Oak Grove Steam Electric Station**

Date Received: **5/26/2021**
Date Reported: **6/3/2021**
Client Sample ID: **R#0102-200273 L#20J1249**
Material Description: **60mil HDPE Textured Geomembrane**

QC'd By: Maria Espitia
TRI Job No.: **G210467**
TRI Control No.: **156077**

| METHOD | DESCRIPTION | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Avg. | Std. Dev. | Min | Max | Proj. Specs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM D5994 | Thickness (mils) | | | | | | | | | | | | | | | |
| | *Apparatus: Dead-weight dial micrometer with gauge points tapered at an angle of 60° +/- 2° to the horizontal with the tip rounded to a radius of 0.8+/-0.1 mm(0.031+/-0.004 in), with a specified force of 0.56+/-0.05 N (2+/-0.2 oz)* | | | | | | | | | | | | | | | 57 min. ave. |
| | *Loading Time: 5 sec Specimen Size: 4" x 4"* | | | | | | | | | | | | | | | 54min. (8 out of 10) |
| | | 60 | 61 | 61 | 65 | 60 | 61 | 61 | 61 | 65 | 61 | 62 | 2 | 60 | 65 | 51min. (for any 10) |
| ASTM D1505 | Density (grams/ $cm.^3$) | | | | | | | | | | | | | | | |
| | | 0.9493 | 0.9493 | 0.9493 | | | | | | | | 0.9493 | 0.0000 | 0.9493 | 0.9493 | 0.940 min. ave. |
| ASTM D6693 Type IV | Tensile Properties: | | | | | | | | | | | | | | | |
| | *Test Specimens: Type IV, Width of narrow section:0.25in, Length of narrow section:1.3in, Width Overall:0.75in, Length Overall: 4.5in Rate of Separation: 2"/min* | | | | | | | | | | | | | | | |
| | Tensile Strength at Yield (lbs/ in.-width) | | | | | | | | | | | | | | | |
| | *MD* | 165 | 170 | 161 | 171 | 163 | | | | | | 166 | 4 | 161 | 171 | 126 min. ave. |
| | *TD* | 169 | 168 | 173 | 166 | 176 | | | | | | 170 | 4 | 166 | 176 | |
| | Tensile Strength at Break (lbs/ in.- width) | | | | | | | | | | | | | | | |
| | *MD* | 184 | 207 | 185 | 170 | 183 | | | | | | 186 | 13 | 170 | 207 | 90 min. ave. |
| | *TD* | 173 | 204 | 182 | 186 | 215 | | | | | | 192 | 17 | 173 | 215 | |
| | Elongation at Yield (percent, %) | | | | | | | | | | | | | | | |
| | *MD* | 17 | 19 | 17 | 17 | 17 | | | | | | 17 | 1 | 17 | 19 | 12 min. ave. |
| | *TD* | 17 | 17 | 16 | 17 | 18 | | | | | | 17 | 1 | 16 | 18 | |
| | Elongation at Break (percent, %) *Gauge Length = 2.0 in.* | | | | | | | | | | | | | | | |
| | *MD* | 481 | 547 | 510 | 459 | 475 | | | | | | 494 | 35 | 459 | 547 | 100 min. ave. |
| | *TD* | 481 | 581 | 495 | 546 | 626 | | | | | | 546 | 60 | 481 | 626 | |
| ASTM D5596 | Carbon Black Dispersion (category rating per reference chart PCN: 12-455960-38) | | | | | | | | | | | | | | | 9 in Cat. 1 or 2 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 out of 10 in Category 1 | | | | 1 in Cat. 3 |
| ASTM D4218 | Carbon Content | | | | | | | | | | | | | | | |
| | *Apparatus: Muffle Furnace* | | | | | | | | | | | | | | | |
| | | 2.40 | 2.41 | | | | | | | | | 2.40 | 0.01 | 2.40 | 2.41 | 2.0 - 3.0 |

(End of Table 4)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

LEGENDS:
MD - MACHINE DIRECTION
TD- TRANSVERSE DIRECTION

September 14, 2021

**Mail To:**

**Natalie Herman**
**ETTL Engineers & Consultants, Inc**
1717 E. Erwin St
Tyler, TX 75702

email: nstraub@ettlinc.com

**Bill To:**

**<= Same**

Dear Mrs. Herman:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report of the laboratory testing for the sample(s) listed below.

| | |
|---|---|
| Project: | **Martin Lake CCR Impoundment Reline East Ash Pond** |
| TRI Job Reference Number: | 66814 |
| Material(s) Tested: | Six, Solmax 60 mil Textured HDPE Geomembrane(s) |
| Test(s) Requested: | Thickness (ASTM D 5994)<br>Density (ASTM D 1505)<br>Carbon Black Content (ASTM D 4218)<br>Carbon Dispersion (ASTM D 5596)<br>Tensile Properties (ASTM D 6693)<br>Puncture Strength (ASTM D 4833)<br>Tear Resistance (ASTM D 1004) |

If you have any questions or require any additional information, please call us at 1-800-880-8378

Sincerely,

Mansukh Patel
Laboratory Manager
Geosynthetic Services Division

*Signature is on file



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

**GEOMEMBRANE TEST RESULTS**
**TRI Client: ETTL Engineers & Consultants, Inc**
**Project: Martin Lake CCR Impoundment Reline East Ash Pond**

**Material: Solmax 60 mil Textured HDPE Geomembrane**
**Sample Identification: 0105-204689**
**TRI Log #: 66814**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| **Thickness (ASTM D 5994)** | | | | | | | | | | | | |
| Thickness (mils) | 64 | 62 | 63 | 62 | 61 | 60 | 60 | 61 | 60 | 60 | 61 | 1 |
| | | | | | | | | | | | 60 | << min |
| **Density (ASTM D 1505)** | | | | | | | | | | | | |
| Density (g/cm3) | 0.946 | 0.946 | 0.946 | | | | | | | | 0.946 | 0.000 |
| **Carbon Black Content (ASTM D 4218)** | | | | | | | | | | | | |
| % Carbon Black | 2.40 | 2.30 | | | | | | | | | 2.35 | 0.07 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 170 | 170 | 174 | 173 | 177 | | | | | | 173 | 3 |
| TD Yield Strength (ppi) | 178 | 179 | 187 | 177 | 174 | | | | | | 179 | 5 |
| MD Break Strength (ppi) | 244 | 228 | 245 | 226 | 203 | | | | | | 229 | 17 |
| TD Break Strength (ppi) | 167 | 134 | 160 | 204 | 221 | | | | | | 177 | 35 |
| MD Yield Elongation (%) | 21 | 17 | 20 | 20 | 20 | | | | | | 20 | 2 |
| TD Yield Elongation (%) | 15 | 17 | 17 | 17 | 16 | | | | | | 16 | 1 |
| MD Break Elongation (%) | 653 | 590 | 617 | 584 | 503 | | | | | | 589 | 55 |
| TD Break Elongation (%) | 446 | 264 | 423 | 566 | 611 | | | | | | 462 | 136 |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | |
| Puncture Strength (lbs) | 156 | 156 | 149 | 145 | 147 | | | | | | 151 | 5 |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 56 | 54 | 57 | 54 | 55 | 58 | 56 | 55 | 55 | 56 | 56 | 1 |
| TD Tear Strength (lbs) | 55 | 56 | 57 | 59 | 60 | 60 | 61 | 60 | 61 | 56 | 59 | 2 |

MD Machine Direction TD Transverse Direction



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

**GEOMEMBRANE TEST RESULTS**
**TRI Client: ETTL Engineers & Consultants, Inc**
**Project: Martin Lake CCR Impoundment Reline East Ash Pond**

**Material: Solmax 60 mil Textured HDPE Geomembrane**
**Sample Identification: 0105-204696**
**TRI Log #: 66814**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| **Thickness (ASTM D 5994)** | | | | | | | | | | | | |
| Thickness (mils) | 63 | 61 | 61 | 60 | 61 | 60 | 60 | 60 | 60 | 60 | 61<br>60 | 1<br><< min |
| **Density (ASTM D 1505)** | | | | | | | | | | | | |
| Density (g/cm3) | 0.946 | 0.946 | 0.946 | | | | | | | | 0.946 | 0.000 |
| **Carbon Black Content (ASTM D 4218)** | | | | | | | | | | | | |
| % Carbon Black | 2.37 | 2.37 | | | | | | | | | 2.37 | 0.00 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 169 | 163 | 160 | 163 | 150 | | | | | | 161 | 7 |
| TD Yield Strength (ppi) | 171 | 162 | 162 | 156 | 156 | | | | | | 161 | 6 |
| MD Break Strength (ppi) | 213 | 155 | 223 | 217 | 220 | | | | | | 206 | 29 |
| TD Break Strength (ppi) | 185 | 178 | 195 | 132 | 208 | | | | | | 180 | 29 |
| MD Yield Elongation (%) | 19 | 19 | 23 | 21 | 20 | | | | | | 20 | 2 |
| TD Yield Elongation (%) | 16 | 18 | 18 | 18 | 16 | | | | | | 17 | 1 |
| MD Break Elongation (%) | 561 | 361 | 599 | 556 | 604 | | | | | | 536 | 100 |
| TD Break Elongation (%) | 486 | 504 | 553 | 408 | 577 | | | | | | 506 | 66 |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | |
| Puncture Strength (lbs) | 146 | 149 | 143 | 148 | 148 | | | | | | 147 | 3 |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 52 | 54 | 55 | 56 | 56 | 54 | 54 | 52 | 53 | 53 | 54 | 2 |
| TD Tear Strength (lbs) | 56 | 58 | 55 | 63 | 61 | 58 | 59 | 56 | 54 | 55 | 58 | 3 |

MD Machine Direction TD Transverse Direction



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

**GEOMEMBRANE TEST RESULTS**
**TRI Client: ETTL Engineers & Consultants, Inc**
**Project: Martin Lake CCR Impoundment Reline East Ash Pond**

**Material: Solmax 60 mil Textured HDPE Geomembrane**
**Sample Identification: 0105-204703**
**TRI Log #: 66814**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| **Thickness (ASTM D 5994)** | | | | | | | | | | | | |
| Thickness (mils) | 60 | 61 | 60 | 60 | 60 | 61 | 61 | 60 | 60 | 60 | 60 | 0 |
| | | | | | | | | | | | 60 | << min |
| **Density (ASTM D 1505)** | | | | | | | | | | | | |
| Density (g/cm3) | 0.946 | 0.946 | 0.946 | | | | | | | | 0.946 | 0.000 |
| **Carbon Black Content (ASTM D 4218)** | | | | | | | | | | | | |
| % Carbon Black | 2.33 | 2.33 | | | | | | | | | 2.33 | 0.00 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 172 | 168 | 168 | 159 | 169 | | | | | | 167 | 5 |
| TD Yield Strength (ppi) | 181 | 182 | 175 | 182 | 172 | | | | | | 178 | 5 |
| MD Break Strength (ppi) | 211 | 229 | 233 | 229 | 237 | | | | | | 228 | 10 |
| TD Break Strength (ppi) | 198 | 204 | 208 | 190 | 205 | | | | | | 201 | 7 |
| MD Yield Elongation (%) | 19 | 21 | 21 | 19 | 21 | | | | | | 20 | 1 |
| TD Yield Elongation (%) | 15 | 18 | 15 | 18 | 17 | | | | | | 17 | 2 |
| MD Break Elongation (%) | 519 | 576 | 580 | 585 | 584 | | | | | | 569 | 28 |
| TD Break Elongation (%) | 501 | 531 | 544 | 466 | 542 | | | | | | 517 | 33 |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | |
| Puncture Strength (lbs) | 151 | 155 | 156 | 148 | 151 | | | | | | 152 | 3 |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 52 | 55 | 52 | 56 | 57 | 55 | 55 | 55 | 54 | 53 | 54 | 2 |
| TD Tear Strength (lbs) | 56 | 56 | 56 | 61 | 57 | 58 | 58 | 59 | 57 | 55 | 57 | 2 |

MD Machine Direction TD Transverse Direction



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality TRI limits reproduction of this report, except in full, without prior approval of TRI.

**GEOMEMBRANE TEST RESULTS**
**TRI Client: ETTL Engineers & Consultants, Inc**
**Project: Martin Lake CCR Impoundment Reline East Ash Pond**

**Material: Solmax 60 mil Textured HDPE Geomembrane**
**Sample Identification: 0105-204711**
**TRI Log #: 66814**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| **Thickness (ASTM D 5994)** | | | | | | | | | | | | |
| Thickness (mils) | 61 | 60 | 61 | 62 | 63 | 61 | 62 | 60 | 61 | 61 | 61 | 1 |
| | | | | | | | | | | | 60 | << min |
| **Density (ASTM D 1505)** | | | | | | | | | | | | |
| Density (g/cm3) | 0.947 | 0.947 | 0.947 | | | | | | | | 0.947 | 0.000 |
| **Carbon Black Content (ASTM D 4218)** | | | | | | | | | | | | |
| % Carbon Black | 2.52 | 2.51 | | | | | | | | | 2.52 | 0.01 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 172 | 169 | 166 | 170 | 172 | | | | | | 170 | 2 |
| TD Yield Strength (ppi) | 181 | 170 | 173 | 175 | 179 | | | | | | 176 | 4 |
| MD Break Strength (ppi) | 190 | 218 | 215 | 231 | 237 | | | | | | 218 | 18 |
| TD Break Strength (ppi) | 201 | 194 | 204 | 140 | 207 | | | | | | 189 | 28 |
| MD Yield Elongation (%) | 17 | 20 | 19 | 19 | 22 | | | | | | 19 | 2 |
| TD Yield Elongation (%) | 17 | 18 | 19 | 18 | 18 | | | | | | 18 | 1 |
| MD Break Elongation (%) | 469 | 582 | 567 | 590 | 597 | | | | | | 561 | 53 |
| TD Break Elongation (%) | 531 | 540 | 566 | 285 | 540 | | | | | | 492 | 117 |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | |
| Puncture Strength (lbs) | 156 | 144 | 148 | 145 | 145 | | | | | | 148 | 5 |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 56 | 59 | 57 | 57 | 57 | 59 | 57 | 54 | 54 | 55 | 56 | 2 |
| TD Tear Strength (lbs) | 59 | 57 | 59 | 60 | 55 | 61 | 59 | 55 | 58 | 55 | 58 | 2 |

MD Machine Direction TD Transverse Direction



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

**GEOMEMBRANE TEST RESULTS**
**TRI Client: ETTL Engineers & Consultants, Inc**
**Project: Martin Lake CCR Impoundment Reline East Ash Pond**

**Material: Solmax 60 mil Textured HDPE Geomembrane**
**Sample Identification: 0105-204721**
**TRI Log #: 66814**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| **Thickness (ASTM D 5994)** | | | | | | | | | | | | |
| Thickness (mils) | 62 | 60 | 62 | 62 | 61 | 62 | 60 | 60 | 60 | 61 | 61 | 1 |
| | | | | | | | | | | | 60 | << min |
| **Density (ASTM D 1505)** | | | | | | | | | | | | |
| Density (g/cm3) | 0.945 | 0.945 | 0.945 | | | | | | | | 0.945 | 0.000 |
| **Carbon Black Content (ASTM D 4218)** | | | | | | | | | | | | |
| % Carbon Black | 2.19 | 2.19 | | | | | | | | | 2.19 | 0.00 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 171 | 161 | 163 | 165 | 162 | | | | | | 164 | 4 |
| TD Yield Strength (ppi) | 186 | 170 | 176 | 175 | 180 | | | | | | 177 | 6 |
| MD Break Strength (ppi) | 234 | 137 | 224 | 223 | 246 | | | | | | 213 | 43 |
| TD Break Strength (ppi) | 233 | 200 | 200 | 133 | 205 | | | | | | 194 | 37 |
| MD Yield Elongation (%) | 18 | 19 | 21 | 21 | 21 | | | | | | 20 | 1 |
| TD Yield Elongation (%) | 17 | 17 | 16 | 16 | 18 | | | | | | 17 | 1 |
| MD Break Elongation (%) | 579 | 213 | 571 | 556 | 617 | | | | | | 507 | 166 |
| TD Break Elongation (%) | 601 | 543 | 529 | 66 | 512 | | | | | | 450 | 217 |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | |
| Puncture Strength (lbs) | 154 | 152 | 146 | 143 | 147 | | | | | | 148 | 4 |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 55 | 58 | 54 | 54 | 54 | 58 | 55 | 58 | 53 | 53 | 55 | 2 |
| TD Tear Strength (lbs) | 58 | 57 | 61 | 58 | 57 | 55 | 58 | 53 | 58 | 56 | 57 | 2 |

MD Machine Direction TD Transverse Direction



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

**GEOMEMBRANE TEST RESULTS**
**TRI Client: ETTL Engineers & Consultants, Inc**
**Project: Martin Lake CCR Impoundment Reline East Ash Pond**

**Material: Solmax 60 mil Textured HDPE Geomembrane**
**Sample Identification: 0105-204729**
**TRI Log #: 66814**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| **Thickness (ASTM D 5994)** | | | | | | | | | | | | |
| Thickness (mils) | 63 | 60 | 62 | 61 | 60 | 61 | 61 | 60 | 61 | 61 | 61 | 1 |
| | | | | | | | | | | | 60 | << min |
| **Density (ASTM D 1505)** | | | | | | | | | | | | |
| Density (g/cm3) | 0.946 | 0.946 | 0.946 | | | | | | | | 0.946 | 0.000 |
| **Carbon Black Content (ASTM D 4218)** | | | | | | | | | | | | |
| % Carbon Black | 2.28 | 2.32 | | | | | | | | | 2.30 | 0.03 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 180 | 178 | 172 | 169 | 161 | | | | | | 172 | 8 |
| TD Yield Strength (ppi) | 178 | 181 | 186 | 182 | 180 | | | | | | 181 | 3 |
| MD Break Strength (ppi) | 156 | 192 | 242 | 196 | 240 | | | | | | 205 | 36 |
| TD Break Strength (ppi) | 212 | 198 | 210 | 199 | 183 | | | | | | 200 | 12 |
| MD Yield Elongation (%) | 20 | 22 | 20 | 24 | 20 | | | | | | 21 | 2 |
| TD Yield Elongation (%) | 16 | 18 | 18 | 17 | 17 | | | | | | 17 | 1 |
| MD Break Elongation (%) | 286 | 467 | 626 | 508 | 631 | | | | | | 504 | 141 |
| TD Break Elongation (%) | 597 | 552 | 564 | 550 | 494 | | | | | | 551 | 37 |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | |
| Puncture Strength (lbs) | 147 | 147 | 144 | 146 | 141 | | | | | | 145 | 2 |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 52 | 54 | 53 | 51 | 56 | 55 | 55 | 56 | 53 | 57 | 54 | 2 |
| TD Tear Strength (lbs) | 60 | 55 | 56 | 59 | 58 | 58 | 57 | 57 | 57 | 59 | 58 | 2 |

MD Machine Direction TD Transverse Direction



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI

# APPENDIX J

# GEOMEMBRANE CONFORMANCE TEST RESULTS

# CONFORMANCE TEST RESULTS FOR 60-MIL SMOOTH HDPE GEOMEMBRANE

March 6, 2021

**Mail To:**

**Zahirul Islam**
**Civil & Environmental Consultants, Inc**

email: zislam@cecinc.com

**Bill To:**

**<= Same**

Greetings

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs.
TRI is pleased to submit this final report of the laboratory testing for the sample(s) listed below.

| | |
|---|---|
| Project: | **US Ecology Cell 51 Phase II Liner System Const** |
| TRI Job Reference Number: | 62022 |
| Material(s) Tested: | One, Solmax 60 mil Smooth HDPE Geomembrane |
| Test(s) Requested: | Thickness (ASTM D 5199)<br>Density (ASTM D 1505)<br>Carbon Black Content (ASTM D 1603, mod.)<br>Carbon Dispersion (ASTM D 5596)<br>Tensile Properties (ASTM D 6693)<br>Puncture Strength (ASTM D 4833)<br>Tear Resistance (ASTM D 1004) |

If you have any questions or require any additional information, please call us at 1-800-880-8378

Sincerely,

Checked by Zahirul
on 3/6/2021

Mansukh Patel
Laboratory Manager
Geosynthetic Services Division
www.GeosyntheticTesting.com

*Signature is on file



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206883**
**TRI Log #: 62022**

| PARAMETER | TEST REPLICATE NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 63.9 | 65.6 | 63.8 | 63.5 | 63.5 | 64.3 | 65.4 | 69.4 | 63.2 | 63.7 | 64.6<br>63.2 | 1.9<br><< min | 60 min ave<br>54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.947 | 0.947 | 0.947 | | | | | | | | 0.947 | 0.000 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.51 | 2.56 | | | | | | | | | 2.54 | 0.04 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 158 | 153 | 178 | 166 | 165 | | | | | | 164 | 9 | 126 min |
| TD Yield Strength (ppi) | 171 | 170 | 167 | 166 | 168 | | | | | | 168 | 2 | 126 min |
| MD Break Strength (ppi) | 267 | 246 | 256 | 229 | 319 | | | | | | 263 | 34 | 228 min |
| TD Break Strength (ppi) | 293 | 294 | 286 | 316 | 305 | | | | | | 299 | 12 | 228 min |
| MD Yield Elongation (%) | 21 | 21 | 21 | 21 | 23 | | | | | | 21 | 1 | 12 min |
| TD Yield Elongation (%) | 19 | 20 | 19 | 17 | 20 | | | | | | 19 | 1 | 12 min |
| MD Break Elongation (%) | 728 | 695 | 644 | 624 | 828 | | | | | | 704 | 81 | 700 min |
| TD Break Elongation (%) | 800 | 832 | 821 | 877 | 864 | | | | | | 839 | 31 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 137 | 136 | 134 | 133 | 130 | | | | | | 134 | 3 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 51 | 50 | 49 | 50 | 51 | 49 | 49 | 49 | 49 | 49 | 50 | 1 | 42 min |
| TD Tear Strength (lbs) | 54 | 54 | 52 | 53 | 54 | 53 | 54 | 53 | 53 | 53 | 53 | 1 | 42 min |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 3/6/2021*



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI

March 8, 2021
March 2, 2021

**Mail To:**

**Zahirul Islam**
**Civil & Environmental Consultants, Inc**

email: zislam@cecinc.com

**Bill To:**

**<= Same**

Greetings

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs.
TRI is pleased to submit this final report of the laboratory testing for the sample(s) listed below.

| | |
|---|---|
| Project: | **US Ecology Cell 51 Phase II Liner System Const** |
| TRI Job Reference Number: | 62021 |
| Material(s) Tested: | Ten, Solmax 60 mil Smooth HDPE Geomembrane |
| Test(s) Requested: | Thickness (ASTM D 5199)<br>Density (ASTM D 1505)<br>Carbon Black Content (ASTM D 1603, mod.)<br>Carbon Dispersion (ASTM D 5596)<br>Tensile Properties (ASTM D 6693)<br>Puncture Strength (ASTM D 4833)<br>Tear Resistance (ASTM D 1004) |

If you have any questions or require any additional information, please call us at 1-800-880-8378

Sincerely,

Mansukh Patel
Laboratory Manager
Geosynthetic Services Division
www.GeosyntheticTesting.com

*Signature is on file

*Checked by Zahirul on 3/8/2021*



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206884**
**TRI Log #: 62021**

| PARAMETER | TEST REPLICATE NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 63.4 | 63.5 | 61.9 | 66.1 | 65.6 | 65.0 | 64.2 | 66.6 | 63.8 | 68.6 | 64.9 | 1.9 | 60 min ave |
| | | | | | | | | | | | 61.9 | << min | 54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.946 | 0.947 | 0.947 | | | | | | | | 0.947 | 0.001 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.57 | 2.57 | | | | | | | | | 2.57 | 0.00 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 153 | 157 | 156 | 161 | 145 | | | | | | 154 | 6 | 126 min |
| TD Yield Strength (ppi) | 162 | 168 | 170 | 155 | 156 | | | | | | 162 | 7 | 126 min |
| MD Break Strength (ppi) | 283 | 251 | 284 | 299 | 313 | | | | | | 286 | 23 | 228 min |
| TD Break Strength (ppi) | 263 | 318 | 325 | 309 | 288 | | | | | | 301 | 25 | 228 min |
| MD Yield Elongation (%) | 19 | 23 | 21 | 22 | 23 | | | | | | 22 | 2 | 12 min |
| TD Yield Elongation (%) | 17 | 19 | 19 | 19 | 20 | | | | | | 19 | 1 | 12 min |
| MD Break Elongation (%) | 756 | 680 | 760 | 785 | 866 | | | | | | 769 | 67 | 700 min |
| TD Break Elongation (%) | 736 | 889 | 904 | 889 | 831 | | | | | | 850 | 69 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 144 | 143 | 138 | 141 | 139 | | | | | | 141 | 2 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 51 | 49 | 51 | 51 | 52 | 50 | 49 | 51 | 50 | 52 | 51 | 1 | 42 min |
| TD Tear Strength (lbs) | 52 | 51 | 54 | 55 | 56 | 53 | 52 | 55 | 54 | 53 | 54 | 2 | 42 min |

MD Machine Direction TD Transverse Direction

Checked by Zahirul on 3/8/2021



The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206889**
**TRI Log #: 62021**

| PARAMETER | TEST REPLICATE NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 66.5 | 62.9 | 65.7 | 64.8 | 64.9 | 65.3 | 67.8 | 61.4 | 64.1 | 65.7 | 64.9<br>61.4 | 1.8<br><< min | 60 min ave<br>54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.947 | 0.947 | 0.947 | | | | | | | | 0.947 | 0.000 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.53 | 2.47 | | | | | | | | | 2.50 | 0.04 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 154 | 157 | 164 | 162 | 157 | | | | | | 159 | 4 | 126 min |
| TD Yield Strength (ppi) | 168 | 171 | 162 | 168 | 156 | | | | | | 165 | 6 | 126 min |
| MD Break Strength (ppi) | 315 | 328 | 312 | 328 | 304 | | | | | | 317 | 10 | 228 min |
| TD Break Strength (ppi) | 328 | 310 | 310 | 337 | 317 | | | | | | 320 | 12 | 228 min |
| MD Yield Elongation (%) | 22 | 22 | 22 | 22 | 23 | | | | | | 22 | 0 | 12 min |
| TD Yield Elongation (%) | 20 | 19 | 19 | 19 | 19 | | | | | | 19 | 0 | 12 min |
| MD Break Elongation (%) | 842 | 854 | 798 | 855 | 801 | | | | | | 830 | 28 | 700 min |
| TD Break Elongation (%) | 909 | 870 | 865 | 921 | 900 | | | | | | 893 | 25 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 141 | 139 | 139 | 138 | 139 | | | | | | 139 | 1 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 52 | 49 | 49 | 52 | 52 | 52 | 52 | 50 | 53 | 51 | 51 | 1 | 42 min |
| TD Tear Strength (lbs) | 53 | 54 | 51 | 55 | 56 | 55 | 53 | 55 | 54 | 54 | 54 | 1 | 42 min |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 3/8/2021*



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206897**
**TRI Log #: 62021**

| PARAMETER | TEST REPLICATE NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 65.7 | 64.4 | 65.1 | 67.3 | 64.6 | 68.7 | 68.3 | 66.3 | 62.8 | 65.5 | 65.9 | 1.8 | 60 min ave |
| | | | | | | | | | | | 62.8 | << min | 54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.947 | 0.948 | 0.948 | | | | | | | | 0.948 | 0.001 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.61 | 2.68 | | | | | | | | | 2.65 | 0.05 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 153 | 152 | 146 | 151 | 154 | | | | | | 151 | 3 | 126 min |
| TD Yield Strength (ppi) | 158 | 163 | 158 | 162 | 164 | | | | | | 161 | 3 | 126 min |
| MD Break Strength (ppi) | 301 | 311 | 289 | 307 | 299 | | | | | | 301 | 8 | 228 min |
| TD Break Strength (ppi) | 306 | 314 | 332 | 331 | 304 | | | | | | 317 | 13 | 228 min |
| MD Yield Elongation (%) | 22 | 22 | 21 | 21 | 22 | | | | | | 22 | 1 | 12 min |
| TD Yield Elongation (%) | 18 | 19 | 18 | 19 | 20 | | | | | | 19 | 1 | 12 min |
| MD Break Elongation (%) | 798 | 835 | 794 | 825 | 801 | | | | | | 811 | 18 | 700 min |
| TD Break Elongation (%) | 880 | 903 | 958 | 936 | 855 | | | | | | 906 | 42 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 134 | 133 | 143 | 140 | 136 | | | | | | 137 | 4 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 49 | 50 | 49 | 49 | 48 | 50 | 50 | 50 | 50 | 49 | 49 | 1 | 42 min |
| TD Tear Strength (lbs) | 53 | 53 | 52 | 54 | 54 | 51 | 53 | 50 | 53 | 53 | 53 | 1 | 42 min |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 3/8/2021*



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206903**
**TRI Log #: 62021**

| PARAMETER | TEST REPLICATE NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 62.6 | 63.6 | 64.2 | 64.4 | 65.1 | 64.9 | 65.3 | 60.3 | 63.3 | 62.6 | 63.6<br>60.3 | 1.5<br><< min | 60 min ave<br>54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.947 | 0.947 | 0.947 | | | | | | | | 0.947 | 0.000 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.61 | 2.61 | | | | | | | | | 2.61 | 0.00 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 157 | 155 | 159 | 149 | 156 | | | | | | 155 | 4 | 126 min |
| TD Yield Strength (ppi) | 163 | 161 | 155 | 162 | 151 | | | | | | 158 | 5 | 126 min |
| MD Break Strength (ppi) | 306 | 278 | 337 | 308 | 313 | | | | | | 308 | 21 | 228 min |
| TD Break Strength (ppi) | 307 | 316 | 288 | 325 | 325 | | | | | | 312 | 15 | 228 min |
| MD Yield Elongation (%) | 23 | 23 | 23 | 23 | 23 | | | | | | 23 | 0 | 12 min |
| TD Yield Elongation (%) | 19 | 18 | 18 | 21 | 19 | | | | | | 19 | 1 | 12 min |
| MD Break Elongation (%) | 807 | 752 | 846 | 860 | 838 | | | | | | 821 | 43 | 700 min |
| TD Break Elongation (%) | 903 | 916 | 845 | 941 | 964 | | | | | | 914 | 45 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 132 | 134 | 133 | 132 | 131 | | | | | | 132 | 1 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 49 | 49 | 49 | 48 | 48 | 47 | 48 | 48 | 48 | 47 | 48 | 1 | 42 min |
| TD Tear Strength (lbs) | 52 | 54 | 52 | 51 | 50 | 53 | 52 | 54 | 53 | 52 | 52 | 1 | 42 min |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 3/8/2021*



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206910**
**TRI Log #: 62021**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | |
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 63.5 | 63.8 | 63.6 | 64.0 | 64.2 | 67.5 | 67.1 | 65.2 | 61.9 | 64.8 | 64.6 | 1.7 | 60 min ave |
| | | | | | | | | | | | 61.9 | << min | 54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.948 | 0.948 | 0.948 | | | | | | | | 0.948 | 0.000 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.81 | 2.83 | | | | | | | | | 2.82 | 0.01 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 137 | 149 | 146 | 150 | 149 | | | | | | 146 | 5 | 126 min |
| TD Yield Strength (ppi) | 159 | 152 | 158 | 158 | 158 | | | | | | 157 | 3 | 126 min |
| MD Break Strength (ppi) | 309 | 323 | 308 | 293 | 284 | | | | | | 303 | 15 | 228 min |
| TD Break Strength (ppi) | 304 | 313 | 328 | 324 | 310 | | | | | | 316 | 10 | 228 min |
| MD Yield Elongation (%) | 22 | 24 | 22 | 21 | 24 | | | | | | 23 | 1 | 12 min |
| TD Yield Elongation (%) | 19 | 17 | 19 | 19 | 21 | | | | | | 19 | 1 | 12 min |
| MD Break Elongation (%) | 872 | 877 | 851 | 803 | 782 | | | | | | 837 | 42 | 700 min |
| TD Break Elongation (%) | 877 | 925 | 954 | 969 | 910 | | | | | | 927 | 36 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 127 | 127 | 127 | 127 | 123 | | | | | | 126 | 2 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 48 | 48 | 49 | 47 | 48 | 49 | 50 | 48 | 48 | 48 | 48 | 1 | 42 min |
| TD Tear Strength (lbs) | 52 | 52 | 52 | 53 | 51 | 51 | 53 | 52 | 50 | 52 | 52 | 1 | 42 min |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 3/8/2021*



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206918**
**TRI Log #: 62021**

| PARAMETER | TEST REPLICATE NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 65.1 | 65.0 | 64.8 | 65.8 | 65.3 | 69.2 | 67.5 | 62.9 | 62.6 | 65.7 | 65.4<br>62.6 | 1.9<br><< min | 60 min ave<br>54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.946 | 0.946 | 0.946 | | | | | | | | 0.946 | 0.000 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.30 | 2.40 | | | | | | | | | 2.35 | 0.07 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 147 | 149 | 144 | 156 | 144 | | | | | | 148 | 5 | 126 min |
| TD Yield Strength (ppi) | 160 | 155 | 156 | 162 | 155 | | | | | | 158 | 3 | 126 min |
| MD Break Strength (ppi) | 319 | 278 | 296 | 321 | 300 | | | | | | 303 | 18 | 228 min |
| TD Break Strength (ppi) | 291 | 251 | 287 | 321 | 271 | | | | | | 284 | 26 | 228 min |
| MD Yield Elongation (%) | 21 | 22 | 22 | 21 | 23 | | | | | | 22 | 1 | 12 min |
| TD Yield Elongation (%) | 19 | 19 | 19 | 19 | 20 | | | | | | 19 | 0 | 12 min |
| MD Break Elongation (%) | 868 | 768 | 821 | 853 | 851 | | | | | | 832 | 40 | 700 min |
| TD Break Elongation (%) | 842 | 754 | 846 | 925 | 798 | | | | | | 833 | 64 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 129 | 126 | 129 | 126 | 126 | | | | | | 127 | 2 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 49 | 48 | 47 | 47 | 47 | 48 | 47 | 48 | 48 | 48 | 48 | 1 | 42 min |
| TD Tear Strength (lbs) | 53 | 52 | 50 | 51 | 50 | 50 | 52 | 52 | 49 | 51 | 51 | 1 | 42 min |

MD Machine Direction TD Transverse Direction

Checked by Zahirul
on 3/8/2021



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206925**
**TRI Log #: 62021**

| PARAMETER | TEST REPLICATE NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 63.1 | 62.3 | 63.9 | 62.0 | 63.6 | 62.6 | 64.0 | 65.8 | 60.4 | 64.0 | 63.2<br>60.4 | 1.5<br><< min | 60 min ave<br>54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.947 | 0.947 | 0.947 | | | | | | | | 0.947 | 0.000 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.37 | 2.43 | | | | | | | | | 2.40 | 0.04 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 150 | 144 | 149 | 142 | 146 | | | | | | 146 | 3 | 126 min |
| TD Yield Strength (ppi) | 160 | 154 | 155 | 159 | 152 | | | | | | 156 | 3 | 126 min |
| MD Break Strength (ppi) | 299 | 252 | 272 | 302 | 291 | | | | | | 283 | 21 | 228 min |
| TD Break Strength (ppi) | 278 | 312 | 311 | 327 | 300 | | | | | | 306 | 18 | 228 min |
| MD Yield Elongation (%) | 23 | 24 | 23 | 21 | 22 | | | | | | 23 | 1 | 12 min |
| TD Yield Elongation (%) | 21 | 20 | 20 | 20 | 22 | | | | | | 21 | 1 | 12 min |
| MD Break Elongation (%) | 813 | 724 | 752 | 859 | 817 | | | | | | 793 | 54 | 700 min |
| TD Break Elongation (%) | 815 | 934 | 924 | 972 | 913 | | | | | | 912 | 58 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 127 | 127 | 123 | 124 | 124 | | | | | | 125 | 2 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 47 | 47 | 47 | 48 | 47 | 47 | 48 | 48 | 48 | 47 | 47 | 1 | 42 min |
| TD Tear Strength (lbs) | 51 | 51 | 50 | 50 | 50 | 53 | 50 | 50 | 52 | 52 | 51 | 1 | 42 min |

MD Machine Direction TD Transverse Direction

Checked by Zahirul
on 3/8/2021



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206933**
**TRI Log #: 62021**

| PARAMETER | TEST REPLICATE NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 61.6 | 62.4 | 64.9 | 63.1 | 63.4 | 65.0 | 63.5 | 62.9 | 63.5 | 59.7 | 63.0 | 1.5 | 60 min ave |
| | | | | | | | | | | | 59.7 | << min | 54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.945 | 0.945 | 0.945 | | | | | | | | 0.945 | 0.000 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.29 | 2.36 | | | | | | | | | 2.33 | 0.05 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 144 | 143 | 146 | 146 | 155 | | | | | | 147 | 5 | 126 min |
| TD Yield Strength (ppi) | 152 | 162 | 156 | 160 | 150 | | | | | | 156 | 5 | 126 min |
| MD Break Strength (ppi) | 290 | 263 | 324 | 326 | 340 | | | | | | 309 | 31 | 228 min |
| TD Break Strength (ppi) | 260 | 297 | 308 | 285 | 252 | | | | | | 280 | 24 | 228 min |
| MD Yield Elongation (%) | 22 | 22 | 22 | 22 | 25 | | | | | | 23 | 1 | 12 min |
| TD Yield Elongation (%) | 20 | 20 | 19 | 19 | 21 | | | | | | 20 | 1 | 12 min |
| MD Break Elongation (%) | 796 | 743 | 882 | 903 | 887 | | | | | | 842 | 69 | 700 min |
| TD Break Elongation (%) | 798 | 882 | 943 | 828 | 779 | | | | | | 846 | 67 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 129 | 135 | 133 | 132 | 132 | | | | | | 132 | 2 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 45 | 45 | 49 | 49 | 46 | 46 | 46 | 46 | 47 | 47 | 47 | 1 | 42 min |
| TD Tear Strength (lbs) | 48 | 50 | 51 | 53 | 50 | 50 | 49 | 49 | 51 | 51 | 50 | 2 | 42 min |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 3/8/2021*



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206939**
**TRI Log #: 62021**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | |
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 59.7 | 61.6 | 60.1 | 62.0 | 57.6 | 66.0 | 64.0 | 60.9 | 59.4 | 61.7 | 61.3<br>57.6 | 2.4<br><< min | 60 min ave<br>54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.945 | 0.946 | 0.946 | | | | | | | | 0.946 | 0.001 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.45 | 2.43 | | | | | | | | | 2.44 | 0.01 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 150 | 149 | 147 | 145 | 145 | | | | | | 147 | 2 | 126 min |
| TD Yield Strength (ppi) | 162 | 157 | 155 | 152 | 144 | | | | | | 154 | 7 | 126 min |
| MD Break Strength (ppi) | 318 | 311 | 254 | 305 | 297 | | | | | | 297 | 25 | 228 min |
| TD Break Strength (ppi) | 315 | 258 | 289 | 304 | 301 | | | | | | 293 | 22 | 228 min |
| MD Yield Elongation (%) | 19 | 21 | 22 | 21 | 24 | | | | | | 21 | 2 | 12 min |
| TD Yield Elongation (%) | 20 | 18 | 20 | 20 | 19 | | | | | | 19 | 1 | 12 min |
| MD Break Elongation (%) | 869 | 862 | 729 | 872 | 836 | | | | | | 834 | 60 | 700 min |
| TD Break Elongation (%) | 937 | 790 | 869 | 937 | 932 | | | | | | 893 | 64 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 138 | 137 | 134 | 132 | 131 | | | | | | 134 | 3 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 46 | 46 | 48 | 48 | 46 | 46 | 46 | 47 | 45 | 45 | 46 | 1 | 42 min |
| TD Tear Strength (lbs) | 49 | 46 | 51 | 51 | 49 | 51 | 48 | 50 | 48 | 48 | 49 | 2 | 42 min |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 3/8/2021*



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: US Ecology Cell 51 Phase II Liner System Const**

**Material: Solmax 60 mil Smooth HDPE Geomembrane**
**Sample Identification: 0108-206943**
**TRI Log #: 62021**

| PARAMETER | TEST REPLICATE NUMBER 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | STD. DEV. | PROJ. SPEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Thickness (ASTM D 5199)** | | | | | | | | | | | | | |
| Thickness (mils) | 60.8 | 61.5 | 59.7 | 62.1 | 63.0 | 63.6 | 62.9 | 62.5 | 64.8 | 64.4 | 62.5<br>59.7 | 1.6<br><< min | 60 min ave<br>54 min ind |
| **Density (ASTM D 1505)** | | | | | | | | | | | | | |
| Density (g/cm3) | 0.945 | 0.945 | 0.945 | | | | | | | | 0.945 | 0.000 | 0.94 min |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | | |
| % Carbon Black | 2.24 | 2.28 | | | | | | | | | 2.26 | 0.03 | 2.0 - 3.0 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | | Cat 1 or 2 |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 140 | 148 | 149 | 158 | 157 | | | | | | 150 | 7 | 126 min |
| TD Yield Strength (ppi) | 158 | 151 | 157 | 151 | 154 | | | | | | 154 | 3 | 126 min |
| MD Break Strength (ppi) | 292 | 316 | 291 | 311 | 334 | | | | | | 309 | 18 | 228 min |
| TD Break Strength (ppi) | 320 | 305 | 324 | 311 | 318 | | | | | | 316 | 8 | 228 min |
| MD Yield Elongation (%) | 24 | 24 | 24 | 24 | 24 | | | | | | 24 | 0 | 12 min |
| TD Yield Elongation (%) | 19 | 19 | 21 | 19 | 21 | | | | | | 20 | 1 | 12 min |
| MD Break Elongation (%) | 838 | 882 | 804 | 828 | 891 | | | | | | 849 | 37 | 700 min |
| TD Break Elongation (%) | 930 | 940 | 950 | 952 | 934 | | | | | | 941 | 10 | 700 min |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | | |
| Puncture Strength (lbs) | 125 | 124 | 123 | 122 | 120 | | | | | | 123 | 2 | 108 min |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 47 | 47 | 48 | 47 | 46 | 46 | 47 | 47 | 46 | 45 | 47 | 1 | 42 min |
| TD Tear Strength (lbs) | 49 | 49 | 51 | 51 | 50 | 50 | 48 | 49 | 50 | 51 | 50 | 1 | 42 min |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 3/8/2021*



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# CONFORMANCE TEST RESULTS FOR 60-MIL TEXTURED HDPE GEOMEMBRANE

February 26, 2021

**Mail To:**

**M Zahirul Islam**
**Civil & Environmental Consultants, Inc**
7500 Rialto Blvd., Building 1, Suite 270
Austin, TX 78735

email: zislam@cecinc.com

**Bill To:**

**<= Same (P.O. # 306-778)**

Dear Mr. Islam:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report of the laboratory testing for the sample(s) listed below.

| | |
|---|---|
| Project: | **Us Ecology Texas Cell 51 Phase 2** |
| TRI Job Reference Number: | 61963 |
| Material(s) Tested: | Four, Solmax 60 mil HDPE Textured Geomembrane |
| Test(s) Requested: | Thickness (ASTM D 5994)<br>Density (ASTM D 1505)<br>Carbon Black Content (ASTM D 1603, mod.)<br>Carbon Dispersion (ASTM D 5596)<br>Tensile Properties (ASTM D 6693)<br>Puncture Strength (ASTM D 4833)<br>Tear Resistance (ASTM D 1004) |

If you have any questions or require any additional information, please call us at 1-800-880-8378

Sincerely,

Mansukh Patel
Technical Director
Geosynthetic Services Division

*Signature is on file

*Checked by Zahirul on 2/26/2021*



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: Us Ecology Texas Cell 51 Phase 2**

**Material: Solmax 60 mil HDPE Textured Geomembrane**
**Sample Identification: 0102-199383**
**TRI Log #: 61963**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| **Thickness (ASTM D 5994)** | | | | | | | | | | | | |
| Thickness (mils) | 61 | 63 | 63 | 61 | 65 | 64 | 65 | 63 | 63 | 65 | 63<br>61 | 1<br><< min |
| **Density (ASTM D 1505)** | | | | | | | | | | | | |
| Density (g/cm3) | 0.946 | 0.947 | 0.947 | | | | | | | | 0.947 | 0.001 |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | |
| % Carbon Black | 2.22 | 2.25 | | | | | | | | | 2.24 | 0.02 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 178 | 174 | 181 | 171 | 179 | | | | | | 177 | 4 |
| TD Yield Strength (ppi) | 187 | 177 | 189 | 174 | 178 | | | | | | 181 | 7 |
| MD Break Strength (ppi) | 238 | 225 | 231 | 208 | 232 | | | | | | 227 | 11 |
| TD Break Strength (ppi) | 161 | 194 | 203 | 210 | 203 | | | | | | 194 | 19 |
| MD Yield Elongation (%) | 19 | 19 | 21 | 21 | 21 | | | | | | 20 | 1 |
| TD Yield Elongation (%) | 18 | 15 | 18 | 18 | 17 | | | | | | 17 | 1 |
| MD Break Elongation (%) | 587 | 564 | 579 | 530 | 584 | | | | | | 569 | 23 |
| TD Break Elongation (%) | 435 | 527 | 540 | 584 | 562 | | | | | | 530 | 57 |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | |
| Puncture Strength (lbs) | 155 | 151 | 160 | 166 | 169 | | | | | | 160 | 7 |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 58 | 56 | 58 | 56 | 54 | 58 | 57 | 60 | 62 | 55 | 57 | 2 |
| TD Tear Strength (lbs) | 61 | 61 | 59 | 62 | 56 | 62 | 59 | 61 | 62 | 59 | 60 | 2 |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 2/26/2021*



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: Us Ecology Texas Cell 51 Phase 2**

**Material: Solmax GSE 60 mil Textured HDPE Geomembrane**
**Sample Identification: 0102-199389**
**TRI Log #: 61963**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| **Thickness (ASTM D 5994)** | | | | | | | | | | | | |
| Thickness (mils) | 64 | 60 | 62 | 64 | 66 | 61 | 61 | 63 | 63 | 64 | 63 | 2 |
| | | | | | | | | | | | 60 | << min |
| **Density (ASTM D 1505)** | | | | | | | | | | | | |
| Density (g/cm3) | 0.946 | 0.946 | 0.946 | | | | | | | | 0.946 | 0.000 |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | |
| % Carbon Black | 2.31 | 2.33 | | | | | | | | | 2.32 | 0.01 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 172 | 171 | 171 | 175 | 179 | | | | | | 174 | 3 |
| TD Yield Strength (ppi) | 180 | 175 | 168 | 177 | 184 | | | | | | 177 | 6 |
| MD Break Strength (ppi) | 224 | 217 | 220 | 206 | 165 | | | | | | 206 | 24 |
| TD Break Strength (ppi) | 197 | 180 | 218 | 178 | 209 | | | | | | 196 | 18 |
| MD Yield Elongation (%) | 20 | 21 | 21 | 21 | 20 | | | | | | 21 | 1 |
| TD Yield Elongation (%) | 18 | 18 | 15 | 18 | 20 | | | | | | 18 | 2 |
| MD Break Elongation (%) | 575 | 556 | 569 | 511 | 431 | | | | | | 528 | 60 |
| TD Break Elongation (%) | 520 | 489 | 616 | 476 | 556 | | | | | | 531 | 56 |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | |
| Puncture Strength (lbs) | 157 | 156 | 156 | 150 | 159 | | | | | | 156 | 3 |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 60 | 53 | 61 | 56 | 57 | 56 | 57 | 57 | 55 | 57 | 57 | 2 |
| TD Tear Strength (lbs) | 61 | 60 | 60 | 59 | 63 | 59 | 55 | 61 | 63 | 59 | 60 | 2 |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 2/26/2021*



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: Us Ecology Texas Cell 51 Phase 2**

**Material: Solmax GSE 60 mil Textured HDPE Geomembrane**
**Sample Identification: 0102-199391**
**TRI Log #: 61963**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| **Thickness (ASTM D 5994)** | | | | | | | | | | | | |
| Thickness (mils) | 64 | 65 | 64 | 66 | 65 | 68 | 64 | 65 | 65 | 65 | 65 | 1 |
| | | | | | | | | | | | 64 | << min |
| **Density (ASTM D 1505)** | | | | | | | | | | | | |
| Density (g/cm3) | 0.947 | 0.947 | 0.947 | | | | | | | | 0.947 | 0.000 |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | |
| % Carbon Black | 2.24 | 2.28 | | | | | | | | | 2.26 | 0.03 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 166 | 181 | 186 | 178 | 183 | | | | | | 179 | 8 |
| TD Yield Strength (ppi) | 183 | 186 | 191 | 185 | 175 | | | | | | 184 | 6 |
| MD Break Strength (ppi) | 226 | 242 | 193 | 209 | 239 | | | | | | 222 | 21 |
| TD Break Strength (ppi) | 196 | 190 | 217 | 135 | 242 | | | | | | 196 | 40 |
| MD Yield Elongation (%) | 19 | 20 | 20 | 19 | 22 | | | | | | 20 | 1 |
| TD Yield Elongation (%) | 18 | 17 | 19 | 17 | 18 | | | | | | 18 | 1 |
| MD Break Elongation (%) | 589 | 589 | 449 | 508 | 585 | | | | | | 544 | 63 |
| TD Break Elongation (%) | 511 | 494 | 576 | 288 | 670 | | | | | | 508 | 141 |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | |
| Puncture Strength (lbs) | 161 | 161 | 155 | 155 | 157 | | | | | | 158 | 3 |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 53 | 57 | 61 | 61 | 53 | 58 | 60 | 57 | 58 | 57 | 58 | 3 |
| TD Tear Strength (lbs) | 57 | 61 | 62 | 62 | 58 | 63 | 59 | 61 | 62 | 63 | 61 | 2 |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 2/26/2021*



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**GEOMEMBRANE TEST RESULTS**
**TRI Client: Civil & Environmental Consultants, Inc**
**Project: Us Ecology Texas Cell 51 Phase 2**

**Material: Solmax GSE 60 mil Textured HDPE Geomembrane**
**Sample Identification: 0102-199399**
**TRI Log #: 61963**

| PARAMETER | TEST REPLICATE NUMBER | | | | | | | | | | MEAN | STD. DEV. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| **Thickness (ASTM D 5994)** | | | | | | | | | | | | |
| Thickness (mils) | 63 | 63 | 62 | 63 | 65 | 68 | 61 | 67 | 62 | 66 | 64 | 2 |
| | | | | | | | | | | | 61 | << min |
| **Density (ASTM D 1505)** | | | | | | | | | | | | |
| Density (g/cm3) | 0.946 | 0.946 | 0.947 | | | | | | | | 0.946 | 0.001 |
| **Carbon Black Content (ASTM D 1603, mod.)** | | | | | | | | | | | | |
| % Carbon Black | 2.31 | 2.36 | | | | | | | | | 2.34 | 0.04 |
| **Carbon Black Dispersion (ASTM D 5596)** | | | | | | | | | | | | |
| Rating - 1st field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Rating - 2nd field view | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| **Tensile Properties (ASTM D 6693, 2 ipm strain rate)** | | | | | | | | | | | | |
| MD Yield Strength (ppi) | 182 | 170 | 184 | 178 | 184 | | | | | | 180 | 6 |
| TD Yield Strength (ppi) | 190 | 181 | 187 | 185 | 173 | | | | | | 183 | 7 |
| MD Break Strength (ppi) | 177 | 232 | 220 | 235 | 230 | | | | | | 219 | 24 |
| TD Break Strength (ppi) | 205 | 232 | 209 | 211 | 192 | | | | | | 210 | 14 |
| MD Yield Elongation (%) | 18 | 20 | 21 | 19 | 20 | | | | | | 20 | 1 |
| TD Yield Elongation (%) | 19 | 15 | 18 | 16 | 18 | | | | | | 17 | 2 |
| MD Break Elongation (%) | 423 | 614 | 525 | 611 | 587 | | | | | | 552 | 80 |
| TD Break Elongation (%) | 523 | 627 | 551 | 557 | 544 | | | | | | 560 | 39 |
| **Puncture Resistance (ASTM D 4833)** | | | | | | | | | | | | |
| Puncture Strength (lbs) | 159 | 160 | 158 | 153 | 159 | | | | | | 158 | 3 |
| **Tear Resistance (ASTM D 1004)** | | | | | | | | | | | | |
| MD Tear Strength (lbs) | 53 | 59 | 57 | 56 | 56 | 59 | 55 | 57 | 56 | 56 | 56 | 2 |
| TD Tear Strength (lbs) | 60 | 62 | 57 | 60 | 58 | 62 | 62 | 60 | 61 | 62 | 60 | 2 |

MD Machine Direction TD Transverse Direction

*Checked by Zahirul on 2/26/2021*



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# APPENDIX – D

## Construction

# APPENDIX – D.1

## Soils

# Field Densities

Oak Grove Steam Electric Station
FGD-A Pond Retrofit
**Upper 6" In-Situ Clay Liner**

95% MDD @ 0 to +6% Opt. M

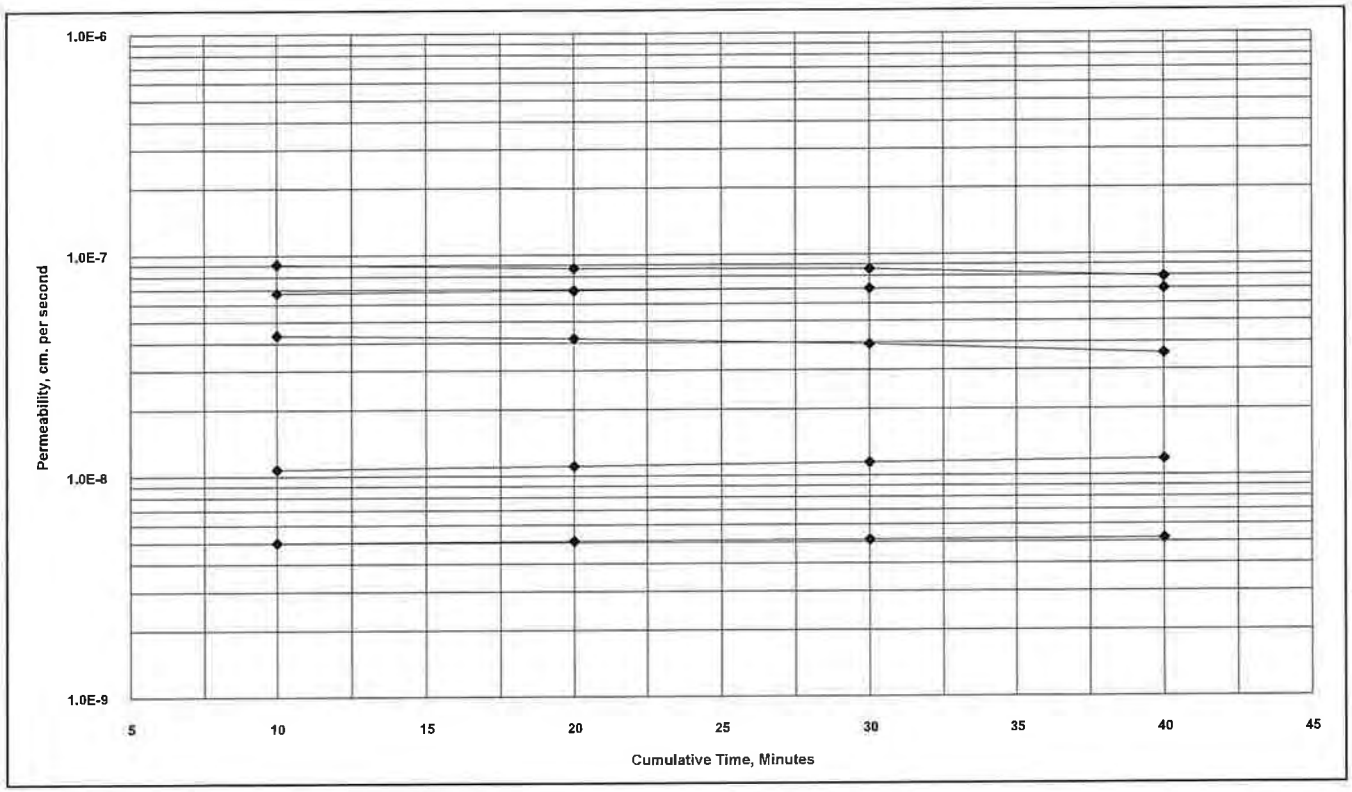
| Date | Test Number | Retest Number | Location | Coordinates | | Lift Number | Probe Depth (inches) | Dry Density (pcf) | Wet Density (pcf) | Moisture (pcf) | Moisture (%) | Compaction (%) | Proctor Data | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | North | East | | | | | | | | Moisture (%) | Density (pcf) |
| 11/15/21 | 20-1 | | Slope | 9925 | 1975 | 1 | 6 | 103.2 | 126.4 | 23.2 | 22.5 | 99.4 | **18.5** | **103.8** |
| 11/15/21 | 20-2 | | Slope | 9825 | 1990 | 1 | 6 | 102.8 | 123.4 | 20.6 | 20.0 | 99.0 | **18.5** | **103.8** |
| 11/15/21 | 20-3 | | Slope | 9870 | 2020 | 1 | 6 | 100.0 | 122.1 | 22.1 | 22.1 | 96.3 | **18.5** | **103.8** |
| 11/15/21 | 20-4 | | Slope | 9900 | 2050 | 1 | 6 | 103.5 | 126.4 | 22.9 | 22.1 | 99.7 | **18.5** | **103.8** |
| 11/15/21 | 20-5 | | Slope | 9810 | 2100 | 1 | 6 | 103.4 | 125.4 | 22.0 | 21.3 | 99.6 | **18.5** | **103.8** |
| 11/15/21 | 20-6 | | Slope | 9940 | 2080 | 1 | 6 | 101.2 | 124.3 | 23.1 | 22.8 | 97.5 | **18.5** | **103.8** |
| 11/15/21 | 20-7 | | Slope | 9760 | 2020 | 1 | 6 | 103.2 | 122.6 | 19.4 | 18.8 | 99.4 | **18.5** | **103.8** |
| 11/15/21 | 20-8 | | Floor | 9675 | 1975 | 1 | 6 | 101.1 | 122.8 | 21.7 | 21.5 | 97.4 | **18.5** | **103.8** |
| 11/15/21 | 20-9 | | Slope | 9580 | 1965 | 1 | 6 | 102.5 | 125.7 | 23.2 | 22.6 | 98.7 | **18.5** | **103.8** |
| 11/15/21 | 20-10 | | Slope | 9580 | 2075 | 1 | 6 | 97.3 | 121.7 | 24.4 | 25.1 | 97.4 | **19.2** | **99.9** |
| 11/15/21 | 20-11 | | Slope | 9685 | 2080 | 1 | 6 | 97.2 | 119.1 | 21.9 | 22.5 | 97.3 | **19.2** | **99.9** |
| 11/15/21 | 20-12 | | Floor | 9760 | 2095 | 1 | 6 | 100.1 | 123.2 | 23.1 | 23.1 | 96.4 | **18.5** | **103.8** |
| 11/15/21 | 20-13 | | Slope | 9525 | 2025 | 1 | 6 | 102.7 | 123.9 | 21.2 | 20.6 | 98.9 | **18.5** | **103.8** |
| 11/15/21 | 20-14 | | Slope | 9425 | 1980 | 1 | 6 | 102.4 | 124.0 | 21.6 | 21.1 | 98.7 | **18.5** | **103.8** |

# Permeabilities

*CQA Testing Laboratory*

Lab ID: 05091

# Permeability Test Summary Sheet




**Project Name:** Oak Grove
**Project Number:** 2122
**Client:** SCS Engineers

| Project Test Number | Date of Testing | Sample Number | Moisture Content, % | Initial Saturation, % | Final Saturation, % | Wet Density (pcf) | Dry Density (pcf) | Average K @ 20 C |
|---|---|---|---|---|---|---|---|---|
| 1 | 11.14.2021 | ST-1 | 20.4 | 90.6 | 104.2 | 127.6 | 105.9 | 6.9E-008 |
| 2 | 11.14.2021 | ST-2 | 24.8 | 96.6 | 106.0 | 125.5 | 100.5 | 5.1E-009 |
| 3 | 11.18.2021 | ST-3 | 24.2 | 93.2 | 100.8 | 124.4 | 100.1 | 8.6E-008 |
| 4 | 11.18.2021 | ST-4 | 19.0 | 88.0 | 106.4 | 128.2 | 107.8 | 1.1E-008 |
| 5 | 11.18.2021 | ST-5 | 22.2 | 94.9 | 96.7 | 127.6 | 104.3 | 4.0E-008 |



**14194 Florida - Livingston, LA. 70754 - Phone 225-435-0408 Mobile 812-603-6840**

*CQA Testing Laboratory*

Lab ID: 05091

## Results of Falling Head Permeability, ASTM D5084
## Undisturbed Specimen

| | | | | | |
|---|---|---|---|---|---|
| **Project Number:** | 2122 | **Specimen Received Date:** | 11.11.2021 | **Test Date:** | 11.14.2021 |
| **Project Name:** | Oak Grove | **Specimen Loaded into Cell:** | 11.12.2021 | **Tested By:** | JMB |
| **Client:** | SCS Engineers | | | **Reviewed By:** | BMG |

| | | | | | |
|---|---|---|---|---|---|
| **Sample Id.** | ST-1 | **Location:** | N/A | **Elevation:** | N/A |
| **Specimen Condition:** | **Before Testing** good | | **After Testing** good | | |

**Special Selection or Preparation if Any:**

**Permeant:** D/A Water

Bottom 18" clay liner

| Specimen Data | Initial | Final | Compaction Data | Proctor | Target | Difference |
|---|---|---|---|---|---|---|
| Moisture Content, (%) | 20.4 | 23.3 | Maximum Dry Density, pcf | | | |
| Percent Saturation | 90.6 | 104.2 | Optimum Moisture Content, (%) | | | |
| Wet Mass Density, (pcf) | 127.6 | 131.0 | **Percent Compacted:** | | | |
| Dry Mass Density, (pcf) | 105.9 | 106.2 | | | | |
| Height of Solids, (in) | 1.291 | 1.291 | **Test Pressures During Test** | | | |
| Void Ratio | 0.621 | 0.616 | Backpressure, psi | 50 | | |
| Calculated Porosity, (%) | 38.30 | 38.12 | Effective Confining Stress, psi | 3 | | |

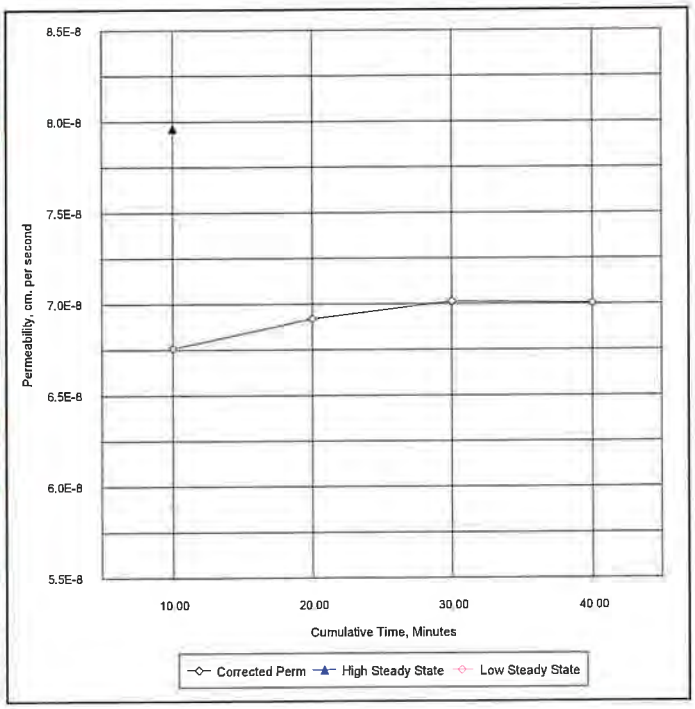
| Specimen Dimensions | Initial | Final |
|---|---|---|
| Specimen Height, cm | 5.31 | 5.30 |
| Specimen Diameter, cm | 7.25 | 7.25 |
| Specimen Area, cm^2 | 41.32 | 41.32 |
| **Specimen Mass** | **Initial** | **Final** |
| Initial Wet Mass, gms | 448.7 | 459.5 |
| Specific Gravity (Assumed): | 2.75 | |

| Traceability Items | | | |
|---|---|---|---|
| **Caliper ID** | 2 | **Cell ID** | 7 |
| **Balance ID** | 3 | **CV Hg ID** | 6 |
| **Thermo ID** | 1 | | |

| Constants During Testing and Equipment | |
|---|---|
| Inflow Buret, ( cm ^2, ain) | 0.7671 |
| Outflow Buret, (cm ^2, aout) | 0.0314 |
| Specific Gravity, (GHg - Gw) = (13.56 - 1) | 12.56 |
| Manometer, M1, (ain*aout/ain+aout) | 0.0302 |
| Manometer, M2, (1+[aout/ain]) | 1.041 |
| Sample, S=(Sample Length/ Sample Area) | 0.1286 |
| **Test Constant, C=(M1*S/G)** | **0.000309** |

| Elapsed Time (Minutes) | Test Cumulative Time (Minutes) | Data Permeability, k (cm/sec) (Uncorrected) | Corrected k For 20 c (cm/sec) |
|---|---|---|---|
| 0 | 0.00 | | |
| 10 | 10.00 | 6.6E-008 | 6.6E-008 |
| 10 | 20.00 | 6.7E-008 | 6.9E-008 |
| 10 | 30.00 | 6.8E-008 | 7.0E-008 |
| 10 | 40.00 | 6.8E-008 | 7.0E-008 |

| Average Permeability, Corrected k: | | 6.9E-008 |
|---|---|---|
| | 15% of Average | 1.0E-008 |
| | High Steady State Limit: | 8.0E-008 |
| | Low Steady State Limit: | 5.9E-008 |




| Date | Clock Time (hh+mm/60) | Trial Elapsed t, sec. | Flow Inflow | Readings Outflow | Gradient During Test | Out/Inflow Ratio | Z out | T | Test Fluid Temp, c |
|---|---|---|---|---|---|---|---|---|---|
| 11.14.2021 | 11.0167 | 0 | 1.200 | 9.900 | 22.202 | | | 0.120 | 19 |
| 11.14.2021 | 11.1833 | 600 | 1.241 | 8.900 | 19.545 | 1.000 | 1.000 | 0.136 | 19 |
| 11.14.2021 | 11.3500 | 600 | 1.278 | 8.000 | 17.154 | 1.000 | 0.900 | 0.155 | 19 |
| 11.14.2021 | 11.5167 | 600 | 1.311 | 7.200 | 15.029 | 1.000 | 0.800 | 0.177 | 19 |
| 11.14.2021 | 11.6833 | 600 | 1.339 | 6.500 | 13.170 | 1.000 | 0.700 | 0.202 | 19 |

| | |
|---|---|
| Initial Gradient: | 30.00 |
| Height of Mercury in Center Column, cm: | 11.76 |
| Unmeasured Flow, cm: | 1.86 |

***Remarks:*** **k = C/t ln [1-(Zout T)] and Corrected k for temp @ 20 C = k x (-0.02452 x temp. + 1.495)**



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*CQA Testing Laboratory*

Lab ID: 05091

# Results of Falling Head Permeability, ASTM D5084
## Undisturbed Specimen

| | | | | | |
|---|---|---|---|---|---|
| **Project Number:** | 2122 | **Specimen Received Date:** | 11.11.2021 | **Test Date:** | 11.14.2021 |
| **Project Name:** | Oak Grove | **Specimen Loaded into Cell:** | 11.12.221 | **Tested By:** | JMB |
| **Client:** | SCS Engineers | | | **Reviewed By:** | BMG |

| | | | | | |
|---|---|---|---|---|---|
| **Sample Id.** | ST-2 | **Location:** | N/A | **Elevation:** | N/A |
| | **Before Testing** | | **After Testing** | | |
| **Specimen Condition:** | good | | good | | |

**Special Selection or Preparation if Any:**

**Permeant:** D/A Water

Bottom 18" clay liner

| Specimen Data | Initial | Final | Compaction Data | Proctor | Target | Difference |
|---|---|---|---|---|---|---|
| Moisture Content, (%) | 24.8 | 27.0 | Maximum Dry Density, pcf | | | |
| Percent Saturation | 96.6 | 106.0 | Optimum Moisture Content, (%) | | | |
| Wet Mass Density, (pcf) | 125.5 | 128.1 | **Percent Compacted:** | | | |
| Dry Mass Density, (pcf) | 100.5 | 100.9 | | | | |
| Height of Solids, (in) | 1.103 | 1.098 | **Test Pressures During Test** | | | |
| Void Ratio | 0.708 | 0.702 | Backpressure, psi | 50 | | |
| Calculated Porosity, (%) | 41.46 | 41.25 | Effective Confining Stress, psi | 3 | | |

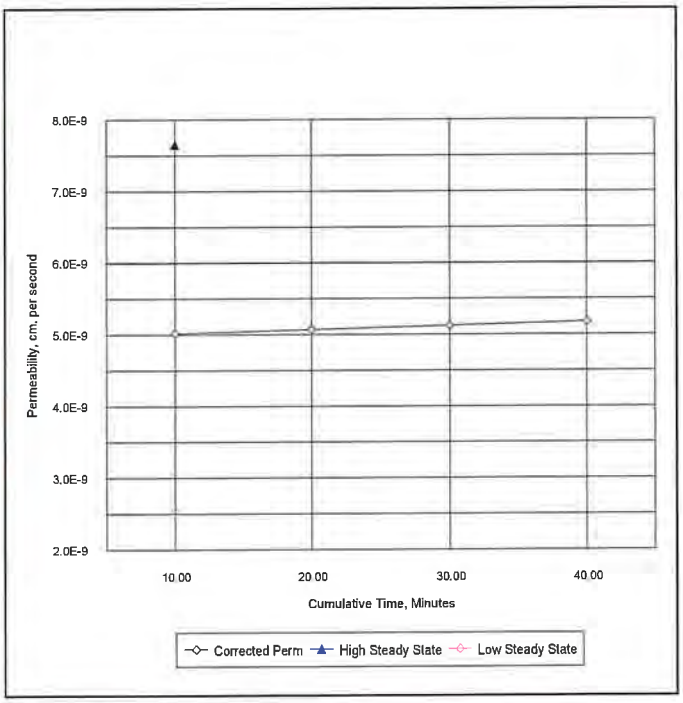
| Specimen Dimensions | Initial | Final |
|---|---|---|
| Specimen Height, cm | 4.79 | 4.75 |
| Specimen Diameter, cm | 7.24 | 7.26 |
| Specimen Area, cm^2 | 41.18 | 41.38 |
| **Specimen Mass** | **Initial** | **Final** |
| Initial Wet Mass, gms | 396.29 | 403.2 |
| Specific Gravity (Assumed) | 2.75 | |

| Traceability Items | | | |
|---|---|---|---|
| **Caliper ID** | 2 | **Cell ID** | 8 |
| **Balance ID** | 3 | **CV Hg ID** | 2 |
| **Thermo ID** | 1 | | |

| Constants During Testing and Equipment | |
|---|---|
| Inflow Buret, ( cm ^2, ain) | 0.7671 |
| Outflow Buret, (cm ^2, aout) | 0.0314 |
| Specific Gravity, (GHg - Gw) = (13.56 - 1) | 12.56 |
| Manometer, M1, (ain*aout/ain+aout) | 0.0302 |
| Manometer, M2, (1+[aout/ain]) | 1.041 |
| Sample, S=(Sample Length/ Sample Area) | 0.1163 |
| **Test Constant, C=(M1*S/G)** | **0.00027957** |

| Test Data | | | |
|---|---|---|---|
| Elapsed Time (Minutes) | Cumulative Time (Minutes) | Permeability, k (cm/sec) (Uncorrected) | Corrected k For 20 c (cm/sec) |
| 0 | 0.00 | | |
| 10 | 10.00 | 4.9E-009 | 5.0E-009 |
| 10 | 20.00 | 4.9E-009 | 5.1E-009 |
| 10 | 30.00 | 5.0E-009 | 5.1E-009 |
| 10 | 40.00 | 5.0E-009 | 5.2E-009 |

| Average Permeability, Corrected k: | 5.1E-009 |
|---|---|
| 50% of Average | 2.5E-009 |
| High Steady State Limit: | 7.6E-009 |
| Low Steady State Limit: | 2.5E-009 |




| | | Trial | Flow | Readings | | | | | Test Fluid |
|---|---|---|---|---|---|---|---|---|---|
| Date | Clock Time (hh+mm/60) | Elapsed t, sec. | Inflow | Outflow | Gradient During Test | Out/Inflow Ratio | Z out | T | Temp, c |
| 11.14.2021 | 11.0333 | 0 | 1.100 | 11.100 | 28.321 | | | 0.104 | 19 |
| 11.14.2021 | 11.2000 | 600 | 1.104 | 11.000 | 28.027 | 1.000 | 0.100 | 0.105 | 19 |
| 11.14.2021 | 11.3667 | 600 | 1.108 | 10.900 | 27.732 | 1.000 | 0.100 | 0.106 | 19 |
| 11.14.2021 | 11.5333 | 600 | 1.112 | 10.800 | 27.437 | 1.000 | 0.100 | 0.107 | 19 |
| 11.14.2021 | 11.7000 | 600 | 1.116 | 10.700 | 27.142 | 1.000 | 0.100 | 0.109 | 19 |

| | |
|---|---|
| Initial Gradient: | 30.00 |
| Height of Mercury in Center Column, cm: | 10.59 |
| Unmeasured Flow, cm: | -0.51 |

***Remarks:*** **k = C/t ln [1-(Zout T)] and Corrected k for temp @ 20 C = k x (-0.02452 x temp. + 1.495)**



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*CQA Testing Laboratory*

Lab ID: 05091

# Results of Falling Head Permeability, ASTM D5084
## Undisturbed Specimen

| | | | | | |
|---|---|---|---|---|---|
| **Project Number:** | 2122 | **Specimen Received Date:** | 11.16.2021 | **Test Date:** | 11.18.2021 |
| **Project Name:** | Oak Grove | **Specimen Loaded into Cell:** | 11.16.2021 | **Tested By:** | JMB |
| **Client:** | SCS Engineers | | | **Reviewed By:** | BMG |

| | | | | | |
|---|---|---|---|---|---|
| **Sample Id.** | ST-3 | **Location:** | N/A | **Elevation:** | N/A |
| | **Before Testing** | **After Testing** | | | |
| **Specimen Condition:** | good | good | | | |

**Special Selection or Preparation if Any:**

**Permeant:** D/A Water

Upper 6" clay liner

| Specimen Data | Initial | Final | Compaction Data | Proctor | Target | Difference |
|---|---|---|---|---|---|---|
| Moisture Content, (%) | 24.2 | 26.5 | Maximum Dry Density, pcf | | | |
| Percent Saturation | 93.2 | 100.8 | Optimum Moisture Content, (%) | | | |
| Wet Mass Density, (pcf) | 124.4 | 126.0 | **Percent Compacted:** | | | |
| Dry Mass Density, (pcf) | 100.1 | 99.6 | | | | |
| Height of Solids, (in) | 0.986 | 0.991 | **Test Pressures During Test** | | | |
| Void Ratio | 0.715 | 0.723 | Backpressure, psi | 50 | | |
| Calculated Porosity, (%) | 41.68 | 41.98 | Effective Confining Stress, psi | 3 | | |

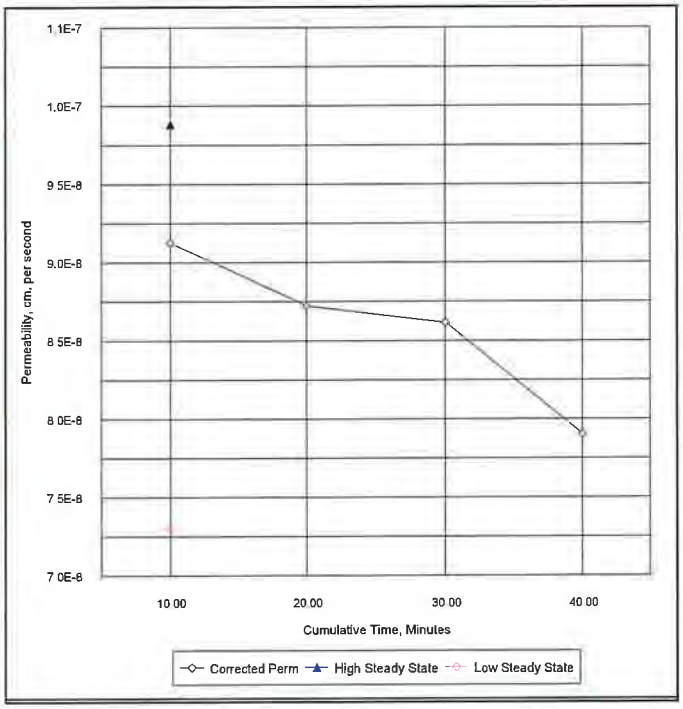
| **Specimen Dimensions** | **Initial** | **Final** |
|---|---|---|
| Specimen Height, cm | 4.30 | 4.34 |
| Specimen Diameter, cm | 7.27 | 7.25 |
| Specimen Area, cm^2 | 41.53 | 41.32 |
| **Specimen Mass** | **Initial** | **Final** |
| Initial Wet Mass, gms | 355.3 | 361.87 |
| Specific Gravity (Assumed): | 2.75 | |

| **Traceability Items** | | | |
|---|---|---|---|
| **Caliper ID** | 2 | **Cell ID** | 7 |
| **Balance ID** | 3 | **CV Hg ID** | 6 |
| **Thermo ID** | 1 | | |

| **Constants During Testing and Equipment** | |
|---|---|
| Inflow Buret, ( cm ^2, ain) | 0.7671 |
| Outflow Buret, (cm ^2, aout) | 0.0314 |
| Specific Gravity, (GHg - Gw) = (13.56 - 1) | 12.56 |
| Manometer, M1, (ain*aout/ain+aout) | 0.0302 |
| Manometer, M2, (1+[aout/ain]) | 1.041 |
| Sample, S=(Sample Length/ Sample Area) | 0.1034 |
| **Test Constant, C=(M1*S/G)** | **0.000249** |

| Elapsed Time (Minutes) | Test Cumulative Time (Minutes) | Data Permeability, k (cm/sec) (Uncorrected) | Corrected k For 20 c (cm/sec) |
|---|---|---|---|
| 0 | 0.00 | | |
| 10 | 10.00 | 9.2E-008 | 9.1E-008 |
| 10 | 20.00 | 8.8E-008 | 8.7E-008 |
| 10 | 30.00 | 8.7E-008 | 8.6E-008 |
| 10 | 40.00 | 8.0E-008 | 7.9E-008 |

| **Average Permeability, Corrected k:** | **8.6E-008** |
|---|---|
| **15% of Average** | 1.3E-008 |
| High Steady State Limit: | 9.9E-008 |
| Low Steady State Limit: | 7.3E-008 |




| Date | Clock Time (hh+mm/60) | Trial Elapsed t, sec. | Flow Inflow | Readings Outflow | Gradient During Test | Out/Inflow Ratio | Z out | T | Test Fluid Temp, c |
|---|---|---|---|---|---|---|---|---|---|
| 11.18.2021 | 11.0000 | 0 | 1.300 | 8.100 | 21.468 | | | 0.153 | 20.5 |
| 11.18.2021 | 11.1667 | 600 | 1.353 | 6.800 | 17.196 | 1.000 | 1.300 | 0.191 | 20.5 |
| 11.18.2021 | 11.3333 | 600 | 1.394 | 5.800 | 13.910 | 1.000 | 1.000 | 0.236 | 20.5 |
| 11.18.2021 | 11.5000 | 600 | 1.427 | 5.000 | 11.281 | 1.000 | 0.800 | 0.291 | 20.5 |
| 11.18.2021 | 11.6667 | 600 | 1.451 | 4.400 | 9.309 | 1.000 | 0.600 | 0.353 | 20.5 |

| | |
|---|---|
| Initial Gradient: | 30.00 |
| Height of Mercury in Center Column, cm: | 9.50 |
| Unmeasured Flow, cm: | 1.40 |

***Remarks:*** k = C/t ln [1-(Zout T)] and Corrected k for temp @ 20 C = k x (-0.02452 x temp. + 1.495)

*CQA Testing Laboratory*

Lab ID: 05091

# Results of Falling Head Permeability, ASTM D5084
## Undisturbed Specimen

| | | | | | |
|---|---|---|---|---|---|
| Project Number: | 2122 | Specimen Received Date: | 11.16.2021 | Test Date: | 11.18.2021 |
| Project Name: | Oak Grove | Specimen Loaded into Cell: | 11.1.2021 | Tested By: | JMB |
| Client: | SCS Engineers | | | Reviewed By: | BMG |

| | | | | | |
|---|---|---|---|---|---|
| Sample Id. | ST-4 | Location: | N/A | Elevation: | N/A |
| | Before Testing | After Testing | | | |
| Specimen Condition: | good | good | | | |

| | | |
|---|---|---|
| Special Selection or Preparation if Any: | Permeant: | D/A Water |

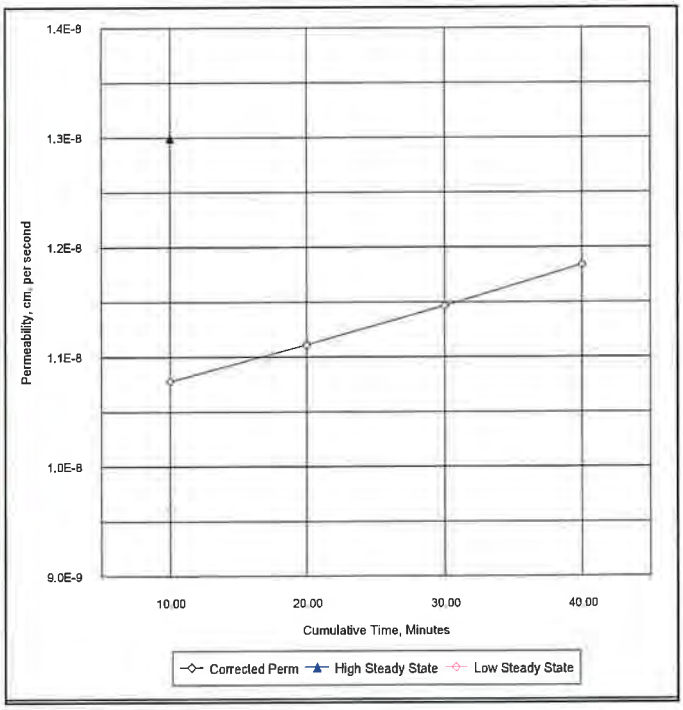
Upper 6" clay liner

| Specimen Data | Initial | Final | Compaction Data | Proctor | Target | Difference |
|---|---|---|---|---|---|---|
| Moisture Content, (%) | 19.0 | 23.6 | Maximum Dry Density, pcf | | | |
| Percent Saturation | 88.0 | 106.4 | Optimum Moisture Content, (%) | | | |
| Wet Mass Density, (pcf) | 128.2 | 131.7 | Percent Compacted: | | | |
| Dry Mass Density, (pcf) | 107.8 | 106.5 | | | | |
| Height of Solids, (in) | 0.934 | 0.935 | Test Pressures During Test | | | |
| Void Ratio | 0.594 | 0.612 | Backpressure, psi | 50 | | |
| Calculated Porosity, (%) | 37.25 | 37.95 | Effective Confining Stress, psi | 3 | | |

| Specimen Dimensions | Initial | Final |
|---|---|---|
| Specimen Height, cm | 3.78 | 3.83 |
| Specimen Diameter, cm | 7.28 | 7.28 |
| Specimen Area, cm^2 | 41.64 | 41.58 |
| **Specimen Mass** | **Initial** | **Final** |
| Initial Wet Mass, gms | 323.16 | 335.82 |
| Specific Gravity (Assumed): | 2.75 | |

| Traceability Items | | | |
|---|---|---|---|
| Caliper ID | 2 | Cell ID | 8 |
| Balance ID | 3 | CV Hg ID | 4 |
| Thermo ID | 1 | | |

| Constants During Testing and Equipment | |
|---|---|
| Inflow Buret, ( cm ^2, ain) | 0.7671 |
| Outflow Buret, (cm ^2, aout) | 0.0314 |
| Specific Gravity, (GHg - Gw) = (13.56 - 1) | 12.56 |
| Manometer, M1, (ain*aout/ain+aout) | 0.0302 |
| Manometer, M2, (1+[aout/ain]) | 1.041 |
| Sample, S=(Sample Length/ Sample Area) | 0.0908 |
| **Test Constant, C=(M1*S/G)** | **0.000218** |




| Test Data | | | |
|---|---|---|---|
| Elapsed Time (Minutes) | Cumulative Time (Minutes) | Permeability, k (cm/sec) (Uncorrected) | Corrected k For 20 c (cm/sec) |
| 0 | 0.00 | | |
| 10 | 10.00 | 1.1E-008 | 1.1E-008 |
| 10 | 20.00 | 1.1E-008 | 1.1E-008 |
| 10 | 30.00 | 1.2E-008 | 1.1E-008 |
| 10 | 40.00 | 1.2E-008 | 1.2E-008 |

| Average Permeability, Corrected k: | | 1.1E-008 |
|---|---|---|
| | 15% of Average | 1.7E-009 |
| | High Steady State Limit: | 1.3E-008 |
| | Low Steady State Limit: | 9.6E-009 |

| | | Trial | Flow | Readings | | | | | Test Fluid |
|---|---|---|---|---|---|---|---|---|---|
| Date | Clock Time (hh+mm/60) | Elapsed t, sec. | Inflow | Outflow | Gradient During Test | Out/Inflow Ratio | Z out | T | Temp, c |
| 11.18.2021 | 11.3500 | 0 | 1.124 | 8.200 | 25.387 | | | 0.147 | 20.5 |
| 11.18.2021 | 11.5167 | 600 | 1.132 | 8.000 | 24.640 | 1.000 | 0.200 | 0.152 | 20.5 |
| 11.18.2021 | 11.6833 | 600 | 1.140 | 7.800 | 23.893 | 1.000 | 0.200 | 0.156 | 20.5 |
| 11.18.2021 | 11.8500 | 600 | 1.149 | 7.600 | 23.146 | 1.000 | 0.200 | 0.161 | 20.5 |
| 11.18.2021 | 12.0167 | 600 | 1.157 | 7.400 | 22.399 | 1.000 | 0.200 | 0.167 | 20.5 |

| | |
|---|---|
| Initial Gradient; | 30.00 |
| Height of Mercury in Center Column, cm: | 8.36 |
| Unmeasured Flow, cm: | 0.16 |

*Remarks:* k = C/t ln [1-(Zout T)] and Corrected k for temp @ 20 C = k x (-0.02452 x temp. + 1.495)

*CQA Testing Laboratory*

Lab ID: 05091

# Results of Falling Head Permeability, ASTM D5084
## Undisturbed Specimen

| | | | | | |
|---|---|---|---|---|---|
| **Project Number:** | 2122 | **Specimen Received Date:** | 11.16.2021 | **Test Date:** | 11.18.2021 |
| **Project Name:** | Oak Grove | **Specimen Loaded into Cell:** | 11.16.2021 | **Tested By:** | JMB |
| **Client:** | SCS Engineers | | | **Reviewed By:** | BMG |

| | | | | | |
|---|---|---|---|---|---|
| **Sample Id.** | ST-5 | **Location:** | N/A | **Elevation:** | N/A |
| | **Before Testing** | **After Testing** | | | |
| **Specimen Condition:** | good | good | | | |

**Special Selection or Preparation if Any:**

**Permeant:** D/A Water

Upper 6" clay liner

| Specimen Data | Initial | Final | Compaction Data | Proctor | Target | Difference |
|---|---|---|---|---|---|---|
| Moisture Content, (%) | 22.2 | 24.9 | Maximum Dry Density, pcf | | | |
| Percent Saturation | 94.9 | 96.7 | Optimum Moisture Content, (%) | | | |
| Wet Mass Density, (pcf) | 127.6 | 125.5 | **Percent Compacted:** | | | |
| Dry Mass Density, (pcf) | 104.3 | 100.4 | | | | |
| Height of Solids, (in) | 1.108 | 1.079 | **Test Pressures During Test** | | | |
| Void Ratio | 0.646 | 0.709 | Backpressure, psi | 50 | | |
| Calculated Porosity, (%) | 39.23 | 41.50 | Effective Confining Stress, psi | 3 | | |

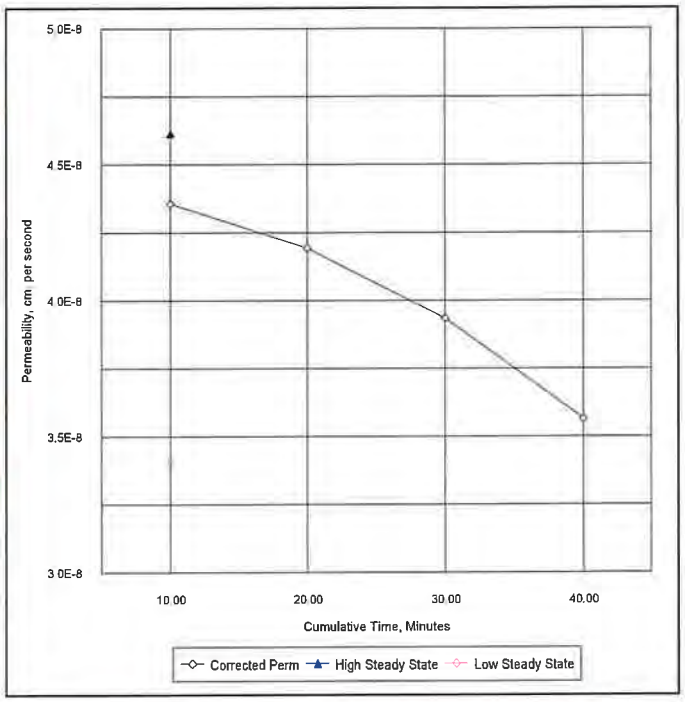
| Specimen Dimensions | Initial | Final |
|---|---|---|
| Specimen Height, cm | 4.63 | 4.68 |
| Specimen Diameter, cm | 7.23 | 7.33 |
| Specimen Area, cm^2 | 41.06 | 42.20 |
| **Specimen Mass** | **Initial** | **Final** |
| Initial Wet Mass, gms | 388.73 | 397.24 |
| Specific Gravity (Assumed): | 2.75 | |

| Traceability Items | | | |
|---|---|---|---|
| **Caliper ID** | 2 | **Cell ID** | 9 |
| **Balance ID** | 3 | **CV Hg ID** | 5 |
| **Thermo ID** | 1 | | |

| Constants During Testing and Equipment | |
|---|---|
| Inflow Buret, ( cm ^2, ain) | 0.7671 |
| Outflow Buret, (cm ^2, aout) | 0.0314 |
| Specific Gravity, (GHg - Gw) = (13.56 - 1) | 12.56 |
| Manometer, M1, (ain*aout/ain+aout) | 0.0302 |
| Manometer, M2, (1+[aout/ain]) | 1.041 |
| Sample, S=(Sample Length/ Sample Area) | 0.1128 |
| **Test Constant, C=(M1*S/G)** | **0.000271** |

| Elapsed Time (Minutes) | Test Cumulative Time (Minutes) | Data Permeability, k (cm/sec) (Uncorrected) | Corrected k For 20 c (cm/sec) |
|---|---|---|---|
| 0 | 0.00 | | |
| 10 | 10.00 | 4.4E-008 | 4.4E-008 |
| 10 | 20.00 | 4.2E-008 | 4.2E-008 |
| 10 | 30.00 | 4.0E-008 | 3.9E-008 |
| 10 | 40.00 | 3.6E-008 | 3.6E-008 |

| Average Permeability, Corrected k: | | 4.0E-008 |
|---|---|---|
| | 15% of Average | 6.0E-009 |
| | High Steady State Limit: | 4.6E-008 |
| | Low Steady State Limit: | 3.4E-008 |




| Date | Clock Time (hh+mm/60) | Trial Elapsed t, sec. | Flow Inflow | Readings Outflow | Gradient During Test | Out/Inflow Ratio | Z out | T | Test Fluid Temp, c |
|---|---|---|---|---|---|---|---|---|---|
| 11.18.2021 | 11.0333 | 0 | 1.000 | 10.000 | 26.342 | | | 0.116 | 20.5 |
| 11.18.2021 | 11.2000 | 600 | 1.033 | 9.200 | 23.904 | 1.000 | 0.800 | 0.127 | 20.5 |
| 11.18.2021 | 11.3667 | 600 | 1.061 | 8.500 | 21.772 | 1.000 | 0.700 | 0.140 | 20.5 |
| 11.18.2021 | 11.5333 | 600 | 1.086 | 7.900 | 19.944 | 1.000 | 0.600 | 0.153 | 20.5 |
| 11.18.2021 | 11.7000 | 600 | 1.106 | 7.400 | 18.420 | 1.000 | 0.500 | 0.165 | 20.5 |

| | |
|---|---|
| Initial Gradient: | 30.00 |
| Height of Mercury in Center Column, cm: | 10.25 |
| Unmeasured Flow, cm: | 0.25 |

***Remarks:*** k = C/t ln [1-(Zout T)] and Corrected k for temp @ 20 C = k x (-0.02452 x temp + 1.495)



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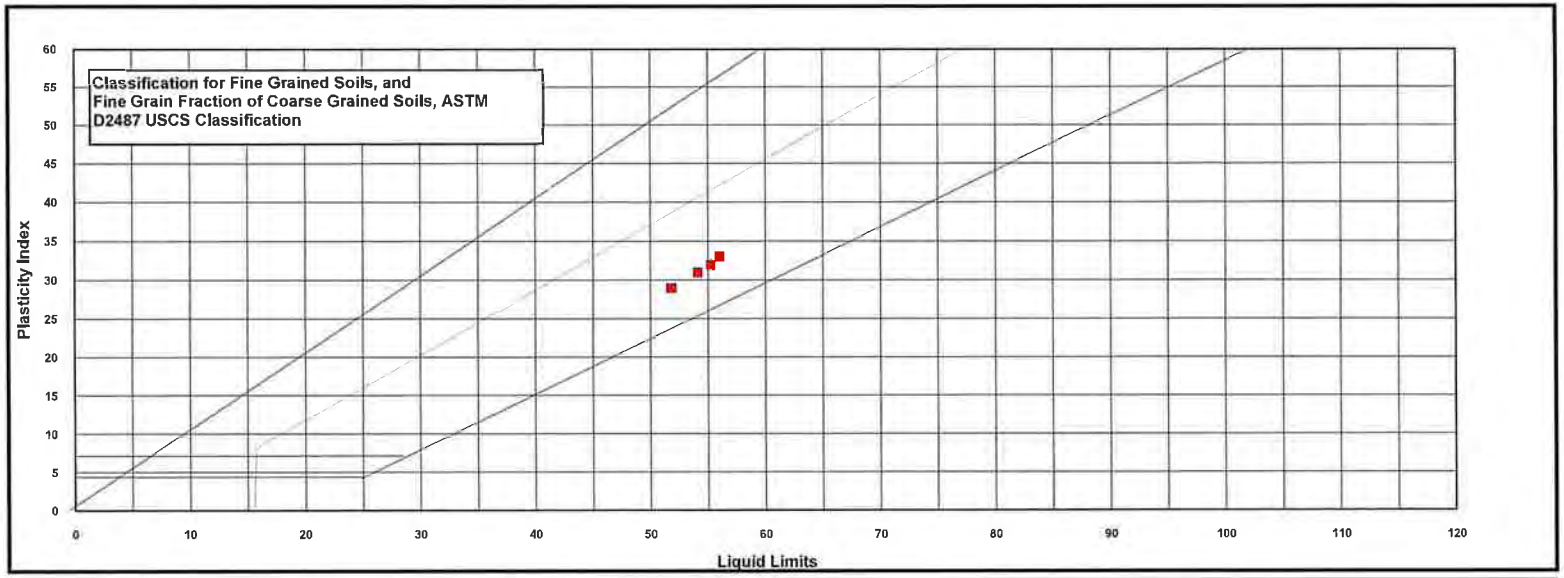
# Soil Properties

# *CQA Testing Laboratory*

Lab ID: 05091




| | | | | |
|---|---|---|---|---|
| Project Name: | Oak Grove | Client's Project No. | N/A | ASTM D2217/AASHTO R-74, Method B, Moist Sample Preparation |
| Project Number: | 2122 | Project Location: | Texas | ASTM D4318, Method A - or - Method B, Liquid and Plastic Limits |
| Client: | SCS Engineers | | | ASTM D422/D1140 - or - D6913/D7928 - or - C136/C117, Grain Size Analysis |

| Project Test Count, This Page | Sample Number and Locations | Liquid Limits | Plasticity Index | Percent Gravel | Percent Fines (Minus #200) | Natural Moisture, % | Sample Description/Classification | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | ST-1 | 52 | 29 | 0.7 | 83.9 | 20.4 | Red/Brown | CH, fat clay, | with sand |
| 2 | ST-2 | 55 | 32 | 0.0 | 91.1 | 24.8 | Brown | CH, fat clay, | |
| 3 | ST-3 | 52 | 29 | 0.0 | 92.2 | 24.2 | Tan | CH, fat clay, | |
| 4 | ST-4 | 54 | 31 | 0.0 | 77.3 | 19.0 | Tan | CH, fat clay, | with sand |
| 5 | ST-5 | 56 | 33 | 0.8 | 87.7 | 22.2 | Tan | CH, fat clay, | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |
| 11 | | | | | | | | | |
| 12 | | | | | | | | | |
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| 17 | | | | | | | | | |
| 18 | | | | | | | | | |
| 19 | | | | | | | | | |
| 20 | | | | | | | | | |
| 21 | | | | | | | | | |
| 22 | | | | | | | | | |
| 23 | | | | | | | | | |
| 24 | | | | | | | | | |
| 25 | | | | | | | | | |

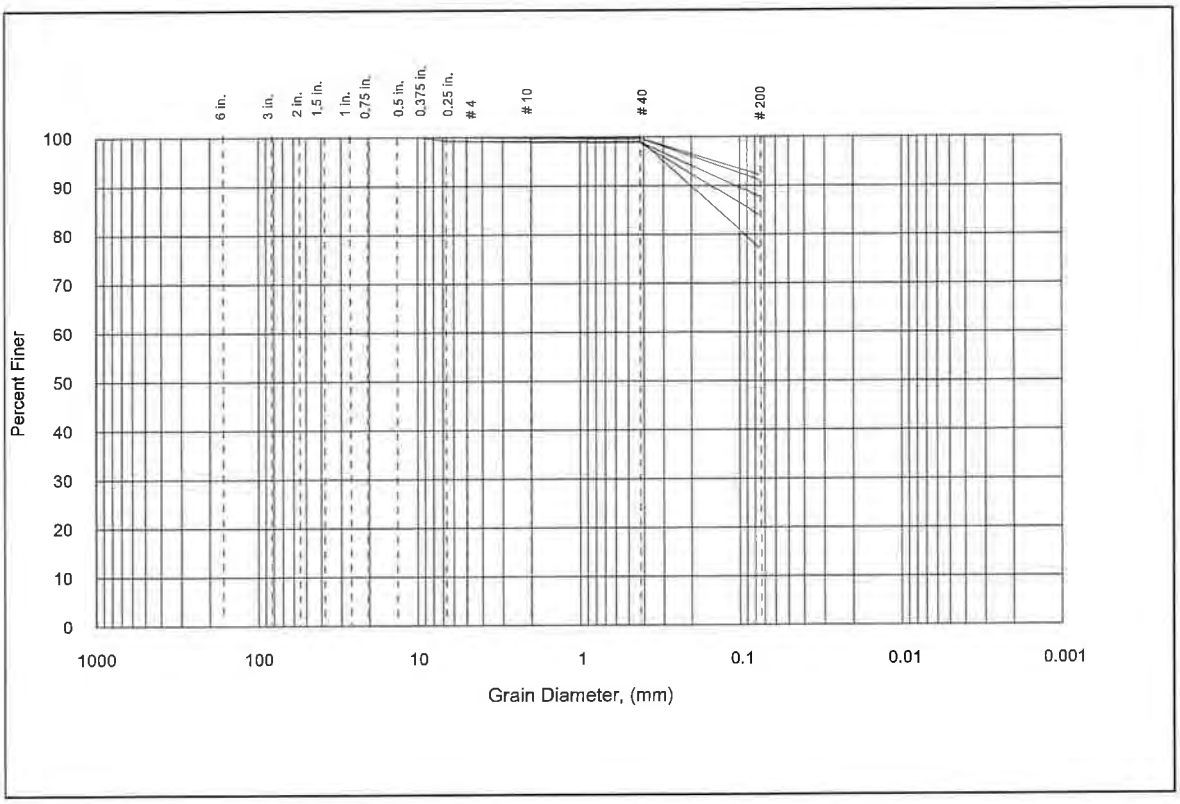
Page ID 1 Limits

14194 Florida - Livingston, LA. 70754 Phone 225-435-0408 Mobile 812-603-6840

*CQA Testing Laboratory*

Lab ID 0520

# Particle Size Distribution Test Report




| | |
|---|---|
| Project Name: Oak Grove | ASTM D2217, Method B, Wet Sample Prep |
| Client: SCS Engineers | ASTM D422 -or- D6913/D7928 Grain Size Analysis |

| Sample Number | NMC (%) | LL (%) | PL (%) | PI (%) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | Sieve Size or Number, Percent Finer 2" | 1.5" | 1" | 0.75" | 0.5" | 0.375" | 0.25" | #4 | #10 | #40 | #200 | Sample Classification and Description | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ST-1 | 20.4 | 52 | 23 | 29 | 0.7 | 15.4 | | | | | | | | 100.0 | 99.3 | 99.3 | 99.0 | 98.9 | 83.8 | Red/Brown | CH fat clay | with sand |
| ST-2 | 24.8 | 55 | 23 | 32 | 0.0 | 8.9 | | | | | | | | | | 100.0 | 99.9 | 99.8 | 91.1 | Brown | CH fat clay | |
| ST-3 | 24.2 | 52 | 23 | 29 | 0.0 | 7.8 | | | | | | | | | | 100.0 | 100.0 | 99.8 | 92.2 | Tan | CH fat clay | |
| ST-4 | 19.0 | 54 | 23 | 31 | 0.0 | 22.7 | | | | | | | | | | 100.0 | 99.8 | 99.6 | 77.3 | Tan | CH fat clay | with sand |
| ST-5 | 22.2 | 56 | 23 | 33 | 0.8 | 11.5 | | | | | | | | 100.0 | 99.2 | 99.2 | 99.2 | 99.0 | 87.7 | Tan | CH fat clay | |



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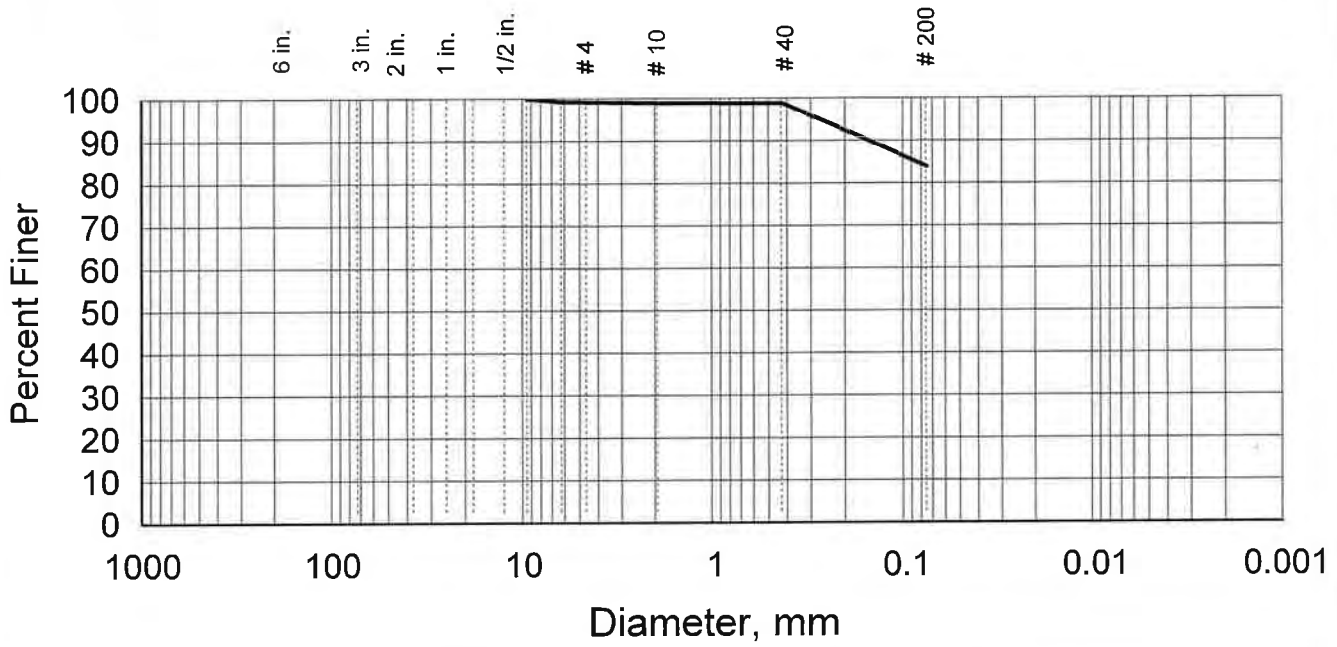
## Particle Distribution Test Result




| | | | | | | |
|---|---|---|---|---|---|---|
| Proj. Name: Oak Grove | **Gravel, %** | **Sand, %** | **Silt, %** | **Clay, %** | **LL** | **PI** |
| Project No.: 2122 | 0.7 | 15.4 | 0.0 | 0.0 | 52 | 29 |
| Report Date 11.27.2021 Log-in Date 11.11.2021 | **Description and Classification** | | | | | |
| Project Loc. Texas | Red/Brown | CH, fat clay, | with sand | | | |
| | **Standard Sieve Sizes - Percent Passing** | | | | | |
| **Sample Identification - Location - Type** | 6 " | | 2.5 " | | 3/8 " | 100.0 |
| ST-1 Tube Sample | 5 " | | 2 " | | 1/4 " | 99.3 |
| **Remarks:** **NMC, %** **20.4** | 4.5 " | | 1- 1/2 " | | # 4 | 99.3 |
| **Moist Method, ASTM D422** Bulk | 4 " | | 1 " | | # 10 | 99.0 |
| Sample split on # 40 sieve Sample wt., kg | 3.5 " | | 3/4 " | | # 40 | 98.9 |
| Clay content reported at 0.005mm | 3 " | | 1/2 " | | # 200 | 83.9 |

| **Hygroscopic Moisture Content Data** | | | | **Traceability Items** | | |
|---|---|---|---|---|---|---|
| WS+t | 0.00 | Hydrometer Specimen Wet wt. | 0.00 | Balance ID | 1 | 2 |
| DS+T | 0.00 | Hydrometer Specimen Dry wt. | ERR | Therm ID | 58981 | NA |
| Tare wt | 0.00 | Assumed Gs | 2.75 | Flask ID | 1 | NA |
| Moist Ratio | ERR | Percent <#40 based on complete specimen | 98.89 | Bulb ID | 1 | 152H |
| | | Calculated biased weight | ERR | Sol Mix, ml | 125 | NA |
| | | Composite Correction at 20 deg C | -6 | Tested By | JMB | BMG |
| | | Meniscus Correction only | 1 | | | |

| **Hydrometer Reading Data** | | | Temp. | Corrected | | | Effective | Diameter, mm | Percent |
|---|---|---|---|---|---|---|---|---|---|
| Time, min. | Readings | Temp. | Correction, Ct | Reading, Rc | K | Rm | depth | | finer |
| 2 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 5 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 15 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 30 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 120 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 240 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 600 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |

Page ID ST-1 Grain-size

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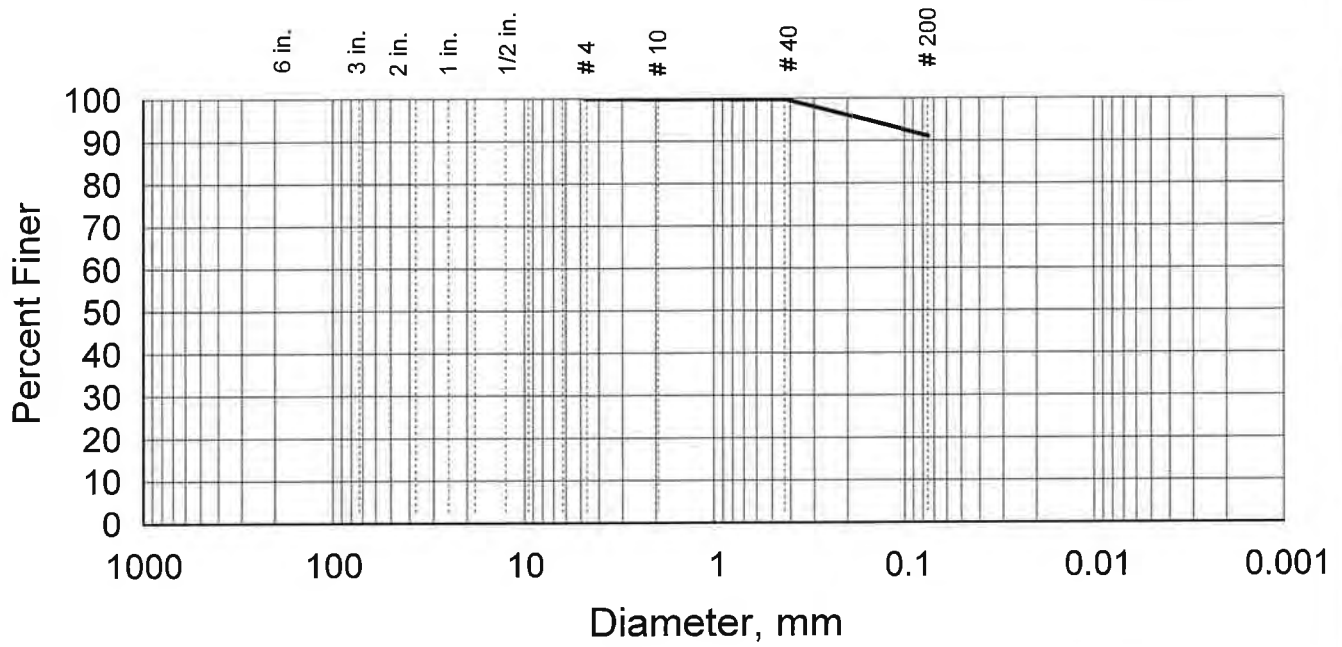
## Particle Distribution Test Result




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Proj. Name: | Oak Grove | **Gravel, %** | **Sand, %** | **Silt, %** | **Clay, %** | **LL** | **PI** |
| Project No.: | 2122 | 0.0 | 8.9 | 0.0 | 0.0 | 55 | 32 |
| Report Date | 11.27.2021 Log-in Date 11.11.2021 | **Description and Classification** | | | | | |
| Project Loc. | Texas | Brown | CH, fat clay, | | | | |
| | | **Standard Sieve Sizes - Percent Passing** | | | | | |
| **Sample Identification - Location - Type** | | 6 " | | 2.5 " | | 3/8 " | |
| ST-2 | Tube Sample | 5 " | | 2 " | | 1/4 " | |
| **Remarks:** | **NMC, %** **24.8** | 4.5 " | | 1- 1/2 " | | # 4 | 100.0 |
| Moist Method, ASTM D422 | Bulk | 4 " | | 1 " | | # 10 | 99.9 |
| Sample split on # 40 sieve | Sample wt., kg | 3.5 " | | 3/4 " | | # 40 | 99.8 |
| Clay content reported at 0.005mm | | 3 " | | 1/2 " | | # 200 | 91.1 |

| **Hygroscopic Moisture Content Data** | | | | **Traceability Items** | | |
|---|---|---|---|---|---|---|
| WS+t | 0.00 | Hydrometer Specimen Wet wt. | 0.00 | | | |
| DS+T | 0.00 | Hydrometer Specimen Dry wt. | ERR | Balance ID | 1 | 2 |
| Tare wt | 0.00 | Assumed Gs | 2.75 | Therm ID | 58981 | NA |
| Moist Ratio | ERR | Percent <#40 based on complete specimen | 99.78 | Flask ID | 1 | NA |
| | | Calculated biased weight | ERR | Bulb ID | 1 | 152H |
| | | Composite Correction at 20 deg C | -6 | Sol Mix, ml | 125 | NA |
| | | Meniscus Correction only | 1 | Tested By | JMB | BMG |

| **Hydrometer Reading Data** | | | Temp. | Corrected | | | Effective | Diameter, mm | Percent |
|---|---|---|---|---|---|---|---|---|---|
| Time, min. | Readings | Temp. | Correction, Ct | Reading, Rc | K | Rm | depth | | finer |
| 2 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 5 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 15 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 30 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 120 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 240 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 600 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |



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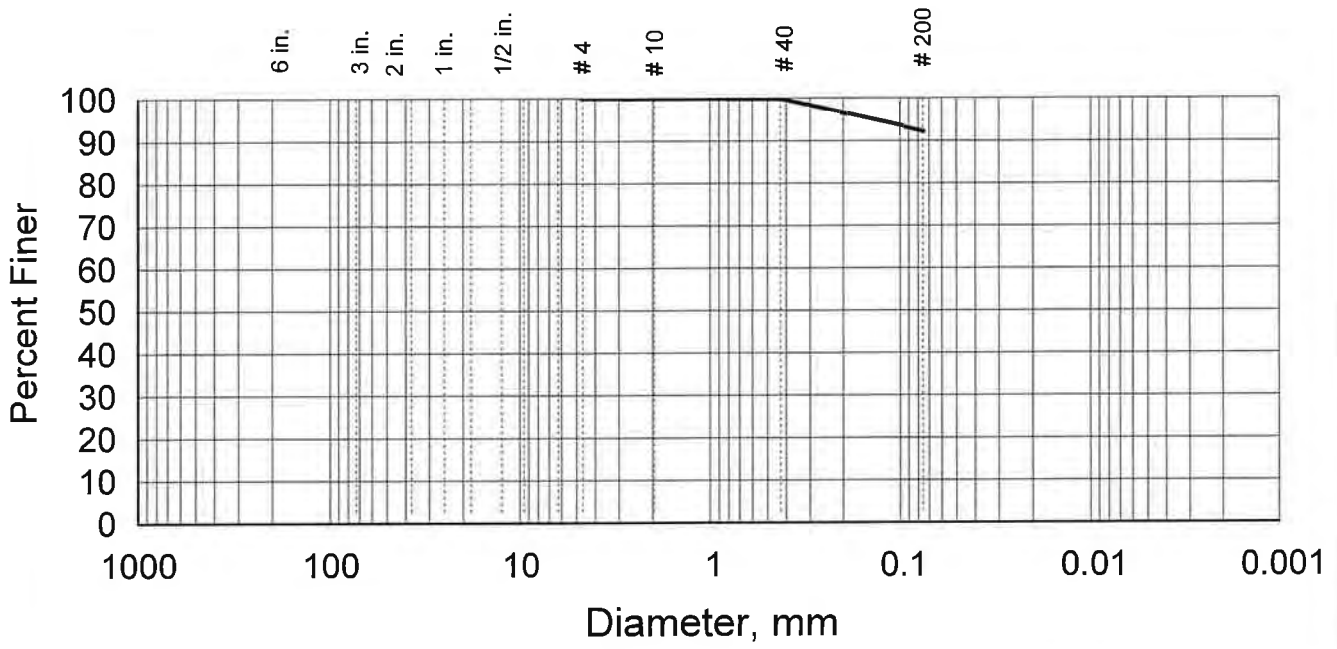
## Particle Distribution Test Result




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Proj. Name: | Oak Grove | | **Gravel, %** | **Sand, %** | **Silt, %** | **Clay, %** | **LL** | **PI** |
| Project No.: 2122 | | | 0.0 | 7.8 | 0.0 | 0.0 | 52 | 29 |
| Report Date 11.27.2021 | Log-in Date 11.16.2021 | | **Description and Classification** | | | | | |
| Project Loc. Texas | | | Tan | CH, fat clay, | | | | |
| | | | **Standard Sieve Sizes - Percent Passing** | | | | | |
| **Sample Identification - Location - Type** | | | 6 " | | 2.5 " | | 3/8 " | |
| ST-3 | Tube Sample | | 5 " | | 2 " | | 1/4 " | |
| **Remarks:** | **NMC, %** | **24.2** | 4.5 " | | 1- 1/2 " | | # 4 | 100.0 |
| Moist Method, ASTM D422 | | Bulk | 4 " | | 1 " | | # 10 | 100.0 |
| Sample split on # 40 sieve | | Sample wt., kg | 3.5 " | | 3/4 " | | # 40 | 99.8 |
| Clay content reported at 0.005mm | | | 3 " | | 1/2 " | | # 200 | 92.2 |

| **Hygroscopic Moisture Content Data** | | Hydrometer Specimen Wet wt. | 0.00 | **Traceability Items** | | |
|---|---|---|---|---|---|---|
| WS+t | 0.00 | Hydrometer Specimen Dry wt. | ERR | Balance ID | 1 | 2 |
| DS+T | 0.00 | Assumed Gs | 2.75 | Therm ID | 58981 | NA |
| Tare wt | 0.00 | Percent <#40 based on complete specimen | 99.82 | Flask ID | 1 | NA |
| Moist Ratio | ERR | Calculated biased weight | ERR | Bulb ID | 1 | 152H |
| | | Composite Correction at 20 deg C | -6 | Sol Mix, ml | 125 | NA |
| | | Meniscus Correction only | 1 | Tested By | JMB | BMG |

| **Hydrometer Reading Data** | | | Temp. | Corrected | | | Effective | Diameter, mm | Percent |
|---|---|---|---|---|---|---|---|---|---|
| Time, min. | Readings | Temp. | Correction, Ct | Reading, Rc | K | Rm | depth | | finer |
| 2 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 5 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 15 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 30 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 120 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 240 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 600 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |

Page ID ST-3 Grain-size

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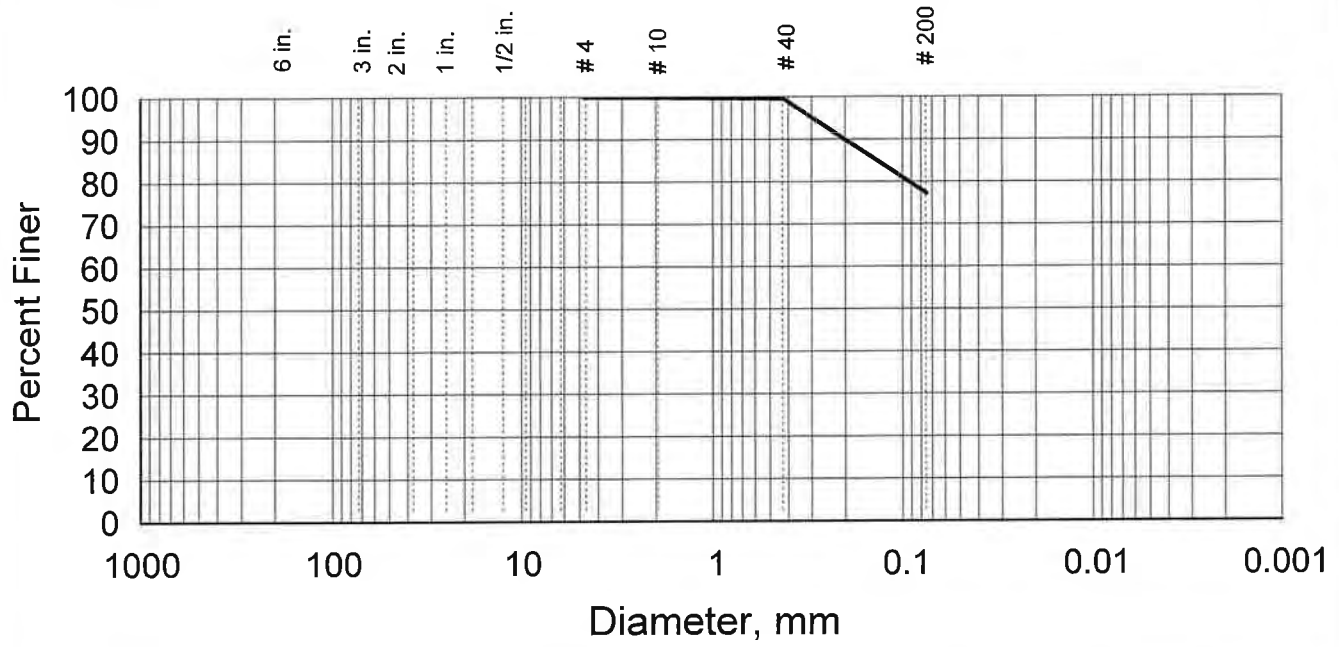
## Particle Distribution Test Result




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Proj. Name: | Oak Grove | | **Gravel, %** | **Sand, %** | **Silt, %** | **Clay, %** | **LL** | **PI** |
| Project No.: | 2122 | | 0.0 | 22.7 | 0.0 | 0.0 | 54 | 31 |
| Report Date | 11.27.2021 | Log-in Date 11.16.2021 | **Description and Classification** | | | | | |
| Project Loc. | Texas | | Tan | CH, fat clay, | with sand | | | |
| | | | **Standard Sieve Sizes - Percent Passing** | | | | | |
| **Sample Identification - Location - Type** | | | 6 " | | 2.5 " | | 3/8 " | |
| ST-4 | Tube Sample | | 5 " | | 2 " | | 1/4 " | |
| **Remarks:** | **NMC, %** | **19.0** | 4.5 " | | 1- 1/2 " | | # 4 | 100.0 |
| Moist Method, ASTM D422 | | Bulk | 4 " | | 1 " | | # 10 | 99.8 |
| Sample split on # 40 sieve | | Sample wt., kg | 3.5 " | | 3/4 " | | # 40 | 99.6 |
| Clay content reported at 0.005mm | | | 3 " | | 1/2 " | | # 200 | 77.3 |

| **Hygroscopic Moisture Content Data** | | Hydrometer Specimen Wet wt. | 0.00 | **Traceability Items** | | |
|---|---|---|---|---|---|---|
| WS+t | 0.00 | Hydrometer Specimen Dry wt. | ERR | Balance ID | 1 | 2 |
| DS+T | 0.00 | Assumed Gs | 2.75 | Therm ID | 58981 | NA |
| Tare wt | 0.00 | Percent <#40 based on complete specimen | 99.57 | Flask ID | 1 | NA |
| Moist Ratio | ERR | Calculated biased weight | ERR | Bulb ID | 1 | 152H |
| | | Composite Correction at 20 deg C | -6 | Sol Mix, ml | 125 | NA |
| | | Meniscus Correction only | 1 | Tested By | JMB | BMG |

| **Hydrometer Reading Data** | | | Temp. | Corrected | | | Effective | Diameter, mm | Percent |
|---|---|---|---|---|---|---|---|---|---|
| Time, min. | Readings | Temp. | Correction, Ct | Reading, Rc | K | Rm | depth | | finer |
| 2 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 5 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 15 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 30 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 120 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 240 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 600 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |



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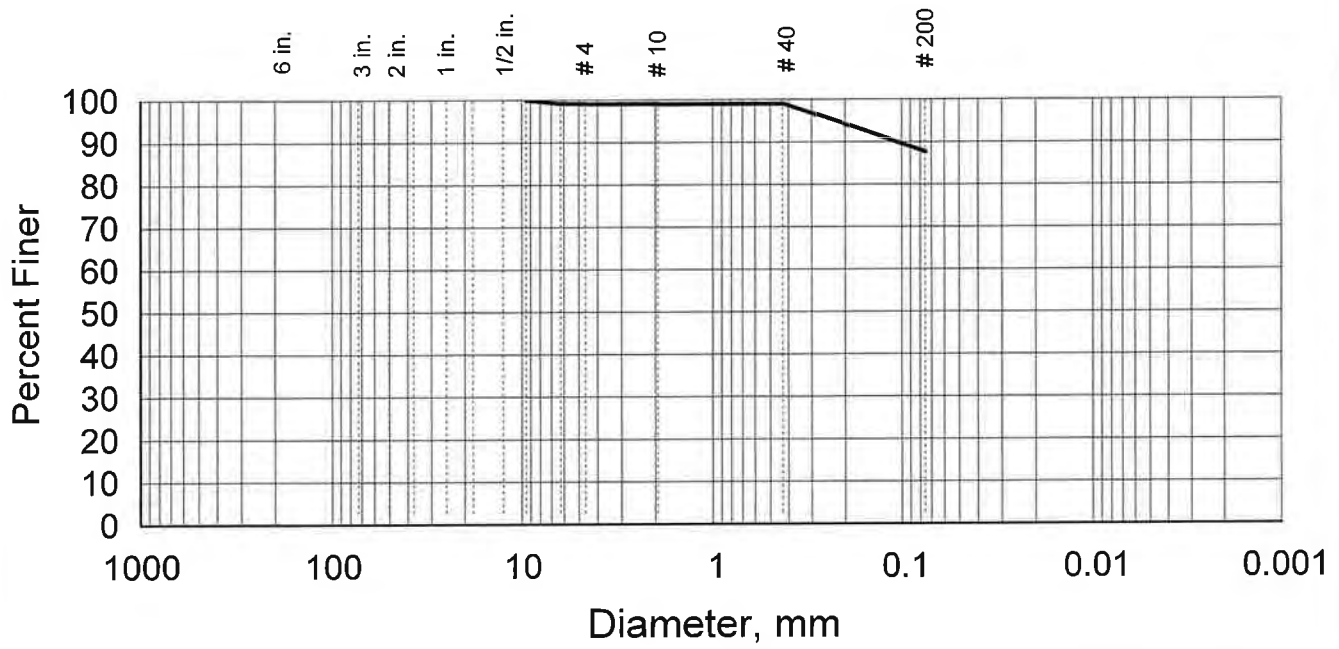
## Particle Distribution Test Result




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Proj. Name: | Oak Grove | **Gravel, %** | **Sand, %** | **Silt, %** | **Clay, %** | **LL** | **PI** |
| Project No.: 2122 | | 0.8 | 11.5 | 0.0 | 0.0 | 56 | 33 |
| Report Date 11.27.2021 | Log-in Date 11.16.2021 | **Description and Classification** | | | | | |
| Project Loc. Texas | | Tan | CH, fat clay, | | | | |
| | | **Standard Sieve Sizes - Percent Passing** | | | | | |
| **Sample Identification - Location - Type** | | 6 " | | 2.5 " | | 3/8 " | 100.0 |
| ST-5 | Tube Sample | 5 " | | 2 " | | 1/4 " | 99.2 |
| **Remarks:** | **NMC, %** **22.2** | 4.5 " | | 1- 1/2 " | | # 4 | 99.2 |
| Moist Method, ASTM D422 | Bulk | 4 " | | 1 " | | # 10 | 99.2 |
| Sample split on # 40 sieve | Sample wt., kg | 3.5 " | | 3/4 " | | # 40 | 99.0 |
| Clay content reported at 0.005mm | | 3 " | | 1/2 " | | # 200 | 87.7 |

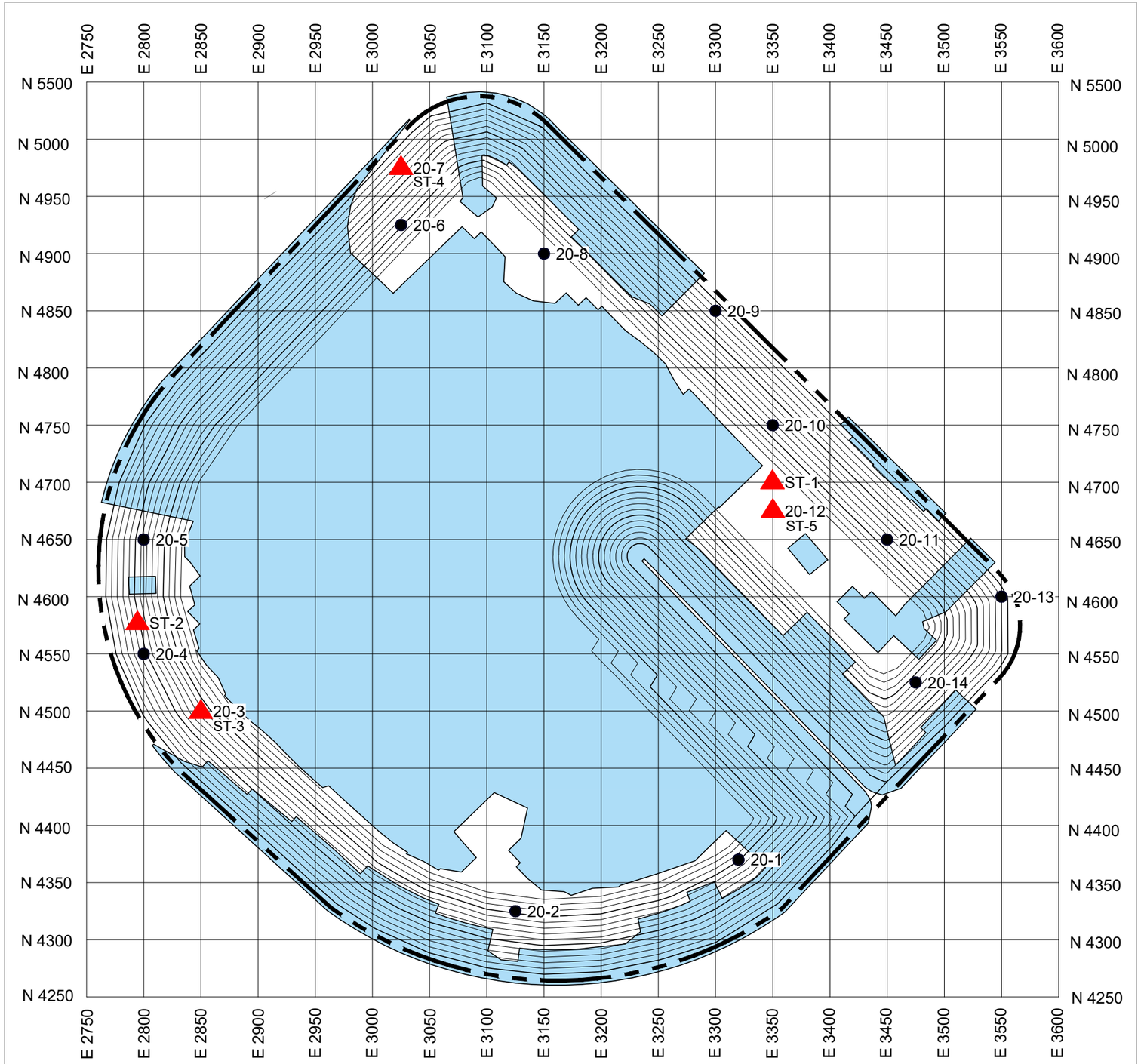
| **Hygroscopic Moisture Content Data** | | | | **Traceability Items** | | |
|---|---|---|---|---|---|---|
| WS+t | 0.00 | Hydrometer Specimen Wet wt. | 0.00 | Balance ID | 1 | 2 |
| DS+T | 0.00 | Hydrometer Specimen Dry wt. | ERR | Therm ID | 58981 | NA |
| Tare wt | 0.00 | Assumed Gs | 2.75 | Flask ID | 1 | NA |
| Moist Ratio | ERR | Percent <#40 based on complete specimen | 99.02 | Bulb ID | 1 | 152H |
| | | Calculated biased weight | ERR | Sol Mix, ml | 125 | NA |
| | | Composite Correction at 20 deg C | -6 | Tested By | JMB | BMG |
| | | Meniscus Correction only | 1 | | | |

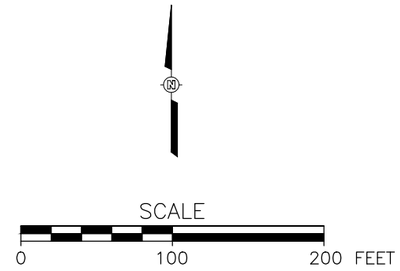
| **Hydrometer Reading Data** | | | Temp. | Corrected | | | Effective | Diameter, mm | Percent |
|---|---|---|---|---|---|---|---|---|---|
| Time, min. | Readings | Temp. | Correction, Ct | Reading, Rc | K | Rm | depth | | finer |
| 2 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 5 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 15 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 30 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 120 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 240 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |
| 600 | 0 | 0 | | -6 | | 1 | 16.13 | 0.0000 | |



14194 Florida - Livingston, LA. 70754 Phone 225-435-0408 Mobile 812-603-6840

# Test Location Maps




## LEGEND

- FGD-A POND LIMITS
- AREA COVERED WITH GCL
- 20-6 DENSITY TEST LOCATION
- ST-1 SHELBY TUBE LOCATION

NOTE:

1. DENSITY TESTS ONLY TAKEN ON UPPER 6" OF THE IN-SITU CLAY LINER.
2. ST-1 AND ST-2 WERE TAKEN FROM THE BOTTOM 18" OF IN-SITU CLAY LINER.

REV | DATE | DESCRIPTION | BY

TEXAS BOARD OF PROFESSIONAL ENGINEERS REG. NO. F-3407

DRAWING TITLE: CLAY LINER TEST LOCATION MAP

PROJECT TITLE: FGD-A POND RETROFIT

CLIENT: OAK GROVE STEAM ELECTRIC STATION
LUMINANT
ROBERTSON COUNTY, TEXAS

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
12000 RICHMOND AVE., SUITE 250, HOUSTON, TX 77077
PH (281) 293-8494 FAX NO. (281) 293-7878

DSN. BY: SF | DWN. BY: SF | CHK. BY: JRM | Q/A RVW BY: JRM | APP. BY: JRM

PROJ. NO. 162210145.00

CADD FILE: DENSITY LOCATION MAP

DATE: 7/2022

SCALE: AS SHOWN

FIGURE NO. 1

7/14/2022 9:59 AM Z:\R&R\Projects\162210145.00\Deliverables\Technical\Bid Docs\2021 FGD-A General Contractor CAD Files\5-a-8_8_20-22_ Clay Plans\Density Location Map

# APPENDIX – D.2

## Geosynthetic

# Trial Weld

# 7753

## Demtech Services, Inc.
Placerville, California, USA

## CALIBRATION CERTIFICATE

Tensiometer Model: Pro-Tester T-0100

Device Calibrated: S-Type load cell
Range: 0 - 340 kilos Max Tension
A/D Module Model No: T-029

Calibration Apparatus:
Pro-Cal unit, model TC-0100/A

Load Cell Serial No: 158699

Channel No: N/A

Load Cell Model No: M2405-750#
AD Module Serial No. 4521158699

| Dead Weight (kilos): | |
|---|---|
| W1 | 1 |
| W2 | 69 |
| W3 | 137 |

| Reference Cell: | |
|---|---|
| R1 | 1 |
| R2 | 69 |
| R3 | 137 |

Indicator reading with no load: 0

Offset: 4.999117 Scale: 3.324482

| Applied Force in kilos | Cell Response: | Deviation Error: |
|---|---|---|
| 1 | 1 | 0.00 |
| 24 | 24 | 0.00 |
| 46 | 46 | 0.00 |
| 69 | 69 | 0.00 |
| 92 | 92 | 0.00 |
| 114 | 114 | 0.00 |
| 137 | 137 | 0.00 |

Total Deviation Error (%): 0.00%

Temperature at time of calibration: 17 degrees C
Exitation Voltage: 5 V DC

This calibration conforms to the standards set by ASTM E4 and is traceable to NIST standards

Note: A/D Module and load cell above have been systems calibrated and are considered a matched pair. In general, calibrated A/D Modules and load cells are not interchangeable.

Calibration Technician: TT Date: 11/23/21

Signature: Tahoe Taylor

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Trial Weld Log**

**60 mil - Minimum peel value = Extrusion 78 ppi, Smooth fusion 91 ppi; minimum shear value = 120ppi.**

| Date | Time | Ambient Temp. | Seamer ID | Machine ID | Extrusion Weld | | Fusion Weld | | Peel Value (ppi) | | Shear Value (ppi) | | CQA Tech. | Weld Type | Material Seam Type | P/F | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Preheat | Barrel Temp. | Wedge Temp. | Wedge Speed | 1 | 2 | 1 | 2 | | | | | |
| 1/10/2022 | 0914 | 44 | VT | 821 | - | - | 850 | 3.0 | 193/183 | 190/187 | 256 | 261 | DR | F | S/T | P | |
| 1/10/2022 | 0917 | 44 | VT | 821 | - | - | 850 | 3.5 | 163/159 | 161/180 | 261 | 257 | DR | F | S/S | P | |
| 1/10/2022 | 0920 | 44 | MS | 457 | - | - | 850 | 4.0 | 172/163 | 160/157 | 258 | 269 | DR | F | S/S | P | |
| 1/10/2022 | 0921 | 44 | MS | 457 | - | - | 850 | 3.5 | 167/159 | 171/183 | 239 | 256 | DR | F | S/T | P | |
| 1/10/2022 | 1323 | 50 | VT | 821 | - | - | 850 | 4.0 | 159/163 | 159/167 | 230 | 219 | DR | F | S/S | P | |
| 1/10/2022 | 1325 | 50 | VT | 821 | - | - | 850 | 3.5 | 167/169 | 177/168 | 235 | 230 | DR | F | S/T | P | |
| 1/10/2022 | 1330 | 50 | MS | 457 | - | - | 850 | 4.0 | 157/161 | 159/167 | 197 | 200 | DR | F | S/S | P | |
| 1/10/2022 | 1332 | 50 | MS | 457 | - | - | 850 | 3.5 | 163/157 | 154/176 | 230 | 227 | DR | F | S/T | P | |
| 1/11/2022 | 0747 | 33 | VT | 821 | - | - | 850 | 4.0 | 143/157 | 145/139 | 240 | 237 | DR | F | S/S | P | |
| 1/11/2022 | 0748 | 33 | VT | 821 | - | - | 850 | 3.5 | 149/140 | 139/143 | 251 | 239 | DR | F | S/T | P | |
| 1/11/2022 | 0746 | 33 | MS | 457 | - | - | 850 | 4.0 | 135/156 | 146/153 | 212 | 226 | DR | F | S/S | P | |
| 1/11/2022 | 0730 | 33 | MS | 457 | - | - | 850 | 3.5 | 140/139 | 153/147 | 230 | 237 | DR | F | S/T | P | |
| 1/11/2022 | 1306 | 45 | VT | 821 | - | - | 850 | 4.0 | 134/146 | 136/143 | 207 | 223 | DR | F | S/S | P | |
| 1/11/2022 | 1307 | 45 | VT | 821 | - | - | 850 | 3.5 | 136/141 | 135/140 | 230 | 227 | DR | F | S/T | P | |
| 1/11/2022 | 1309 | 45 | MS | 457 | - | - | 850 | 4.0 | 138/146 | 141/138 | 207 | 216 | DR | F | S/S | P | |
| 1/11/2022 | 1310 | 45 | MS | 457 | - | - | 850 | 3.5 | 143/139 | 145/135 | 223 | 215 | DR | F | S/T | P | |
| 1/12/2022 | 0755 | 45 | DL | 1063 | 550 | 550 | - | - | 139 | 123 | 170 | 166 | DR | EX | T/T | P | |
| 1/12/2022 | 1057 | 60 | VT | 821 | - | - | 850 | 4.0 | 136/129 | 131/129 | 167 | 159 | DR | F | S/S | P | |
| 1/12/2022 | 1102 | 60 | VT | 821 | - | - | 850 | 3.5 | 129/136 | 129/134 | 170 | 169 | DR | F | S/T | P | |
| 1/12/2022 | 1110 | 60 | MS | 457 | - | - | 850 | 4.0 | 136/129 | 137/130 | 159 | 167 | DR | F | S/S | P | |
| 1/12/2022 | 1114 | 60 | MS | 457 | - | - | 850 | 3.5 | 138/141 | 139/144 | 167 | 176 | DR | F | S/T | P | |
| 1/12/2022 | 1315 | 63 | VT | 821 | - | - | 850 | 4.0 | 133/146 | 137/141 | 169 | 179 | DR | F | S/S | P | |
| 1/12/2022 | 1317 | 63 | VT | 821 | - | - | 850 | 3.5 | 139/149 | 145/137 | 170 | 166 | DR | F | S/T | P | |
| 1/12/2022 | 1328 | 63 | MS | 457 | - | - | 850 | 4.0 | 143/153 | 146/136 | 169 | 173 | DR | F | S/S | P | |
| 1/12/2022 | 1330 | 63 | MS | 457 | - | - | 850 | 3.5 | 150/147 | 140/135 | 171 | 169 | DR | F | S/T | P | |
| 1/13/2022 | 0753 | 45 | MS | 457 | - | - | 850 | 4.0 | 161/154 | 160/153 | 171 | 169 | DR | F | S/S | P | |
| 1/13/2022 | 0755 | 45 | MS | 457 | - | - | 850 | 3.5 | 159/163 | 156/149 | 210 | 219 | DR | F | S/T | P | |
| 1/13/2022 | 0758 | 45 | VT | 821 | - | - | 850 | 4.0 | 163/153 | 159/164 | 199 | 207 | DR | F | S/S | P | |
| 1/13/2022 | 0759 | 45 | VT | 821 | - | - | 850 | 3.5 | 159/160 | 161/158 | 198 | 200 | DR | F | S/T | P | |
| 1/13/2022 | 1318 | 70 | VT | 821 | - | - | 850 | 4.5 | 150/147 | 149/154 | 169 | 177 | DR | F | S/S | P | |
| 1/13/2022 | 1319 | 70 | VT | 821 | - | - | 850 | 3.5 | 160/156 | 149/146 | 179 | 171 | DR | F | S/T | P | |
| 1/13/2022 | 1320 | 70 | MS | 457 | - | - | 850 | 4.0 | 157/161 | 150/147 | 180 | 169 | DR | F | S/S | P | |
| 1/13/2022 | 1322 | 70 | MS | 457 | - | - | 850 | 3.4 | 147/153 | 149/155 | 169 | 176 | DR | F | S/T | P | |
| 1/14/2022 | 0750 | 45 | VT | 821 | - | - | 850 | 4.0 | 137/129 | 139/125 | 179 | 167 | DR | F | S/S | P | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Trial Weld Log**

**60 mil - Minimum peel value = Extrusion 78 ppi, Smooth fusion 91 ppi; minimum shear value = 120ppi.**

| Date | Time | Ambient Temp. | Seamer ID | Machine ID | Extrusion Weld | | Fusion Weld | | Peel Value (ppi) | | Shear Value (ppi) | | CQA Tech. | Weld Type | Material Seam Type | P/F | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Preheat | Barrel Temp. | Wedge Temp. | Wedge Speed | 1 | 2 | 1 | 2 | | | | | |
| 1/14/2022 | 0752 | 45 | VT | 821 | - | - | 850 | 3.0 | 161/154 | 156/161 | 230 | 237 | DR | F | S/T | P | |
| 1/14/2022 | 0830 | 45 | MS | 457 | - | - | 850 | 4.5 | 146/139 | 149/153 | 155 | 154 | DR | F | S/S | P | |
| 1/14/2022 | 1325 | 72 | VT | 821 | - | - | 850 | 4.0 | 137/141 | 135/140 | 155 | 154 | DR | F | S/S | P | |
| 1/14/2022 | 1340 | 72 | MS | 457 | - | - | 850 | 4.5 | 140/136 | 130/135 | 159 | 161 | DR | F | S/S | P | |
| 1/14/2022 | 1523 | 72 | MS | 457 | - | - | 850 | 3.5 | 137/143 | 139/141 | 167 | 159 | DR | F | T/T | P | |
| 1/15/2022 | 0725 | 44 | DL | 1063 | 550 | 550 | - | - | 149 | 156 | 176 | 169 | DR | EX | T/T | P | |
| 1/15/2022 | 0830 | 44 | FM | 690 | 550 | 550 | - | - | 147 | 151 | 178 | 171 | DR | EX | T/T | P | |
| 1/15/2022 | 1330 | 44 | FM | 690 | 550 | 550 | - | - | 151 | 147 | 171 | 169 | DR | EX | T/T | P | |
| 1/16/2022 | 0740 | 37 | VT | 821 | - | - | 850 | 3.5 | 146/153 | 149/161 | 217 | 229 | DR | EX | S/S | P | |
| 1/16/2022 | 0742 | 37 | MS | 457 | - | - | 850 | 4.0 | 163/149 | 157/163 | 210 | 231 | DR | EX | S/S | P | |
| 1/16/2022 | 1140 | 52 | MS | 457 | - | - | 850 | 3.5 | 156/147 | 154/161 | 176 | 189 | DR | EX | T/T | P | |
| 1/16/2022 | 1337 | 52 | MS | 457 | - | - | 850 | 4.5 | 139/140 | 135/141 | 176 | 167 | DR | EX | S/S | P | |
| 1/16/2022 | 1343 | 52 | VT | 821 | - | - | 850 | 4.0 | 145/136 | 141/135 | 169 | 170 | DR | EX | S/S | P | |
| 1/16/2022 | 1445 | 52 | VT | 821 | - | - | 850 | 3.0 | 136/141 | 135/139 | 156 | 164 | DR | EX | T/T | P | |
| 1/16/2022 | 1457 | 52 | MS | 457 | - | - | 850 | 3.5 | 141/139 | 135/141 | 156 | 171 | DR | EX | T/T | P | |
| 1/17/2022 | 0753 | 40 | MS | 457 | - | - | 850 | 4.0 | 146/151 | 149/141 | 231 | 229 | DR | F | S/S | P | |
| 1/17/2022 | 0757 | 40 | VT | 821 | - | - | 850 | 3.5 | 153/144 | 150/156 | 217 | 223 | DR | F | S/S | P | |
| 1/17/2022 | 0845 | 40 | MS | 457 | - | - | 850 | 3.5 | 161/157 | 159/163 | 193 | 200 | DR | F | T/T | P | |
| 1/17/2022 | 1310 | 56 | VT | 821 | - | - | 850 | 4.0 | 139/138 | 147/143 | 179 | 169 | DR | F | S/S | P | |
| 1/17/2022 | 1311 | 56 | VT | 821 | - | - | 850 | 3.5 | 146/135 | 149/139 | 167 | 171 | DR | F | T/T | P | |
| 1/17/2022 | 1335 | 56 | MS | 457 | - | - | 850 | 4.5 | 149/137 | 140/137 | 171 | 169 | DR | F | S/S | P | |
| 1/17/2022 | 1338 | 56 | MS | 457 | - | - | 850 | 4.0 | 146/139 | 143/136 | 167 | 171 | DR | F | T/T | P | |
| 1/18/2022 | 0741 | 38 | MS | 457 | - | - | 850 | 4.0 | 146/139 | 144/151 | 200 | 217 | DR | F | S/S | P | |
| 1/18/2022 | 0743 | 38 | MS | 457 | - | - | 850 | 3.5 | 150/151 | 157/149 | 199 | 210 | DR | F | T/T | P | |
| 1/18/2022 | 0747 | 38 | VT | 821 | - | - | 850 | 3.5 | 156/144 | 139/159 | 200 | 230 | DR | F | S/S | P | |
| 1/18/2022 | 0748 | 38 | VT | 821 | - | - | 850 | 3.0 | 149/150 | 159/153 | 199 | 210 | DR | F | T/T | P | |
| 1/18/2022 | 1345 | 70 | FM | 690 | 550 | 550 | - | - | 157 | 149 | 165 | 161 | DR | EX | T/T | P | |
| 1/18/2022 | 1700 | 65 | VT | 821 | - | - | 850 | 3.0 | 146/139 | 147/151 | 179 | 169 | DR | F | T/T | P | |
| 1/19/2022 | 0715 | 44 | MS | 457 | - | - | 850 | 3.0 | 146/139 | 147/151 | 200 | 190 | DR | F | S/S | P | |
| 1/19/2022 | 0720 | 44 | VT | 821 | - | - | 850 | 3.0 | 157/147 | 145/151 | 197 | 189 | DR | F | S/S | P | |
| 1/19/2022 | 0721 | 44 | MS | 457 | - | - | 850 | 3.0 | 143/153 | 140/149 | 210 | 197 | DR | F | S/T | P | |
| 1/19/2022 | 0725 | 44 | VT | 821 | - | - | 850 | 3.0 | 141/149 | 153/150 | 217 | 200 | DR | F | S/T | P | |
| 1/19/2022 | 1100 | 44 | DL | 690 | 550 | 550 | - | - | 136 | 146 | 159 | 167 | DR | EX | T/T | P | |
| 1/19/2022 | 1315 | 70 | MS | 457 | - | - | 850 | 4.5 | 139/147 | 151/144 | 169 | 176 | DR | F | S/S | P | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Trial Weld Log**

**60 mil - Minimum peel value = Extrusion 78 ppi, Smooth fusion 91 ppi; minimum shear value = 120ppi.**

| Date | Time | Ambient Temp. | Seamer ID | Machine ID | Extrusion Weld | | Fusion Weld | | Peel Value (ppi) | | Shear Value (ppi) | | CQA Tech. | Weld Type | Material Seam Type | P/F | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Preheat | Barrel Temp. | Wedge Temp. | Wedge Speed | 1 | 2 | 1 | 2 | | | | | |
| 1/19/2022 | 1335 | 70 | DL | 690 | 550 | 550 | - | - | 130 | 141 | 157 | 161 | DR | EX | T/T | P | |
| 1/19/2022 | 1537 | 70 | MS | 457 | - | - | 850 | 4.0 | 146/141 | 139/153 | 179 | 181 | DR | F | S/T | P | |
| 1/20/2022 | 0820 | 29 | DL | 690 | 550 | 550 | - | - | 135 | 143 | 156 | 163 | DR | EX | T/T | P | |
| 1/21/2022 | 0822 | 35 | VT | 821 | - | - | 850 | 3.5 | 157/161 | 154/160 | 236 | 230 | DR | F | S/S | P | |
| 1/21/2022 | 0826 | 35 | MS | 4483 | - | - | 850 | 4.0 | 150/163 | 158/161 | 210 | 194 | DR | F | S/S | P | |
| 1/21/2022 | 0847 | 35 | FM | 5189 | - | - | 850 | 3.5 | 156/161 | 157/153 | 197 | 189 | DR | F | S/S | P | |
| 1/21/2022 | 1310 | 57 | VT | 821 | - | - | 850 | 4.0 | 149/153 | 151/147 | 176 | 170 | DR | F | S/S | P | |
| 1/21/2022 | 1316 | 57 | FM | 5189 | - | - | 850 | 3.5 | 139/146 | 143/138 | 167 | 171 | DR | F | S/S | P | |
| 1/21/2022 | 1321 | 57 | MS | 4483 | - | - | 850 | 4.0 | 140/139 | 149/135 | 176 | 169 | DR | F | S/S | P | |
| 1/21/2022 | 1630 | 59 | MS | 4483 | - | - | 850 | 3.0 | 145/151 | 159/160 | 181 | 181 | DR | F | T/T | P | |
| 1/21/2022 | 1800 | 59 | VT | 821 | - | - | 850 | 3.0 | 144/151 | 153/139 | 229 | 217 | DR | F | T/T | P | |
| 1/21/2022 | 1803 | 59 | FM | 5189 | - | - | 850 | 3.0 | 141/149 | 151/144 | 197 | 159 | DR | F | T/T | P | |
| 1/22/2022 | 0950 | 35 | FM | 5189 | - | - | 850 | 3.5 | 146/151 | 142/139 | 210 | 227 | DR | F | S/S | P | |
| 1/22/2022 | 0955 | 35 | FM | 5189 | - | - | 850 | 3.0 | 156/147 | 153/150 | 231 | 225 | DR | F | S/T | P | |
| 1/22/2022 | 1315 | 40 | VT | 821 | - | - | 850 | 4.0 | 149/153 | 140/153 | 197 | 210 | DR | F | S/S | P | |
| 1/22/2022 | 1316 | 40 | VT | 821 | - | - | 850 | 3.5 | 151/149 | 146/147 | 169 | 191 | DR | F | S/T | P | |
| 1/22/2022 | 1317 | 40 | MS | 4483 | - | - | 850 | 4.0 | 157/145 | 153/150 | 167 | 177 | DR | F | S/S | P | |
| 1/22/2022 | 1318 | 40 | MS | 4483 | - | - | 850 | 3.5 | 149/153 | 143/149 | 176 | 183 | DR | F | S/T | P | |
| 1/22/2022 | 1320 | 40 | FM | 5189 | - | - | 850 | 3.5 | 152/139 | 146/150 | 181 | 177 | DR | F | S/S | P | |
| 1/22/2022 | 1635 | 50 | MS | 4483 | - | - | 850 | 3.0 | 156/149 | 151/144 | 179 | 169 | DR | F | T/T | P | |
| 1/22/2022 | 1640 | 50 | VT | 821 | - | - | 850 | 3.0 | 149/156 | 150/147 | 198 | 199 | DR | F | T/T | P | |
| 1/22/2022 | 1700 | 50 | FM | 5189 | - | - | 850 | 3.0 | 159/153 | 150/154 | 191 | 186 | DR | F | T/T | P | |
| 1/23/2022 | 0747 | 35 | MS | 4483 | - | - | 850 | 4.0 | 146/153 | 156/149 | 199 | 186 | DR | F | S/S | P | |
| 1/23/2022 | 0749 | 35 | MS | 4483 | - | - | 850 | 3.5 | 149/151 | 139/144 | 184 | 178 | DR | F | S/S | P | |
| 1/23/2022 | 0750 | 35 | VT | 821 | - | - | 850 | 3.5 | 156/141 | 146/139 | 200 | 190 | DR | F | S/S | P | |
| 1/23/2022 | 0755 | 35 | VT | 821 | - | - | 850 | 3.0 | 149/159 | 151/149 | 187 | 178 | DR | F | T/T | P | |
| 1/23/2022 | 0800 | 35 | FM | 5189 | - | - | 850 | 3.0 | 161/157 | 163/158 | 210 | 200 | DR | F | S/S | P | |
| 1/23/2022 | 0805 | 35 | FM | 5189 | - | - | 850 | 3.0 | 159/160 | 155/151 | 230 | 197 | DR | F | T/T | P | |
| 1/23/2022 | 1045 | 56 | DL | 690 | 550 | 550 | - | - | 146 | 139 | 176 | 103 | DR | EX | T/T | P | |
| 1/23/2022 | 1050 | 56 | FM | 1063 | 550 | 550 | - | - | 151 | 148 | 176 | 179 | DR | EX | T/T | P | |
| 1/23/2022 | 1320 | 65 | DL | 690 | 550 | 550 | - | - | 139 | 140 | 169 | 170 | DR | EX | T/T | P | |
| 1/23/2022 | 1325 | 65 | FM | 1063 | 550 | 550 | - | - | 141 | 137 | 171 | 159 | DR | EX | T/T | P | |
| 1/24/2022 | 0725 | 33 | DL | 690 | 550 | 550 | - | - | 136 | 142 | 159 | 161 | DR | EX | T/T | P | |
| 1/25/2022 | 0730 | 37 | DL | 690 | 550 | 550 | - | - | 141 | 136 | 156 | 163 | DR | EX | T/T | P | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Trial Weld Log**

**60 mil - Minimum peel value = Extrusion 78 ppi, Smooth fusion 91 ppi; minimum shear value = 120ppi.**

| Date | Time | Ambient Temp. | Seamer ID | Machine ID | Extrusion Weld | | Fusion Weld | | Peel Value (ppi) | | Shear Value (ppi) | | CQA Tech. | Weld Type | Material Seam Type | P/F | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Preheat | Barrel Temp. | Wedge Temp. | Wedge Speed | 1 | 2 | 1 | 2 | | | | | |
| 1/25/2022 | 1101 | 37 | FM | 1063 | 550 | 550 | - | - | 134 | 140 | 161 | 157 | DR | EX | T/T | P | |
| 1/27/2022 | 0815 | 40 | DL | 690 | 550 | 550 | - | - | 147 | 139 | 164 | 156 | DF | EX | T/T | P | |
| 2/18/2022 | 0950 | 40 | DL | 690 | 550 | 550 | - | - | 136 | 141 | 190 | 189 | DF | EX | T/T | P | |

# Panel Placement

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/10/22 | 0836 | 1 | Slope | LL-19-2021 | 17 | 0 | 41 | 41 | PV | | |
| 01/10/22 | 0840 | 2 | Slope | LL-19-2021 | 17 | 0 | 42 | 42 | PV | | |
| 01/10/22 | 0844 | 3 | Slope | LL-19-2021 | 17 | 0 | 41 | 41 | PV | | |
| 01/10/22 | 0848 | 4 | Slope | LL-48-2021 | 74 | 0 | 41 | 41 | PV | | |
| 01/10/22 | 0850 | 5 | Slope | LL-48-2021 | 74 | 0 | 20 | 20 | PV | | |
| 01/10/22 | 0853 | 6 | Slope | LL-48-2021 | 74 | 0 | 62 | 62 | PV | | |
| 01/10/22 | 0900 | 7 | Slope | LL-48-2021 | 147 | 0 | 54 | 54 | DR | | |
| 01/10/22 | 0910 | 8 | Slope | LL-48-2021 | 147 | 0 | 54 | 54 | DR | | |
| 01/10/22 | 0915 | 9 | Slope | LL-48-2021 | 69 | 0 | 53 | 53 | DR | | |
| 01/10/22 | 0920 | 10 | Slope | LL-48-2021 | 69 | 0 | 53 | 53 | DR | | |
| 01/10/22 | 1043 | 11 | Slope | LL-48-2021 | 78 | 0 | 38 | 38 | PV | | |
| 01/10/22 | 1045 | 12 | Slope | LL-48-2021 | 78 | 0 | 31 | 31 | PV | | |
| 01/10/22 | 1047 | 13 | Slope | LL-48-2021 | 78 | 0 | 32 | 32 | PV | | |
| 01/10/22 | 1049 | 14 | Slope | LL-48-2021 | 78 | 0 | 29 | 29 | PV | | |
| 01/10/22 | 1053 | 15 | Slope | LL-48-2021 | 80 | 0 | 33 | 33 | PV | | |
| 01/10/22 | 1055 | 16 | Slope | LL-48-2021 | 80 | 0 | 31 | 31 | PV | | |
| 01/10/22 | 1057 | 17 | Slope | LL-48-2021 | 80 | 0 | 32 | 32 | PV | | |
| 01/10/22 | 1059 | 18 | Slope | LL-48-2021 | 80 | 0 | 32 | 32 | PV | | |
| 01/10/22 | 1110 | 19 | Slope | LL-48-2021 | 69 | 0 | 25 | 25 | PV | | |
| 01/10/22 | 1115 | 20 | Slope | LL-48-2021 | 69 | 0 | 29 | 29 | PV | | |
| 01/10/22 | 1417 | 21 | Slope | LL-48-2021 | 67 | 0 | 49 | 49 | PV | | |
| 01/10/22 | 1419 | 22 | Slope | LL-48-2021 | 67 | 0 | 49 | 49 | PV | | |
| 01/10/22 | 1435 | 23 | Slope | LL-48-2021 | 82 | 0 | 49 | 49 | PV | | |
| 01/10/22 | 1442 | 24 | Slope | LL-48-2021 | 82 | 0 | 62 | 62 | PV | | |
| 01/10/22 | 1446 | 25 | Slope | LL-48-2021 | 70 | 0 | 66 | 66 | PV | | |
| 01/10/22 | 1450 | 26 | Slope | LL-48-2021 | 70 | 0 | 73 | 73 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/10/22 | 1455 | 27 | Slope | LL-48-2021 | 76 | 0 | 70 | 70 | PV | | |
| 01/10/22 | 1458 | 28 | Slope | LL-48-2021 | 76 | 0 | 70 | 70 | PV | | |
| 01/10/22 | 1503 | 29 | Slope | LL-48-2021 | 72 | 0 | 58 | 58 | PV | | |
| 01/10/22 | 1507 | 30 | Slope | LL-48-2021 | 72 | 0 | 50 | 50 | PV | | |
| 01/10/22 | 1604 | 31 | Slope | LL-48-2021 | 75 | 0 | 50 | 50 | PV | | |
| 01/10/22 | 1607 | 32 | Slope | LL-48-2021 | 75 | 0 | 47 | 47 | PV | | |
| 01/11/22 | 0755 | 33 | Slope | LL-48-2021 | 106 | 0 | 45 | 45 | PV | | |
| 01/11/22 | 0758 | 34 | Slope | LL-48-2021 | 106 | 0 | 45 | 45 | PV | | |
| 01/11/22 | 0801 | 35 | Slope | LL-48-2021 | 106 | 0 | 45 | 45 | PV | | |
| 01/11/22 | 0810 | 36 | Slope | LL-48-2021 | 68 | 0 | 38 | 38 | PV | | |
| 01/11/22 | 0816 | 37 | Slope | LL-48-2021 | 68 | 0 | 38 | 38 | PV | | |
| 01/11/22 | 0818 | 38 | Slope | LL-48-2021 | 68 | 0 | 36 | 36 | PV | | |
| 01/11/22 | 0850 | 39 | Slope | LL-48-2021 | 102 | 0 | 35 | 35 | PV | | |
| 01/11/22 | 0852 | 40 | Slope | LL-48-2021 | 102 | 0 | 28 | 28 | PV | | |
| 01/11/22 | 0854 | 41 | Slope | LL-48-2021 | 102 | 0 | 28 | 28 | PV | | |
| 01/11/22 | 0857 | 42 | Slope | LL-48-2021 | 68 | 0 | 24 | 24 | PV | | |
| 01/11/22 | 0900 | 43 | Slope | LL-48-2021 | 102 | 0 | 10 | 10 | PV | | |
| 01/11/22 | 0901 | 44 | Slope | LL-48-2021 | 102 | 0 | 5 | 5 | PV | | |
| 01/11/22 | 1105 | 45 | Slope | LL-48-2021 | 93 | 61 | 87 | 26 | PV | | |
| 01/12/22 | 1017 | 46 | Slope | LL-48-2021 | 81 | 90 | 0 | 90 | PV | | |
| 01/12/22 | 1030 | 47 | Slope | LL-48-2021 | 84 | 91 | 0 | 91 | PV | | |
| 01/12/22 | 1037 | 48 | Slope | LL-48-2021 | 71 | 93 | 0 | 93 | PV | | |
| 01/12/22 | 1043 | 49 | Slope | LL-48-2021 | 93 | 69 | 0 | 69 | PV | | |
| 01/12/22 | 1048 | 50 | Slope | LL-48-2021 | 101 | 84 | 69 | 69 | PV | | |
| 01/12/22 | 1050 | 51 | Slope | LL-48-2021 | 101 | 0 | 94 | 94 | PV | | |
| 01/12/22 | 1330 | 52 | Slope | LL-48-2021 | 89 | 0 | 95 | 95 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/12/22 | 1337 | 53 | Slope | LL-48-2021 | 96 | 0 | 92 | 92 | PV | | |
| 01/12/22 | 1400 | 54 | Slope | LL-48-2021 | 123 | 0 | 93 | 93 | PV | | |
| 01/12/22 | 1428 | 55 | Slope | LL-48-2021 | 86 | 0 | 94 | 94 | PV | | |
| 01/12/22 | 1435 | 56 | Slope | LL-48-2021 | 79 | 0 | 93 | 93 | PV | | |
| 01/12/22 | 1453 | 57 | Slope | LL-48-2021 | 99 | 0 | 92 | 92 | PV | | |
| 01/12/22 | 1457 | 58 | Slope | LL-48-2021 | 97 | 0 | 91 | 91 | PV | | |
| 01/12/22 | 1521 | 59 | Slope | LL-48-2021 | 158 | 0 | 91 | 91 | PV | | |
| 01/12/22 | 1528 | 60 | Slope | LL-48-2021 | 87 | 0 | 93 | 93 | PV | | |
| 01/12/22 | 1539 | 61 | Slope | LL-48-2021 | 83 | 0 | 95 | 95 | PV | | |
| 01/12/22 | 1600 | 62 | Slope | LL-48-2021 | 95 | 0 | 92 | 92 | PV | | |
| 01/12/22 | 1616 | 63 | Slope | LL-48-2021 | 103 | 0 | 92 | 92 | PV | | |
| 01/12/22 | 1642 | 64 | Slope | LL-48-2021 | 90 | 0 | 92 | 92 | PV | | |
| 01/12/22 | 1654 | 65 | Slope | LL-48-2021 | 85 | 0 | 92 | 92 | PV | | |
| 01/13/22 | 0745 | 66 | Slope | LL-48-2021 | 91 | 93 | 0 | 93 | PV | | |
| 01/13/22 | 0754 | 67 | Slope | LL-48-2021 | 157 | 94 | 0 | 94 | PV | | |
| 01/13/22 | 0758 | 68 | Slope | LL-48-2021 | 157 | 47 | 0 | 47 | PV | | |
| 01/13/22 | 0800 | 69 | Slope | LL-48-2021 | 91 | 48 | 0 | 48 | PV | | |
| 01/13/22 | 0805 | 70 | Slope | LL-48-2021 | 90 | 29 | 0 | 29 | PV | | |
| 01/13/22 | 0810 | 71 | Slope | LL-48-2021 | 90 | 15 | 0 | 15 | PV | | |
| 01/13/22 | 0813 | 72 | Slope | LL-48-2021 | 85 | 10 | 0 | 10 | PV | | |
| 01/13/22 | 0815 | 73 | Slope | LL-48-2021 | 85 | 10 | 0 | 10 | PV | | |
| 01/13/22 | 0817 | 74 | Slope | LL-48-2021 | 85 | 8 | 0 | 8 | PV | | |
| 01/13/22 | 0819 | 75 | Slope | LL-48-2021 | 85 | 5 | 0 | 5 | PV | | |
| 01/13/22 | 0820 | 76 | Slope | LL-48-2021 | 85 | 3 | 0 | 3 | PV | | |
| 01/13/22 | 0935 | 77 | Slope | LL-48-2021 | 92 | 98 | 0 | 98 | PV | | |
| 01/13/22 | 0945 | 78 | Slope | LL-48-2021 | 116 | 93 | 0 | 93 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/13/22 | 1037 | 79 | Slope | LL-48-2021 | 77 | 69 | 0 | 69 | PV | | |
| 01/13/22 | 1040 | 80 | Slope | LL-48-2021 | 77 | 60 | 0 | 60 | PV | | |
| 01/13/22 | 1059 | 81 | Slope | LL-48-2021 | 154 | 24 | 0 | 24 | PV | | |
| 01/13/22 | 1106 | 82 | Slope | LL-48-2021 | 154 | 25 | 0 | 25 | PV | | |
| 01/13/22 | 1330 | 83 | Floor | LL-48-2021 | 88 | 0 | 146 | 146 | PV | | |
| 01/13/22 | 1340 | 84 | Floor | LL-48-2021 | 154 | 146 | 224 | 78 | PV | | |
| 01/13/22 | 1345 | 85 | Floor | LL-48-2021 | 139 | 216 | 366 | 150 | PV | | |
| 01/13/22 | 1350 | 86 | Floor | LL-48-2021 | 105 | 66 | 216 | 150 | PV | | |
| 01/13/22 | 1355 | 87 | Floor | LL-48-2021 | 153 | 0 | 66 | 66 | PV | | |
| 01/13/22 | 1400 | 88 | Floor | LL-48-2021 | 153 | 224 | 248 | 28 | PV | | |
| 01/13/22 | 1405 | 89 | Floor | LL-48-2021 | 153 | 366 | 377 | 11 | PV | | |
| 01/13/22 | 1410 | 90 | Floor | LL-48-2021 | 153 | 332 | 394 | 62 | PV | | |
| 01/13/22 | 1420 | 91 | Slope | LL-48-2021 | 159 | 31 | 0 | 31 | PV | | |
| 01/13/22 | 1425 | 92 | Slope | LL-48-2021 | 159 | 30 | 0 | 30 | PV | | |
| 01/13/22 | 1430 | 93 | Slope | LL-48-2021 | 159 | 31 | 0 | 31 | PV | | |
| 01/13/22 | 1435 | 94 | Slope | LL-48-2021 | 159 | 31 | 0 | 31 | PV | | |
| 01/13/22 | 1440 | 95 | Floor | LL-48-2021 | 159 | 0 | 11 | 11 | DR | | |
| 01/13/22 | 1450 | 96 | Floor | LL-48-2021 | 145 | 11 | 53 | 42 | DR | | |
| 01/13/22 | 1455 | 97 | Floor | LL-48-2021 | 116 | 53 | 99 | 46 | DR | | |
| 01/13/22 | 1514 | 98 | Floor | LL-48-2021 | 95 | 99 | 147 | 48 | DR | | |
| 01/13/22 | 1515 | 99 | Floor | LL-48-2021 | 92 | 147 | 189 | 42 | DR | | |
| 01/13/22 | 1517 | 100 | Floor | LL-48-2021 | 98 | 189 | 238 | 49 | DR | | |
| 01/13/22 | 1520 | 101 | Floor | LL-48-2021 | 99 | 238/ | 290 | 52 | PV | | |
| 01/13/22 | 1521 | 102 | Floor | LL-48-2021 | 97 | 290 | 332 | 42 | PV | | |
| 01/14/22 | 0750 | 103 | Floor | LL-48-2021 | 164 | 0 | 150 | 150 | PV | | |
| 01/14/22 | 0755 | 104 | Floor | LL-48-2021 | 152 | 150 | 300 | 150 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/14/22 | 0800 | 105 | Floor | LL-48-2021 | 155 | 0 | 150 | 150 | PV | | |
| 01/14/22 | 0805 | 106 | Floor | LL-48-2021 | 146 | 150 | 300 | 150 | PV | | |
| 01/14/22 | 0810 | 107 | Floor | LL-48-2021 | 83 | 342 | 390 | 48 | PV | | |
| 01/14/22 | 0820 | 108 | Floor | LL-48-2021 | 79 | 300 | 342 | 42 | PV | | |
| 01/14/22 | 0830 | 109 | Floor | LL-48-2021 | 123 | 300 | 318 | 18 | PV | | |
| 01/14/22 | 0840 | 110 | Floor | LL-48-2021 | 87 | 318 | 366 | 48 | PV | | |
| 01/14/22 | 0850 | 111 | Floor | LL-48-2021 | 98 | 366 | 415 | 49 | PV | | |
| 01/14/22 | 0855 | 112 | Floor | LL-48-2021 | 123 | 385 | 421 | 36 | PV | | |
| 01/14/22 | 0900 | 113 | Slope | LL-48-2021 | 151 | 53 | 0 | 53 | PV | | |
| 01/14/22 | 0905 | 114 | Slope | LL-48-2021 | 100 | 53 | 0 | 53 | PV | | |
| 01/14/22 | 0910 | 115 | Floor | LL-48-2021 | 100 | 0 | 85 | 85 | PV | | |
| 01/14/22 | 0920 | 116 | Floor | LL-48-2021 | 131 | 85 | 235 | 150 | PV | | |
| 01/14/22 | 0935 | 117 | Floor | LL-48-2021 | 156 | 235 | 385 | 150 | PV | | |
| 01/14/22 | 1045 | 118 | Slope | LL-48-2021 | 144 | 62 | 0 | 62 | PV | | |
| 01/14/22 | 0940 | 119 | Floor | LL-48-2021 | 151 | 0 | 36 | 36 | PV | | |
| 01/14/22 | 0950 | 120 | Floor | LL-48-2021 | 96 | 36 | 95 | 59 | PV | | |
| 01/14/22 | 1000 | 121 | Floor | LL-48-2021 | 158 | 95 | 141 | 46 | PV | | |
| 01/14/22 | 1010 | 122 | Floor | LL-48-2021 | 96 | 141 | 191 | 50 | PV | | |
| 01/14/22 | 1022 | 123 | Floor | LL-48-2021 | 102 | 191 | 225 | 34 | PV | | |
| 01/14/22 | 1024 | 124 | Floor | LL-48-2021 | 67 | 225 | 263 | 38 | PV | | |
| 01/14/22 | 1023 | 125 | Floor | LL-48-2021 | 86 | 263 | 311 | 48 | PV | | |
| 01/14/22 | 1030 | 126 | Floor | LL-48-2021 | 82 | 311 | 337 | 26 | PV | | |
| 01/14/22 | 1033 | 127 | Floor | LL-48-2021 | 72 | 337 | 362 | 25 | PV | | |
| 01/14/22 | 1035 | 128 | Floor | LL-48-2021 | 75 | 362 | 403 | 41 | PV | | |
| 01/14/22 | 1038 | 129 | Floor | LL-48-2021 | 84 | 403 | 432 | 29 | PV | | |
| 01/14/22 | 1056 | 130 | Slope | LL-48-2021 | 150 | 63 | 0 | 63 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/14/22 | 1115 | 131 | Floor | LL-48-2021 | 144 | 0 | 54 | 54 | PV | | |
| 01/14/22 | 1120 | 132 | Floor | LL-48-2021 | 81 | 54 | 108 | 54 | PV | | |
| 01/14/22 | 1140 | 133 | Floor | LL-48-2021 | 71 | 108 | 157 | 49 | PV | | |
| 01/14/22 | 1155 | 134 | Floor | LL-48-2021 | 148 | 157 | 307 | 150 | PV | | |
| 01/14/22 | 1210 | 135 | Floor | LL-48-2021 | 142 | 307 | 457 | 150 | PV | | |
| 01/14/22 | 1220 | 136 | Floor | LL-48-2021 | 84 | 457 | 477 | 20 | PV | | |
| 01/14/22 | 1230 | 137 | Slope | LL-48-2021 | 137 | 63 | 0 | 63 | PV | | |
| 01/14/22 | 1240 | 138 | Floor | LL-48-2021 | 145 | 0 | 60 | 60 | PV | | |
| 01/14/22 | 1300 | 139 | Floor | LL-48-2021 | 150 | 60 | 143 | 83 | PV | | |
| 01/14/22 | 1330 | 140 | Floor | LL-48-2021 | 138 | 143 | 293 | 150 | PV | | |
| 01/14/22 | 1334 | 141 | Floor | LL-48-2021 | 137 | 293 | 307 | 14 | PV | | |
| 01/14/22 | 1336 | 142 | Floor | LL-48-2021 | 140 | 307 | 453 | 146 | PV | | |
| 01/14/22 | 1340 | 143 | Slope | LL-48-2021 | 108 | 64 | 0 | 64 | PV | | |
| 01/14/22 | 1343 | 144 | Floor | LL-48-2021 | 137 | 0 | 64 | 64 | PV | | |
| 01/14/22 | 1410 | 145 | Floor | LL-48-2021 | 143 | 64 | 214 | 150 | PV | | |
| 01/14/22 | 1420 | 146 | Floor | LL-48-2021 | 162 | 214 | 364 | 150 | PV | | |
| 01/14/22 | 1505 | 147 | Floor | LL-48-2021 | 141 | 364 | 467 | 103 | PV | | |
| 01/14/22 | 1515 | 148 | Slope | LL-48-2021 | 108 | 64 | 0 | 64 | PV | | |
| 01/14/22 | 1530 | 149 | Floor | LL-48-2021 | 118 | 0 | 134 | 134 | PV | | |
| 01/14/22 | 1545 | 150 | Floor | LL-48-2021 | 163 | 134 | 284 | 150 | PV | | |
| 01/14/22 | 1600 | 151 | Floor | LL-48-2021 | 124 | 284 | 434 | 150 | PV | | |
| 01/14/22 | 1610 | 152 | Floor | LL-48-2021 | 141 | 434 | 480 | 46 | PV | | |
| 01/16/22 | 0730 | 153 | Slope | LL-48-2021 | 94 | 63 | 0 | 63 | PV | | |
| 01/16/22 | 0745 | 154 | Floor | LL-48-2021 | 115 | 0 | 150 | 150 | PV | | |
| 01/16/22 | 0800 | 155 | Floor | LL-48-2021 | 111 | 150 | 300 | 150 | PV | | |
| 01/16/22 | 0815 | 156 | Floor | LL-48-2021 | 109 | 300 | 450 | 150 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/16/22 | 0830 | 157 | Floor | LL-48-2021 | 132 | 450 | 482 | 32 | PV | | |
| 01/16/22 | 0840 | 158 | Slope | LL-48-2021 | 94 | 63 | 0 | 63 | PV | | |
| 01/16/22 | 0850 | 159 | Floor | LL-48-2021 | 107 | 0 | 150 | 150 | PV | | |
| 01/16/22 | 0900 | 160 | Floor | LL-48-2021 | 113 | 150 | 300 | 150 | PV | | |
| 01/16/22 | 0915 | 161 | Floor | LL-48-2021 | 112 | 300 | 450 | 150 | PV | | |
| 01/16/22 | 0930 | 162 | Floor | LL-48-2021 | 132 | 450 | 486 | 36 | PV | | |
| 01/16/22 | 0940 | 163 | Slope | LL-48-2021 | 104 | 63 | 0 | 63 | PV | | |
| 01/16/22 | 0955 | 164 | Floor | LL-48-2021 | 94 | 0 | 9 | 19 | PV | | |
| 01/16/22 | 1015 | 165 | Floor | LL-48-2021 | 117 | 9 | 55 | 46 | PV | | |
| 01/16/22 | 1030 | 166 | Floor | LL-48-2021 | 110 | 55 | 205 | 150 | PV | | |
| 01/16/22 | 1045 | 167 | Floor | LL-48-2021 | 134 | 205 | 355 | 150 | PV | | |
| 01/16/22 | 1055 | 168 | Floor | LL-48-2021 | 104 | 355 | 440 | 85 | PV | | |
| 01/16/22 | 1110 | 169 | Floor | LL-48-2021 | 132 | 440 | 476 | 36 | PV | | |
| 01/16/22 | 1125 | 170 | Slope | LL-48-2021 | 73 | 63 | 0 | 63 | PV | | |
| 01/16/22 | 1145 | 171 | Floor | LL-48-2021 | 117 | 0 | 101 | 101 | PV | | |
| 01/16/22 | 1300 | 172 | Floor | LL-48-2021 | 114 | 101 | 251 | 150 | PV | | |
| 01/16/22 | 1315 | 173 | Floor | LL-48-2021 | 136 | 251 | 401 | 150 | PV | | |
| 01/16/22 | 1330 | 174 | Floor | LL-48-2021 | 132 | 401 | 433 | 32 | PV | | |
| 01/16/22 | 1349 | 175 | Floor | LL-48-2021 | 73 | 0 | 74 | 74 | PV | | |
| 01/16/22 | 1400 | 176 | Floor | LL-48-2021 | 149 | 74 | 224 | 150 | PV | | |
| 01/16/22 | 1415 | 177 | Floor | LL-48-2021 | 135 | 224 | 374 | 150 | PV | | |
| 01/16/22 | 1420 | 178 | Floor | LL-48-2021 | 130 | 374 | 429 | 55 | PV | | |
| 01/16/22 | 1430 | 179 | Floor | LL-48-2021 | 93 | 0 | 39 | 39 | PV | | |
| 01/16/22 | 1435 | 180 | Floor | LL-48-2021 | 121 | 39 | 167 | 128 | PV | | |
| 01/16/22 | 1445 | 181 | Floor | LL-48-2021 | 165 | 167 | 317 | 150 | PV | | |
| 01/16/22 | 1450 | 182 | Floor | LL-48-2021 | 160 | 317 | 467 | 150 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/16/22 | 1459 | 183 | Floor | LL-48-2021 | 161 | 0 | 118 | 118 | PV | | |
| 01/16/22 | 1505 | 184 | Floor | LL-48-2021 | 118 | 118 | 130 | 12 | PV | | |
| 01/16/22 | 1510 | 185 | Floor | LL-48-2021 | 108 | 130 | 142 | 12 | PV | | |
| 01/16/22 | 1512 | 186 | Floor | LL-48-2021 | 121 | 142 | 159 | 17 | PV | | |
| 01/16/22 | 1520 | 187 | Floor | LL-48-2021 | 120 | 159 | 309 | 150 | PV | | |
| 01/16/22 | 1530 | 188 | Floor | LL-48-2021 | 161 | 0 | 29 | 29 | PV | | |
| 01/16/22 | 1540 | 189 | Floor | LL-48-2021 | 126 | 29 | 179 | 150 | PV | | |
| 01/16/22 | 1550 | 190 | Floor | LL-48-2021 | 127 | 179 | 294 | 115 | PV | | |
| 01/17/22 | 0800 | 191 | Floor | LL-48-2021 | 119 | 0 | 150 | 150 | PV | | |
| 01/17/22 | 0815 | 192 | Floor | LL-48-2021 | 133 | 150 | 275 | 125 | PV | | |
| 01/17/22 | 0830 | 193 | Floor | LL-48-2021 | 129 | 0 | 150 | 150 | PV | | |
| 01/17/22 | 0840 | 194 | Floor | LL-48-2021 | 133 | 150 | 171 | 21 | PV | | |
| 01/17/22 | 0850 | 195 | Floor | LL-48-2021 | 128 | 171 | 261 | 91 | PV | | |
| 01/17/22 | 0900 | 196 | Floor | LL-48-2021 | 125 | 0 | 150 | 150 | PV | | |
| 01/17/22 | 0910 | 197 | Floor | LL-48-2021 | 128 | 150 | 203 | 53 | PV | | |
| 01/17/22 | 0920 | 198 | Floor | LL-48-2021 | 151 | 203 | 265 | 62 | PV | | |
| 01/17/22 | 0930 | 199 | Floor | LL-48-2021 | 154 | 0 | 21 | 21 | PV | | |
| 01/17/22 | 0945 | 200 | Floor | LL-42-2021 | 51 | 21 | 171 | 150 | PV | | |
| 01/17/22 | 0955 | 201 | Floor | LL-42-2021 | 46 | 171 | 254 | 83 | PV | | |
| 01/17/22 | 1015 | 202 | Floor | LL-42-2021 | 61 | 90 | 214 | 124 | PV | | |
| 01/17/22 | 1030 | 203 | Floor | LL-42-2021 | 49 | 214 | 346 | 132 | PV | | |
| 01/17/22 | 1040 | 204 | Slope | LL-42-2021 | 60 | 0 | 90 | 90 | PV | | |
| 01/17/22 | 1110 | 205 | Slope | LL-42-2021 | 44 | 0 | 150 | 150 | PV | | |
| 01/17/22 | 1125 | 206 | Floor | LL-42-2021 | 60 | 150 | 187 | 37 | PV | | |
| 01/17/22 | 1140 | 207 | Floor | LL-42-2021 | 48 | 187 | 337 | 150 | PV | | |
| 01/17/22 | 1150 | 208 | Floor | LL-42-2021 | 49 | 337 | 350 | 13 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/17/22 | 1200 | 209 | Slope | LL-42-2021 | 56 | 0 | 150 | 150 | PV | | |
| 01/17/22 | 1230 | 210 | Floor | LL-42-2021 | 52 | 150 | 183 | 33 | PV | | |
| 01/17/22 | 1240 | 211 | Floor | LL-42-2021 | 63 | 183 | 333 | 150 | PV | | |
| 01/17/22 | 1250 | 212 | Floor | LL-42-2021 | 60 | 333 | 353 | 20 | PV | | |
| 01/17/22 | 1315 | 213 | Floor | LL-42-2021 | 59 | 0 | 150 | 150 | PV | | |
| 01/17/22 | 1330 | 214 | Floor | LL-42-2021 | 52 | 150 | 195 | 45 | PV | | |
| 01/17/22 | 1345 | 215 | Floor | LL-42-2021 | 54 | 195 | 345 | 150 | PV | | |
| 01/17/22 | 1400 | 216 | Slope/Floor | LL-42-2021 | 64 | 0 | 115 | 115 | PV | | |
| 01/17/22 | 1410 | 217 | Floor | LL-42-2021 | 53 | 115 | 242 | 127 | PV | | |
| 01/17/22 | 1425 | 218 | Floor | LL-42-2021 | 50 | 242 | 262 | 20 | PV | | |
| 01/17/22 | 1435 | 219 | Slope/Floor | LL-42-2021 | 50 | 0 | 115 | 115 | PV | | |
| 01/17/22 | 1440 | 220 | Floor | LL-42-2021 | 45 | 115 | 265 | 150 | PV | | |
| 01/17/22 | 1450 | 221 | Floor | LL-42-2021 | 52 | 265 | 331 | 66 | PV | | |
| 01/17/22 | 1500 | 222 | Slope/Floor | LL-42-2021 | 65 | 0 | 150 | 150 | PV | | |
| 01/17/22 | 1515 | 223 | Floor | LL-42-2021 | 55 | 150 | 202 | 52 | PV | | |
| 01/17/22 | 1520 | 224 | Floor | LL-42-2021 | 64 | 202 | 237 | 35 | PV | | |
| 01/17/22 | 1530 | 225 | Floor | LL-42-2021 | 53 | 237 | 259 | 22 | PV | | |
| 01/17/22 | 1540 | 226 | Slope/Floor | LL-42-2021 | 58 | 0 | 150 | 150 | PV | | |
| 01/17/22 | 1555 | 227 | Floor | LL-42-2021 | 57 | 150 | 190 | 40 | PV | | |
| 01/17/22 | 1600 | 228 | Floor | LL-42-2021 | 55 | 190 | 282 | 92 | PV | | |
| 01/17/22 | 1610 | 229 | Slope/Floor | LL-42-2021 | 57 | 0 | 105 | 105 | PV | | |
| 01/17/22 | 1620 | 230 | Floor | LL-42-2021 | 62 | 105 | 255 | 150 | PV | | |
| 01/17/22 | 1630 | 231 | Floor | LL-19-2021 | 26 | 255 | 285 | 30 | PV | | |
| 01/17/22 | 1640 | 232 | Slope/Floor | LL-19-2021 | 21 | 0 | 150 | 150 | PV | | |
| 01/17/22 | 1650 | 233 | Floor | LL-19-2021 | 20 | 150 | 163 | 13 | PV | | |
| 01/17/22 | 1700 | 234 | Floor | LL-19-2021 | 26 | 163 | 281 | 118 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/18/22 | 0700 | 235 | Slope/Floor | LL-19-2021 | 20 | 0 | 128 | 128 | PV | | |
| 01/18/22 | 0715 | 236 | Floor | LL-48-2021 | 122 | 128 | 268 | 140 | PV | | |
| 01/18/22 | 0730 | 237 | Slope/Floor | LL-19-2021 | 13 | 0 | 142 | 142 | PV | | |
| 01/18/22 | 0745 | 238 | Floor | LL-19-2021 | 12 | 142 | 266 | 124 | PV | | |
| 01/18/22 | 0800 | 239 | Slope/Floor | LL-19-2021 | 2 | 0 | 150 | 150 | PV | | |
| 01/18/22 | 0815 | 240 | Floor | LL-19-2021 | 3 | 150 | 208 | 58 | PV | | |
| 01/18/22 | 0830 | 241 | Floor | LL-19-2021 | 12 | 208 | 244 | 36 | PV | | |
| 01/18/22 | 0845 | 242 | Slope/Floor | LL-19-2021 | 8 | 0 | 144 | 144 | PV | | |
| 01/18/22 | 0900 | 243 | Floor | LL-19-2021 | 3 | 144 | 228 | 84 | PV | | |
| 01/18/22 | 0915 | 244 | Slope/Floor | LL-19-2021 | 38 | 0 | 144 | 144 | PV | | |
| 01/18/22 | 0930 | 245 | Floor | LL-19-2021 | 14 | 144 | 192 | 48 | PV | | |
| 01/18/22 | 0945 | 246 | Slope/Floor | LL-19-2021 | 11 | 0 | 140 | 140 | PV | | |
| 01/18/22 | 1000 | 247 | Floor | LL-19-2021 | 14 | 140 | 180 | 40 | PV | | |
| 01/18/22 | 1015 | 248 | Slope | LL-48-2021 | 102 | 0 | 102 | 102 | PV | | |
| 01/18/22 | 1030 | 249 | Slope | LL-19-2021 | 22 | 0 | 97 | 97 | PV | | |
| 01/19/22 | 0735 | 250 | E. Slope | LL-19-2021 | 1 | 0 | 89 | 89 | PV | | |
| 01/19/22 | 0745 | 251 | E. Slope | LL-19-2021 | 1 | 0 | 66 | 66 | PV | | |
| 01/19/22 | 0815 | 252 | E. Slope | LL-19-2021 | 10 | 0 | 92 | 92 | PV | | |
| 01/19/22 | 0818 | 253 | E. Slope | LL-19-2021 | 14 | 0 | 89 | 89 | PV | | |
| 01/19/22 | 0825 | 254 | E. Slope | LL-19-2021 | 7 | 0 | 40 | 40 | PV | | |
| 01/19/22 | 0835 | 255 | E. Slope | LL-19-2021 | 10 | 0 | 27 | 27 | PV | | |
| 01/19/22 | 0845 | 256 | E. Slope | LL-19-2021 | 10 | 0 | 13 | 13 | PV | | |
| 01/19/22 | 0851 | 257 | E. Slope | LL-19-2021 | 16 | 0 | 59 | 59 | PV | | |
| 01/19/22 | 0852 | 258 | E. Slope | LL-19-2021 | 16 | 0 | 59 | 59 | PV | | |
| 01/19/22 | 0915 | 259 | E. Slope | LL-19-2021 | 22 | 0 | 45 | 45 | PV | | |
| 01/19/22 | 0940 | 260 | E. Slope | LL-19-2021 | 27 | 0 | 27 | 27 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/19/22 | 0947 | 261 | E. Slope | LL-19-2021 | 27 | 0 | 19 | 19 | PV | | |
| 01/19/22 | 1450 | 262 | Pen. Slope | LL-19-2021 | 15 | 0 | 86 | 86 | PV | | |
| 01/19/22 | 1455 | 263 | Pen. Slope | LL-19-2021 | 27 | 0 | 86 | 86 | PV | | |
| 01/19/22 | 1500 | 264 | Pen. Slope | LL-19-2021 | 4 | 0 | 88 | 88 | PV | | |
| 01/19/22 | 1505 | 265 | Pen. Slope | LL-19-2021 | 4 | 40 | 88 | 48 | PV | | |
| 01/19/22 | 1510 | 266 | Pen. Slope | LL-19-2021 | 30 | 0 | 90 | 90 | PV | | |
| 01/19/22 | 1515 | 267 | Pen. Slope | LL-19-2021 | 30 | 41 | 90 | 49 | PV | | |
| 01/19/22 | 1530 | 268 | Pen. Slope | LL-19-2021 | 9 | 0 | 90 | 90 | PV | | |
| 01/19/22 | 1610 | 269 | Pen. Slope | LL-19-2021 | 23 | 46 | 0 | 46 | DR | | |
| 01/19/22 | 1620 | 270 | Pen. Slope | LL-19-2021 | 23 | 0 | 90 | 90 | DR | | |
| 01/19/22 | 1630 | 271 | Pen. Slope | LL-19-2021 | 29 | 40 | 90 | 50 | DR | | |
| 01/21/22 | 0845 | 272 | Floor | LL-19-2021 | 29 | 0 | 109 | 109 | PV | | |
| 01/21/22 | 0900 | 273 | N. Slope | LL-19-2021 | 15 | 0 | 13 | 13 | PV | | |
| 01/21/22 | 0905 | 274 | N. Slope | LL-19-2021 | 15 | 0 | 13 | 13 | PV | | |
| 01/21/22 | 0910 | 275 | N. Slope | LL-19-2021 | 15 | 0 | 16 | 16 | PV | | |
| 01/21/22 | 0915 | 276 | N. Slope | LL-19-2021 | 4 | 0 | 14 | 14 | PV | | |
| 01/21/22 | 0920 | 277 | N. Slope | LL-19-2021 | 4 | 0 | 14 | 14 | PV | | |
| 01/21/22 | 0925 | 278 | N. Slope | LL-19-2021 | 29 | 0 | 15 | 15 | PV | | |
| 01/21/22 | 0930 | 279 | N. Slope | LL-19-2021 | 15 | 0 | 15 | 15 | PV | | |
| 01/21/22 | 0935 | 280 | N. Slope | LL-19-2021 | 15 | 0 | 14 | 14 | PV | | |
| 01/21/22 | 0940 | 281 | Floor | LL-19-2021 | 4 | 0 | 9 | 9 | PV | | |
| 01/21/22 | 0945 | 282 | Floor | LL-19-2021 | 15 | 0 | 4 | 4 | PV | | |
| 01/21/22 | 1348 | 283 | Floor | LL-19-2021 | 9 | 0 | 9 | 9 | PV | | |
| 01/21/22 | 1355 | 284 | N. Slope | LL-19-2021 | 6 | 0 | 98 | 98 | PV | | |
| 01/21/22 | 1357 | 285 | E. Slope | LL-19-2021 | 6 | 68 | 91 | 23 | PV | | |
| 01/21/22 | 1530 | 286 | E. Slope | LL-19-2021 | 6 | 69 | 92 | 23 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/21/22 | 1535 | 287 | E. Slope | LL-19-2021 | 30 | 0 | 25 | 25 | PV | | |
| 01/21/22 | 1540 | 288 | E. Slope | LL-19-2021 | 30 | 0 | 23 | 23 | PV | | |
| 01/21/22 | 1543 | 289 | E. Slope | LL-19-2021 | 23 | 0 | 24 | 24 | PV | | |
| 01/21/22 | 1618 | 290 | E. Slope | LL-19-2021 | 23 | 0 | 20 | 20 | PV | | |
| 01/21/22 | 1620 | 291 | E. Slope | LL-19-2021 | 9 | 0 | 20 | 20 | PV | | |
| 01/21/22 | 1622 | 292 | E. Slope | LL-19-2021 | 9 | 0 | 19 | 19 | PV | | |
| 01/21/22 | 1710 | 293 | E. Slope | LL-19-2021 | 34 | 0 | 29 | 29 | PV | | |
| 01/22/22 | 0812 | 294 | Pen. Slope | LL-19-2021 | 34 | 0 | 93 | 93 | PV | | |
| 01/22/22 | 0824 | 295 | Pen. Slope | LL-19-2021 | 34 | 43 | 90 | 47 | PV | | |
| 01/22/22 | 0826 | 296 | Pen. Slope | LL-19-2021 | 19 | 0 | 90 | 90 | PV | | |
| 01/22/22 | 0830 | 297 | Floor | LL-19-2021 | 19 | 50 | 97 | 47 | PV | | |
| 01/22/22 | 0835 | 298 | Pen. Slope | LL-19-2021 | 19 | 43 | 90 | 47 | PV | | |
| 01/22/22 | 0837 | 299 | Pen. Slope | LL-19-2021 | 5 | 0 | 90 | 90 | PV | | |
| 01/22/22 | 0839 | 300 | Pen. Slope | LL-19-2021 | 5 | 48 | 95 | 47 | PV | | |
| 01/22/22 | 0841 | 301 | Floor | LL-19-2021 | 5 | 15 | 60 | 45 | PV | | |
| 01/22/22 | 0843 | 302 | Pen. Slope | LL-19-2021 | 35 | 0 | 90 | 90 | PV | | |
| 01/22/22 | 0846 | 303 | Pen. Slope | LL-19-2021 | 35 | 45 | 57 | 12 | PV | | |
| 01/22/22 | 0848 | 304 | Floor | LL-19-2021 | 35 | 15 | 25 | 10 | PV | | |
| 01/22/22 | 0850 | 305 | Floor | LL-19-2021 | 35 | 25 | 77 | 52 | PV | | |
| 01/22/22 | 0852 | 306 | Floor | LL-19-2021 | 24 | 77 | 101 | 24 | PV | | |
| 01/22/22 | 0854 | 307 | Slope | LL-19-2021 | 24 | 0 | 91 | 91 | PV | | |
| 01/22/22 | 0856 | 308 | Pen. Slope | LL-19-2021 | 24 | 49 | 90 | 41 | PV | | |
| 01/22/22 | 0858 | 309 | Floor | LL-19-2021 | 24 | 56 | 85 | 29 | PV | | |
| 01/22/22 | 0900 | 310 | Floor | LL-19-2021 | 28 | 15 | 56 | 41 | PV | | |
| 01/22/22 | 0902 | 311 | Floor | LL-19-2021 | 28 | 15 | 68 | 53 | PV | | |
| 01/22/22 | 0906 | 312 | Floor | LL-19-2021 | 28 | 15 | 23 | 8 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/22/22 | 0908 | 313 | Floor | LL-19-2021 | 28 | 23 | 70 | 47 | PV | | |
| 01/22/22 | 0910 | 314 | Floor | LL-42-2021 | 47 | 15 | 50 | 35 | PV | | |
| 01/22/22 | 1145 | 315 | Floor | LL-19-2021 | 17 | 15 | 23 | 8 | PV | | |
| 01/22/22 | 1150 | 316 | Floor | LL-19-2021 | 17 | 23 | 31 | 8 | PV | | |
| 01/22/22 | 1420 | 317 | Slope/Floor | LL-19-2021 | 37 | 0 | 129 | 129 | PV | | |
| 01/22/22 | 1442 | 318 | Pen. Slope | LL-42-2021 | 47 | 0 | 42 | 42 | PV | | |
| 01/22/22 | 1444 | 319 | Pen. Slope | LL-42-2021 | 47 | 0 | 42 | 42 | PV | | |
| 01/22/22 | 1446 | 320 | Pen. Slope | LL-19-2021 | 40 | 0 | 42 | 42 | PV | | |
| 01/22/22 | 1448 | 321 | Pen. Slope | LL-19-2021 | 40 | 0 | 42 | 42 | PV | | |
| 01/22/22 | 1450 | 322 | Pen. Slope | LL-19-2021 | 40 | 0 | 42 | 42 | PV | | |
| 01/22/22 | 1510 | 323 | Pen. Slope | LL-19-2021 | 33 | 0 | 42 | 42 | PV | | |
| 01/22/22 | 1513 | 324 | Pen. Slope | LL-19-2021 | 33 | 0 | 42 | 42 | PV | | |
| 01/22/22 | 1515 | 325 | Pen. Slope | LL-19-2021 | 33 | 0 | 42 | 42 | PV | | |
| 01/22/22 | 1544 | 326 | Pen. Slope | LL-19-2021 | 31 | 0 | 42 | 42 | PV | | |
| 01/22/22 | 1546 | 327 | Pen. Slope | LL-19-2021 | 31 | 0 | 77 | 77 | PV | | |
| 01/22/22 | 1550 | 328 | Floor | LL-19-2021 | 31 | 0 | 14 | 14 | PV | | |
| 01/22/22 | 1553 | 329 | Floor | LL-19-2021 | 18 | 14 | 83 | 69 | PV | | |
| 01/22/22 | 1556 | 330 | Floor | LL-19-2021 | 18 | 0 | 78 | 78 | PV | | |
| 01/22/22 | 1605 | 331 | Slope | LL-19-2021 | 36 | 0 | 76 | 76 | PV | | |
| 01/22/22 | 1615 | 332 | Slope | LL-19-2021 | 25 | 0 | 75 | 75 | PV | | |
| 01/23/22 | 0740 | 333 | Floor | LL-19-2021 | 16 | 83 | 103 | 20 | PV | | |
| 01/23/22 | 0742 | 334 | Floor | LL-19-2021 | 34 | 78 | 92 | 14 | PV | | |
| 01/23/22 | 0747 | 335 | Slope | LL-19-2021 | 32 | 0 | 76 | 76 | PV | | |
| 01/23/22 | 0750 | 336 | Floor | LL-19-2021 | 32 | 92 | 106 | 14 | PV | | |
| 01/23/22 | 0755 | 337 | Slope | LL-19-2021 | 25 | 0 | 63 | 63 | PV | | |
| 01/23/22 | 0800 | 338 | Slope | LL-19-2021 | 36 | 0 | 63 | 63 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**GCL Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/23/22 | 0840 | 339 | N. Slope Cor | LL-19-2021 | 41 | 0 | 63 | 63 | PV | | |
| 01/23/22 | 0843 | 340 | N. Slope Cor | LL-19-2021 | 41 | 0 | 63 | 63 | PV | | |
| 01/23/22 | 0904 | 341 | N. Slope Cor | LL-19-2021 | 39 | 0 | 56 | 56 | PV | | |
| 01/23/22 | 0907 | 342 | N. Slope Cor | LL-19-2021 | 39 | 0 | 44 | 44 | PV | | |
| 01/23/22 | 0908 | 343 | N. Slope Cor | LL-19-2021 | 39 | 0 | 31 | 31 | PV | | |
| 01/23/22 | 0909 | 344 | N. Slope Cor | LL-19-2021 | 39 | 0 | 10 | 10 | PV | | |
| 01/23/22 | 0940 | 345 | N. Slope Cor | LL-19-2021 | 41 | 0 | 15 | 15 | PV | | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**HDPE Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/10/22 | 0856 | 1 | S Slope | 19J1007 | 10519 7550 | 0 | 89 | 89 | PV | 61 61 62 62 61 | |
| 01/10/22 | 0916 | 2 | S Slope | 19J1007 | 10519 7550 | 0 | 90 | 90 | PV | 62 62 63 63 61 | |
| 01/10/22 | 0934 | 3 | S Slope | 19J1007 | 10519 7550 | 0 | 90 | 90 | DR | 62 61 63 63 62 | |
| 01/10/22 | 0946 | 4 | S Slope | 19J1007 | 10519 7550 | 0 | 95 | 95 | DR | 61 62 61 60 60 | |
| 01/10/22 | 1000 | 5 | S Slope | 19J1007 | 10519 7550 | 0 | 42 | 42 | DR | 61 61 62 61 61 | |
| 01/10/22 | 1015 | 6 | S Slope | 19J1007 | 10519 7550 | 0 | 91 | 91 | DR | 61 61 62 62 62 | |
| 01/10/22 | 1030 | 7 | S Slope | D661L3PL3B | 0102-20 0397 | 0 | 90 | 90 | DR | 63 62 62 62 62 | |
| 01/10/22 | 1045 | 8 | S Slope | D661L3PL3B | 0102-20 0397 | 0 | 89 | 89 | DR | 62 61 62 61 62 | |
| 01/10/22 | 1055 | 9 | S Slope | D661L3PL3B | 0102-20 0397 | 0 | 93 | 93 | DR | 62 62 62 62 61 | |
| 01/10/22 | 1110 | 10 | S Slope | D661L3PL3B | 0102-20 0397 | 0 | 95 | 95 | DR | 61 63 63 62 62 | |
| 01/10/22 | 1300 | 11 | S Slope | 19J1008 | 10419 7182 | 0 | 89 | 89 | DR | 61 60 60 62 62 | |
| 01/10/22 | 1315 | 12 | S Slope | 19J1008 | 10419 7182 | 0 | 46 | 46 | DR | 61 62 61 61 61 | |
| 01/10/22 | 1330 | 13 | S Slope | 19J1008 | 10419 7182 | 0 | 92 | 92 | DR | 61 62 62 61 61 | |
| 01/10/22 | 1415 | 14 | S Slope | 19J1008 | 10419 7182 | 0 | 93 | 93 | DR | 62 62 62 63 61 | |
| 01/10/22 | 1430 | 15 | S Slope | 19J1008 | 10419 7182 | 0 | 93 | 93 | DR | 61 61 62 62 61 | |
| 01/10/22 | 1450 | 16 | S Slope | 20J1249 | 0102-20 0273 | 0 | 94 | 94 | DR | 63 63 63 61 61 | |
| 01/10/22 | 1500 | 17 | S Slope | 20J1249 | 0102-20 0273 | 0 | 98 | 98 | DR | 60 61 64 62 64 | |
| 01/10/22 | 1515 | 18 | S Slope | 20J1249 | 0102-20 0273 | 0 | 44 | 44 | DR | 63 63 63 62 64 | |
| 01/10/22 | 1530 | 19 | S Slope | 20J1249 | 0102-20 0273 | 0 | 89 | 89 | DR | 62 63 62 61 62 | |
| 01/10/22 | 1540 | 20 | S Slope | 19G1020 | 10820 3110 | 0 | 92 | 92 | DR | 63 64 62 62 61 | |
| 01/10/22 | 1600 | 21 | S Slope | 19G1020 | 10820 3110 | 0 | 92 | 92 | DR | 61 62 64 62 64 | |
| 01/10/22 | 1615 | 22 | S Slope | 19G1020 | 10820 3110 | 0 | 91 | 91 | DR | 62 62 61 62 62 | |
| 01/11/22 | 0808 | 23 | S Slope | 19G1020 | 10820 3110 | 0 | 38 | 38 | PV | 62 63 63 62 62 | |
| 01/11/22 | 0811 | 24 | S Slope | 19G1020 | 10820 3110 | 0 | 89 | 89 | PV | 62 61 61 63 63 | |
| 01/11/22 | 0835 | 25 | S Slope | 19G1020 | 10820 3110 | 0 | 88 | 88 | PV | 62 62 61 62 61 | |
| 01/11/22 | 0840 | 26 | S Slope | 19G1020 | 10820 3110 | 0 | 87 | 87 | PV | 62 63 62 62 62 | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**HDPE Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/11/22 | 0904 | 27 | S Slope | 20C1308 | 0102-19 8266 | 0 | 87 | 87 | PV | 63 62 62 61 63 | |
| 01/11/22 | 0909 | 28 | S Slope | 20C1308 | 0102-19 8266 | 0 | 87 | 87 | PV | 63 63 62 62 62 | |
| 01/11/22 | 0916 | 29 | S Slope | 20C1308 | 0102-19 8266 | 0 | 85 | 85 | PV | 63 61 61 63 63 | |
| 01/11/22 | 0919 | 30 | S Slope | 20C1308 | 0102-19 8266 | 0 | 87 | 87 | PV | 61 63 63 63 61 | |
| 01/11/22 | 0922 | 31 | S Slope | 20C1308 | 0102-19 8266 | 0 | 91 | 91 | PV | 62 62 62 61 62 | |
| 01/11/22 | 1002 | 32 | S Slope | 20E1328 | 0102-19 9421 | 0 | 91 | 91 | PV | 62 63 63 61 61 | |
| 01/11/22 | 1010 | 33 | W Corner | 20E1328 | 0102-19 9421 | 0 | 44 | 44 | PV | 61 61 61 63 61 | |
| 01/11/22 | 1018 | 34 | W Corner | 20E1328 | 0102-19 9421 | 0 | 88 | 88 | PV | 61 62 61 61 63 | |
| 01/11/22 | 1025 | 35 | W Corner | 20E1328 | 0102-19 9421 | 0 | 94 | 94 | PV | 62 62 62 62 61 | |
| 01/11/22 | 1030 | 36 | W Corner | 20E1328 | 0102-19 9421 | 0 | 91 | 91 | PV | 62 62 61 61 63 | |
| 01/11/22 | 1038 | 37 | W Corner | 20E1328 | 0102-19 9421 | 0 | 43 | 43 | PV | 63 63 62 63 61 | |
| 01/11/22 | 1048 | 38 | W Corner | 20E1328 | 0102-19 9421 | 0 | 91 | 91 | PV | 62 62 62 62 62 | |
| 01/11/22 | 1316 | 39 | W Corner | 20E1327 | 0102-19 9430 | 0 | 94 | 94 | PV | 61 62 61 62 62 | |
| 01/11/22 | 1357 | 40 | W Corner | 20E1327 | 0102-19 9430 | 0 | 93 | 93 | PV | 62 60 61 62 62 | |
| 01/11/22 | 1410 | 41 | W Corner | 20E1327 | 0102-19 9430 | 0 | 44 | 44 | PV | 60 60 62 61 62 | |
| 01/11/22 | 1420 | 42 | W Corner | 20E1327 | 0102-19 9430 | 0 | 93 | 93 | PV | 62 62 62 61 61 | |
| 01/12/22 | 1102 | 43 | W Corner | 20E1327 | 0102-19 9430 | 93 | 0 | 93 | PV | 61 63 63 62 63 | |
| 01/12/22 | 1110 | 44 | W Corner | 20E1327 | 0102-19 9430 | 95 | 0 | 95 | PV | 63 63 62 62 61 | |
| 01/12/22 | 1118 | 45 | W Corner | 20E1327 | 0102-19 9430 | 45 | 0 | 45 | PV | 62 62 61 62 61 | |
| 01/12/22 | 1135 | 46 | W Corner | 18G1300 | 10219 1807 | 89 | 0 | 89 | PV | 62 62 62 62 61 | |
| 01/12/22 | 1150 | 47 | N Slope | 18G1300 | 10219 1807 | 93 | 0 | 93 | PV | 62 62 61 63 63 | |
| 01/12/22 | 1420 | 48 | N Slope | 18G1300 | 10219 1807 | 92 | 0 | 92 | PV | 63 62 63 63 62 | |
| 01/12/22 | 1439 | 49 | N Slope | 18G1300 | 10219 1807 | 89 | 0 | 89 | PV | 62 61 63 63 62 | |
| 01/12/22 | 1501 | 50 | N Slope | 18G1300 | 10219 1807 | 87 | 0 | 87 | PV | 62 62 61 61 61 | |
| 01/12/22 | 1532 | 51 | N Slope | 21C1073 | 0102-20 0650 | 91 | 0 | 91 | PV | 61 63 61 63 63 | |
| 01/12/22 | 1538 | 52 | N Slope | 21C1073 | 0102-20 0650 | 91 | 0 | 91 | PV | 62 61 61 62 63 | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**HDPE Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/12/22 | 1619 | 53 | N Slope | 21C1073 | 0102-20 0650 | 91 | 0 | 91 | PV | 62 62 63 61 62 | |
| 01/12/22 | 1650 | 54 | N Slope | 21C1073 | 0102-20 0650 | 91 | 0 | 91 | PV | 61 62 61 62 62 | |
| 01/12/22 | 1658 | 55 | N Slope | 21C1073 | 0102-20 0650 | 92 | 0 | 92 | PV | 63 63 61 61 61 | |
| 01/13/22 | 0826 | 56 | N Slope | 21C1073 | 0102-20 0648 | 95 | 0 | 95 | PV | 62 61 62 61 62 | |
| 01/13/22 | 0830 | 57 | N Slope | 21C1073 | 0102-20 0648 | 90 | 0 | 90 | PV | 63 62 61 61 62 | |
| 01/13/22 | 0835 | 58 | N Slope | 21C1073 | 0102-20 0648 | 90 | 0 | 90 | PV | 62 62 61 61 61 | |
| 01/13/22 | 0841 | 59 | N Slope | 21C1073 | 0102-20 0648 | 90 | 0 | 90 | PV | 62 61 62 62 61 | |
| 01/13/22 | 0845 | 60 | N Slope | 21C1073 | 0102-20 0648 | 90 | 0 | 90 | PV | 62 62 61 62 61 | |
| 01/13/22 | 0915 | 61 | N Slope | 20E1328 | 0102-19 9418 | 90 | 0 | 90 | PV | 63 62 62 61 63 | |
| 01/13/22 | 0950 | 62 | N Slope | 20E1328 | 0102-19 9418 | 90 | 0 | 90 | PV | 63 63 62 61 61 | |
| 01/13/22 | 0958 | 63 | N Slope | 20E1328 | 0102-19 9418 | 40 | 0 | 40 | PV | 61 62 61 62 62 | |
| 01/13/22 | 1010 | 64 | N Corner | 20E1328 | 0102-19 9418 | 90 | 0 | 90 | PV | 62 62 63 62 62 | |
| 01/13/22 | 1017 | 65 | N Corner | 20E1328 | 0102-19 9418 | 41 | 0 | 41 | PV | 62 62 63 62 63 | |
| 01/13/22 | 1025 | 66 | N Corner | 20E1328 | 0102-19 9418 | 92 | 0 | 92 | PV | 63 62 62 62 61 | |
| 01/13/22 | 1048 | 67 | N Corner | 20E1328 | 0102-19 9418 | 42 | 0 | 42 | PV | 60 61 62 61 60 | |
| 01/13/22 | 1130 | 68 | N Corner | 20E1328 | 0102-19 9418 | 48 | 0 | 48 | DR | 63 62 63 62 62 | |
| 01/13/22 | 1145 | 69 | N Corner | 20E1328 | 0102-19 9418 | 92 | 0 | 92 | DR | 63 63 62 61 63 | |
| 01/13/22 | 1432 | 70 | E Slope/Floor | 20E1328 | 0102-19 9428 | 0 | 475 | 475 | PV | 63 62 62 63 63 | |
| 01/13/22 | 1528 | 71 | E Slope/Floor | 21C1073 | 0102-20 0658 | 0 | 489 | 489 | PV | 63 62 63 62 62 | |
| 01/13/22 | 1720 | 72 | Floor | 21C1073 | 0102-20 0658 | 417 | 430 | 13 | PV | 62 63 62 62 63 | |
| 01/14/22 | 0840 | 73 | E Slope/Floor | 20E1327 | 0102-19 9432 | 0 | 506 | 506 | PV | 63 62 62 63 62 | |
| 01/14/22 | 0927 | 74 | E Slope/Floor | 20J1245 | 0102-20 0667 | 0 | 503 | 503 | PV | 62 62 62 62 63 | |
| 01/14/22 | 1200 | 75 | E Slope/Floor | 21C1073 | 0102-20 0655 | 0 | 500 | 500 | PV | 63 62 63 62 63 | |
| 01/14/22 | 1350 | 76 | E Slope/Floor | 21C1073 | 0102-20 0659 | 0 | 500 | 500 | PV | 63 62 63 62 63 | |
| 01/14/22 | 1420 | 77 | Floor | D661L3PL3B | 0102-20 0397 | 506 | 523 | 17 | PV | 62 63 62 63 62 | |
| 01/14/22 | 1430 | 78 | Floor | D661L3PL3B | 0102-20 0397 | 503 | 539 | 36 | PV | 63 63 63 62 62 | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**HDPE Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/14/22 | 1440 | 79 | Floor | 19J1008 | 10419 7182 | 500 | 555 | 55 | PV | 63 62 62 63 62 | |
| 01/14/22 | 1450 | 80 | Floor | 19J1008 | 10419 7182 | 500 | 557 | 57 | PV | 62 63 62 62 61 | |
| 01/14/22 | 1535 | 81 | E Slope/Floor | 21C1073 | 0102-20 0657 | 0 | 500 | 500 | PV | 61 61 62 63 63 | |
| 01/14/22 | 1630 | 82 | Floor | 20J1249 | 0102-20 0273 | 500 | 557 | 57 | DR | 63 62 62 63 63 | |
| 01/16/22 | 0815 | 83 | E Slope/Floor | 20E1328 | 0102-19 9423 | 0 | 502 | 502 | PV | 61 61 61 63 61 | |
| 01/16/22 | 0906 | 84 | E Slope/Floor | 20J1245 | 0102-20 0662 | 0 | 502 | 502 | PV | 62 63 62 62 62 | |
| 01/16/22 | 1010 | 85 | E Slope/Floor | 20G1344 | 0107-18 0016 | 0 | 511 | 511 | PV | 63 61 62 62 61 | |
| 01/16/22 | 1106 | 86 | Floor | 21C1073 | 0102-20 0656 | 93 | 511 | 418 | PV | 61 61 62 61 62 | |
| 01/16/22 | 1130 | 87 | E Slope/Floor | 21C1073 | 0102-20 0654 | 93 | 0 | 93 | PV | 62 62 63 63 62 | |
| 01/16/22 | 1330 | 88 | Floor | 21C1073 | 0102-20 0656 | 501 | 584 | 83 | PV | 62 62 62 62 62 | |
| 01/16/22 | 1350 | 89 | Floor | 21C1073 | 0102-20 0654 | 500 | 562 | 62 | PV | 61 62 61 61 61 | |
| 01/16/22 | 1410 | 90 | Floor | 21C1073 | 0102-20 0654 | 505 | 558 | 53 | PV | 62 61 62 61 61 | |
| 01/16/22 | 1420 | 91 | Floor | 21C1073 | 0102-20 0654 | 505 | 557 | 52 | PV | 62 62 61 62 61 | |
| 01/16/22 | 1500 | 92 | Floor | 21C1073 | 0102-20 0654 | 322 | 547 | 225 | DR | 61 62 62 61 61 | |
| 01/16/22 | 1600 | 93 | Floor | 20J1245 | 0102-20 0663 | 217 | 322 | 105 | PV | 63 63 62 62 63 | |
| 01/17/22 | 0815 | 94 | Floor | 20J1245 | 0102-20 0663 | 276 | 557 | 281 | PV | 62 62 61 62 61 | |
| 01/17/22 | 0854 | 95 | Floor | 20J1245 | 0102-20 0663 | 270 | 397 | 127 | PV | 62 62 61 62 61 | |
| 01/17/22 | 0917 | 96 | Floor | 20J1245 | 0102-20 0664 | 397 | 532 | 135 | PV | 63 63 63 62 63 | |
| 01/17/22 | 0955 | 97 | Floor | 20J1245 | 0102-20 0664 | 0 | 257 | 257 | PV | 62 62 61 63 61 | |
| 01/17/22 | 1045 | 98 | W Peninsula/ Floor | 21C1073 | 0102-20 0651 | 0 | 344 | 344 | PV | 62 61 62 62 61 | |
| 01/17/22 | 1153 | 99 | W Peninsula/ Floor | 20G1344 | 0107-18 0017 | 0 | 171 | 171 | PV | 62 61 62 61 62 | |
| 01/17/22 | 1130 | 100 | Floor | 21C1073 | 0102-20 0651 | 171 | 340 | 169 | PV | 62 62 62 63 63 | |
| 01/17/22 | 1400 | 101 | W Peninsula/ Floor | 20G1344 | 0107-18 0017 | 0 | 215 | 215 | PV | 63 61 63 62 62 | |
| 01/17/22 | 1330 | 102 | Floor | 20J1245 | 0102-20 0664 | 215 | 334 | 119 | PV | 62 62 62 62 63 | |
| 01/17/22 | 1500 | 103 | W Peninsula/ Floor | 21C1073 | 0102-20 0647 | 0 | 202 | 202 | PV | 63 63 62 61 61 | |
| 01/17/22 | 1445 | 104 | Floor | 20G1344 | 0107-18 0017 | 202 | 318 | 116 | PV | 63 62 62 61 62 | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**HDPE Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/17/22 | 1540 | 105 | W Peninsula/ Floor | 21C1073 | 0102-20 0647 | 0 | 293 | 293 | PV | 61 62 61 62 63 | |
| 01/17/22 | 1635 | 106 | Floor | 20J1245 | 0102-20 0668 | 293 | 306 | 13 | PV | 62 62 63 62 63 | |
| 01/17/22 | 1615 | 107 | W Peninsula/ Floor | 20J1245 | 0102-20 0668 | 0 | 294 | 294 | PV | 62 61 62 61 62 | |
| 01/18/22 | 0750 | 108 | W Peninsula/ Floor | 20J1245 | 0102-20 0668 | 0 | 201 | 201 | PV | 62 62 63 62 62 | |
| 01/18/22 | 0818 | 109 | Floor | 20J1245 | 0102-20 0669 | 201 | 275 | 74 | PV | 61 62 61 62 61 | |
| 01/18/22 | 0845 | 110 | W Peninsula/ Floor | 20J1245 | 0102-20 0669 | 0 | 252 | 252 | PV | 60 63 62 62 62 | |
| 01/18/22 | 1020 | 111 | W Peninsula/ Floor | 20J1245 | 0102-20 0669 | 0 | 163 | 163 | PV | 63 62 62 62 61 | |
| 01/18/22 | 1040 | 112 | Floor | 20J1245 | 0102-20 0671 | 163 | 228 | 65 | PV | 63 62 62 62 61 | |
| 01/18/22 | 1050 | 113 | W Peninsula/ Floor | 20J1245 | 0102-20 0671 | 0 | 196 | 196 | PV | 63 63 62 62 61 | |
| 01/18/22 | 1100 | 114 | Floor | 20J1245 | 0102-20 0671 | 113 | 139 | 26 | PV | 63 63 62 62 63 | |
| 01/19/22 | 0855 | 115 | W Peninsula Corner | 20J1245 | 0102-20 0671 | 0 | 120 | 120 | PV | 62 62 62 62 62 | |
| 01/19/22 | 0910 | 116 | W Peninsula Corner | 21C1073 | 0102-20 0652 | 0 | 88 | 88 | PV | 62 63 63 62 62 | |
| 01/19/22 | 0921 | 117 | W Peninsula Corner | 21C1073 | 0102-20 0652 | 0 | 65 | 65 | PV | 62 63 62 63 62 | |
| 01/19/22 | 0953 | 118 | W Peninsula Corner | 20J1245 | 0102-20 0671 | 0 | 46 | 46 | PV | 62 62 62 63 61 | |
| 01/19/22 | 0900 | 119 | W Peninsula Corner | 21C1073 | 0102-20 0652 | 0 | 29 | 29 | PV | 61 61 62 61 62 | |
| 01/19/22 | 0845 | 120 | W Peninsula Corner | 20J1249 | 0102-20 0273 | 0 | 47 | 47 | PV | 61 62 61 62 61 | |
| 01/19/22 | 0805 | 121 | W Peninsula Corner | 21C1073 | 0102-20 0652 | 0 | 88 | 88 | PV | 60 60 61 62 61 | |
| 01/19/22 | 0753 | 122 | W Peninsula Corner | 20J1245 | 0102-20 0671 | 0 | 115 | 115 | PV | 62 61 60 61 62 | |
| 01/19/22 | 1530 | 123 | N Peninsula | 20J1245 | 0102-20 0665 | 0 | 90 | 90 | PV | 62 63 62 62 62 | |
| 01/19/22 | 1535 | 124 | N Peninsula | 20J1245 | 0102-20 0665 | 44 | 90 | 46 | PV | 62 63 63 63 62 | |
| 01/19/22 | 1545 | 125 | N Peninsula | 20J1245 | 0102-20 0665 | 0 | 91 | 91 | PV | 63 63 64 61 62 | |
| 01/19/22 | 1555 | 126 | N Peninsula | 20J1245 | 0102-20 0665 | 0 | 44 | 44 | PV | 62 62 63 63 62 | |
| 01/19/22 | 1645 | 127 | E Slope | 20J1245 | 0102-20 0665 | 0 | 98 | 98 | PV | 60 60 61 61 61 | |
| 01/21/22 | 1033 | 128 | E Slope | 20G1344 | 0107-18 0018 | 0 | 99 | 99 | PV | 62 62 62 61 61 | |
| 01/21/22 | 1039 | 129 | E Slope | 20G1344 | 0107-18 0018 | 0 | 100 | 100 | PV | 62 61 61 62 61 | |
| 01/21/22 | 1044 | 130 | E Slope | 20G1344 | 0107-18 0018 | 0 | 99 | 99 | PV | 61 62 61 62 61 | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**HDPE Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/21/22 | 1050 | 131 | E Slope | 20G1344 | 0107-18 0018 | 0 | 100 | 100 | PV | 62 63 62 62 62 | |
| 01/21/22 | 1110 | 132 | E Slope | 21G1200 | 0105-20 4704 | 0 | 93 | 93 | PV | 62 63 63 62 62 | |
| 01/21/22 | 1115 | 133 | E Slope | 21G1200 | 0105-20 4704 | 0 | 93 | 93 | PV | 61 61 61 62 62 | |
| 01/21/22 | 1124 | 134 | E Slope | 21G1200 | 0105-20 4704 | 0 | 94 | 94 | PV | 62 62 61 61 61 | |
| 01/21/22 | 1315 | 135 | E Slope | 21G1200 | 0105-20 4704 | 0 | 95 | 95 | PV | 64 62 63 62 62 | |
| 01/21/22 | 1320 | 136 | E Slope | 21G1200 | 0105-20 4704 | 0 | 94 | 94 | PV | 63 63 63 63 63 | |
| 01/21/22 | 1330 | 137 | E Slope | 21G1198 | 0105-20 4697 | 0 | 95 | 95 | PV | 62 62 63 62 64 | |
| 01/21/22 | 1335 | 138 | E Slope | 21G1198 | 0105-20 4697 | 0 | 96 | 96 | PV | 62 63 62 62 63 | |
| 01/21/22 | 1342 | 139 | E Slope | 21G1198 | 0105-20 4697 | 0 | 95 | 95 | PV | 63 63 62 62 63 | |
| 01/21/22 | 1403 | 140 | E Slope | 21G1198 | 0105-20 4697 | 0 | 95 | 95 | PV | 61 62 61 62 61 | |
| 01/21/22 | 1412 | 141 | E Corner | 21G1198 | 0105-20 4697 | 0 | 93 | 93 | PV | 61 60 61 60 61 | |
| 01/21/22 | 1435 | 142 | N. Slope | 21G1200 | 0105-20 4709 | 0 | 68 | 68 | PV | 60 61 60 61 61 | |
| 01/21/22 | 1440 | 143 | N. Slope | 21G1200 | 0105-20 4709 | 0 | 40 | 40 | PV | 62 62 63 62 62 | |
| 01/21/22 | 1518 | 144 | N. Slope | 21G1200 | 0105-20 4709 | 0 | 5 | 5 | PV | 64 62 63 62 63 | |
| 01/21/22 | 1515 | 145 | N. Slope | 21G1200 | 0105-20 4709 | 0 | 37 | 37 | PV | 62 63 62 63 62 | |
| 01/21/22 | 1520 | 146 | N. Slope | 21G1200 | 0105-20 4709 | 0 | 69 | 69 | PV | 62 63 62 63 62 | |
| 01/21/22 | 1530 | 147 | N. Slope | 21G1200 | 0105-20 4709 | 0 | 87 | 87 | PV | 61 62 61 61 63 | |
| 01/21/22 | 1545 | 148 | SE Slope | 21G1200 | 0105-20 4709 | 0 | 91 | 91 | PV | 61 62 61 62 61 | |
| 01/21/22 | 1610 | 149 | SE Slope | 21G1200 | 0105-20 4709 | 0 | 91 | 91 | PV | 61 62 61 61 63 | |
| 01/21/22 | 1627 | 150 | SE Slope | 20E1328 | 0102-19 9386 | 0 | 91 | 91 | PV | 62 62 63 62 64 | |
| 01/21/22 | 1654 | 151 | E Peninsula Corner | 20E1328 | 0102-19 9386 | 0 | 67 | 67 | PV | 64 62 62 61 62 | |
| 01/21/22 | 1712 | 152 | E Peninsula Corner | 20E1328 | 0102-19 9386 | 0 | 41 | 41 | PV | 64 62 63 63 63 | |
| 01/21/22 | 1718 | 153 | E Peninsula Corner | 20E1328 | 0102-19 9386 | 0 | 21 | 21 | PV | 63 63 63 61 61 | |
| 01/21/22 | 1740 | 154 | N Peninsula | 20E1328 | 0102-19 9386 | 0 | 92 | 92 | PV | 62 62 61 61 62 | |
| 01/21/22 | 1745 | 155 | N Peninsula | 20E1328 | 0102-19 9386 | 50 | 92 | 42 | PV | 63 62 62 61 61 | |
| 01/22/22 | 0930 | 156 | N Peninsula | 20J1245 | 0102-20 0666 | 0 | 93 | 93 | PV | 62 61 63 62 61 | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**HDPE Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/22/22 | 0945 | 157 | N Peninsula | 20J1245 | 0102-20 0666 | 0 | 98 | 98 | PV | 61 61 61 62 61 | |
| 01/22/22 | 1000 | 158 | N Peninsula | 20J1245 | 0102-20 0666 | 0 | 98 | 98 | PV | 62 61 63 61 62 | |
| 01/22/22 | 1015 | 159 | N Peninsula | 20J1245 | 0102-20 0666 | 0 | 99 | 99 | PV | 63 62 63 63 61 | |
| 01/22/22 | 1115 | 160 | N Peninsula | 20J1245 | 0102-20 0666 | 0 | 99 | 99 | PV | 61 61 62 62 62 | |
| 01/22/22 | 1120 | 161 | N Peninsula | 20J1245 | 0102-20 0666 | 0 | 95 | 95 | PV | 61 61 62 63 62 | |
| 01/22/22 | 1325 | 162 | N Peninsula | 20J1245 | 0102-20 0666 | 0 | 93 | 93 | PV | 61 62 62 61 62 | |
| 01/22/22 | 1330 | 163 | N Peninsula | 20J1245 | 0102-20 0666 | 64 | 93 | 29 | PV | 62 63 62 62 63 | |
| 01/22/22 | 1350 | 164 | Floor | 20J1245 | 0102-20 0666 | 95 | 175 | 80 | PV | 63 61 61 62 61 | |
| 01/22/22 | 1355 | 165 | Floor | 20E1328 | 0102-19 9386 | 95 | 158 | 63 | PV | 61 61 62 62 63 | |
| 01/22/22 | 1404 | 166 | Floor | 20E1328 | 0102-19 9399 | 95 | 147 | 52 | PV | 61 61 62 61 62 | |
| 01/22/22 | 1410 | 167 | Floor | 20E1328 | 0102-19 9399 | 95 | 134 | 39 | PV | 61 62 62 61 62 | |
| 01/22/22 | 1435 | 168 | E Peninsula | 20E1328 | 0102-19 9399 | 0 | 127 | 127 | PV | 63 61 61 62 62 | |
| 01/22/22 | 1455 | 169 | E Peninsula | 20E1328 | 0102-19 9399 | 0 | 131 | 131 | PV | 62 62 61 62 61 | |
| 01/22/22 | 1503 | 170 | E Peninsula | 20E1328 | 0102-19 9399 | 0 | 131 | 131 | PV | 62 62 62 61 61 | |
| 01/22/22 | 1511 | 171 | E Peninsula | 20E1328 | 0102-19 9385 | 0 | 131 | 131 | PV | 63 63 63 62 62 | |
| 01/22/22 | 1527 | 172 | E Peninsula | 20E1328 | 0102-19 9385 | 0 | 133 | 133 | PV | 62 63 62 61 62 | |
| 01/22/22 | 1600 | 173 | E Peninsula | 20E1328 | 0102-19 9399 | 0 | 133 | 133 | PV | 61 62 61 62 61 | |
| 01/22/22 | 1620 | 174 | E Peninsula | 21C1073 | 0102-20 0649 | 0 | 133 | 133 | PV | 62 63 63 64 61 | |
| 01/22/22 | 1627 | 175 | E Peninsula | 21C1073 | 0102-20 0649 | 0 | 136 | 136 | PV | 61 61 62 61 61 | |
| 01/23/22 | 0810 | 176 | E Peninsula | 21C1073 | 0102-20 0649 | 0 | 137 | 137 | PV | 62 62 62 61 62 | |
| 01/23/22 | 0823 | 177 | E Peninsula | 20G1366 | 0107-18 0010 | 0 | 137 | 137 | PV | 62 63 62 61 61 | |
| 01/23/22 | 0850 | 178 | E Peninsula Corner | 20G1366 | 0107-18 0010 | 0 | 99 | 99 | PV | 61 62 61 62 63 | |
| 01/23/22 | 0920 | 179 | E Peninsula Corner | 20G1366 | 0107-18 0010 | 0 | 70 | 70 | PV | 63 62 62 63 61 | |
| 01/23/22 | 0932 | 180 | E Peninsula Corner | 20G1366 | 0107-18 0010 | 0 | 50 | 50 | PV | 62 62 62 62 62 | |
| 01/23/22 | 0950 | 181 | E Peninsula Corner | 20G1366 | 0107-18 0010 | 0 | 20 | 20 | PV | 60 61 62 61 61 | |
| 01/23/22 | 1000 | 182 | Floor | 20G1366 | 0107-18 0010 | 0 | 2 | 2 | PV | 62 62 60 61 64 | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**HDPE Panel Placement Log**

| Date | Time | Identification | | Panel Data | | Stationing | | Deployed Panel Length | CQA Tech. | Field Thickness Values | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | Location | Lot Number | Roll Number | Beginning | End | | | | |
| 01/23/22 | 1015 | 183 | Floor | 20G1366 | 0107-18 0010 | 0 | 2 | 2 | PV | 62 62 62 61 61 | |

# Panel Seaming

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/10/2022 | 0947 | 2/3 | S Slope | MS | 457 | 0 | 90 | 90 | S/S | DR | DS 2 @ 80 |
| 1/10/2022 | 1021 | 4/5 | S Slope | MS | 457 | 0 | 42 | 42 | S/S | DR | |
| 1/10/2022 | 1040 | 5/6 | S Slope | MS | 457 | 0 | 39 | 39 | T/S | DR | |
| 1/10/2022 | 1050 | 4/6 | S Slope | MS | 457 | 39 | 87 | 48 | T/S | DR | |
| 1/10/2022 | 1115 | 7/8 | S Slope | MS | 457 | 0 | 89 | 89 | S/S | DR | |
| 1/10/2022 | 1144 | 9/10 | S Slope | MS | 457 | 0 | 91 | 91 | S/S | DR | |
| 1/10/2022 | 1351 | 11/12 | S Slope | MS | 457 | 0 | 46 | 46 | S/S | DR | |
| 1/10/2022 | 1410 | 12/13 | S Slope | MS | 457 | 0 | 42 | 42 | S/T | DR | |
| 1/10/2022 | 1425 | 11/13 | S Slope | MS | 457 | 42 | 84 | 42 | S/T | DR | DS 3 @ 82 |
| 1/10/2022 | 1446 | 14/15 | S Slope | MS | 457 | 0 | 90 | 90 | S/S | DR | |
| 1/10/2022 | 1525 | 16/17 | S Slope | MS | 457 | 0 | 94 | 94 | S/S | DR | |
| 1/10/2022 | 1556 | 19/20 | S Slope | MS | 457 | 0 | 89 | 89 | S/S | DR | |
| 1/10/2022 | 1633 | 21/22 | S Slope | MS | 457 | 0 | 91 | 91 | S/S | DR | |
| 1/10/2022 | 0930 | 1/2 | S Slope | VT | 821 | 0 | 89 | 89 | S/S | DR | DS 1 @ 80 |
| 1/10/2022 | 1008 | 3/4 | S Slope | VT | 821 | 0 | 90 | 90 | S/S | DR | |
| 1/10/2022 | 1028 | 6/7 | S Slope | VT | 821 | 0 | 90 | 90 | S/S | DR | |
| 1/10/2022 | 1130 | 8/9 | S Slope | VT | 821 | 0 | 89 | 89 | S/S | DR | |
| 1/10/2022 | 1345 | 10/11 | S Slope | VT | 821 | 0 | 89 | 89 | S/S | DR | |
| 1/10/2022 | 1435 | 13/14 | S Slope | VT | 821 | 0 | 91 | 91 | S/S | DR | DS 4 @ 89 |
| 1/10/2022 | 1515 | 15/16 | S Slope | VT | 821 | 0 | 92 | 92 | S/S | DR | |
| 1/10/2022 | 1540 | 17/18 | S Slope | VT | 821 | 0 | 44 | 44 | S/S | DR | |
| 1/10/2022 | 1557 | 18/19 | S Slope | VT | 821 | 0 | 40 | 40 | S/T | DR | |
| 1/10/2022 | 1605 | 17/19 | S Slope | VT | 821 | 40 | 89 | 49 | S/T | DR | |
| 1/10/2022 | 1650 | 20/21 | S Slope | VT | 821 | 0 | 90 | 90 | S/T | DR | |
| 1/11/2022 | 0840 | 24/25 | W Slope | VT | 821 | 0 | 87 | 87 | S/S | DR | |
| 1/11/2022 | 0919 | 26/27 | W Slope | VT | 821 | 0 | 86 | 86 | S/S | DR | DS 6 @ 78 |
| 1/11/2022 | 0948 | 22/24 | W Slope | VT | 821 | 83 | 37 | 46 | S/T | DR | |
| 1/11/2022 | 1002 | 23/24 | W Slope | VT | 821 | 37 | 0 | 37 | S/T | DR | |
| 1/11/2022 | 1029 | 30/31 | W Slope | VT | 821 | 0 | 85 | 85 | S/S | DR | |
| 1/11/2022 | 1050 | 32/33 | W Slope | VT | 821 | 0 | 43 | 43 | S/S | DR | |
| 1/11/2022 | 1107 | 33/34 | W Slope | VT | 821 | 0 | 40 | 40 | S/T | DR | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/11/2022 | 1115 | 32/34 | W Slope | VT | 821 | 40 | 88 | 48 | S/T | DR | |
| 1/11/2022 | 1132 | 36/37 | W Slope | VT | 821 | 0 | 42 | 42 | S/T | DR | |
| 1/11/2022 | 1330 | 35/36 | W Slope | VT | 821 | 0 | 89 | 89 | S/S | DR | |
| 1/11/2022 | 1400 | 38/39 | W Slope | VT | 821 | 0 | 90 | 90 | S/S | DR | DS 8 @ 43 |
| 1/11/2022 | 1421 | 40/41 | W Slope | VT | 821 | 44 | 0 | 44 | S/S | DR | |
| 1/11/2022 | 1435 | 41/42 | W Slope | VT | 821 | 0 | 42 | 42 | S/T | DR | |
| 1/11/2022 | 1448 | 40/42 | W Slope | VT | 821 | 42 | 88 | 46 | S/T | DR | |
| 1/11/2022 | 0815 | 22/23 | W Slope | MS | 457 | 0 | 38 | 38 | S/S | DR | |
| 1/11/2022 | 0819 | 25/26 | W Slope | MS | 457 | 0 | 86 | 86 | S/S | DR | DS 5 @ 78 |
| 1/11/2022 | 0918 | 27/28 | W Slope | MS | 457 | 0 | 86 | 86 | S/S | DR | |
| 1/11/2022 | 0946 | 28/29 | W Slope | MS | 457 | 0 | 85 | 85 | S/S | DR | |
| 1/11/2022 | 1014 | 29/30 | W Slope | MS | 457 | 0 | 84 | 84 | S/S | DR | |
| 1/11/2022 | 1047 | 31/32 | W Slope | MS | 457 | 0 | 88 | 88 | S/S | DR | |
| 1/11/2022 | 1117 | 34/35 | W Slope | MS | 457 | 0 | 88 | 88 | S/S | DR | |
| 1/11/2022 | 1336 | 37/38 | W Slope | MS | 457 | 0 | 40 | 40 | S/T | DR | |
| 1/11/2022 | 1351 | 36/38 | W Slope | MS | 457 | 40 | 87 | 47 | S/T | DR | DS 7 @ 45 |
| 1/11/2022 | 1409 | 39/40 | W Slope | MS | 457 | 0 | 92 | 92 | S/S | DR | |
| 1/12/2022 | 1124 | 43/44 | N Slope | MS | 457 | 0 | 92 | 92 | S/S | DR | |
| 1/12/2022 | 1350 | 46/47 | N Slope | MS | 457 | 0 | 89 | 89 | S/S | DR | |
| 1/12/2022 | 1459 | 48/49 | N Slope | MS | 457 | 0 | 89 | 89 | S/S | DR | |
| 1/12/2022 | 1535 | 50/51 | N Slope | MS | 457 | 0 | 87 | 87 | S/S | DR | DS 10 @ 76 |
| 1/12/2022 | 1624 | 52/53 | N Slope | MS | 457 | 0 | 90 | 90 | S/S | DR | |
| 1/12/2022 | 1702 | 54/55 | N Slope | MS | 457 | 0 | 90 | 90 | S/S | DR | |
| 1/12/2022 | 1115 | 42/43 | N Slope | VT | 821 | 0 | 92 | 92 | S/S | DR | |
| 1/12/2022 | 1140 | 44/45 | N Slope | VT | 821 | 0 | 45 | 45 | S/S | DR | |
| 1/12/2022 | 1340 | 45/46 | N Slope | VT | 821 | 0 | 43 | 43 | S/S | DR | |
| 1/12/2022 | 1350 | 44/46 | N Slope | VT | 821 | 43 | 89 | 46 | S/S | DR | |
| 1/12/2022 | 1437 | 47/48 | N Slope | VT | 821 | 0 | 91 | 91 | S/S | DR | DS 9 @ 83 |
| 1/12/2022 | 1505 | 49/50 | N Slope | VT | 821 | 0 | 87 | 87 | S/S | DR | |
| 1/12/2022 | 1545 | 51/52 | N Slope | VT | 821 | 0 | 90 | 90 | S/S | DR | |
| 1/12/2022 | 1630 | 53/54 | N Slope | VT | 821 | 0 | 90 | 90 | S/S | DR | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/13/2022 | 0836 | 56/57 | N Slope | MS | 457 | 0 | 90 | 90 | S/S | DR | |
| 1/13/2022 | 0903 | 58/59 | N Slope | MS | 457 | 0 | 90 | 90 | S/S | DR | |
| 1/13/2022 | 0933 | 60/61 | N Slope | MS | 457 | 0 | 89 | 89 | S/S | DR | DS 12 @ 84 |
| 1/13/2022 | 1007 | 62/63 | N Slope | MS | 457 | 0 | 40 | 40 | S/S | DR | |
| 1/13/2022 | 1025 | 64/65 | N Corner | MS | 457 | 0 | 40 | 40 | S/S | DR | |
| 1/13/2022 | 1039 | 65/66 | N Corner | MS | 457 | 0 | 40 | 40 | S/T | DR | |
| 1/13/2022 | 1053 | 64/66 | N Corner | MS | 457 | 40 | 89 | 49 | S/T | DR | |
| 1/13/2022 | 1547 | 70/71 | E Slope/Floor | MS | 457 | 0 | 475 | 475 | S/S | DR | DS 14 @ 307 |
| 1/13/2022 | 0830 | 55/56 | N Slope | VT | 821 | 0 | 90 | 90 | S/S | DR | |
| 1/13/2022 | 0854 | 57/58 | N Slope | VT | 821 | 0 | 90 | 90 | S/S | DR | DS 11 @ 85 |
| 1/13/2022 | 0917 | 59/60 | N Slope | VT | 821 | 0 | 89 | 89 | S/S | DR | |
| 1/13/2022 | 0951 | 61/62 | N Slope | VT | 821 | 0 | 89 | 89 | S/S | DR | |
| 1/13/2022 | 1021 | 63/64 | N Slope | VT | 821 | 0 | 40 | 40 | S/S | DR | |
| 1/13/2022 | 1032 | 62/64 | N Slope | VT | 821 | 40 | 89 | 49 | S/T | DR | |
| 1/13/2022 | 1050 | 66/67 | N Corner | VT | 821 | 0 | 42 | 42 | S/S | DR | |
| 1/13/2022 | 1153 | 68/69 | N Corner | VT | 821 | 0 | 48 | 48 | S/S | DR | |
| 1/13/2022 | 1505 | 69/70 | N Slope/Floor | VT | 821 | 0 | 91 | 91 | S/S | DR | |
| 1/13/2022 | 1600 | 66/70 | Floor | VT | 821 | 0 | 7 | 7 | S/T | DR | |
| 1/13/2022 | 1602 | 64/70 | Floor | VT | 821 | 7 | 11 | P | S/T | DR | |
| 1/13/2022 | 1603 | 62/70 | Floor | VT | 821 | 11 | 19 | 8 | S/T | DR | |
| 1/13/2022 | 1604 | 61/70 | Floor | VT | 821 | 19 | 41 | 22 | S/T | DR | DS 13 @ 22 |
| 1/13/2022 | 1608 | 60/70 | Floor | VT | 821 | 41 | 64 | 23 | T/T | PV | |
| 1/13/2022 | 1612 | 59/70 | Floor | VT | 821 | 64 | 86 | 22 | T/T | PV | |
| 1/13/2022 | 1614 | 58/70 | Floor | VT | 821 | 86 | 109 | 23 | T/T | PV | |
| 1/13/2022 | 1621 | 57/70 | Floor | VT | 821 | 109 | 131 | 22 | T/T | PV | |
| 1/13/2022 | 1626 | 56/70 | Floor | VT | 821 | 131 | 153 | 22 | T/T | PV | |
| 1/13/2022 | 1631 | 55/70 | Floor | VT | 821 | 153 | 176 | 23 | T/T | PV | |
| 1/13/2022 | 1635 | 54/70 | Floor | VT | 821 | 176 | 199 | 23 | T/T | PV | |
| 1/13/2022 | 1639 | 53/70 | Floor | VT | 821 | 199 | 221 | 22 | T/T | PV | |
| 1/13/2022 | 1645 | 52/70 | Floor | VT | 821 | 221 | 243 | 22 | T/T | PV | |
| 1/13/2022 | 1650 | 51/70 | Floor | VT | 821 | 243 | 266 | 23 | T/T | PV | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/13/2022 | 1655 | 50/70 | Floor | VT | 821 | 266 | 288 | 22 | T/T | PV | |
| 1/13/2022 | 1701 | 49/70 | Floor | VT | 821 | 288 | 310 | 22 | T/T | PV | |
| 1/13/2022 | 1706 | 48/70 | Floor | VT | 821 | 310 | 326 | 16 | T/T | PV | |
| 1/13/2022 | 1710 | 47/70 | Floor | VT | 821 | 326 | 348 | 22 | T/T | PV | |
| 1/13/2022 | 1715 | 46/70 | Floor | VT | 821 | 348 | 370 | 22 | T/T | PV | |
| 1/13/2022 | 1722 | 44/70 | Floor | VT | 821 | 370 | 378 | 8 | T/T | PV | |
| 1/13/2022 | 1723 | 43/70 | Floor | VT | 821 | 378 | 396 | 18 | T/T | PV | |
| 1/13/2022 | 1727 | 43/71 | Floor | VT | 821 | 396 | 400 | 4 | T/T | PV | |
| 1/13/2022 | 1730 | 42/71 | Floor | VT | 821 | 400 | 415 | 15 | T/T | PV | |
| 1/13/2022 | 1735 | 71/72 | Floor | VT | 821 | 0 | 11 | 11 | T/T | PV | |
| 1/13/2022 | 1739 | 42/72 | Floor | VT | 821 | 415 | 421 | 6 | T/T | PV | |
| 1/13/2022 | 1741 | 40/72 | Floor | VT | 821 | 421 | 431 | 10 | T/T | PV | |
| 1/14/2022 | 0902 | 71/73 | E Slope/Floor | MS | 457 | 0 | 489 | 489 | S/S | DR | DS 16 @ 312 |
| 1/14/2022 | 1046 | 72/73 | Floor | MS | 457 | 489 | 502 | 13 | S/S | DR | |
| 1/14/2022 | 1132 | 74/75 | E Slope/Floor | MS | 457 | 0 | 500 | 500 | S/S | DR | DS 18 @ 287 |
| 1/14/2022 | 1525 | 77/78 | Floor | MS | 457 | 506 | 523 | 17 | S/S | DR | |
| 1/14/2022 | 1532 | 78/79 | Floor | MS | 457 | 503 | 539 | 36 | S/S | DR | |
| 1/14/2022 | 1543 | 79/80 | Floor | MS | 457 | 500 | 555 | 55 | S/S | DR | |
| 1/14/2022 | 1603 | 76/80 | Floor | MS | 457 | 0 | 22 | 22 | T/T | DR | |
| 1/14/2022 | 1610 | 75/79 | Floor | MS | 457 | 0 | 22 | 22 | T/T | DR | |
| 1/14/2022 | 1617 | 74/78 | Floor | MS | 457 | 0 | 22 | 22 | T/T | DR | |
| 1/14/2022 | 1624 | 73/77 | Floor | MS | 457 | 0 | 20 | 20 | T/T | DR | |
| 1/14/2022 | 1633 | 81/82 | Floor | MS | 457 | 0 | 22 | 22 | T/T | DR | |
| 1/14/2022 | 1650 | 80/82 | Floor | MS | 457 | 500 | 557 | 57 | S/S | DR | DS 21 @ 546 |
| 1/14/2022 | 1707 | 39/72 | Floor | MS | 457 | 3 | 7 | 4 | T/T | DR | |
| 1/14/2022 | 1710 | 39/77 | Floor | MS | 457 | 7 | 21 | 14 | T/T | DR | |
| 1/14/2022 | 1713 | 38/77 | Floor | MS | 457 | 0 | 12 | 12 | T/T | DR | |
| 1/14/2022 | 1717 | 38/78 | Floor | MS | 457 | 12 | 22 | 10 | T/T | DR | |
| 1/14/2022 | 1720 | 36/78 | Floor | MS | 457 | 0 | 6 | 6 | T/T | DR | |
| 1/14/2022 | 1722 | 35/78 | Floor | MS | 457 | 0 | 10 | 10 | T/T | DR | |
| 1/14/2022 | 1725 | 35/79 | Floor | MS | 457 | 10 | 21 | 11 | T/T | DR | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/14/2022 | 1729 | 34/79 | Floor | MS | 457 | 0 | 11 | 11 | T/T | DR | |
| 1/14/2022 | 1733 | 34/80 | Floor | MS | 457 | 11 | 21 | 10 | T/T | DR | |
| 1/14/2022 | 1736 | 32/80 | Floor | MS | 457 | 0 | 5 | 5 | T/T | DR | |
| 1/14/2022 | 1738 | 31/80 | Floor | MS | 457 | 0 | 7 | 7 | T/T | DR | |
| 1/14/2022 | 1740 | 31/82 | Floor | MS | 457 | 7 | 22 | 15 | T/T | DR | |
| 1/14/2022 | 1745 | 30/82 | Floor | MS | 457 | 0 | 8 | 8 | T/T | DR | |
| 1/14/2022 | 0812 | 67/68 | N Corner/Slope | VT | 821 | 0 | 42 | 42 | S/T | DR | DS 15 @ 40 |
| 1/14/2022 | 0826 | 66/69 | N Corner/Slope | VT | 821 | 42 | 83 | 41 | S/T | DR | |
| 1/14/2022 | 0948 | 73/74 | E Slope/Floor | VT | 821 | 0 | 503 | 503 | S/S | DR | DS 17 @ 413 |
| 1/14/2022 | 1411 | 75/76 | E Slope/Floor | VT | 821 | 0 | 500 | 500 | S/S | DR | DS 19 @ 367 |
| 1/14/2022 | 1604 | 76/81 | E Slope/Floor | VT | 821 | 0 | 500 | 500 | S/S | DR | DS 20 @ 347 |
| 1/16/2022 | 0913 | 83/84 | E Slope/Floor | MS | 457 | 0 | 502 | 502 | S/S | DR | DS 23 @ 346 |
| 1/16/2022 | 1150 | 86/87 | Floor | MS | 457 | 0 | 22 | 22 | T/T | DR | |
| 1/16/2022 | 1345 | 85/87 | E Slope | MS | 457 | 0 | 93 | 93 | S/S | DR | |
| 1/16/2022 | 1402 | 85/86 | Floor | MS | 457 | 93 | 511 | 418 | S/S | DR | DS 25 @ 302 |
| 1/16/2022 | 1606 | 92/93 | Floor | MS | 457 | 0 | 20 | 20 | T/T | DR | |
| 1/16/2022 | 1614 | 86/93 | Floor | MS | 457 | 217 | 322 | 105 | S/S | DR | |
| 1/16/2022 | 0823 | 81/83 | E Slope/Floor | VT | 821 | 0 | 500 | 500 | S/S | DR | DS 22 @ 325 |
| 1/16/2022 | 1027 | 84/85 | E Slope/Floor | VT | 821 | 0 | 500 | 500 | S/S | DR | DS 24 @ 305 |
| 1/16/2022 | 1359 | 82/88 | Floor | VT | 821 | 501 | 557 | 56 | S/S | DR | |
| 1/16/2022 | 1411 | 88/89 | Floor | VT | 821 | 501 | 562 | 61 | S/S | DR | |
| 1/16/2022 | 1424 | 89/90 | Floor | VT | 821 | 505 | 558 | 53 | S/S | DR | |
| 1/16/2022 | 1435 | 85/89 | Floor | VT | 821 | 505 | 511 | 6 | S/S | DR | |
| 1/16/2022 | 1439 | 90/91 | Floor | VT | 821 | 505 | 557 | 52 | S/S | DR | |
| 1/16/2022 | 1450 | 86/91 | Floor | VT | 821 | 0 | 20 | 20 | T/T | DR | DS 26 @ 10 |
| 1/16/2022 | 1455 | 85/90 | Floor | VT | 821 | 0 | 20 | 20 | T/T | DR | |
| 1/16/2022 | 1500 | 84/89 | Floor | VT | 821 | 0 | 20 | 20 | T/T | DR | |
| 1/16/2022 | 1505 | 83/88 | Floor | VT | 821 | 0 | 20 | 20 | T/T | DR | |
| 1/16/2022 | 1535 | 86/92 | Floor | VT | 821 | 322 | 511 | 185 | S/S | DR | |
| 1/16/2022 | 1540 | 91/92 | Floor | VT | 821 | 511 | 557 | 46 | S/S | DR | |
| 1/16/2022 | 1634 | 30/88 | Floor | VT | 821 | 7 | 20 | 13 | S/S | DR | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/16/2022 | 1637 | 29/88 | Floor | VT | 821 | 0 | 7 | 7 | S/S | DR | |
| 1/16/2022 | 1639 | 29/89 | Floor | VT | 821 | 7 | 20 | 13 | S/S | DR | |
| 1/16/2022 | 1643 | 28/89 | Floor | VT | 821 | 0 | 7 | 7 | S/S | DR | |
| 1/16/2022 | 1645 | 28/90 | Floor | VT | 821 | 7 | 20 | 13 | S/S | DR | |
| 1/16/2022 | 1649 | 27/90 | Floor | VT | 821 | 0 | 7 | 7 | S/S | DR | |
| 1/16/2022 | 1652 | 27/91 | Floor | VT | 821 | 7 | 20 | 13 | T/T | DR | |
| 1/16/2022 | 1656 | 26/91 | Floor | VT | 821 | 0 | 7 | 7 | T/T | DR | |
| 1/16/2022 | 1658 | 26/92 | Floor | VT | 821 | 7 | 20 | 13 | T/T | DR | |
| 1/16/2022 | 1703 | 25/92 | Floor | VT | 821 | 0 | 7 | 7 | T/T | DR | |
| 1/17/2022 | 0907 | 94/95 | Floor | MS | 457 | 276 | 397 | 121 | S/S | DR | |
| 1/17/2022 | 0940 | 95/96 | Floor | MS | 457 | 0 | 20 | 20 | T/T | DR | |
| 1/17/2022 | 0948 | 94/96 | Floor | MS | 457 | 397 | 532 | 135 | S/S | DR | DS 28 @ 520 |
| 1/17/2022 | 1059 | 97/98 | Floor | MS | 457 | 0 | 257 | 257 | S/S | DR | |
| 1/17/2022 | 1355 | 100/102 | Floor | MS | 457 | 334 | 215 | 119 | S/S | DR | |
| 1/17/2022 | 1420 | 101/102 | Floor | MS | 457 | 0 | 20 | 20 | S/S | DR | |
| 1/17/2022 | 1427 | 100/101 | Floor | MS | 457 | 215 | 171 | 44 | S/S | DR | |
| 1/17/2022 | 1437 | 99/101 | W Peninsula | MS | 457 | 171 | 0 | 171 | S/S | DR | DS 30 @ 151 |
| 1/17/2022 | 1553 | 104/105 | Floor | MS | 457 | 293 | 202 | 91 | S/S | DR | |
| 1/17/2022 | 1612 | 103/105 | W Peninsula | MS | 457 | 202 | 0 | 202 | S/S | DR | |
| 1/17/2022 | 1703 | 105/106 | Floor | MS | 457 | 0 | 20 | 20 | T/T | DR | |
| 1/17/2022 | 1714 | 104/106 | Floor | MS | 457 | 293 | 306 | 13 | T/T | DR | DS 32 @ 295 |
| 1/17/2022 | 1721 | 25/94 | Floor | MS | 457 | 7 | 14 | 7 | T/T | DR | |
| 1/17/2022 | 1725 | 24/94 | Floor | MS | 457 | 14 | 21 | 7 | T/T | DR | |
| 1/17/2022 | 1728 | 24/96 | Floor | MS | 457 | 0 | 14 | 14 | T/T | DR | |
| 1/17/2022 | 1732 | 22/96 | Floor | MS | 457 | 14 | 21 | 7 | T/T | DR | |
| 1/17/2022 | 1735 | 22/97 | Floor | MS | 457 | 0 | 3 | 3 | T/T | DR | |
| 1/17/2022 | 1735 | 21/97 | Floor | MS | 457 | 3 | 21 | 18 | T/T | DR | |
| 1/17/2022 | 1740 | 20/98 | Floor | MS | 457 | 0 | 18 | 18 | T/T | DR | |
| 1/17/2022 | 1742 | 19/98 | Floor | MS | 457 | 18 | 21 | 3 | T/T | DR | |
| 1/17/2022 | 1744 | 19/100 | Floor | MS | 457 | 0 | 19 | 19 | T/T | DR | |
| 1/17/2022 | 1746 | 17/100 | Floor | MS | 457 | 19 | 22 | 3 | T/T | DR | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/17/2022 | 1748 | 17/102 | Floor | MS | 457 | 2 | 6 | 4 | T/T | DR | |
| 1/17/2022 | 1750 | 16/102 | Floor | MS | 457 | 0 | 18 | 18 | T/T | DR | |
| 1/17/2022 | 1752 | 16/104 | Floor | MS | 457 | 18 | 22 | 4 | T/T | DR | |
| 1/17/2022 | 1754 | 15/104 | Floor | MS | 457 | 0 | 19 | 19 | T/T | DR | |
| 1/17/2022 | 1756 | 15/106 | Floor | MS | 457 | 19 | 22 | 3 | T/T | DR | |
| 1/17/2022 | 1758 | 14/106 | Floor | MS | 457 | 0 | 20 | 20 | T/T | DR | |
| 1/17/2022 | 1800 | 13/107 | Floor | MS | 457 | 0 | 20 | 20 | T/T | DR | |
| 1/17/2022 | 1803 | 11/107 | Floor | MS | 457 | 0 | 3 | 3 | T/T | DR | |
| 1/17/2022 | 0845 | 93/94 | Floor | VT | 821 | 276 | 322 | 46 | S/S | DR | |
| 1/17/2022 | 0855 | 92/94 | Floor | VT | 821 | 322 | 547 | 225 | S/S | DR | DS 27 @ 351 |
| 1/17/2022 | 1005 | 95/97 | Floor | VT | 821 | 0 | 127 | 127 | S/S | DR | |
| 1/17/2022 | 1028 | 96/97 | Floor | VT | 821 | 127 | 257 | 130 | S/S | DR | |
| 1/17/2022 | 1340 | 98/99 | W Peninsula | VT | 821 | 0 | 171 | 171 | S/S | DR | DS 29 @ 49 |
| 1/17/2022 | 1405 | 99/100 | Floor | VT | 821 | 0 | 20 | 20 | T/T | DR | |
| 1/17/2022 | 1410 | 98/100 | Floor | VT | 821 | 171 | 390 | 169 | S/S | DR | |
| 1/17/2022 | 1455 | 102/104 | Floor | VT | 821 | 318 | 215 | 103 | S/S | DR | |
| 1/17/2022 | 1514 | 101/104 | Floor | VT | 821 | 215 | 202 | 13 | S/S | DR | |
| 1/17/2022 | 1516 | 103/104 | Floor | VT | 821 | 20 | 0 | 20 | T/T | DR | |
| 1/17/2022 | 1523 | 101/103 | W Peninsula | VT | 821 | 202 | 0 | 202 | S/S | DR | DS 31 @ 88 |
| 1/17/2022 | 1640 | 105/107 | W Peninsula | VT | 821 | 293 | 0 | 293 | S/S | DR | |
| 1/18/2022 | 0821 | 107/109 | W Peninsula | VT | 821 | 275 | 201 | 74 | S/S | DR | DS 33 @ 243 |
| 1/18/2022 | 0847 | 107/108 | W Peninsula | VT | 821 | 201 | 0 | 201 | S/S | DR | |
| 1/18/2022 | 1009 | 110/111 | W Peninsula | VT | 821 | 163 | 0 | 163 | S/S | DR | |
| 1/18/2022 | 1050 | 111/112 | Floor | VT | 821 | 0 | 20 | 20 | T/T | DR | |
| 1/18/2022 | 1715 | 11/107 | Floor | VT | 821 | 0 | 3 | 3 | T/T | DR | |
| 1/18/2022 | 1721 | 11/109 | Floor | VT | 821 | 0 | 3 | 3 | T/T | DR | |
| 1/18/2022 | 1725 | 10/109 | Floor | VT | 821 | 0 | 22 | 22 | T/T | DR | |
| 1/18/2022 | 1727 | 9/109 | Floor | VT | 821 | 0 | 3 | 3 | T/T | DR | |
| 1/18/2022 | 1730 | 9/110 | Floor | VT | 821 | 3 | 23 | 20 | T/T | DR | DS 35 @ 22 |
| 1/18/2022 | 1735 | 8/110 | Floor | VT | 821 | 0 | 13 | 13 | T/T | DR | |
| 1/18/2022 | 1740 | 8/112 | Floor | VT | 821 | 13 | 21 | 8 | T/T | DR | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/18/2022 | 1745 | 7/112 | Floor | VT | 821 | 0 | 22 | 22 | T/T | DR | |
| 1/18/2022 | 1750 | 6/112 | Floor | VT | 821 | 0 | 10 | 10 | T/T | DR | |
| 1/18/2022 | 1755 | 6/113 | Floor | VT | 821 | 10 | 22 | 12 | T/T | DR | |
| 1/18/2022 | 1800 | 4/113 | Floor | VT | 821 | 0 | 6 | 6 | T/T | DR | |
| 1/18/2022 | 1805 | 3/113 | Floor | VT | 821 | 0 | 22 | 22 | T/T | DR | |
| 1/18/2022 | 1810 | 2/113 | Floor | VT | 821 | 0 | 18 | 18 | T/T | DR | |
| 1/18/2022 | 1815 | 1/114 | Floor | VT | 821 | 0 | 21 | 21 | T/T | DR | |
| 1/18/2022 | 0831 | 108/109 | Floor | MS | 457 | 0 | 20 | 20 | T/T | DR | |
| 1/18/2022 | 0902 | 109/110 | Floor | MS | 457 | 252 | 201 | 51 | S/S | DR | |
| 1/18/2022 | 0916 | 108/110 | W Peninsula | MS | 457 | 201 | 0 | 201 | S/S | DR | |
| 1/18/2022 | 1043 | 110/112 | Floor | MS | 457 | 228 | 163 | 65 | S/S | DR | DS 34 @ 195 |
| 1/18/2022 | 1112 | 112/113 | Floor | MS | 457 | 196 | 163 | 33 | S/S | DR | |
| 1/18/2022 | 1140 | 111/113 | Floor | MS | 457 | 163 | 0 | 163 | S/S | DR | |
| 1/19/2022 | 0808 | 1/122 | W Peninsula Corner | MS | 457 | 0 | 88 | 88 | S/S | DR | |
| 1/19/2022 | 0856 | 120/121 | W Peninsula Corner | MS | 457 | 0 | 47 | 47 | S/S | DR | |
| 1/19/2022 | 0912 | 115/116 | W Peninsula Corner | MS | 457 | 86 | 0 | 86 | S/S | DR | DS 36 @ 29 |
| 1/19/2022 | 0957 | 115/122 | W Peninsula Corner | MS | 457 | 110 | 93 | 17 | S/S | DR | |
| 1/19/2022 | 1005 | 115/121 | W Peninsula Corner | MS | 457 | 93 | 90 | 3 | S/S | DR | |
| 1/19/2022 | 1007 | 116/121 | W Peninsula Corner | MS | 457 | 90 | 68 | 22 | S/S | DR | |
| 1/19/2022 | 1015 | 116/120 | W Peninsula Corner | MS | 457 | 68 | 65 | 3 | S/S | DR | |
| 1/19/2022 | 1016 | 117/120 | W Peninsula Corner | MS | 457 | 55 | 31 | 24 | S/S | DR | |
| 1/19/2022 | 1023 | 117/119 | W Peninsula Corner | MS | 457 | 31 | 28 | 3 | S/S | DR | |
| 1/19/2022 | 1025 | 118/119 | W Peninsula Corner | MS | 457 | 28 | 0 | 28 | S/S | DR | |
| 1/19/2022 | 1540 | 98/123 | W Peninsula | MS | 457 | 0 | 86 | 86 | S/S | DR | |
| 1/19/2022 | 1606 | 123/124 | N Peninsula | MS | 457 | 47 | 91 | 44 | S/S | DR | |
| 1/19/2022 | 1630 | 123/125 | N Peninsula | MS | 457 | 0 | 47 | 47 | S/S | DR | |
| 1/19/2022 | 1645 | 124/125 | N Peninsula | MS | 457 | 47 | 91 | 44 | S/T | DR | |
| 1/19/2022 | 1655 | 125/126 | N Peninsula | MS | 457 | 0 | 44 | 44 | S/S | DR | DS 37 @ 35 |
| 1/19/2022 | 0748 | 113/114 | Floor | VT | 821 | 136 | 110 | 26 | S/S | DR | |
| 1/19/2022 | 0800 | 113/115 | W Peninsula | VT | 821 | 110 | 0 | 110 | S/S | DR | |
| 1/19/2022 | 0835 | 121/122 | W Peninsula Corner | VT | 821 | 0 | 88 | 88 | S/S | DR | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/19/2022 | 0905 | 119/120 | W Peninsula Corner | VT | 821 | 0 | 26 | 26 | S/S | DR | |
| 1/19/2022 | 0928 | 116/117 | W Peninsula Corner | VT | 821 | 65 | 0 | 65 | S/S | DR | |
| 1/19/2022 | 1004 | 117/118 | W Peninsula Corner | VT | 821 | 46 | 0 | 46 | S/S | DR | |
| 1/21/2022 | 1037 | 87/127 | E Slope | VT | 821 | 0 | 93 | 93 | S/S | DR | DS 38 @ 51 |
| 1/21/2022 | 1100 | 129/130 | E Slope | VT | 821 | 0 | 98 | 98 | S/S | DR | |
| 1/21/2022 | 1130 | 132/133 | E Slope | VT | 821 | 0 | 92 | 92 | S/S | DR | |
| 1/21/2022 | 1318 | 134/135 | E Slope | VT | 821 | 0 | 92 | 92 | S/S | DR | |
| 1/21/2022 | 1345 | 137/138 | E Slope | VT | 821 | 0 | 93 | 93 | S/S | DR | |
| 1/21/2022 | 1420 | 140/141 | E Slope | VT | 821 | 0 | 93 | 93 | S/S | DR | DS 41 @ 58 |
| 1/21/2022 | 1513 | 146/147 | E Slope | VT | 821 | 0 | 69 | 69 | S/S | DR | |
| 1/21/2022 | 1614 | 148/149 | E Slope | VT | 821 | 0 | 90 | 90 | S/S | DR | |
| 1/21/2022 | 1702 | 150/151 | E Slope | VT | 821 | 0 | 67 | 67 | S/S | DR | |
| 1/21/2022 | 1723 | 152/153 | E Slope | VT | 821 | 0 | 21 | 21 | S/S | DR | |
| 1/21/2022 | 1752 | 154/156 | N Peninsula | VT | 821 | 0 | 44 | 44 | S/S | DR | |
| 1/21/2022 | 1805 | 97/123 | Floor | VT | 821 | 0 | 22 | 22 | T/T | DR | |
| 1/21/2022 | 1810 | 95/124 | Floor | VT | 821 | 0 | 19 | 19 | T/T | DR | |
| 1/21/2022 | 1815 | 95/125 | Floor | VT | 821 | 19 | 22 | 22 | T/T | DR | |
| 1/21/2022 | 1816 | 94/125 | Floor | VT | 821 | 0 | 16 | 16 | T/T | DR | |
| 1/21/2022 | 1820 | 94/126 | Floor | VT | 821 | 16 | 6 | 10 | T/T | DR | |
| 1/21/2022 | 1038 | 127/128 | E Slope | MS | 4483 | 0 | 98 | 98 | S/S | DR | DS 39 @ 96 |
| 1/21/2022 | 1100 | 130/131 | E Slope | MS | 4483 | 0 | 98 | 98 | S/S | DR | |
| 1/21/2022 | 1130 | 133/134 | E Slope | MS | 4483 | 0 | 92 | 92 | S/S | DR | |
| 1/21/2022 | 1331 | 136/137 | E Slope | MS | 4483 | 0 | 93 | 93 | S/S | DR | |
| 1/21/2022 | 1408 | 139/140 | E Slope | MS | 4483 | 0 | 93 | 93 | S/S | DR | |
| 1/21/2022 | 1446 | 142/143 | E Slope | MS | 4483 | 0 | 40 | 40 | S/S | DR | |
| 1/21/2022 | 1547 | 147/148 | E Slope | MS | 4483 | 0 | 87 | 87 | S/S | DR | DS 42 @ 64 |
| 1/21/2022 | 1645 | 143/144 | E Corner | MS | 4483 | 0 | 3 | 3 | T/T | DR | |
| 1/21/2022 | 1647 | 143/145 | E Corner | MS | 4483 | 3 | 31 | 28 | T/T | DR | |
| 1/21/2022 | 1656 | 142/145 | E Corner | MS | 4483 | 31 | 33 | 2 | T/T | DR | |
| 1/21/2022 | 1657 | 142/146 | E Corner | MS | 4483 | 33 | 64 | 31 | T/T | DR | |
| 1/21/2022 | 1706 | 141/146 | E Corner | MS | 4483 | 64 | 67 | 3 | T/T | DR | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/21/2022 | 1707 | 141/147 | E Corner | MS | 4483 | 67 | 95 | 28 | T/T | DR | |
| 1/21/2022 | 1042 | 128/129 | E Slope | FM | 5189 | 0 | 98 | 98 | S/S | DR | DS 40 @ 96 |
| 1/21/2022 | 1116 | 131/132 | E Slope | FM | 5189 | 0 | 93 | 93 | S/S | DR | |
| 1/21/2022 | 1325 | 135/136 | E Slope | FM | 5189 | 0 | 93 | 93 | S/S | DR | |
| 1/21/2022 | 1346 | 138/139 | E Slope | FM | 5189 | 0 | 93 | 93 | S/S | DR | |
| 1/21/2022 | 1441 | 141/142 | E Slope | FM | 5189 | 0 | 68 | 68 | S/S | DR | |
| 1/21/2022 | 1521 | 145/146 | E Slope | FM | 5189 | 0 | 37 | 37 | S/S | DR | |
| 1/21/2022 | 1532 | 144/145 | E Slope | FM | 5189 | 0 | 5 | 5 | S/S | DR | |
| 1/21/2022 | 1635 | 149/150 | E Slope | FM | 5189 | 0 | 90 | 90 | S/S | DR | DS 43 @ 80 |
| 1/21/2022 | 1721 | 151/152 | E Slope | FM | 5189 | 0 | 41 | 41 | S/S | DR | |
| 1/21/2022 | 1735 | 125/154 | N Peninsula | FM | 5189 | 0 | 60 | 60 | S/S | DR | |
| 1/21/2022 | 1758 | 126/154 | N Peninsula | FM | 5189 | 60 | 92 | 32 | S/S | DR | |
| 1/21/2022 | 1815 | 93/126 | Floor | FM | 5189 | 0 | 6 | 6 | T/T | DR | |
| 1/21/2022 | 1817 | 93/154 | Floor | FM | 5189 | 0 | 22 | 22 | T/T | DR | |
| 1/21/2022 | 1821 | 93/155 | Floor | FM | 5189 | 0 | 18 | 18 | T/T | DR | |
| 1/22/2022 | 1030 | 156/157 | N Peninsula | MS | 4483 | 0 | 93 | 93 | S/T | DR | |
| 1/22/2022 | 1132 | 159/160 | N Peninsula | MS | 4483 | 0 | 97 | 97 | S/T | DR | |
| 1/22/2022 | 1411 | 165/166 | Floor | MS | 4483 | 95 | 144 | 49 | S/S | DR | |
| 1/22/2022 | 1508 | 169/170 | Floor | MS | 4483 | 0 | 131 | 131 | S/S | DR | DS 47 @ 113 |
| 1/22/2022 | 1540 | 171/172 | E Peninsula | MS | 4483 | 0 | 131 | 131 | S/S | DR | |
| 1/22/2022 | 1605 | 172/173 | E Peninsula | MS | 4483 | 0 | 131 | 131 | S/S | DR | |
| 1/22/2022 | 1650 | 131/168 | Floor | MS | 4483 | 0 | 22 | 22 | T/T | DR | |
| 1/22/2022 | 1656 | 130/167 | Floor | MS | 4483 | 0 | 22 | 22 | T/T | DR | |
| 1/22/2022 | 1702 | 129/166 | Floor | MS | 4483 | 0 | 22 | 22 | T/T | DR | |
| 1/22/2022 | 1708 | 128/165 | Floor | MS | 4483 | 0 | 22 | 22 | T/T | DR | |
| 1/22/2022 | 1714 | 127/164 | Floor | MS | 4483 | 0 | 22 | 22 | T/T | DR | |
| 1/22/2022 | 1722 | 134/171 | Floor | MS | 4483 | 0 | 21 | 21 | T/T | DR | |
| 1/22/2022 | 1728 | 133/170 | Floor | MS | 4483 | 0 | 21 | 21 | T/T | DR | |
| 1/22/2022 | 1735 | 132/169 | Floor | MS | 4483 | 0 | 21 | 21 | T/T | DR | |
| 1/22/2022 | 1040 | 157/158 | N Peninsula | FM | 5189 | 0 | 98 | 98 | S/T | DR | |
| 1/22/2022 | 1345 | 161/162 | N Peninsula | FM | 5189 | 0 | 92 | 92 | S/T | DR | |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/22/2022 | 1416 | 166/167 | Floor | FM | 5189 | 95 | 134 | 39 | S/S | DR | |
| 1/22/2022 | 1435 | 163/168 | Floor | FM | 5189 | 97 | 67 | 30 | S/S | DR | |
| 1/22/2022 | 1454 | 162/168 | Floor | FM | 5189 | 67 | 0 | 67 | S/S | DR | |
| 1/22/2022 | 1531 | 168/169 | N Peninsula | FM | 5189 | 127 | 0 | 127 | S/S | DR | DS 46 @ 66 |
| 1/22/2022 | 1633 | 174/175 | N Peninsula | FM | 5189 | 0 | 131 | 131 | S/S | DR | |
| 1/22/2022 | 1715 | 138/175 | Floor | FM | 5189 | 0 | 22 | 22 | T/T | DR | |
| 1/22/2022 | 1721 | 137/174 | Floor | FM | 5189 | 0 | 20 | 20 | T/T | DR | |
| 1/22/2022 | 1728 | 136/173 | Floor | FM | 5189 | 0 | 20 | 20 | T/T | DR | |
| 1/22/2022 | 1734 | 135/172 | Floor | FM | 5189 | 0 | 21 | 21 | T/T | DR | |
| 1/22/2022 | 1735 | 162/166 | Floor | VT | 821 | 21 | 12 | 9 | S/T | DR | |
| 1/22/2022 | 1737 | 162/167 | Floor | VT | 821 | 12 | 0 | 12 | S/T | DR | |
| 1/22/2022 | 1741 | 163/167 | Floor | VT | 821 | 7 | 0 | 7 | S/T | DR | |
| 1/22/2022 | 1002 | 155/156 | N Peninsula | VT | 821 | 50 | 92 | 42 | S/T | DR | DS 44 @ 80 |
| 1/22/2022 | 1015 | 154/155 | N Peninsula | VT | 821 | 50 | 92 | 42 | S/T | DR | |
| 1/22/2022 | 1050 | 158/159 | N Peninsula | VT | 821 | 0 | 98 | 98 | S/T | DR | |
| 1/22/2022 | 1130 | 160/161 | N Peninsula | VT | 821 | 0 | 93 | 93 | S/T | DR | |
| 1/22/2022 | 1440 | 162/163 | N Peninsula | VT | 821 | 64 | 93 | 29 | S/S | DR | |
| 1/22/2022 | 1358 | 164/165 | Floor | VT | 821 | 95 | 158 | 63 | S/S | DR | |
| 1/22/2022 | 1352 | 86/164 | Floor | VT | 821 | 95 | 170 | 75 | S/S | DR | |
| 1/22/2022 | 1445 | 167/168 | Floor | VT | 821 | 95 | 134 | 39 | S/S | DR | DS 45 @ 90 |
| 1/22/2022 | 1525 | 170/171 | Floor | VT | 821 | 0 | 130 | 130 | S/S | DR | |
| 1/22/2022 | 1625 | 173/174 | Floor | VT | 821 | 0 | 130 | 130 | S/S | DR | |
| 1/22/2022 | 1703 | 93/156 | Floor | VT | 821 | 21 | 6 | 15 | T/T | DR | |
| 1/22/2022 | 1708 | 86/156 | Floor | VT | 821 | 6 | 0 | 6 | T/T | DR | |
| 1/22/2022 | 1709 | 86/157 | Floor | VT | 821 | 20 | 0 | 20 | T/T | DR | |
| 1/22/2022 | 1713 | 86/158 | Floor | VT | 821 | 16 | 0 | 16 | T/T | DR | |
| 1/22/2022 | 1717 | 158/164 | Floor | VT | 821 | 8 | 0 | 8 | T/T | DR | |
| 1/22/2022 | 1719 | 159/164 | Floor | VT | 821 | 20 | 0 | 20 | T/T | DR | |
| 1/22/2022 | 1724 | 160/165 | Floor | VT | 821 | 20 | 0 | 20 | T/T | DR | |
| 1/22/2022 | 1730 | 161/165 | Floor | VT | 821 | 15 | 20 | 5 | T/T | DR | |
| 1/22/2022 | 1732 | 161/166 | Floor | VT | 821 | 15 | 0 | 15 | T/T | DR | DS 48 @ 2 |

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Panel Seaming**

| Date | Time | Seam ID | Seam Location | Seamer ID | Machine ID | Stationing | | Seam Length | Seam Material | CQA Tech. | DS Location/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Beginning | End | | | | |
| 1/23/2022 | 0834 | 176/177 | E Peninsula | MS | 4483 | 135 | 0 | 135 | S/S | DR | DS 49 @ 104 |
| 1/23/2022 | 0818 | 175/176 | E Peninsula | VT | 821 | 0 | 135 | 135 | S/S | DR | |
| 1/23/2022 | 0927 | 178/179 | E Peninsula | VT | 821 | 0 | 70 | 70 | S/S | DR | |
| 1/23/2022 | 0954 | 180/181 | E Peninsula Corner | VT | 821 | 0 | 20 | 20 | S/S | DR | |
| 1/23/2022 | 1004 | 153/181 | E Peninsula Corner | VT | 821 | 0 | 20 | 20 | S/S | DR | |
| 1/23/2022 | 1011 | 152/180 | E Peninsula Corner | VT | 821 | 20 | 53 | 23 | S/T | DR | |
| 1/23/2022 | 1020 | 151/179 | E Peninsula Corner | VT | 821 | 53 | 88 | 35 | S/T | DR | |
| 1/23/2022 | 1030 | 150/178 | E Peninsula Corner | VT | 821 | 88 | 117 | 29 | S/T | DR | DS 50 @ 100 |
| 1/23/2022 | 0855 | 177/178 | E Peninsula Corner | FM | 5189 | 0 | 95 | 95 | S/S | DR | |
| 1/23/2022 | 0945 | 179/180 | E Peninsula Corner | FM | 5189 | 0 | 50 | 50 | S/S | DR | |
| 1/23/2022 | 1006 | 140/177 | Floor | FM | 5189 | 0 | 21 | 21 | S/S | DR | |
| 1/23/2022 | 1013 | 139/176 | Floor | FM | 5189 | 21 | 43 | 22 | S/S | DR | DS 51 @ 41 |
| 1/23/2022 | 1021 | 177/182 | Floor | FM | 5189 | 0 | 22 | 22 | T/T | DR | |
| 1/23/2022 | 1027 | 177/183 | Floor | FM | 5189 | 0 | 22 | 22 | T/T | DR | |
| 1/23/2022 | 1038 | 149/182 | Floor | FM | 5189 | 0 | 22 | 22 | T/T | DR | |
| 1/23/2022 | 1045 | 148/183 | Floor | FM | 5189 | 0 | 22 | 22 | T/T | DR | |

# Non-Destruct

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/11/2022 | 1/2 | S Slope | 89 | 0 | MS | 1515 | 1520 | 30 | 30 | P | | PV | |
| 1/11/2022 | 2/3 | S Slope | 90 | 0 | MS | 1517 | 1522 | 30 | 30 | P | | PV | |
| 1/11/2022 | 3/4 | S Slope | 90 | 0 | MS | 1522 | 1527 | 30 | 30 | P | | PV | |
| 1/11/2022 | 4/5 | S Slope | 42 | 0 | MS | 1530 | 1535 | 30 | 30 | P | | DR | |
| 1/11/2022 | 4/6 | S Slope | 39 | 87 | MS | 1523 | 1528 | 30 | 30 | P | | PV | |
| 1/11/2022 | 5/6 | S Slope | 39 | 0 | MS | 1532 | 1537 | 30 | 30 | P | | DR | |
| 1/11/2022 | 6/7 | S Slope | 90 | 0 | MS | 1539 | 1544 | 30 | 30 | P | | PV | |
| 1/11/2022 | 7/8 | S Slope | 89 | 0 | MS | 1541 | 1546 | 30 | 30 | P | | PV | |
| 1/11/2022 | 8/9 | S Slope | 89 | 0 | MS | 1547 | 1552 | 30 | 30 | P | | PV | |
| 1/11/2022 | 9/10 | S Slope | 91 | 0 | MS | 1549 | 1554 | 30 | 30 | P | | PV | |
| 1/11/2022 | 10/11 | S Slope | 89 | 0 | MS | 1557 | 1562 | 30 | 30 | P | | PV | |
| 1/11/2022 | 11/12 | S Slope | 46 | 0 | MS | 1558 | 1603 | 30 | 30 | P | | DR | |
| 1/11/2022 | 11/13 | S Slope | 84 | 42 | MS | 1601 | 1606 | 30 | 30 | P | | DR | |
| 1/11/2022 | 12/13 | S Slope | 42 | 0 | MS | 1606 | 1611 | 30 | 30 | P | | DR | |
| 1/19/2022 | 1/114 | Floor | 0 | 21 | MS | 1131 | 1136 | 30 | 30 | P | | PV | |
| 1/19/2022 | 1/122 | S Slope | 0 | 88 | MS | 1135 | 1140 | 30 | 30 | P | | PV | |
| 1/19/2022 | 10/109 | Floor | 0 | 22 | MS | 1049 | 1054 | 30 | 30 | P | | PV | |
| 1/18/2022 | 100/101 | Floor | 171 | 215 | MS | 1658 | 1703 | 30 | 30 | P | | PV | |
| 1/18/2022 | 100/102 | Floor | 215 | 334 | MS | 1507 | 1512 | 30 | 30 | P | | PV | |
| 1/18/2022 | 101/102 | Floor | 0 | 20 | MS | 1652 | 1657 | 30 | 30 | P | | PV | |
| 1/18/2022 | 101/103 | W Peninsula | 0 | 202 | MS | 1644 | 1649 | 30 | 30 | P | | PV | |
| 1/18/2022 | 101/104 | Floor | 202 | 215 | MS | 1654 | 1659 | 30 | 30 | P | | PV | |
| 1/18/2022 | 102/104 | Floor | 215 | 318 | MS | 1509 | 1514 | 30 | 28 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ | | | |
| | | | Beginning | End | | Begin | End | Begin | End | Fail | | | |
| 1/18/2022 | 103/104 | Floor | 0 | 20 | MS | 1648 | 1653 | 30 | 30 | P | | PV | |
| 1/18/2022 | 103/105 | W Peninsula | 0 | 202 | MS | 1642 | 1647 | 30 | 30 | P | | PV | |
| 1/18/2022 | 104/105 | Floor | 202 | 293 | MS | 1534 | 1539 | 30 | 30 | P | | PV | |
| 1/18/2022 | 104/106 | Floor | 293 | 306 | MS | 1526 | 1531 | 30 | 30 | P | | PV | |
| 1/18/2022 | 105/106 | Floor | 0 | 20 | MS | 1528 | 1533 | 30 | 30 | P | | PV | |
| 1/18/2022 | 105/107 | W Peninsula | 0 | 293 | MS | 1522 | 1527 | 30 | 30 | P | | PV | |
| 1/18/2022 | 107/108 | W Peninsula | 0 | 201 | MS | 1639 | 1644 | 30 | 30 | P | | PV | |
| 1/18/2022 | 107/109 | Floor | 201 | 275 | MS | 1540 | 1545 | 30 | 30 | P | | PV | |
| 1/18/2022 | 108/109 | Floor | 0 | 20 | MS | 1632 | 1637 | 30 | 29 | P | | PV | |
| 1/18/2022 | 108/110 | W Peninsula | 0 | 201 | MS | 1630 | 1635 | 30 | 30 | P | | PV | |
| 1/18/2022 | 109/110 | Floor | 201 | 252 | MS | 1541 | 1546 | 30 | 28 | P | | PV | |
| 1/18/2022 | 11/107 | Floor | 0 | 3 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/18/2022 | 11/109 | Floor | 0 | 3 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/18/2022 | 110/111 | W Peninsula | 0 | 163 | MS | 1623 | 1628 | 30 | 30 | P | | PV | |
| 1/18/2022 | 110/112 | Floor | 163 | 228 | MS | 1547 | 1552 | 30 | 30 | P | | PV | |
| 1/18/2022 | 111/112 | Slope | 0 | 20 | MS | 1624 | 1629 | 30 | 29 | P | | PV | |
| 1/18/2022 | 111/113 | W Peninsula | 0 | 52 | MS | 1601 | 1606 | 30 | 30 | P | | PV | |
| 1/18/2022 | 111/113 | W Peninsula | 52 | 163 | MS | 1559 | 1604 | 30 | 30 | P | | PV | |
| 1/18/2022 | 112/113 | Floor | 163 | 196 | MS | 1547 | 1552 | 30 | 30 | P | | PV | |
| 1/18/2022 | 113/114 | Floor | 110 | 136 | MS | 1549 | 1554 | 30 | 30 | P | | PV | |
| 1/19/2022 | 113/115 | W Peninsula | 0 | 110 | MS | 1143 | 1148 | 30 | 30 | P | | PV | |
| 1/19/2022 | 115/116 | W Peninsula | 0 | 86 | MS | 1149 | 5 | 30 | 30 | P | | PV | |
| 1/19/2022 | 115/121 | W Peninsula Corner | 90 | 93 | - | - | - | - | - | - | - | PV | See Repair Log |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/19/2022 | 115/122 | W Peninsula Corner | 93 | 105 | MS | 1140 | 5 | 30 | 30 | P | | PV | |
| 1/19/2022 | 115/122 | W Peninsula Corner | 105 | 110 | MS | 1137 | 1142 | 30 | 30 | P | | PV | |
| 1/19/2022 | 116/117 | W Peninsula Corner | 0 | 65 | MS | 1156 | 1201 | 30 | 30 | P | | PV | |
| 1/19/2022 | 116/120 | W Peninsula Corner | 65 | 68 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/19/2022 | 116/121 | W Peninsula Corner | 68 | 90 | MS | 1152 | 5 | 30 | 30 | P | | PV | |
| 1/19/2022 | 117/118 | W Peninsula Corner | 0 | 46 | MS | 1340 | 5 | 30 | 30 | P | | PV | |
| 1/19/2022 | 117/119 | W Peninsula Corner | 28 | 31 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/19/2022 | 117/120 | W Peninsula Corner | 31 | 55 | MS | 1331 | 1336 | 30 | 30 | P | | PV | |
| 1/19/2022 | 118/119 | W Peninsula Corner | 0 | 28 | MS | 1343 | 1348 | 30 | 30 | P | | PV | |
| 1/19/2022 | 119/120 | W Peninsula Corner | 0 | 26 | MS | 1336 | 1341 | 30 | 30 | P | | PV | |
| 1/19/2022 | 120/121 | W Peninsula Corner | 0 | 47 | MS | 1154 | 1159 | 30 | 30 | P | | PV | |
| 1/19/2022 | 121/122 | W Peninsula Corner | 0 | 88 | MS | 1146 | 5 | 30 | 30 | P | | PV | |
| 1/23/2022 | 123/124 | N Peninsula | 47 | 91 | MS | 1453 | 1458 | 30 | 30 | P | | PV | |
| 1/23/2022 | 123/125 | N Peninsula | 0 | 47 | MS | 1454 | 1459 | 30 | 30 | P | | PV | |
| 1/23/2022 | 124/125 | N Peninsula | 47 | 91 | MS | 1508 | 1513 | 30 | 30 | P | | PV | |
| 1/23/2022 | 125/126 | N Peninsula | 0 | 44 | MS | 1428 | 1433 | 30 | 30 | P | | PV | |
| 1/23/2022 | 125/154 | N Peninsula | 0 | 60 | MS | 1429 | 1434 | 30 | 30 | P | | PV | |
| 1/23/2022 | 126/154 | N Peninsula | 60 | 92 | MS | 1422 | 1427 | 30 | 30 | P | | PV | |
| 1/23/2022 | 127/128 | E Slope | 0 | 98 | MS | 1033 | 1038 | 30 | 29 | P | | PV | |
| 1/23/2022 | 127/164 | Floor | 0 | 14 | MS | 927 | 932 | 30 | 30 | P | | PV | |
| 1/23/2022 | 127/164 | Floor | 14 | 22 | MS | 926 | 931 | 30 | 30 | P | | PV | |
| 1/23/2022 | 128/129 | E Slope | 0 | 98 | MS | 1039 | 1044 | 30 | 30 | P | | PV | |
| 1/23/2022 | 128/165 | Floor | 0 | 22 | MS | 933 | 938 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/23/2022 | 129/130 | E Slope | 0 | 98 | MS | 1040 | 1045 | 30 | 30 | P | | PV | |
| 1/23/2022 | 129/166 | Floor | 0 | 22 | MS | 934 | 939 | 30 | 30 | P | | PV | |
| 1/18/2022 | 13/107 | Floor | 0 | 20 | MS | 1535 | 1540 | 30 | 29 | P | | PV | |
| 1/11/2022 | 13/14 | S Slope | 91 | 0 | MS | 1609 | 1614 | 30 | 30 | P | | PV | |
| 1/23/2022 | 130/131 | E Slope | 0 | 98 | MS | 1046 | 1051 | 30 | 30 | P | | PV | |
| 1/23/2022 | 130/167 | Floor | 0 | 22 | MS | 940 | 945 | 30 | 30 | P | | PV | |
| 1/23/2022 | 131/132 | E Slope | 0 | 47 | MS | 1054 | 1059 | 30 | 30 | P | | PV | |
| 1/23/2022 | 131/132 | E Slope | 47 | 93 | MS | 1050 | 1055 | 30 | 30 | P | | PV | |
| 1/23/2022 | 131/168 | Floor | 0 | 22 | MS | 942 | 947 | 30 | 30 | P | | PV | |
| 1/23/2022 | 132/133 | E Slope | 0 | 92 | MS | 1100 | 1105 | 30 | 30 | P | | PV | |
| 1/23/2022 | 132/169 | Floor | 0 | 21 | MS | 947 | 952 | 30 | 30 | P | | PV | |
| 1/23/2022 | 133/134 | E Slope | 0 | 92 | MS | 1102 | 1107 | 30 | 30 | P | | PV | |
| 1/23/2022 | 133/170 | Floor | 0 | 21 | MS | 953 | 958 | 30 | 29 | P | | PV | |
| 1/23/2022 | 134/135 | E Slope | 0 | 92 | MS | 1600 | 1605 | 30 | 30 | P | | PV | |
| 1/23/2022 | 134/171 | Floor | 0 | 21 | MS | 1000 | 1005 | 30 | 30 | P | | PV | |
| 1/23/2022 | 135/136 | E Slope | 0 | 93 | MS | 1602 | 1607 | 30 | 30 | P | | PV | |
| 1/23/2022 | 135/172 | Floor | 0 | 21 | MS | 1522 | 1527 | 30 | 30 | P | | PV | |
| 1/23/2022 | 136/137 | E Slope | 0 | 93 | MS | 1607 | 1612 | 30 | 30 | P | | PV | |
| 1/23/2022 | 136/173 | Floor | 0 | 20 | MS | 1524 | 1529 | 30 | 30 | P | | PV | |
| 1/23/2022 | 137/138 | E Slope | 0 | 93 | MS | 1610 | 1615 | 30 | 30 | P | | PV | |
| 1/23/2022 | 137/174 | Floor | 0 | 20 | MS | 1530 | 1535 | 30 | 30 | P | | PV | |
| 1/23/2022 | 138/139 | E Slope | 0 | 93 | MS | 1612 | 1617 | 30 | 30 | P | | PV | |
| 1/23/2022 | 138/175 | Floor | 0 | 22 | MS | 1737 | 1742 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/23/2022 | 139/140 | E Slope | 0 | 93 | MS | 1616 | 1621 | 30 | 30 | P | | PV | |
| 1/23/2022 | 139/176 | Floor | 21 | 43 | MS | 1543 | 1548 | 30 | 30 | P | | PV | |
| 1/18/2022 | 14/106 | Floor | 0 | 20 | MS | 1526 | 1531 | 30 | 30 | P | | PV | |
| 1/11/2022 | 14/15 | S Slope | 90 | 0 | MS | 1613 | 1618 | 30 | 30 | P | | PV | |
| 1/23/2022 | 140/141 | E Corner | 0 | 93 | MS | 1620 | 1625 | 30 | 30 | P | | PV | |
| 1/23/2022 | 140/177 | Floor | 0 | 21 | MS | 1542 | 1547 | 30 | 30 | P | | PV | |
| 1/25/2022 | 141/142 | E Corner | 0 | 68 | MS | 826 | 831 | 30 | 29 | P | | PV | |
| 1/23/2022 | 141/146 | E Corner | 64 | 67 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/25/2022 | 141/147 | E Corner | 67 | 95 | MS | 825 | 830 | 30 | 29 | P | | PV | |
| 1/25/2022 | 142/143 | E Corner | 0 | 40 | MS | 0838 | 843 | 30 | 30 | P | | PV | |
| 1/23/2022 | 142/145 | E Corner | 31 | 33 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/25/2022 | 142/146 | E Corner | 33 | 64 | MS | 0834 | 839 | 30 | 29 | P | | PV | |
| 1/25/2022 | 143/144 | E Corner | 0 | 3 | MS | 0846 | 851 | 30 | 29 | P | | PV | |
| 1/25/2022 | 143/145 | E Corner | 3 | 31 | MS | 0839 | 844 | 30 | 30 | P | | PV | |
| 1/25/2022 | 144/145 | E Corner | 0 | 5 | MS | 0845 | 850 | 30 | 30 | P | | PV | |
| 1/25/2022 | 145/146 | E Corner | 0 | 37 | MS | 832 | 837 | 30 | 28 | P | | PV | |
| 1/25/2022 | 146/147 | E Corner | 0 | 69 | MS | 824 | 829 | 30 | 30 | P | | PV | |
| 1/23/2022 | 147/148 | E Corner | 0 | 87 | MS | 1621 | 1626 | 30 | 30 | P | | PV | |
| 1/23/2022 | 148/149 | E Slope | 0 | 90 | MS | 1552 | 1557 | 30 | 30 | P | | PV | |
| 1/23/2022 | 148/183 | Floor | 0 | 22 | MS | 1624 | 1629 | 30 | 29 | P | | PV | |
| 1/23/2022 | 149/150 | E Peninsula Corner | 0 | 90 | MS | 1638 | 1643 | 30 | 30 | P | | PV | |
| 1/23/2022 | 149/182 | Floor | 0 | 22 | MS | 1631 | 1636 | 30 | 30 | P | | PV | |
| 1/18/2022 | 15/104 | Floor | 0 | 19 | MS | 1520 | 1525 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/18/2022 | 15/106 | Floor | 19 | 22 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/11/2022 | 15/16 | S Slope | 92 | 0 | MS | 1615 | 1620 | 30 | 30 | P | | PV | |
| 1/23/2022 | 150/151 | E Peninsula Corner | 0 | 67 | MS | 1642 | 1647 | 30 | 30 | P | | PV | |
| 1/23/2022 | 150/178 | E Peninsula Corner | 88 | 117 | MS | 1646 | 1651 | 30 | 30 | P | | PV | |
| 1/25/2022 | 151/152 | E Peninsula Corner | 0 | 41 | MS | 805 | 810 | 30 | 29 | P | | PV | |
| 1/25/2022 | 151/179 | E Peninsula Corner | 53 | 88 | MS | 758 | 803 | 30 | 30 | P | | PV | |
| 1/25/2022 | 152/153 | E Peninsula Corner | 0 | 21 | MS | 812 | 817 | 30 | 30 | P | | PV | |
| 1/25/2022 | 152/180 | E Peninsula Corner | 20 | 53 | MS | 808 | 813 | 30 | 30 | P | | PV | |
| 1/25/2022 | 153/181 | E Peninsula Corner | 0 | 20 | MS | 818 | 823 | 30 | 29 | P | | PV | |
| 1/23/2022 | 154/155 | N Peninsula | 50 | 92 | MS | 1414 | 1419 | 30 | 29 | P | | PV | |
| 1/23/2022 | 154/156 | N Peninsula | 0 | 44 | MS | 1406 | 1411 | 30 | 29 | P | | PV | |
| 1/23/2022 | 155/156 | N Peninsula | 50 | 92 | MS | 1410 | 1415 | 30 | 28 | P | | PV | |
| 1/23/2022 | 156/157 | N Peninsula | 0 | 93 | MS | 1358 | 1403 | 30 | 29 | P | | PV | |
| 1/23/2022 | 157/158 | N Peninsula | 0 | 98 | MS | 1345 | 1350 | 30 | 30 | P | | PV | |
| 1/23/2022 | 158/159 | N Peninsula | 0 | 98 | MS | 1333 | 1338 | 30 | 29 | P | | PV | |
| 1/23/2022 | 158/164 | Floor | 0 | 8 | MS | 1334 | 1339 | 30 | 30 | P | | PV | |
| 1/23/2022 | 159/160 | N Peninsula | 0 | 97 | MS | 1325 | 1330 | 30 | 30 | P | | PV | |
| 1/23/2022 | 159/164 | Floor | 0 | 20 | MS | 1327 | 1332 | 30 | 30 | P | | PV | |
| 1/18/2022 | 16/102 | Floor | 0 | 18 | MS | 1514 | 1519 | 30 | 29 | P | | PV | |
| 1/18/2022 | 16/104 | Floor | 18 | 22 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/12/2022 | 16/17 | S Slope | 94 | 0 | MS | 749 | 754 | 30 | 30 | P | | PV | |
| 1/23/2022 | 160/161 | Floor | 0 | 93 | MS | 1155 | 1200 | 30 | 30 | P | | PV | |
| 1/23/2022 | 160/165 | Floor | 0 | 20 | MS | 1201 | 1206 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ | | | |
| | | | Beginning | End | | Begin | End | Begin | End | Fail | | | |
| 1/23/2022 | 161/162 | N Peninsula | 0 | 92 | MS | 1132 | 1137 | 30 | 30 | P | | PV | |
| 1/23/2022 | 161/165 | Floor | 15 | 20 | MS | 1154 | 1159 | 30 | 30 | P | | PV | |
| 1/23/2022 | 161/166 | Floor | 0 | 15 | MS | 1151 | 1156 | 30 | 30 | P | | PV | |
| 1/23/2022 | 162/163 | N Peninsula | 64 | 93 | MS | 1130 | 1135 | 30 | 30 | P | | PV | |
| 1/23/2022 | 162/166 | Floor | 12 | 21 | MS | 1145 | 1150 | 30 | 30 | P | | PV | |
| 1/23/2022 | 162/167 | Floor | 0 | 12 | MS | 1139 | 1144 | 30 | 30 | P | | PV | |
| 1/23/2022 | 162/168 | N Peninsula | 0 | 67 | MS | 1125 | 1130 | 30 | 30 | P | | PV | |
| 1/23/2022 | 163/167 | Floor | 0 | 97 | MS | 1136 | 1141 | 30 | 30 | P | | PV | |
| 1/23/2022 | 163/168 | N Peninsula | 67 | 97 | MS | 1123 | 1128 | 30 | 30 | P | | PV | |
| 1/23/2022 | 164/165 | Floor | 95 | 158 | MS | 1202 | 1207 | 30 | 30 | P | | PV | |
| 1/23/2022 | 165/166 | Floor | 95 | 144 | MS | 1147 | 1152 | 30 | 30 | P | | PV | |
| 1/23/2022 | 166/167 | Floor | 95 | 134 | MS | 1141 | 1146 | 30 | 30 | P | | PV | |
| 1/23/2022 | 167/168 | Floor | 95 | 134 | MS | 1116 | 1121 | 30 | 30 | P | | PV | |
| 1/23/2022 | 168/169 | E Peninsula | 0 | 127 | MS | 1112 | 1117 | 30 | 30 | P | | PV | |
| 1/23/2022 | 169/170 | E Peninsula | 0 | 131 | MS | 1119 | 1124 | 30 | 30 | P | | PV | |
| 1/18/2022 | 17/100 | Floor | 19 | 22 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/18/2022 | 17/102 | Floor | 2 | 6 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/12/2022 | 17/18 | S Slope | 44 | 0 | MS | 757 | 802 | 30 | 30 | P | | DR | |
| 1/12/2022 | 17/19 | S Slope | 40 | 89 | MS | 755 | 800 | 30 | 30 | P | | PV | |
| 1/23/2022 | 170/171 | E Peninsula | 0 | 130 | MS | 1106 | 1111 | 30 | 30 | P | | PV | |
| 1/23/2022 | 171/172 | E Peninsula | 0 | 131 | MS | 1518 | 1523 | 30 | 30 | P | | PV | |
| 1/23/2022 | 172/173 | E Peninsula | 0 | 131 | MS | 1521 | 1526 | 30 | 30 | P | | PV | |
| 1/23/2022 | 173/174 | E Peninsula | 0 | 130 | MS | 1528 | 1533 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/23/2022 | 174/175 | E Peninsula | 0 | 131 | MS | 1429 | 1434 | 30 | 30 | P | | PV | |
| 1/23/2022 | 175/176 | E Peninsula | 0 | 135 | MS | 1535 | 1540 | 30 | 30 | P | | PV | |
| 1/23/2022 | 176/177 | E Peninsula | 0 | 135 | MS | 1539 | 1544 | 30 | 30 | P | | PV | |
| 1/23/2022 | 177/178 | Pen Slope | 0 | 95 | MS | 1651 | 1656 | 30 | 30 | P | | PV | |
| 1/23/2022 | 177/182 | Floor | 0 | 22 | MS | 1627 | 1632 | 30 | 30 | P | | PV | |
| 1/23/2022 | 177/183 | Floor | 0 | 22 | MS | 1625 | 1630 | 30 | 28 | P | | PV | |
| 1/23/2022 | 178/179 | E Peninsula | 0 | 70 | MS | 1653 | 1658 | 30 | 30 | P | | PV | |
| 1/25/2022 | 179/180 | E Peninsula Corner | 0 | 50 | MS | 0800 | 805 | 30 | 30 | P | | PV | |
| 1/12/2022 | 18/19 | S Slope | 0 | 20 | MS | 805 | 810 | 30 | 30 | P | | DR | |
| 1/12/2022 | 18/19 | S Slope | 20 | 40 | MS | 803 | 808 | 30 | 30 | P | | DR | |
| 1/25/2022 | 180/181 | E Peninsula Corner | 0 | 20 | MS | 814 | 819 | 30 | 30 | P | | PV | |
| 1/18/2022 | 19/100 | Floor | 0 | 19 | MS | 1508 | 1513 | 30 | 28 | P | | PV | |
| 1/12/2022 | 19/20 | S Slope | 89 | 0 | MS | 811 | 816 | 30 | 30 | P | | PV | |
| 1/18/2022 | 19/98 | Floor | 18 | 21 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/19/2022 | 2/113 | Floor | 0 | 6 | MS | 1118 | 1123 | 30 | 30 | P | | PV | |
| 1/19/2022 | 2/113 | Floor | 6 | 11 | MS | 1125 | 1130 | 30 | 28 | P | | PV | |
| 1/19/2022 | 2/113 | Floor | 11 | 18 | MS | 1127 | 1132 | 30 | 28 | P | | PV | |
| 1/12/2022 | 20/21 | S Slope | 90 | 0 | MS | 817 | 822 | 30 | 30 | P | | PV | |
| 1/18/2022 | 20/98 | Floor | 0 | 18 | MS | 1310 | 1315 | 30 | 30 | P | | PV | |
| 1/12/2022 | 21/22 | S Slope | 91 | 0 | MS | 823 | 828 | 30 | 30 | P | | PV | |
| 1/18/2022 | 21/97 | Floor | 3 | 21 | MS | 1455 | 1500 | 30 | 30 | P | | PV | |
| 1/12/2022 | 22/23 | S Slope | 38 | 0 | MS | 834 | 839 | 30 | 30 | P | | DR | |
| 1/12/2022 | 22/24 | S Slope | 83 | 37 | MS | 825 | 830 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/18/2022 | 22/96 | Floor | 14 | 21 | MS | 1448 | 1453 | 30 | 29 | P | | PV | |
| 1/18/2022 | 22/97 | Floor | 0 | 3 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/12/2022 | 23/24 | S Slope | 37 | 0 | MS | 836 | 841 | 30 | 30 | P | | DR | |
| 1/12/2022 | 24/25 | S Slope | 87 | 0 | MS | 842 | 847 | 30 | 29 | P | | PV | |
| 1/18/2022 | 24/94 | Floor | 14 | 21 | MS | 1430 | 1435 | 30 | 30 | P | | PV | |
| 1/18/2022 | 24/96 | Floor | 0 | 14 | MS | 1442 | 1447 | 30 | 30 | P | | PV | |
| 1/12/2022 | 25/26 | S Slope | 86 | 0 | MS | 845 | 850 | 30 | 30 | P | | PV | |
| 1/18/2022 | 25/92 | Floor | 0 | 7 | MS | 1417 | 1422 | 30 | 29 | P | | PV | |
| 1/18/2022 | 25/94 | Floor | 7 | 14 | MS | 1426 | 1431 | 30 | 28 | P | | PV | |
| 1/12/2022 | 26/27 | S Slope | 86 | 0 | MS | 849 | 854 | 30 | 30 | P | | PV | |
| 1/27/2022 | 26/91 | Floor | 0 | 7 | MS | 0915 | 920 | 30 | 30 | P | | PV | |
| 1/18/2022 | 26/92 | Floor | 7 | 20 | MS | 1414 | 1419 | 30 | 30 | P | | PV | |
| 1/12/2022 | 27/28 | S Slope | 86 | 0 | MS | 853 | 858 | 30 | 29 | P | | PV | |
| 1/27/2022 | 27/90 | Floor | 0 | 7 | MS | 0918 | 923 | 30 | 30 | P | | PV | |
| 1/27/2022 | 27/91 | Floor | 7 | 20 | MS | 0916 | 921 | 30 | 30 | P | | PV | |
| 1/12/2022 | 28/29 | S Slope | 85 | 0 | MS | 858 | 903 | 30 | 29 | P | | PV | |
| 1/27/2022 | 28/89 | Floor | 0 | 7 | MS | 0922 | 927 | 30 | 30 | P | | PV | |
| 1/27/2022 | 28/90 | Floor | 7 | 20 | MS | 0920 | 925 | 30 | 30 | P | | PV | |
| 1/12/2022 | 29/30 | S Slope | 84 | 0 | MS | 901 | 906 | 30 | 29 | P | | PV | |
| 1/27/2022 | 29/88 | Floor | 0 | 7 | MS | 0927 | 932 | 30 | 30 | P | | PV | |
| 1/27/2022 | 29/89 | Floor | 7 | 20 | MS | 0924 | 929 | 30 | 30 | P | | PV | |
| 1/19/2022 | 3/113 | Floor | 0 | 22 | MS | 1114 | 1119 | 30 | 29 | P | | PV | |
| 1/12/2022 | 30/31 | S Slope | 85 | 0 | MS | 905 | 910 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ | | | |
| | | | Beginning | End | | Begin | End | Begin | End | Fail | | | |
| 1/15/2022 | 30/82 | Floor | 0 | 8 | MS | 1528 | 1533 | 30 | 30 | P | | PV | |
| 1/23/2022 | 30/88 | Floor | 7 | 20 | MS | 1723 | 1728 | 30 | 30 | P | | PV | |
| 1/12/2022 | 31/32 | S Slope | 88 | 0 | MS | 907 | 912 | 30 | 30 | P | | PV | |
| 1/15/2022 | 31/80 | Floor | 0 | 7 | MS | 1517 | 1522 | 30 | 30 | P | | PV | |
| 1/15/2022 | 31/82 | Floor | 7 | 22 | MS | 1523 | 1528 | 30 | 30 | P | | PV | |
| 1/12/2022 | 32/33 | W Corner | 43 | 0 | MS | 915 | 920 | 30 | 30 | P | | DR | |
| 1/12/2022 | 32/34 | Slope | 88 | 40 | MS | 912 | 917 | 30 | 30 | P | | PV | |
| 1/15/2022 | 32/80 | Floor | 0 | 5 | MS | 1514 | 1519 | 30 | 30 | P | | PV | |
| 1/12/2022 | 33/34 | W Corner | 40 | 0 | MS | 919 | 924 | 30 | 30 | P | | DR | |
| 1/12/2022 | 34/35 | W Corner | 88 | 0 | MS | 926 | 931 | 30 | 30 | P | | PV | |
| 1/15/2022 | 34/79 | Floor | 0 | 11 | MS | 1500 | 1505 | 30 | 30 | P | | PV | |
| 1/15/2022 | 34/80 | Floor | 11 | 21 | MS | 1508 | 1513 | 30 | 30 | P | | PV | |
| 1/12/2022 | 35/36 | W Corner | 89 | 0 | MS | 929 | 934 | 30 | 30 | P | | PV | |
| 1/15/2022 | 35/78 | Floor | 0 | 10 | MS | 1454 | 1459 | 30 | 30 | P | | PV | |
| 1/15/2022 | 35/79 | Floor | 10 | 21 | MS | 1457 | 1502 | 30 | 30 | P | | PV | |
| 1/12/2022 | 36/37 | W Corner | 42 | 0 | MS | 940 | 945 | 30 | 30 | P | | PV | |
| 1/12/2022 | 36/38 | W Corner | 87 | 40 | MS | 933 | 938 | 30 | 30 | P | | PV | |
| 1/15/2022 | 36/78 | Floor | 0 | 6 | MS | 1447 | 1452 | 30 | 30 | P | | PV | |
| 1/12/2022 | 37/38 | W Corner | 40 | 0 | MS | 942 | 947 | 30 | 30 | P | | DR | |
| 1/12/2022 | 38/39 | W Corner | 90 | 0 | MS | 953 | 958 | 30 | 30 | P | | PV | |
| 1/15/2022 | 38/77 | Floor | 0 | 12 | MS | 1410 | 1415 | 30 | 30 | P | | PV | |
| 1/15/2022 | 38/78 | Floor | 12 | 22 | MS | 1442 | 1447 | 30 | 30 | P | | PV | |
| 1/12/2022 | 39/40 | W Corner | 92 | 0 | MS | 956 | 1001 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ | | | |
| | | | Beginning | End | | Begin | End | Begin | End | Fail | | | |
| 1/15/2022 | 39/72 | Floor | 3 | 7 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/15/2022 | 39/77 | Floor | 7 | 21 | MS | 1403 | 1408 | 30 | 30 | P | | PV | |
| 1/19/2022 | 4/113 | Floor | 0 | 6 | MS | 1104 | 5 | 30 | 30 | P | | PV | |
| 1/12/2022 | 40/41 | W Corner | 44 | 0 | MS | 1004 | 1009 | 30 | 30 | P | | PV | |
| 1/12/2022 | 40/42 | W Corner | 42 | 88 | MS | 1001 | 1006 | 30 | 30 | P | | PV | |
| 1/15/2022 | 40/72 | Floor | 421 | 431 | MS | 1349 | 1354 | 30 | 30 | P | | PV | |
| 1/12/2022 | 41/42 | W Corner | 42 | 0 | MS | 1011 | 1016 | 30 | 30 | P | | PV | |
| 1/15/2022 | 42/43 | W Corner | 92 | 0 | MS | 751 | 756 | 30 | 30 | P | | PV | |
| 1/15/2022 | 42/71 | Floor | 400 | 415 | MS | 1010 | 1015 | 30 | 30 | P | | PV | |
| 1/15/2022 | 42/72 | Floor | 415 | 421 | MS | 1347 | 1352 | 30 | 30 | P | | PV | |
| 1/15/2022 | 43/44 | W Corner | 92 | 0 | MS | 753 | 758 | 30 | 30 | P | | PV | |
| 1/15/2022 | 43/70 | Floor | 378 | 396 | MS | 1012 | 1017 | 30 | 30 | P | | PV | |
| 1/15/2022 | 43/71 | Floor | 396 | 400 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/15/2022 | 44/45 | W Corner | 45 | 0 | MS | 806 | 811 | 30 | 29 | P | | PV | |
| 1/15/2022 | 44/46 | W Corner | 43 | 89 | MS | 759 | 804 | 30 | 30 | P | | PV | |
| 1/15/2022 | 44/70 | Floor | 370 | 378 | MS | 1017 | 1022 | 30 | 30 | P | | PV | |
| 1/15/2022 | 45/46 | W Corner | 43 | 0 | MS | 804 | 809 | 30 | 28 | P | | PV | |
| 1/15/2022 | 46/47 | N Slope | 89 | 0 | MS | 810 | 815 | 30 | 30 | P | | PV | |
| 1/15/2022 | 46/70 | Floor | 370 | 348 | MS | 1032 | 1037 | 30 | 30 | P | | PV | |
| 1/15/2022 | 47/48 | N Slope | 50 | 0 | MS | 742 | 747 | 30 | 30 | P | | PV | |
| 1/15/2022 | 47/48 | N Slope | 50 | 91 | MS | 744 | 749 | 30 | 30 | P | | PV | |
| 1/15/2022 | 47/70 | Floor | 348 | 326 | MS | 1034 | 1039 | 30 | 30 | P | | PV | |
| 1/15/2022 | 48/49 | N Slope | 89 | 0 | MS | 813 | 818 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/15/2022 | 48/70 | Floor | 326 | 310 | MS | 1037 | 1042 | 30 | 29 | P | | PV | |
| 1/15/2022 | 49/50 | N Slope | 87 | 0 | MS | 817 | 822 | 30 | 30 | P | | PV | |
| 1/15/2022 | 49/70 | Floor | 291 | 288 | MS | 1043 | 1048 | 30 | 30 | P | | PV | |
| 1/15/2022 | 49/70 | Floor | 293 | 291 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/15/2022 | 49/70 | Floor | 310 | 293 | MS | 1039 | 1044 | 30 | 30 | P | | PV | |
| 1/15/2022 | 50/51 | N Slope | 87 | 0 | MS | 819 | 824 | 30 | 30 | P | | PV | |
| 1/15/2022 | 50/70 | Floor | 288 | 266 | MS | 1045 | 1050 | 30 | 30 | P | | PV | |
| 1/15/2022 | 51/52 | N Slope | 90 | 0 | MS | 824 | 829 | 30 | 30 | P | | PV | |
| 1/15/2022 | 51/70 | Floor | 266 | 243 | MS | 1050 | 1055 | 30 | 30 | P | | PV | |
| 1/15/2022 | 52/53 | N Slope | 90 | 0 | MS | 826 | 831 | 30 | 30 | P | | PV | |
| 1/15/2022 | 52/70 | Floor | 243 | 221 | MS | 1052 | 1057 | 30 | 30 | P | | PV | |
| 1/15/2022 | 53/54 | N Slope | 90 | 0 | MS | 832 | 837 | 30 | 30 | P | | PV | |
| 1/15/2022 | 53/70 | Floor | 221 | 199 | MS | 1105 | 1110 | 30 | 30 | P | | PV | |
| 1/15/2022 | 54/55 | N Slope | 90 | 0 | MS | 834 | 839 | 30 | 29 | P | | PV | |
| 1/15/2022 | 54/70 | Floor | 199 | 176 | MS | 1107 | 1112 | 30 | 30 | P | | PV | |
| 1/15/2022 | 55/56 | N Slope | 90 | 0 | MS | 839 | 844 | 30 | 30 | P | | PV | |
| 1/15/2022 | 55/70 | Floor | 176 | 153 | MS | 1112 | 1117 | 30 | 30 | P | | PV | |
| 1/15/2022 | 56/57 | N Slope | 90 | 0 | MS | 842 | 847 | 30 | 30 | P | | PV | |
| 1/15/2022 | 56/70 | Floor | 153 | 131 | MS | 1114 | 1119 | 30 | 30 | P | | PV | |
| 1/15/2022 | 57/58 | N Slope | 90 | 0 | MS | 846 | 851 | 30 | 30 | P | | PV | |
| 1/15/2022 | 57/70 | Floor | 131 | 109 | MS | 1121 | 1126 | 30 | 30 | P | | PV | |
| 1/15/2022 | 58/59 | N Slope | 90 | 0 | MS | 849 | 854 | 30 | 29 | P | | PV | |
| 1/15/2022 | 58/70 | Floor | 109 | 86 | MS | 1123 | 1128 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/15/2022 | 59/60 | N Slope | 89 | 0 | MS | 853 | 858 | 30 | 30 | P | | PV | |
| 1/15/2022 | 59/70 | Floor | 86 | 64 | MS | 1130 | 1135 | 30 | 30 | P | | PV | |
| 1/19/2022 | 6/112 | Floor | 0 | 10 | MS | 1058 | 1103 | 30 | 30 | P | | PV | |
| 1/19/2022 | 6/113 | Floor | 10 | 22 | MS | 1102 | 1107 | 30 | 30 | P | | PV | |
| 1/15/2022 | 60/61 | N Slope | 89 | 0 | MS | 857 | 902 | 30 | 30 | P | | PV | |
| 1/15/2022 | 60/70 | Floor | 64 | 41 | MS | 1132 | 1137 | 30 | 30 | P | | PV | |
| 1/15/2022 | 61/62 | N Slope | 89 | 0 | MS | 859 | 904 | 30 | 30 | P | | PV | |
| 1/15/2022 | 61/70 | Floor | 41 | 19 | MS | 1139 | 1144 | 30 | 30 | P | | PV | |
| 1/15/2022 | 62/63 | N Slope | 40 | 0 | MS | 906 | 911 | 30 | 30 | P | | PV | |
| 1/15/2022 | 62/64 | N Corner | 40 | 89 | MS | 945 | 950 | 30 | 30 | P | | PV | |
| 1/15/2022 | 62/70 | Floor | 19 | 11 | MS | 1141 | 1146 | 30 | 30 | P | | PV | |
| 1/15/2022 | 63/64 | N Corner | 40 | 0 | MS | 912 | 917 | 30 | 30 | P | | PV | |
| 1/15/2022 | 64/65 | N Corner | 40 | 0 | MS | 919 | 924 | 30 | 30 | P | | PV | |
| 1/15/2022 | 64/66 | N Corner | 40 | 89 | MS | 913 | 918 | 30 | 30 | P | | PV | |
| 1/15/2022 | 64/70 | Floor | 7 | 11 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/15/2022 | 65/66 | N Corner | 40 | 0 | MS | 920 | 925 | 30 | 30 | P | | PV | |
| 1/15/2022 | 66/67 | N Corner | 42 | 0 | MS | 927 | 932 | 30 | 30 | P | | PV | |
| 1/15/2022 | 66/69 | N Corner | 42 | 83 | MS | 926 | 931 | 30 | 30 | P | | PV | |
| 1/15/2022 | 66/70 | Floor | 7 | 0 | MS | 1147 | 1152 | 30 | 30 | P | | PV | |
| 1/15/2022 | 67/68 | N Corner | 42 | 0 | MS | 933 | 938 | 30 | 30 | P | | PV | |
| 1/15/2022 | 68/69 | N Corner | 48 | 0 | MS | 934 | 939 | 30 | 30 | P | | PV | |
| 1/15/2022 | 69/70 | N Corner | 91 | 0 | MS | 942 | 947 | 30 | 30 | P | | PV | |
| 1/19/2022 | 7/112 | Floor | 0 | 22 | MS | 1056 | 1101 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ | | | |
| | | | Beginning | End | | Begin | End | Begin | End | Fail | | | |
| 1/15/2022 | 70/71 | E Slope/ Floor | 475 | 0 | MS | 1023 | 1028 | 30 | 30 | P | | PV | |
| 1/15/2022 | 71/72 | Floor | 0 | 11 | MS | 1340 | 1345 | 30 | 30 | P | | PV | |
| 1/15/2022 | 71/73 | E Slope/ Floor | 489 | 0 | MS | 1025 | 1030 | 30 | 30 | P | | PV | |
| 1/15/2022 | 72/73 | Floor | 489 | 502 | MS | 1338 | 1343 | 30 | 30 | P | | PV | |
| 1/15/2022 | 73/74 | E Slope/ Floor | 503 | 0 | MS | 1417 | 1422 | 30 | 28 | P | | PV | |
| 1/15/2022 | 73/77 | Floor | 0 | 20 | MS | 1359 | 1404 | 30 | 30 | P | | PV | |
| 1/15/2022 | 74/75 | Floor/Slope | 500 | 0 | MS | 1422 | 1427 | 30 | 30 | P | | PV | |
| 1/15/2022 | 74/78 | Floor | 0 | 22 | MS | 1415 | 1420 | 30 | 30 | P | | PV | |
| 1/15/2022 | 75/76 | E Slope/ Floor | 500 | 0 | MS | 1424 | 1429 | 30 | 30 | P | | PV | |
| 1/15/2022 | 75/79 | Floor | 0 | 22 | MS | 1431 | 1436 | 30 | 30 | P | | PV | |
| 1/15/2022 | 76/80 | Floor | 0 | 22 | MS | 1437 | 1442 | 30 | 30 | P | | PV | |
| 1/15/2022 | 76/81 | E Slope/ Floor | 500 | 0 | MS | 1430 | 1435 | 30 | 30 | P | | PV | |
| 1/15/2022 | 77/78 | Floor | 506 | 523 | MS | 1406 | 1411 | 30 | 30 | P | | PV | |
| 1/15/2022 | 78/79 | Floor | 503 | 539 | MS | 1449 | 1454 | 30 | 30 | P | | PV | |
| 1/15/2022 | 79/80 | Floor | 500 | 555 | MS | 1506 | 1511 | 30 | 30 | P | | PV | |
| 1/19/2022 | 8/110 | Floor | 0 | 13 | MS | 1050 | 1055 | 30 | 29 | P | | PV | |
| 1/19/2022 | 8/112 | Floor | 13 | 21 | MS | 1052 | 1057 | 30 | 30 | P | | PV | |
| 1/15/2022 | 80/82 | Floor | 500 | 557 | MS | 1521 | 1526 | 30 | 30 | P | | PV | |
| 1/15/2022 | 81/82 | Floor | 0 | 22 | MS | 1438 | 1443 | 30 | 29 | P | | PV | |
| 1/18/2022 | 81/83 | E Slope/ Floor | 0 | 500 | MS | 1346 | 1351 | 30 | 30 | P | | PV | |
| 1/27/2022 | 82/88 | Floor | 501 | 557 | MT | 0912 | 917 | 30 | 30 | P | | DR | |
| 1/18/2022 | 83/84 | E Slope/ Floor | 0 | 502 | MS | 1353 | 1358 | 30 | 30 | P | | PV | |
| 1/18/2022 | 83/88 | Floor | 0 | 20 | MS | 1347 | 1352 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/18/2022 | 84/85 | E Slope/ Floor | 0 | 500 | MS | 1400 | 1405 | 30 | 30 | P | | PV | |
| 1/18/2022 | 84/89 | Floor | 0 | 20 | MS | 1354 | 1359 | 30 | 30 | P | | PV | |
| 1/18/2022 | 85/86 | Floor | 93 | 511 | MS | 1410 | 1415 | 30 | 30 | P | | PV | |
| 1/18/2022 | 85/87 | Floor/Slope | 0 | 93 | MS | 1741 | 1746 | 30 | 30 | P | | PV | |
| 1/18/2022 | 85/89 | Floor | 505 | 511 | MS | 1403 | 1408 | 30 | 30 | P | | PV | |
| 1/18/2022 | 85/90 | Floor | 0 | 20 | MS | 1406 | 1411 | 30 | 30 | P | | PV | |
| 1/23/2022 | 86/156 | Floor | 0 | 6 | MS | 1400 | 1405 | 30 | 30 | P | | PV | |
| 1/23/2022 | 86/157 | Floor | 0 | 20 | MS | 1352 | 1357 | 30 | 28 | P | | PV | |
| 1/23/2022 | 86/158 | Floor | 0 | 16 | MS | 1346 | 1351 | 30 | 29 | P | | PV | |
| 1/23/2022 | 86/164 | Floor | 95 | 170 | MS | 1339 | 1344 | 30 | 29 | P | | PV | |
| 1/18/2022 | 86/87 | Floor | 0 | 22 | MS | 1733 | 1738 | 30 | 30 | P | | PV | |
| 1/18/2022 | 86/91 | Floor | 0 | 20 | MS | 1502 | 1507 | 30 | 30 | P | | PV | |
| 1/18/2022 | 86/92 | Floor | 322 | 511 | MS | 1332 | 1337 | 30 | 30 | P | | PV | |
| 1/18/2022 | 86/93 | Floor | 217 | 322 | MS | 1723 | 1728 | 30 | 30 | P | | PV | |
| 1/23/2022 | 87/127 | E Slope | 0 | 93 | MS | 1031 | 1036 | 30 | 28 | P | | PV | |
| 1/27/2022 | 88/89 | Floor | 501 | 562 | MS | 0911 | 916 | 30 | 30 | P | | DR | |
| 1/27/2022 | 89/90 | Floor | 505 | 558 | MS | 0902 | 907 | 30 | 30 | P | | DR | |
| 1/19/2022 | 9/109 | Floor | 0 | 3 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/19/2022 | 9/110 | Floor | 3 | 23 | MS | 1045 | 1050 | 30 | 28 | P | | PV | |
| 1/27/2022 | 90/91 | Floor | 505 | 557 | MT | 0850 | 855 | 30 | 30 | P | | DR | |
| 1/18/2022 | 91/92 | Floor | 511 | 557 | MS | 1330 | 1335 | 30 | 30 | P | | PV | |
| 1/18/2022 | 92/93 | Floor | 0 | 20 | MS | 1729 | 1734 | 30 | 30 | P | | PV | |
| 1/18/2022 | 92/94 | Floor | 322 | 547 | MS | 1424 | 1429 | 30 | 30 | P | | PV | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Nondestructive Seam Testing Log**

Note: This log is sorted by seam ID.

| Date | Seam ID | Seam Location | Stationing | | Test Crew | Air Testing | | | | | Vacuum Test | CQA Tech. | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time | | Pressure | | Pass/ Fail | | | |
| | | | Beginning | End | | Begin | End | Begin | End | | | | |
| 1/23/2022 | 93/126 | Floor | 0 | 6 | MS | 1459 | 1464 | 30 | 30 | P | | PV | |
| 1/23/2022 | 93/154 | Floor | 0 | 22 | MS | 1420 | 1425 | 30 | 30 | P | | PV | |
| 1/23/2022 | 93/155 | Floor | 0 | 18 | MS | 1416 | 1421 | 30 | 30 | P | | PV | |
| 1/23/2022 | 93/156 | Floor | 6 | 21 | MS | 1404 | 1409 | 30 | 30 | P | | PV | |
| 1/18/2022 | 93/94 | Floor | 276 | 322 | MS | 1722 | 1727 | 30 | 30 | P | | PV | |
| 1/23/2022 | 94/125 | Floor | 0 | 16 | MS | 1447 | 1452 | 30 | 30 | P | | PV | |
| 1/23/2022 | 94/126 | Floor | 16 | 6 | MS | 1440 | 1445 | 30 | 30 | P | | PV | |
| 1/18/2022 | 94/95 | Floor | 276 | 397 | MS | 1712 | 1717 | 30 | 30 | P | | PV | |
| 1/18/2022 | 94/96 | Floor | 397 | 532 | MS | 1439 | 1444 | 30 | 30 | P | | PV | |
| 1/23/2022 | 95/124 | Floor | 0 | 19 | MS | 1509 | 1514 | 30 | 30 | P | | PV | |
| 1/23/2022 | 95/125 | Floor | 19 | 22 | - | - | - | - | - | - | - | PV | See Repair Log |
| 1/18/2022 | 95/96 | Floor | 0 | 20 | MS | 1710 | 1715 | 30 | 30 | P | | PV | |
| 1/18/2022 | 95/97 | Floor | 0 | 127 | MS | 1709 | 1714 | 30 | 30 | P | | PV | |
| 1/18/2022 | 96/97 | Floor | 127 | 257 | MS | 1450 | 1455 | 30 | 30 | P | | PV | |
| 1/23/2022 | 97/123 | Floor | 0 | 22 | MS | 1511 | 1516 | 30 | 30 | P | | PV | |
| 1/18/2022 | 97/98 | Floor | 0 | 257 | MS | 1454 | 1459 | 30 | 30 | P | | PV | |
| 1/18/2022 | 98/100 | Floor | 171 | 390 | MS | 1459 | 1504 | 30 | 30 | P | | PV | |
| 1/23/2022 | 98/123 | N Peninsula | 0 | 86 | MS | 1508 | 1513 | 30 | 30 | P | | PV | |
| 1/18/2022 | 98/99 | Floor | 0 | 171 | MS | 1702 | 1707 | 30 | 30 | P | | PV | |
| 1/18/2022 | 99/100 | Floor | 0 | 20 | MS | 1705 | 1710 | 30 | 30 | P | | PV | |
| 1/18/2022 | 99/101 | Floor | 0 | 171 | MS | 1700 | 1705 | 30 | 30 | P | | PV | |

# Destruct

**Oak Grove Steam Electric Station**
**FGD-A Pond Retrofit**
**Seam Length Data for Destruct Samples**

| Fusion Welding Machine | Total Length of Seam Welding | Destructs Required | Destructs Taken |
|---|---|---|---|
| 457 | 8,135 | 16.3 | 18 |
| 821 | 11,241 | 22.5 | 25 |
| 4483 | 1,636 | 3.3 | 4 |
| 5189 | 1,699 | 3.4 | 4 |
| | **22,711** | 45.4 | **51** |

Destructs taken at 1 per 500 lf or major fraction

| Extrusion Welding Machine | Machine Operator | Total Length of Seam Welding | Destructs Taken |
|---|---|---|---|
| 1063 | DL | Repairs only | 1 |
| 690 | DL | Repairs only | 2 |
| 1063 | FM | Repairs only | 2 |
| 690 | FM | Repairs only | 3 |
| | | | **8** |

**Oak Grove Steam Electric Station**

FGD-A Pond Retrofit

Destructive Seam Sample Log

Minimum peel value = Extrusion - 78 ppi. Fusion - 91 ppi. Minimum Shear Value = 120 ppi.

| Sample ID | Seam ID | Seam Material Type | Weld Type | Station | Seamer ID | Machine ID | Field Destruct Data | | | | Lab Pass/ Fail | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Peel ppi | Peel ppi | Shear ppi | Shear ppi | | |
| DS-1 | 1/2 | S/S | F | 80 | VT | 821 | 145/137 | 145/148 | 197 | 195 | P | |
| DS-2 | 2/3 | S/S | F | 80 | MS | 457 | 138/144 | 157/147 | 200 | 196 | P | |
| DS-3 | 11/13 | S/T | F | 82 | MS | 457 | 154/146 | 157/149 | 225 | 216 | P | |
| DS-4 | 13/14 | S/S | F | 89 | VT | 821 | 138/157 | 146/138 | 194 | 200 | P | |
| DS-5 | 25/26 | S/S | F | 78 | MS | 457 | 146/157 | 156/152 | 198 | 215 | P | |
| DS-6 | 26/27 | S/S | F | 78 | VT | 821 | 149/145 | 148/147 | 197 | 210 | P | |
| DS-7 | 36/38 | S/S | F | 45 | MS | 457 | 146/157 | 142/149 | 167 | 198 | P | |
| DS-8 | 38/39 | S/S | F | 43 | VT | 821 | 152/157 | 156/157 | 189 | 197 | P | |
| DS-9 | 47/48 | S/S | F | 83 | VT | 821 | 150/149 | 157/146 | 176 | 195 | P | |
| DS-10 | 50/51 | S/S | F | 76 | MS | 457 | 138/155 | 149/157 | 185 | 196 | P | |
| DS-11 | 57/58 | S/S | F | 85 | VT | 821 | 155/149 | 152/137 | 179 | 195 | P | |
| DS-12 | 60/61 | S/S | F | 84 | MS | 457 | 137/146 | 138/145 | 168 | 197 | P | |
| DS-13 | 61/70 | S/T | F | 22 | VT | 821 | 148/146 | 157/152 | 197 | 179 | P | |
| DS-14 | 70/71 | S/S | F | 307 | MS | 457 | 157/137 | 146/162 | 192 | 186 | P | |
| DS-15 | 67/68 | S/T | F | 40 | VT | 821 | 146/146 | 152/164 | 199 | 197 | P | |
| DS-16 | 71/73 | S/S | F | 312 | MS | 457 | 155/150 | 157/157 | 200 | 185 | P | |
| DS-17 | 73/74 | S/S | F | 413 | VT | 821 | 148/157 | 148/155 | 227 | 195 | P | |
| DS-18 | 74/75 | S/S | F | 287 | MS | 457 | 139/157 | 146/146 | 200 | 194 | P | |
| DS-19 | 75/76 | S/S | F | 367 | VT | 821 | 137/142 | 144/142 | 231 | 197 | P | |
| DS-20 | 76/81 | S/S | F | 347 | VT | 821 | 146/139 | 137/149 | 210 | 189 | P | |
| DS-21 | 80/82 | S/S | F | 546 | MS | 457 | 155/149 | 139/156 | 214 | 186 | P | |
| DS-22 | 81/83 | S/S | F | 325 | VT | 821 | 149/152 | 146/152 | 200 | 192 | P | |
| DS-23 | 83/84 | S/S | F | 346 | MS | 457 | 142/146 | 157/157 | 194 | 197 | P | |
| DS-24 | 84/85 | S/S | F | 305 | VT | 821 | 147/152 | 152/155 | 195 | 188 | P | |
| DS-25 | 85/86 | S/S | F | 302 | MS | 457 | 142/154 | 159/142 | 196 | 197 | P | |
| DS-26 | 86/91 | T/T | F | 10 | VT | 821 | 140/148 | 158/148 | 197 | 196 | P | |
| DS-27 | 92/94 | S/S | F | 351 | VT | 821 | 138/146 | 156/145 | 159 | 197 | P | |
| DS-28 | 94/96 | S/S | F | 520 | MS | 457 | 145/137 | 138/135 | 167 | 194 | P | |
| DS-29 | 98/99 | S/S | F | 49 | VT | 821 | 146/157 | 143/157 | 197 | 198 | P | |
| DS-30 | 99/101 | S/S | F | 151 | MS | 457 | 147/146 | 156/156 | 157 | 195 | P | |
| DS-31 | 101/103 | S/S | F | 88 | VT | 821 | 143/157 | 157/155 | 152 | 196 | P | |

**Oak Grove Steam Electric Station**

FGD-A Pond Retrofit

Destructive Seam Sample Log

Minimum peel value = Extrusion - 78 ppi. Fusion - 91 ppi. Minimum Shear Value = 120 ppi.

| Sample ID | Seam ID | Seam Material Type | Weld Type | Station | Seamer ID | Machine ID | Field Destruct Data | | | | Lab Pass/ Fail | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Peel ppi | Peel ppi | Shear ppi | Shear ppi | | |
| DS-32 | 104/106 | T/T | F | 295 | MS | 457 | 144/158 | 159/148 | 156 | 197 | P | |
| DS-33 | 107/109 | S/S | F | 243 | VT | 821 | 146/156 | 152/149 | 188 | 187 | P | |
| DS-34 | 110/112 | S/S | F | 195 | MS | 457 | 148/149 | 157/143 | 146 | 188 | P | |
| DS-35 | 9/110 | T/T | F | 22 | VT | 821 | 157/143 | 158/137 | 194 | 186 | P | |
| DS-36 | 115/116 | S/S | F | 29 | MS | 457 | 156/148 | 150/135 | 195 | 194 | P | |
| DS-37 | 125/126 | S/S | F | 35 | MS | 457 | 142/147 | 156/145 | 155 | 199 | P | |
| DS-38 | 87/127 | S/S | F | 51 | VT | 821 | 139/138 | 144/146 | 164 | 175 | P | |
| DS-39 | 127/128 | S/S | F | 96 | MS | 4483 | 146/137 | 138/152 | 168 | 199 | P | |
| DS-40 | 128/129 | S/S | F | 96 | FM | 5189 | 148/153 | 144/148 | 164 | 198 | P | |
| DS-41 | 140/141 | S/S | F | 58 | VT | 821 | 157/158 | 147/142 | 175 | 187 | P | |
| DS-42 | 147/148 | S/S | F | 64 | MS | 4483 | 152/146 | 142/147 | 179 | 179 | P | |
| DS-43 | 149/150 | S/S | F | 80 | FM | 5189 | 138/153 | 137/143 | 164 | 187 | P | |
| DS-44 | 155/156 | S/T | F | 80 | VT | 821 | 145/147 | 143/148 | 169 | 176 | P | |
| DS-45 | 167/168 | S/S | F | 90 | VT | 821 | 148/148 | 153/153 | 176 | 169 | P | |
| DS-46 | 168/169 | S/S | F | 66 | FM | 5189 | 153/142 | 148/152 | 159 | 187 | P | |
| DS-47 | 169/170 | S/S | F | 113 | MS | 4483 | 137/137 | 157/156 | 187 | 164 | P | |
| DS-48 | 161/166 | T/T | F | 2 | VT | 821 | 143/136 | 153/147 | 169 | 179 | P | |
| DS-49 | 176/177 | S/S | F | 104 | MS | 4483 | 147/138 | 148/148 | 164 | 176 | P | |
| DS-50 | 150/178 | S/T | F | 100 | VT | 821 | 149/140 | 147/144 | 169 | 174 | P | |
| DS-51 | 139/176 | T/T | F | 41 | FM | 5189 | 153/147 | 154/138 | 164 | 169 | P | |
| DX-1 | R9/14 | T/T | EX | 89 | DL | 1063 | 146 | 136 | 169 | 158 | P | |
| DX-2 | R29/73 | T/T | EX | 312 | FM | 690 | 139 | 153 | 175 | 169 | P | |
| DX-3 | R80/82 | T/T | EX | 546 | FM | 690 | 152 | 146 | 187 | 169 | P | |
| DX-4 | R125/101 | T/T | EX | 88 | FM | 690 | 149 | 152 | 176 | 186 | P | |
| DX-5 | R142/113 | T/T | EX | 18 | DL | 690 | 158 | 144 | 168 | 177 | P | |
| DX-6 | R177/86 | T/T | EX | 93 | FM | 1063 | 146 | 153 | 160 | 164 | P | |
| DX-7 | R226/177 | T/T | EX | 1 | DL | 690 | 157 | 149 | 187 | 187 | P | |
| DX-8 | R237/168 | T/T | EX | 66 | FM | 1063 | 149 | 148 | 176 | 175 | P | |

GAI-LAP
Initial: @VZ #:0.13
DATE: 1/14/2022

January 14, 2022

Sam Franco
***SCS Engineers***
12651 Briar Forest Dr. Suite 205
Houston, TX, 77077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the *final* laboratory report for the Seam testing of nine (9) HDPE Seam sample/s.

**PROJECT NAME: Oak Grove Steam Electric Station** DATE REPORTED: **January 14, 2022**

**REFERENCE TRI JOB NO.:** CA220014

**DATE RECEIVED:** January 14, 2022

**SAMPLE(S) SENT BY:** SCS Engineers

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI-CA CONTROL NUMBER* | *SAMPLE ID* | *TRI-CA CONTROL NUMBER* |
|---|---|---|---|
| DX-1 R9/P14 | 161089 | DS-5 P25/P26 | 161094 |
| DS-1 P1/P2 | 161090 | DS-6 P26/P27 | 161095 |
| DS-2 P2/P3 | 161091 | DS-7 P36/P38 | 161096 |
| DS-3 P11/P13 | 161092 | DS-8 P38/P39 | 161097 |
| DS-4 P13/P14 | 161093 | | |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D6392 | Shear Bond Strength |
| 2. ASTM D6392 | Peel Bond Adhesion |

**TEST RESULTS:** The test results are summarized in the attached Table(s) 1 to 5.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,

**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the **sample/s** tested **is/are** believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**6 Pages Total** *(including this sheet)*

TRI ENVIRONMENTAL
TESTING, RESEARCH, CONSULTING AND FIELD SERVICES
Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

GAI-LAP

## TABLE 1.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers** | MATERIAL: **HDPE SEAM** | QC'd By: Maria Epitia
PROJECT: **Oak Grove Steam Electric** | SEAM TYPE: **Extrusion/Fusion Weld** | TEST METHOD: ASTM D6392
DATE REC'D: **14-Jan-22** | TRI JOB #: **CA220014** | DATE REPORT: 14-Jan-22

| | | Crosshead Speed: 2 in/min | | | | Crosshead Speed: 2 in/min | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SHEAR EVALUATION | | | | PEEL EVALUATION | | | | |
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| DX-1 | 161089 | 182 | > 50% | BRK | | 1 Outside | 139 | 0 | SE3 | |
| R9/P14 | | 185 | > 50% | BRK | | 2 Outside | 140 | 0 | SE3 | |
| | | 183 | > 50% | BRK | | 3 Outside | 134 | 0 | SE3 | |
| | | 184 | > 50% | BRK | | 4 Outside | 123 | 0 | SE3 | |
| EXT | | 182 | > 50% | BRK | | 5 Outside | 112 | 0 | SE3 | |
| | | | | | | **AVG:** | **129** | | | 78 |
| | | | | | | STD. DEV. | **12** | | | |
| | | | | | | 1 Inside | N/A | | | |
| | | | | | | 2 Inside | | | | |
| | | | | | | 3 Inside | | | | |
| | | | | | | 4 Inside | | | | |
| | | | | | | 5 Inside | | | | |
| | **AVG.** | **183** | | | 120 | **AVG:** | | | | |
| | STD. DEV. | **1** | | | | STD. DEV. | | | | |
| DS- 1 | 161090 | 215 | > 50% | BRK | | 1 Outside | 164 | 0 | SE1 | |
| P1/P2 | | 219 | > 50% | BRK | | 2 Outside | 165 | 0 | SE1 | |
| | | 219 | > 50% | BRK | | 3 Outside | 165 | 0 | SE1 | |
| | | 220 | > 50% | BRK | | 4 Outside | 164 | 0 | SE1 | |
| FUS | | 217 | > 50% | BRK | | 5 Outside | 165 | 0 | SE1 | |
| | | | | | | **AVG:** | **164** | | | 91 |
| | | | | | | STD. DEV. | **1** | | | |
| | | | | | | 1 Inside | 158 | 0 | SE1 | |
| | | | | | | 2 Inside | 163 | 0 | SE1 | |
| | | | | | | 3 Inside | 162 | 0 | SE1 | |
| | | | | | | 4 Inside | 163 | 0 | SE1 | |
| | | | | | | 5 Inside | 171 | 0 | SE1 | |
| | **AVG:** | **218** | | | 120 | **AVG:** | **164** | | | 91 |
| | STD. DEV. | **2** | | | | STD. DEV. | **5** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 1)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit.

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## TABLE 2.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **14-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220014**

QC'd By: Maria Cipitia
TEST METHOD: ASTM D6392
DATE REPORT: 14-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC (lb/in width) |
| **DS- 2** | **161091** | 214 | > 50% | BRK | | 1 Outside | 174 | 0 | SE1 | |
| **P2/P3** | | 215 | > 50% | BRK | | 2 Outside | 173 | 0 | SE1 | |
| | | 213 | > 50% | BRK | | 3 Outside | 160 | 0 | SE1 | |
| | | 222 | > 50% | BRK | | 4 Outside | 144 | 0 | SE1 | |
| | | 216 | > 50% | BRK | | 5 Outside | 173 | 0 | SE1 | |
| | | | | | | **AVG:** | **165** | | | 91 |
| | | | | | | STD. DEV. | **13** | | | |
| | | | | | | 1 Inside | 156 | 0 | SE1 | |
| | | | | | | 2 Inside | 170 | 0 | SE1 | |
| | | | | | | 3 Inside | 166 | 0 | SE1 | |
| | | | | | | 4 Inside | 153 | 0 | SE1 | |
| | | | | | | 5 Inside | 174 | 0 | SE1 | |
| | **AVG.** | **216** | | | 120 | **AVG:** | **164** | | | 91 |
| | STD. DEV. | **4** | | | | STD. DEV. | **9** | | | |
| **DS- 3** | **161092** | 207 | > 50% | BRK | | 1 Outside | 159 | 0 | SE1 | |
| **P11/P13** | | 206 | > 50% | BRK | | 2 Outside | 145 | 0 | SE1 | |
| | | 205 | > 50% | BRK | | 3 Outside | 146 | 0 | SE1 | |
| | | 206 | > 50% | BRK | | 4 Outside | 149 | 0 | SE1 | |
| | | 203 | > 50% | BRK | | 5 Outside | 151 | 0 | SE1 | |
| | | | | | | **AVG:** | **150** | | | 91 |
| | | | | | | STD. DEV. | **5** | | | |
| | | | | | | 1 Inside | 161 | 0 | SE1 | |
| | | | | | | 2 Inside | 157 | 0 | SE1 | |
| | | | | | | 3 Inside | 158 | 0 | SE1 | |
| | | | | | | 4 Inside | 165 | 0 | SE1 | |
| | | | | | | 5 Inside | 151 | 0 | SE1 | |
| | **AVG:** | **206** | | | 120 | **AVG:** | **158** | | | 91 |
| | STD. DEV. | **2** | | | | STD. DEV. | **5** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 2)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit

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## TABLE 3.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **14-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220014**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 14-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC (lb/in width) |
| DS- 4 P13/P14 | 161093 | 204 | > 50% | BRK | | 1 Outside | 147 | 0 | SE1 | |
| | | 208 | > 50% | BRK | | 2 Outside | 152 | 0 | SE1 | |
| | | 205 | > 50% | BRK | | 3 Outside | 154 | 0 | SE1 | |
| | | 212 | > 50% | BRK | | 4 Outside | 154 | 0 | SE1 | |
| | | 204 | > 50% | BRK | | 5 Outside | 139 | 0 | SE1 | |
| | | | | | | **AVG:** | **149** | | | 91 |
| | | | | | | STD. DEV. | **7** | | | |
| | | | | | | 1 Inside | 152 | 0 | SE1 | |
| | | | | | | 2 Inside | 158 | 0 | SE1 | |
| | | | | | | 3 Inside | 166 | 0 | SE1 | |
| | | | | | | 4 Inside | 165 | 0 | SE1 | |
| | | | | | | 5 Inside | 153 | 0 | SE1 | |
| | **AVG.** | **207** | | | 120 | **AVG:** | **159** | | | 91 |
| | STD. DEV. | **3** | | | | STD. DEV. | **6** | | | |
| DS- 5 P25/P26 | 161094 | 190 | > 50% | BRK | | 1 Outside | 131 | 0 | SE1 | |
| | | 187 | > 50% | BRK | | 2 Outside | 133 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 3 Outside | 130 | 0 | SE1 | |
| | | 191 | > 50% | BRK | | 4 Outside | 131 | 0 | SE1 | |
| | | 193 | > 50% | BRK | | 5 Outside | 131 | 0 | SE1 | |
| | | | | | | **AVG:** | **131** | | | 91 |
| | | | | | | STD. DEV. | **1** | | | |
| | | | | | | 1 Inside | 140 | 0 | SE1 | |
| | | | | | | 2 Inside | 141 | 0 | SE1 | |
| | | | | | | 3 Inside | 140 | 0 | SE1 | |
| | | | | | | 4 Inside | 142 | 0 | SE1 | |
| | | | | | | 5 Inside | 141 | 0 | SE1 | |
| | **AVG:** | **190** | | | 120 | **AVG:** | **141** | | | 91 |
| | STD. DEV. | **2** | | | | STD. DEV. | **1** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 3)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 4.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **14-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220014**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 14-Jan-22

| | | SHEAR EVALUATION | | | | PEEL EVALUATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Crosshead Speed: 2 in/min | | | | Crosshead Speed: 2 in/min | | | | |
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 6** | **161095** | 189 | > 50% | BRK | | 1 Outside | 140 | 0 | SE1 | |
| **P26/P27** | | 189 | > 50% | BRK | | 2 Outside | 143 | 0 | SE1 | |
| | | 190 | > 50% | BRK | | 3 Outside | 138 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 4 Outside | 141 | 0 | SE1 | |
| | | 189 | > 50% | BRK | | 5 Outside | 139 | 0 | SE1 | |
| | | | | | | **AVG:** | **140** | | | 91 |
| | | | | | | STD. DEV. | **2** | | | |
| | | | | | | 1 Inside | 144 | 0 | SE1 | |
| | | | | | | 2 Inside | 155 | 0 | SE1 | |
| | | | | | | 3 Inside | 158 | 0 | SE1 | |
| | | | | | | 4 Inside | 158 | 0 | SE1 | |
| | | | | | | 5 Inside | 153 | 0 | SE1 | |
| | **AVG.** | **189** | | | 120 | **AVG:** | **153** | | | 91 |
| | STD. DEV. | **1** | | | | STD. DEV. | **6** | | | |
| **DS- 7** | **161096** | 193 | > 50% | BRK | | 1 Outside | 139 | 0 | SE1 | |
| **P36/P38** | | 199 | > 50% | BRK | | 2 Outside | 140 | 0 | SE1 | |
| | | 192 | > 50% | BRK | | 3 Outside | 133 | 0 | SE1 | |
| | | 194 | > 50% | BRK | | 4 Outside | 139 | 0 | SE1 | |
| | | 195 | > 50% | BRK | | 5 Outside | 146 | 0 | SE1 | |
| | | | | | | **AVG:** | **139** | | | 91 |
| | | | | | | STD. DEV. | **5** | | | |
| | | | | | | 1 Inside | 135 | 0 | SE1 | |
| | | | | | | 2 Inside | 134 | 0 | SE1 | |
| | | | | | | 3 Inside | 138 | 0 | SE1 | |
| | | | | | | 4 Inside | 134 | 0 | SE1 | |
| | | | | | | 5 Inside | 132 | 0 | SE1 | |
| | **AVG:** | **194** | | | 120 | **AVG:** | **134** | | | 91 |
| | STD. DEV. | **3** | | | | STD. DEV. | **2** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE |
| BRK | BREAK IN SHEETING |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE SPECIMENS DELAMINATED UNDER THE BEAD |
| AD2 | ADHESION FAILURE |
| AD-WLD | BREAK THROUGH THE FILLET |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM |
| SE2 | BREAK AT TOP EDGE OF SEAM |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 4)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit

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## TABLE 5.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **14-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220014**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 14-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 8** | **161097** | 181 | > 50% | BRK | | 1 Outside | 132 | 0 | SE1 | |
| **P38/P39** | | 177 | > 50% | BRK | | 2 Outside | 134 | 0 | SE1 | |
| | | 183 | > 50% | BRK | | 3 Outside | 136 | 0 | SE1 | |
| | | 181 | > 50% | BRK | | 4 Outside | 138 | 0 | SE1 | |
| | | 179 | > 50% | BRK | | 5 Outside | 138 | 0 | SE1 | |
| | | | | | | **AVG:** | **136** | | | 91 |
| | | | | | | STD. DEV. | **3** | | | |
| | | | | | | 1 Inside | 143 | 0 | SE1 | |
| | | | | | | 2 Inside | 155 | 0 | SE1 | |
| | | | | | | 3 Inside | 156 | 0 | SE1 | |
| | | | | | | 4 Inside | 167 | 0 | SE1 | |
| | | | | | | 5 Inside | 155 | 0 | SE1 | |
| | **AVG.** | **180** | | | 120 | **AVG:** | **155** | | | 91 |
| | STD. DEV. | **2** | | | | STD. DEV. | **8** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

(End of Table 5)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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Initial: CVZ #:0.13
DATE: 1/18/2022

January 18, 2022

Sam Franco
***SCS Engineers***
12651 Briar Forest Dr. Suite 205
Houston, TX, 77077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the *final* laboratory report for the Seam testing of fifteen (15) HDPE Seam sample/s.

**PROJECT NAME:** Oak Grove Steam Electric Station DATE REPORTED: **January 18, 2022**

**REFERENCE TRI JOB NO.:** CA220019

**DATE RECEIVED:** January 18, 2022

**SAMPLE(S) SENT BY:** SCS Engineers

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI-CA CONTROL NUMBER* | *SAMPLE ID* | *TRI-CA CONTROL NUMBER* |
|---|---|---|---|
| DX-2 R29/P73 | 161108 | DS-15 P66/P67 | 161116 |
| DX-3 P82/R80 | 161109 | DS-16 P71/P73 | 161117 |
| DS-9 P47/P48 | 161110 | DS-17 P74/P73 | 161118 |
| DS-10 P50/P51 | 161111 | DS-18 P74/P25 | 161119 |
| DS-11 P57/P58 | 161112 | DS-19 P75/P76 | 161120 |
| DS-12 P60/P61 | 161113 | DS-20 P76/P81 | 161121 |
| DS-13 P61/P70 | 161114 | DS-21 P80/P82 | 161122 |
| DS-14 P70/P71 | 161115 | | |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D6392 | Shear Bond Strength |
| 2. ASTM D6392 | Peel Bond Adhesion |

**TEST RESULTS:** The test results are summarized in the attached Table(s) 1 to 8.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,

**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the **sample/s** tested **is/are** believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**9 Pages Total** *(including this sheet)*

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## TABLE 1.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **18-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Extrusion Weld**
TRI JOB #: **CA220019**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 18-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DX-2** | **161108** | 160 | > 50% | BRK | | 1 Outside | 144 | 0 | SE3 | |
| **R29/P73** | | 165 | > 50% | BRK | | 2 Outside | 152 | 0 | SE3 | |
| | | 162 | > 50% | BRK | | 3 Outside | 139 | 0 | SE3 | |
| | | 163 | > 50% | BRK | | 4 Outside | 150 | 0 | SE3 | |
| | | 166 | > 50% | BRK | | 5 Outside | 151 | 0 | SE3 | |
| | | | | | | **AVG:** | **147** | | | |
| | | | | | | STD. DEV. | **6** | | | |
| | | | | | | 1 Inside | N/A | | | |
| | | | | | | 2 Inside | | | | |
| | | | | | | 3 Inside | | | | |
| | | | | | | 4 Inside | | | | |
| | | | | | | 5 Inside | | | | |
| | **AVG.** | **163** | | | | **AVG:** | | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | | | | |
| **DX-3** | **161109** | 173 | > 50% | BRK | | 1 Outside | 155 | 0 | SE3 | |
| **P82/R80** | | 168 | > 50% | BRK | | 2 Outside | 149 | 0 | SE3 | |
| | | 166 | > 50% | BRK | | 3 Outside | 155 | 0 | SE3 | |
| | | 178 | > 50% | BRK | | 4 Outside | 155 | 0 | SE3 | |
| | | 172 | > 50% | BRK | | 5 Outside | 162 | 0 | SE3 | |
| | | | | | | **AVG:** | **155** | | | |
| | | | | | | STD. DEV. | **5** | | | |
| | | | | | | 1 Inside | N/A | | | |
| | | | | | | 2 Inside | | | | |
| | | | | | | 3 Inside | | | | |
| | | | | | | 4 Inside | | | | |
| | | | | | | 5 Inside | | | | |
| | **AVG:** | **171** | | | | **AVG:** | | | | |
| | STD. DEV. | **5** | | | | STD. DEV. | | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 1)



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## TABLE 2.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **18-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220019**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 18-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC (lb/in width) |
| **DS- 9** | **161110** | 203 | > 50% | BRK | | 1 Outside | 138 | 0 | SE1 | |
| **P47/P48** | | 210 | > 50% | BRK | | 2 Outside | 138 | 0 | SE1 | |
| | | 204 | > 50% | BRK | | 3 Outside | 139 | 0 | SE1 | |
| | | 205 | > 50% | BRK | | 4 Outside | 141 | 0 | SE1 | |
| | | 207 | > 50% | BRK | | 5 Outside | 143 | 0 | SE1 | |
| | | | | | | **AVG:** | **140** | | | |
| | | | | | | STD. DEV. | **2** | | | |
| | | | | | | 1 Inside | 162 | 0 | SE1 | |
| | | | | | | 2 Inside | 179 | 0 | SE1 | |
| | | | | | | 3 Inside | 184 | 0 | SE1 | |
| | | | | | | 4 Inside | 138 | 0 | SE1 | |
| | | | | | | 5 Inside | 141 | 0 | SE1 | |
| | **AVG.** | **206** | | | | **AVG:** | **161** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **21** | | | |
| **DS- 10** | **161111** | 187 | > 50% | BRK | | 1 Outside | 169 | 0 | SE1 | |
| **P50/P51** | | 192 | > 50% | BRK | | 2 Outside | 161 | 0 | SE1 | |
| | | 189 | > 50% | BRK | | 3 Outside | 168 | 0 | SE1 | |
| | | 184 | > 50% | BRK | | 4 Outside | 163 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 5 Outside | 168 | 0 | SE1 | |
| | | | | | | **AVG:** | **166** | | | |
| | | | | | | STD. DEV. | **4** | | | |
| | | | | | | 1 Inside | 142 | 0 | SE1 | |
| | | | | | | 2 Inside | 157 | 0 | SE1 | |
| | | | | | | 3 Inside | 137 | 0 | SE1 | |
| | | | | | | 4 Inside | 149 | 0 | SE1 | |
| | | | | | | 5 Inside | 144 | 0 | SE1 | |
| | **AVG:** | **188** | | | | **AVG:** | **146** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **8** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 2)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

## TABLE 3.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **18-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220019**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 18-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 11** | **161112** | 179 | > 50% | BRK | | 1 Outside | 126 | 0 | SE1 | |
| **P57/P58** | | 185 | > 50% | BRK | | 2 Outside | 139 | 0 | SE1 | |
| | | 179 | > 50% | BRK | | 3 Outside | 131 | 0 | SE1 | |
| | | 179 | > 50% | BRK | | 4 Outside | 131 | 0 | SE1 | |
| | | 182 | > 50% | BRK | | 5 Outside | 131 | 0 | SE1 | |
| | | | | | | **AVG:** | **132** | | | |
| | | | | | | STD. DEV. | **5** | | | |
| | | | | | | 1 Inside | 151 | 0 | SE1 | |
| | | | | | | 2 Inside | 145 | 0 | SE1 | |
| | | | | | | 3 Inside | 141 | 0 | SE1 | |
| | | | | | | 4 Inside | 139 | 0 | SE1 | |
| | | | | | | 5 Inside | 141 | 0 | SE1 | |
| | **AVG.** | **181** | | | | **AVG:** | **143** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **5** | | | |
| **DS- 12** | **161113** | 186 | > 50% | BRK | | 1 Outside | 147 | 0 | SE1 | |
| **P60/P61** | | 191 | > 50% | BRK | | 2 Outside | 143 | 0 | SE1 | |
| | | 184 | > 50% | BRK | | 3 Outside | 145 | 0 | SE1 | |
| | | 183 | > 50% | BRK | | 4 Outside | 151 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 5 Outside | 142 | 0 | SE1 | |
| | | | | | | **AVG:** | **146** | | | |
| | | | | | | STD. DEV. | **4** | | | |
| | | | | | | 1 Inside | 144 | 0 | SE1 | |
| | | | | | | 2 Inside | 147 | 0 | SE1 | |
| | | | | | | 3 Inside | 138 | 0 | SE1 | |
| | | | | | | 4 Inside | 154 | 0 | SE1 | |
| | | | | | | 5 Inside | 151 | 0 | SE1 | |
| | **AVG:** | **186** | | | | **AVG:** | **147** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **6** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 3)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 4.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **18-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220019**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 18-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 13** | **161114** | 177 | > 50% | BRK | | 1 Outside | 144 | 0 | SE1 | |
| **P61/P70** | | 182 | > 50% | BRK | | 2 Outside | 166 | 0 | SE1 | |
| | | 177 | > 50% | BRK | | 3 Outside | 160 | 0 | SE1 | |
| | | 176 | > 50% | BRK | | 4 Outside | 155 | 0 | SE1 | |
| | | 179 | > 50% | BRK | | 5 Outside | 157 | 0 | SE1 | |
| | | | | | | **AVG:** | **156** | | | |
| | | | | | | STD. DEV. | **8** | | | |
| | | | | | | 1 Inside | 139 | 0 | SE1 | |
| | | | | | | 2 Inside | 153 | 0 | SE1 | |
| | | | | | | 3 Inside | 122 | 0 | SE1 | |
| | | | | | | 4 Inside | 136 | 0 | SE1 | |
| | | | | | | 5 Inside | 120 | 0 | SE1 | |
| | **AVG.** | **178** | | | | **AVG:** | **134** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **13** | | | |
| **DS- 14** | **161115** | 181 | > 50% | BRK | | 1 Outside | 135 | 0 | SE1 | |
| **P70/P71** | | 188 | > 50% | BRK | | 2 Outside | 133 | 0 | SE1 | |
| | | 182 | > 50% | BRK | | 3 Outside | 126 | 0 | SE1 | |
| | | 186 | > 50% | BRK | | 4 Outside | 129 | 0 | SE1 | |
| | | 186 | > 50% | BRK | | 5 Outside | 134 | 0 | SE1 | |
| | | | | | | **AVG:** | **131** | | | |
| | | | | | | STD. DEV. | **4** | | | |
| | | | | | | 1 Inside | 168 | 0 | SE1 | |
| | | | | | | 2 Inside | 161 | 0 | SE1 | |
| | | | | | | 3 Inside | 158 | 0 | SE1 | |
| | | | | | | 4 Inside | 163 | 0 | SE1 | |
| | | | | | | 5 Inside | 164 | 0 | SE1 | |
| | **AVG:** | **185** | | | | **AVG:** | **163** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **4** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 4)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 5.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **18-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220019**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 18-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 15** | **161116** | 177 | > 50% | BRK | | 1 Outside | 138 | 0 | SE1 | |
| **P66/P67** | | 181 | > 50% | BRK | | 2 Outside | 137 | 0 | SE1 | |
| | | 181 | > 50% | BRK | | 3 Outside | 137 | 0 | SE1 | |
| | | 182 | > 50% | BRK | | 4 Outside | 145 | 0 | SE1 | |
| | | 177 | > 50% | BRK | | 5 Outside | 153 | 0 | SE1 | |
| | | | | | | **AVG:** | **142** | | | |
| | | | | | | STD. DEV. | **7** | | | |
| | | | | | | 1 Inside | 140 | 0 | SE1 | |
| | | | | | | 2 Inside | 153 | 0 | SE1 | |
| | | | | | | 3 Inside | 148 | 0 | SE1 | |
| | | | | | | 4 Inside | 141 | 0 | SE1 | |
| | | | | | | 5 Inside | 138 | 0 | SE1 | |
| | **AVG.** | **180** | | | | **AVG:** | **144** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **6** | | | |
| **DS- 16** | **161117** | 184 | > 50% | BRK | | 1 Outside | 136 | 0 | SE1 | |
| **P71/P73** | | 188 | > 50% | BRK | | 2 Outside | 158 | 0 | SE1 | |
| | | 185 | > 50% | BRK | | 3 Outside | 141 | 0 | SE1 | |
| | | 185 | > 50% | BRK | | 4 Outside | 144 | 0 | SE1 | |
| | | 183 | > 50% | BRK | | 5 Outside | 145 | 0 | SE1 | |
| | | | | | | **AVG:** | **145** | | | |
| | | | | | | STD. DEV. | **8** | | | |
| | | | | | | 1 Inside | 131 | 0 | SE1 | |
| | | | | | | 2 Inside | 149 | 0 | SE1 | |
| | | | | | | 3 Inside | 130 | 0 | SE1 | |
| | | | | | | 4 Inside | 126 | 0 | SE1 | |
| | | | | | | 5 Inside | 146 | 0 | SE1 | |
| | **AVG:** | **185** | | | | **AVG:** | **136** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **10** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 5)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 6.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **18-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220019**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 18-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 17** | **161118** | 185 | > 50% | BRK | | 1 Outside | 130 | 0 | SE1 | |
| **P74/P73** | | 193 | > 50% | BRK | | 2 Outside | 132 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 3 Outside | 132 | 0 | SE1 | |
| | | 189 | > 50% | BRK | | 4 Outside | 133 | 0 | SE1 | |
| | | 190 | > 50% | BRK | | 5 Outside | 133 | 0 | SE1 | |
| | | | | | | **AVG:** | **132** | | | |
| | | | | | | STD. DEV. | **1** | | | |
| | | | | | | 1 Inside | 146 | 0 | SE1 | |
| | | | | | | 2 Inside | 132 | 0 | SE1 | |
| | | | | | | 3 Inside | 132 | 0 | SE1 | |
| | | | | | | 4 Inside | 124 | 0 | SE1 | |
| | | | | | | 5 Inside | 130 | 0 | SE1 | |
| | **AVG.** | **189** | | | | **AVG:** | **133** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **8** | | | |
| **DS- 18** | **161119** | 181 | > 50% | BRK | | 1 Outside | 152 | 0 | SE1 | |
| **P74/P25** | | 187 | > 50% | BRK | | 2 Outside | 153 | 0 | SE1 | |
| | | 181 | > 50% | BRK | | 3 Outside | 147 | 0 | SE1 | |
| | | 182 | > 50% | BRK | | 4 Outside | 143 | 0 | SE1 | |
| | | 182 | > 50% | BRK | | 5 Outside | 151 | 0 | SE1 | |
| | | | | | | **AVG:** | **149** | | | |
| | | | | | | STD. DEV. | **4** | | | |
| | | | | | | 1 Inside | 129 | 0 | SE1 | |
| | | | | | | 2 Inside | 154 | 0 | SE1 | |
| | | | | | | 3 Inside | 148 | 0 | SE1 | |
| | | | | | | 4 Inside | 144 | 0 | SE1 | |
| | | | | | | 5 Inside | 143 | 0 | SE1 | |
| | **AVG:** | **183** | | | | **AVG:** | **144** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **9** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 6)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 7.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **18-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220019**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 18-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 19** | **161120** | 182 | > 50% | BRK | | 1 Outside | 143 | 0 | SE1 | |
| **P75/P76** | | 185 | > 50% | BRK | | 2 Outside | 149 | 0 | SE1 | |
| | | 179 | > 50% | BRK | | 3 Outside | 138 | 0 | SE1 | |
| | | 181 | > 50% | BRK | | 4 Outside | 133 | 0 | SE1 | |
| | | 180 | > 50% | BRK | | 5 Outside | 132 | 0 | SE1 | |
| | | | | | | **AVG:** | **139** | | | |
| | | | | | | STD. DEV. | **7** | | | |
| | | | | | | 1 Inside | 117 | 0 | SE1 | |
| | | | | | | 2 Inside | 135 | 0 | SE1 | |
| | | | | | | 3 Inside | 130 | 0 | SE1 | |
| | | | | | | 4 Inside | 126 | 0 | SE1 | |
| | | | | | | 5 Inside | 140 | 0 | SE1 | |
| | **AVG.** | **181** | | | | **AVG:** | **130** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **9** | | | |
| **DS- 20** | **161121** | 183 | > 50% | BRK | | 1 Outside | 135 | 0 | SE1 | |
| **P76/P81** | | 188 | > 50% | BRK | | 2 Outside | 149 | 0 | SE1 | |
| | | 184 | > 50% | BRK | | 3 Outside | 149 | 0 | SE1 | |
| | | 184 | > 50% | BRK | | 4 Outside | 142 | 0 | SE1 | |
| | | 183 | > 50% | BRK | | 5 Outside | 141 | 0 | SE1 | |
| | | | | | | **AVG:** | **143** | | | |
| | | | | | | STD. DEV. | **6** | | | |
| | | | | | | 1 Inside | 143 | 0 | SE1 | |
| | | | | | | 2 Inside | 158 | 0 | SE1 | |
| | | | | | | 3 Inside | 142 | 0 | SE1 | |
| | | | | | | 4 Inside | 145 | 0 | SE1 | |
| | | | | | | 5 Inside | 147 | 0 | SE1 | |
| | **AVG:** | **185** | | | | **AVG:** | **147** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **7** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 7)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 8.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **18-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220019**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 18-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| DS- 21 | 161122 | 187 | > 50% | BRK | | 1 Outside | 142 | 0 | SE1 | |
| P80/P82 | | 193 | > 50% | BRK | | 2 Outside | 161 | 0 | SE1 | |
| | | 192 | > 50% | BRK | | 3 Outside | 139 | 0 | SE1 | |
| | | 190 | > 50% | BRK | | 4 Outside | 142 | 0 | SE1 | |
| | | 193 | > 50% | BRK | | 5 Outside | 146 | 0 | SE1 | |
| | | | | | | **AVG:** | **146** | | | |
| | | | | | | STD. DEV. | **9** | | | |
| | | | | | | 1 Inside | 137 | 0 | SE1 | |
| | | | | | | 2 Inside | 156 | 0 | SE1 | |
| | | | | | | 3 Inside | 139 | 0 | SE1 | |
| | | | | | | 4 Inside | 151 | 0 | SE1 | |
| | | | | | | 5 Inside | 146 | 0 | SE1 | |
| | **AVG.** | **191** | | | | **AVG:** | **146** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **8** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 8)



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GAI-LAP
Initial: CVZ #:0.13
DATE: 1/21/2022

January 21, 2022

Sam Franco
***SCS Engineers***
12651 Briar Forest Dr. Suite 205
Houston, TX, 77077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the *final* laboratory report for the Seam testing of seventeen (17) HDPE Seam sample/s.

**PROJECT NAME:** Oak Grove Steam Electric Station DATE REPORTED: **January 21, 2022**

**REFERENCE TRI JOB NO.:** CA220028

**DATE RECEIVED:** January 21, 2022

**SAMPLE(S) SENT BY:** SCS Engineers

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI-CA CONTROL NUMBER* | *SAMPLE ID* | *TRI-CA CONTROL NUMBER* |
|---|---|---|---|
| DS- 22 P81/P83 | 161155 | DS- 29 P99/P98 | 161164 |
| DS- 23 P84/P83 | 161156 | DS- 30 P101/P99 | 161165 |
| DS- 24 P85/P84 | 161157 | DS- 31 P103/P101 | 161166 |
| DS- 25 P86/P85 | 161158 | DS- 32 P106/P104 | 161167 |
| DS- 26 P91/P86 | 161159 | DS- 33 P109/P107 | 161168 |
| DS- 27 P94/P92 | 161160 | DS- 34 P112/P110 | 161169 |
| DS- 28 P94/P96 | 161161 | DS- 35 P9/P110 | 161170 |
| DX- 4 P125/P101 | 161162 | DS- 36 P115/P116 | 161171 |
| DX- 5 P113/P142 | 161163 | | |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D6392 | Shear Bond Strength |
| 2. ASTM D6392 | Peel Bond Adhesion |

**TEST RESULTS:** The test results are summarized in the attached Table(s) 1 to 9.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,

**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the **sample/s** tested **is/are** believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**10 Pages Total** *(including this sheet)*

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## TABLE 1.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **21-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220028**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 21-Jan-22

| | | Crosshead Speed: 2 in/min | | | | Crosshead Speed: 2 in/min | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SHEAR EVALUATION | | | | PEEL EVALUATION | | | | |
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| DS- 22 P81/P83 | 161155 | 184 | > 50% | BRK | | 1 Outside | 141 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 2 Outside | 141 | 0 | SE1 | |
| | | 187 | > 50% | BRK | | 3 Outside | 139 | 0 | SE1 | |
| | | 186 | > 50% | BRK | | 4 Outside | 136 | 0 | SE1 | |
| | | 186 | > 50% | BRK | | 5 Outside | 136 | 0 | SE1 | |
| | | | | | | **AVG:** | **139** | | | |
| | | | | | | STD. DEV. | **3** | | | |
| | | | | | | 1 Inside | 159 | 0 | SE1 | |
| | | | | | | 2 Inside | 149 | 0 | SE1 | |
| | | | | | | 3 Inside | 151 | 0 | SE1 | |
| | | | | | | 4 Inside | 149 | 0 | SE1 | |
| | | | | | | 5 Inside | 150 | 0 | SE1 | |
| | **AVG.** | **186** | | | | **AVG:** | **152** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **4** | | | |
| DS- 23 P84/P83 | 161156 | 187 | > 50% | BRK | | 1 Outside | 130 | 0 | SE1 | |
| | | 191 | > 50% | BRK | | 2 Outside | 130 | 0 | SE1 | |
| | | 189 | > 50% | BRK | | 3 Outside | 137 | 0 | SE1 | |
| | | 189 | > 50% | BRK | | 4 Outside | 135 | 0 | SE1 | |
| | | 187 | > 50% | BRK | | 5 Outside | 131 | 0 | SE1 | |
| | | | | | | **AVG:** | **133** | | | |
| | | | | | | STD. DEV. | **3** | | | |
| | | | | | | 1 Inside | 155 | 0 | SE1 | |
| | | | | | | 2 Inside | 163 | 0 | SE1 | |
| | | | | | | 3 Inside | 156 | 0 | SE1 | |
| | | | | | | 4 Inside | 171 | 0 | SE1 | |
| | | | | | | 5 Inside | 164 | 0 | SE1 | |
| | **AVG:** | **189** | | | | **AVG:** | **162** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **6** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

(End of Table 1)



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## TABLE 2.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **21-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220028**

QC'd By: Maria Cipitia
TEST METHOD: ASTM D6392
DATE REPORT: 21-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 24 P85/P84** | **161157** | 185 | > 50% | BRK | | 1 Outside | 141 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 2 Outside | 142 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 3 Outside | 142 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 4 Outside | 142 | 0 | SE1 | |
| | | 189 | > 50% | BRK | | 5 Outside | 143 | 0 | SE1 | |
| | | | | | | **AVG:** | **142** | | | |
| | | | | | | STD. DEV. | **1** | | | |
| | | | | | | 1 Inside | 131 | 0 | SE1 | |
| | | | | | | 2 Inside | 126 | 0 | SE1 | |
| | | | | | | 3 Inside | 138 | 0 | SE1 | |
| | | | | | | 4 Inside | 131 | 0 | SE1 | |
| | | | | | | 5 Inside | 142 | 0 | SE1 | |
| | **AVG.** | **188** | | | | **AVG:** | **134** | | | |
| | STD. DEV. | **1** | | | | STD. DEV. | **6** | | | |
| **DS- 25 P86/P85** | **161158** | 185 | > 50% | BRK | | 1 Outside | 131 | 0 | SE1 | |
| | | 187 | > 50% | BRK | | 2 Outside | 149 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 3 Outside | 147 | 0 | SE1 | |
| | | 187 | > 50% | BRK | | 4 Outside | 141 | 0 | SE1 | |
| | | 184 | > 50% | BRK | | 5 Outside | 133 | 0 | SE1 | |
| | | | | | | **AVG:** | **140** | | | |
| | | | | | | STD. DEV. | **8** | | | |
| | | | | | | 1 Inside | 163 | 0 | SE1 | |
| | | | | | | 2 Inside | 145 | 0 | SE1 | |
| | | | | | | 3 Inside | 164 | 0 | SE1 | |
| | | | | | | 4 Inside | 168 | 0 | SE1 | |
| | | | | | | 5 Inside | 141 | 0 | SE1 | |
| | **AVG:** | **186** | | | | **AVG:** | **156** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **12** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 2)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 3.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **21-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220028**

QC'd By: Maria Cipitia
TEST METHOD: ASTM D6392
DATE REPORT: 21-Jan-22

| | | Crosshead Speed: 2 in/min — SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min — PEEL EVALUATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 26** | **161159** | 183 | > 50% | BRK | | 1 Outside | 156 | 0 | SE1 | |
| **P91/P86** | | 184 | > 50% | BRK | | 2 Outside | 166 | 0 | SE1 | |
| | | 189 | > 50% | BRK | | 3 Outside | 158 | 0 | SE1 | |
| | | 184 | > 50% | BRK | | 4 Outside | 164 | 0 | SE1 | |
| | | 185 | > 50% | BRK | | 5 Outside | 160 | 0 | SE1 | |
| | | | | | | **AVG:** | **161** | | | |
| | | | | | | STD. DEV. | **4** | | | |
| | | | | | | 1 Inside | 159 | 0 | SE1 | |
| | | | | | | 2 Inside | 160 | 0 | SE1 | |
| | | | | | | 3 Inside | 147 | 0 | SE1 | |
| | | | | | | 4 Inside | 169 | 0 | SE1 | |
| | | | | | | 5 Inside | 166 | 0 | SE1 | |
| | **AVG.** | **185** | | | | **AVG:** | **160** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **8** | | | |
| **DS- 27** | **161160** | 181 | > 50% | BRK | | 1 Outside | 139 | 0 | SE1 | |
| **P94/P92** | | 183 | > 50% | BRK | | 2 Outside | 150 | 0 | SE1 | |
| | | 186 | > 50% | BRK | | 3 Outside | 152 | 0 | SE1 | |
| | | 187 | > 50% | BRK | | 4 Outside | 149 | 0 | SE1 | |
| | | 185 | > 50% | BRK | | 5 Outside | 153 | 0 | SE1 | |
| | | | | | | **AVG:** | **149** | | | |
| | | | | | | STD. DEV. | **6** | | | |
| | | | | | | 1 Inside | 155 | 0 | SE1 | |
| | | | | | | 2 Inside | 143 | 0 | SE1 | |
| | | | | | | 3 Inside | 162 | 0 | SE1 | |
| | | | | | | 4 Inside | 157 | 0 | SE1 | |
| | | | | | | 5 Inside | 151 | 0 | SE1 | |
| | **AVG:** | **185** | | | | **AVG:** | **153** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **7** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE SPECIMENS DELAMINATED UNDER THE BEAD |
| AD2 | ADHESION FAILURE |
| AD-WLD | BREAK THROUGH THE FILLET |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

(End of Table 3)

(Sheet 1 of 1)

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## TABLE 4.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **21-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion/Extrusion Weld**
TRI JOB #: **CA220028**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 21-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 28** | **161161** | 195 | > 50% | BRK | | 1 Outside | 166 | 0 | SE1 | |
| **P94/P96** | | 195 | > 50% | BRK | | 2 Outside | 157 | 0 | SE1 | |
| | | 198 | > 50% | BRK | | 3 Outside | 166 | 0 | SE1 | |
| | | 197 | > 50% | BRK | | 4 Outside | 171 | 0 | SE1 | |
| **FUS** | | 197 | > 50% | BRK | | 5 Outside | 155 | 0 | SE1 | |
| | | | | | | **AVG:** | **163** | | | |
| | | | | | | STD. DEV. | **7** | | | |
| | | | | | | 1 Inside | 129 | 0 | SE1 | |
| | | | | | | 2 Inside | 135 | 0 | SE1 | |
| | | | | | | 3 Inside | 151 | 0 | SE1 | |
| | | | | | | 4 Inside | 145 | 0 | SE1 | |
| | | | | | | 5 Inside | 134 | 0 | SE1 | |
| | **AVG.** | **196** | | | | **AVG:** | **139** | | | |
| | STD. DEV. | **1** | | | | STD. DEV. | **9** | | | |
| **DX-4** | **161162** | 165 | > 50% | BRK | | 1 Outside | 126 | 0 | SE3 | |
| **P125/P101** | | 171 | > 50% | BRK | | 2 Outside | 139 | 0 | SE3 | |
| | | 175 | > 50% | BRK | | 3 Outside | 137 | 0 | SE3 | |
| | | 174 | > 50% | BRK | | 4 Outside | 126 | 0 | SE3 | |
| **EXT** | | 179 | > 50% | BRK | | 5 Outside | 109 | 0 | SE3 | |
| | | | | | | **AVG:** | **127** | | | |
| | | | | | | STD. DEV. | **12** | | | |
| | | | | | | 1 Inside | N/A | | | |
| | | | | | | 2 Inside | | | | |
| | | | | | | 3 Inside | | | | |
| | | | | | | 4 Inside | | | | |
| | | | | | | 5 Inside | | | | |
| | **AVG:** | **173** | | | | **AVG:** | | | | |
| | STD. DEV. | **5** | | | | STD. DEV. | | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM |
| SE2 | BREAK AT INNER EDGE OF SEAM |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 4)

(Sheet 1 of 1)

By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit

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## TABLE 5.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **21-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Extrusion/ Fusion Weld**
TRI JOB #: **CA220028**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 21-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| DX-5 | 161163 | 176 | > 50% | BRK | | 1 Outside | 128 | 0 | SE3 | |
| P113/P142 | | 182 | > 50% | BRK | | 2 Outside | 153 | 0 | SE3 | |
| | | 179 | > 50% | BRK | | 3 Outside | 136 | 0 | SE3 | |
| | | 182 | > 50% | BRK | | 4 Outside | 153 | 0 | SE3 | |
| EXT | | 180 | > 50% | BRK | | 5 Outside | 153 | 0 | SE3 | |
| | | | | | | **AVG:** | **145** | | | |
| | | | | | | STD. DEV. | **12** | | | |
| | | | | | | 1 Inside | N/A | | | |
| | | | | | | 2 Inside | | | | |
| | | | | | | 3 Inside | | | | |
| | | | | | | 4 Inside | | | | |
| | | | | | | 5 Inside | | | | |
| | **AVG.** | **180** | | | | **AVG:** | | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | | | | |
| DS- 29 | 161164 | 170 | > 50% | BRK | | 1 Outside | 143 | 0 | SE1 | |
| P99/P98 | | 171 | > 50% | BRK | | 2 Outside | 140 | 0 | SE1 | |
| | | 173 | > 50% | BRK | | 3 Outside | 151 | 0 | SE1 | |
| | | 173 | > 50% | BRK | | 4 Outside | 137 | 0 | SE1 | |
| FUS | | 173 | > 50% | BRK | | 5 Outside | 137 | 0 | SE1 | |
| | | | | | | **AVG:** | **141** | | | |
| | | | | | | STD. DEV. | **6** | | | |
| | | | | | | 1 Inside | 130 | 0 | SE1 | |
| | | | | | | 2 Inside | 130 | 0 | SE1 | |
| | | | | | | 3 Inside | 130 | 0 | SE1 | |
| | | | | | | 4 Inside | 153 | 0 | SE1 | |
| | | | | | | 5 Inside | 135 | 0 | SE1 | |
| | **AVG:** | **172** | | | | **AVG:** | **135** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **10** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING |
| SE1 | BREAK AT OUTER EDGE OF SEAM |
| SE2 | BREAK AT INNER EDGE OF SEAM |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 5)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 6.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **21-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220028**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 21-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| DS- 30 P101/P99 | 161165 | 170 | > 50% | BRK | | 1 Outside | 132 | 0 | SE1 | |
| | | 173 | > 50% | BRK | | 2 Outside | 131 | 0 | SE1 | |
| | | 174 | > 50% | BRK | | 3 Outside | 134 | 0 | SE1 | |
| | | 173 | > 50% | BRK | | 4 Outside | 136 | 0 | SE1 | |
| | | 172 | > 50% | BRK | | 5 Outside | 126 | 0 | SE1 | |
| | | | | | | **AVG:** | **132** | | | |
| | | | | | | STD. DEV. | **4** | | | |
| | | | | | | 1 Inside | 143 | 0 | SE1 | |
| | | | | | | 2 Inside | 139 | 0 | SE1 | |
| | | | | | | 3 Inside | 137 | 0 | SE1 | |
| | | | | | | 4 Inside | 134 | 0 | SE1 | |
| | | | | | | 5 Inside | 133 | 0 | SE1 | |
| | **AVG.** | **172** | | | | **AVG:** | **137** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **4** | | | |
| DS- 31 P103/P101 | 161166 | 172 | > 50% | BRK | | 1 Outside | 140 | 0 | SE1 | |
| | | 173 | > 50% | BRK | | 2 Outside | 139 | 0 | SE1 | |
| | | 179 | > 50% | BRK | | 3 Outside | 146 | 0 | SE1 | |
| | | 173 | > 50% | BRK | | 4 Outside | 146 | 0 | SE1 | |
| | | 177 | > 50% | BRK | | 5 Outside | 151 | 0 | SE1 | |
| | | | | | | **AVG:** | **144** | | | |
| | | | | | | STD. DEV. | **5** | | | |
| | | | | | | 1 Inside | 125 | 0 | SE1 | |
| | | | | | | 2 Inside | 141 | 0 | SE1 | |
| | | | | | | 3 Inside | 153 | 0 | SE1 | |
| | | | | | | 4 Inside | 152 | 0 | SE1 | |
| | | | | | | 5 Inside | 133 | 0 | SE1 | |
| | **AVG:** | **175** | | | | **AVG:** | **141** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **12** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE |
| AD-WLD | BREAK THROUGH THE FILLET |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

(End of Table 6)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 7.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **21-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220028**

QC'd By: Maria Cipitia
TEST METHOD: ASTM D6392
DATE REPORT: 21-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| DS- 32 P106/P104 | 161167 | 172 | > 50% | BRK | | 1 Outside | 155 | 0 | SE1 | |
| | | 175 | > 50% | BRK | | 2 Outside | 135 | 0 | SE1 | |
| | | 176 | > 50% | BRK | | 3 Outside | 145 | 0 | SE1 | |
| | | 175 | > 50% | BRK | | 4 Outside | 164 | 0 | SE1 | |
| | | 176 | > 50% | BRK | | 5 Outside | 134 | 0 | SE1 | |
| | | | | | | **AVG:** | **147** | | | |
| | | | | | | STD. DEV. | **13** | | | |
| | | | | | | 1 Inside | 136 | 0 | SE1 | |
| | | | | | | 2 Inside | 123 | 0 | SE1 | |
| | | | | | | 3 Inside | 121 | 0 | SE1 | |
| | | | | | | 4 Inside | 132 | 0 | SE1 | |
| | | | | | | 5 Inside | 137 | 0 | SE1 | |
| | **AVG.** | **175** | | | | **AVG:** | **130** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **8** | | | |
| DS- 33 P109/P107 | 161168 | 186 | > 50% | BRK | | 1 Outside | 143 | 0 | SE1 | |
| | | 186 | > 50% | BRK | | 2 Outside | 141 | 0 | SE1 | |
| | | 190 | > 50% | BRK | | 3 Outside | 151 | 0 | SE1 | |
| | | 187 | > 50% | BRK | | 4 Outside | 146 | 0 | SE1 | |
| | | 186 | > 50% | BRK | | 5 Outside | 144 | 0 | SE1 | |
| | | | | | | **AVG:** | **145** | | | |
| | | | | | | STD. DEV. | **4** | | | |
| | | | | | | 1 Inside | 143 | 0 | SE1 | |
| | | | | | | 2 Inside | 125 | 0 | SE1 | |
| | | | | | | 3 Inside | 134 | 0 | SE1 | |
| | | | | | | 4 Inside | 136 | 0 | SE1 | |
| | | | | | | 5 Inside | 130 | 0 | SE1 | |
| | **AVG:** | **187** | | | | **AVG:** | **134** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **7** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

(End of Table 7)

(Sheet 1 of 1)

By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit

## TABLE 8.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers** | MATERIAL: **HDPE SEAM** | QC'd By: Maria Espitia
PROJECT: **Oak Grove Steam Electric** | SEAM TYPE: **Fusion Weld** | TEST METHOD: ASTM D6392
DATE REC'D: **21-Jan-22** | TRI JOB #: **CA220028** | DATE REPORT: 21-Jan-22

| | | Crosshead Speed: 2 in/min | | | | Crosshead Speed: 2 in/min | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SHEAR EVALUATION | | | | PEEL EVALUATION | | | | |
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS- 34** | **161169** | 188 | > 50% | BRK | | 1 Outside | 142 | 0 | SE1 | |
| **P112/110** | | 185 | > 50% | BRK | | 2 Outside | 143 | 0 | SE1 | |
| | | 189 | > 50% | BRK | | 3 Outside | 151 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 4 Outside | 151 | 0 | SE1 | |
| | | 189 | > 50% | BRK | | 5 Outside | 147 | 0 | SE1 | |
| | | | | | | **AVG:** | **147** | | | |
| | | | | | | STD. DEV. | **4** | | | |
| | | | | | | 1 Inside | 157 | 0 | SE1 | |
| | | | | | | 2 Inside | 143 | 0 | SE1 | |
| | | | | | | 3 Inside | 154 | 0 | SE1 | |
| | | | | | | 4 Inside | 146 | 0 | SE1 | |
| | | | | | | 5 Inside | 150 | 0 | SE1 | |
| | **AVG.** | **188** | | | | **AVG:** | **150** | | | |
| | STD. DEV. | **1** | | | | STD. DEV. | **5** | | | |
| **DS- 35** | **161170** | 190 | > 50% | BRK | | 1 Outside | 163 | 0 | SE1 | |
| **P9/P110** | | 187 | > 50% | BRK | | 2 Outside | 145 | 0 | SE1 | |
| | | 191 | > 50% | BRK | | 3 Outside | 145 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 4 Outside | 154 | 0 | SE1 | |
| | | 183 | > 50% | BRK | | 5 Outside | 154 | 0 | SE1 | |
| | | | | | | **AVG:** | **152** | | | |
| | | | | | | STD. DEV. | **8** | | | |
| | | | | | | 1 Inside | 166 | 0 | SE1 | |
| | | | | | | 2 Inside | 154 | 0 | SE1 | |
| | | | | | | 3 Inside | 151 | 0 | SE1 | |
| | | | | | | 4 Inside | 160 | 0 | SE1 | |
| | | | | | | 5 Inside | 164 | 0 | SE1 | |
| | **AVG:** | **188** | | | | **AVG:** | **159** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **6** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM |
| SE2 | BREAK AT TOP EDGE OF SEAM |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 8)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 9.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **21-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220028**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 21-Jan-22

| Crosshead Speed: 2 in/min | | | | | | Crosshead Speed: 2 in/min | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SHEAR EVALUATION | | | | PEEL EVALUATION | | | | |
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| DS- 36 P115/P116 | 161171 | 182 | > 50% | BRK | | 1 Outside | 140 | 0 | SE1 | |
| | | 181 | > 50% | BRK | | 2 Outside | 142 | 0 | SE1 | |
| | | 183 | > 50% | BRK | | 3 Outside | 142 | 0 | SE1 | |
| | | 183 | > 50% | BRK | | 4 Outside | 145 | 0 | SE1 | |
| | | 182 | > 50% | BRK | | 5 Outside | 131 | 0 | SE1 | |
| | | | | | | AVG: | 140 | | | |
| | | | | | | STD. DEV. | 5 | | | |
| | | | | | | 1 Inside | 148 | 0 | SE1 | |
| | | | | | | 2 Inside | 163 | 0 | SE1 | |
| | | | | | | 3 Inside | 168 | 0 | SE1 | |
| | | | | | | 4 Inside | 152 | 0 | SE1 | |
| | | | | | | 5 Inside | 160 | 0 | SE1 | |
| | AVG. | 182 | | | | AVG: | 158 | | | |
| | STD. DEV. | 1 | | | | STD. DEV. | 8 | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING |
| SE1 | BREAK AT OUTER EDGE OF SEAM |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE SPECIMENS DELAMINATED UNDER THE BEAD |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 9)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

GAI-LAP
Initial: GVZ #:0.13
DATE: 1/25/2022

January 25, 2022

Sam Franco
***SCS Engineers***
12651 Briar Forest Dr. Suite 205
Houston, TX, 77077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the *final* laboratory report for the Seam testing of sixteen (16) HDPE Seam sample/s.

**PROJECT NAME:** Oak Grove Steam Electric Station DATE REPORTED: **January 25, 2022**

**REFERENCE TRI JOB NO.:** CA220037

**DATE RECEIVED:** January 25, 2022

**SAMPLE(S) SENT BY:** SCS Engineers

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI-CA CONTROL NUMBER* | *SAMPLE ID* | *TRI-CA CONTROL NUMBER* |
|---|---|---|---|
| DS- 37 P25/P26 | 161219 | DS- 48 P161/P166 | 161227 |
| DS- 39 P128/P127 | 161220 | DS- 49 P177/P176 | 161228 |
| DS- 40 P129/P128 | 161221 | DS- 50 P178/P1150 | 161229 |
| DS- 42 P148/1P47 | 161222 | DS- 51 P176/P139 | 161230 |
| DS- 43 P150/P149 | 161223 | DS- 38 P127/P87 | 161215 |
| DS- 44 P155/P156 | 161224 | DS- 41 P140/P141 | 161216 |
| DS- 46 P167/P168 | 161225 | DS- 45 P168/P163 | 161217 |
| DS- 47 P170/P169 | 161226 | Dx- 6 P86/R177 | 161218 |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D6392 | Shear Bond Strength |
| 2. ASTM D6392 | Peel Bond Adhesion |

**TEST RESULTS:** The test results are summarized in the attached Table(s) 1 to 9.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,

**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the **sample/s** tested **is/are** believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**10 Pages Total** *(including this sheet)*

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## TABLE 1.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **25-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220037**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 25-Jan-22

| | | Crosshead Speed: 2 in/min | | | | Crosshead Speed: 2 in/min | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SHEAR EVALUATION | | | | PEEL EVALUATION | | | | |
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| DS-37 P25/P26 | 161219 | 195 | > 50% | BRK | | 1 Outside | 163 | 0 | SE1 | |
| | | 195 | > 50% | BRK | | 2 Outside | 170 | 0 | SE1 | |
| | | 196 | > 50% | BRK | | 3 Outside | 159 | 0 | SE1 | |
| | | 195 | > 50% | BRK | | 4 Outside | 134 | 0 | SE1 | |
| | | 195 | > 50% | BRK | | 5 Outside | 129 | 0 | SE1 | |
| | | | | | | **AVG:** | **151** | | | |
| | | | | | | STD. DEV. | **18** | | | |
| | | | | | | 1 Inside | 166 | 0 | SE1 | |
| | | | | | | 2 Inside | 163 | 0 | SE1 | |
| | | | | | | 3 Inside | 162 | 0 | SE1 | |
| | | | | | | 4 Inside | 162 | 0 | SE1 | |
| | | | | | | 5 Inside | 164 | 0 | SE1 | |
| | **AVG.** | **195** | | | | **AVG:** | **163** | | | |
| | STD. DEV. | **1** | | | | STD. DEV. | **2** | | | |
| DS-39 P128P127 | 161220 | 169 | > 50% | BRK | | 1 Outside | 153 | 0 | SE1 | |
| | | 174 | > 50% | BRK | | 2 Outside | 148 | 0 | SE1 | |
| | | 174 | > 50% | BRK | | 3 Outside | 154 | 0 | SE1 | |
| | | 178 | > 50% | BRK | | 4 Outside | 153 | 0 | SE1 | |
| | | 170 | > 50% | BRK | | 5 Outside | 153 | 0 | SE1 | |
| | | | | | | **AVG:** | **152** | | | |
| | | | | | | STD. DEV. | **2** | | | |
| | | | | | | 1 Inside | 137 | 0 | SE1 | |
| | | | | | | 2 Inside | 134 | 0 | SE1 | |
| | | | | | | 3 Inside | 133 | 0 | SE1 | |
| | | | | | | 4 Inside | 139 | 0 | SE1 | |
| | | | | | | 5 Inside | 137 | 0 | SE1 | |
| | **AVG:** | **173** | | | | **AVG:** | **136** | | | |
| | STD. DEV. | **4** | | | | STD. DEV. | **3** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM |
| SE2 | BREAK AT INNER EDGE OF SEAM |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 1)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 2.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **25-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220037**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 25-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| DS-40 P129/P128 | 161221 | 181 | > 50% | BRK | | 1 Outside | 131 | 0 | SE1 | |
| | | 179 | > 50% | BRK | | 2 Outside | 124 | 0 | SE1 | |
| | | 178 | > 50% | BRK | | 3 Outside | 126 | 0 | SE1 | |
| | | 176 | > 50% | BRK | | 4 Outside | 133 | 0 | SE1 | |
| | | 177 | > 50% | BRK | | 5 Outside | 131 | 0 | SE1 | |
| | | | | | | **AVG:** | **129** | | | |
| | | | | | | STD. DEV. | **4** | | | |
| | | | | | | 1 Inside | 141 | 0 | SE1 | |
| | | | | | | 2 Inside | 145 | 0 | SE1 | |
| | | | | | | 3 Inside | 143 | 0 | SE1 | |
| | | | | | | 4 Inside | 131 | 0 | SE1 | |
| | | | | | | 5 Inside | 135 | 0 | SE1 | |
| | **AVG.** | **178** | | | | **AVG:** | **139** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **6** | | | |
| DS-42 P148/P147 | 161222 | 208 | > 50% | BRK | | 1 Outside | 144 | 0 | SE1 | |
| | | 209 | > 50% | BRK | | 2 Outside | 151 | 0 | SE1 | |
| | | 209 | > 50% | BRK | | 3 Outside | 143 | 0 | SE1 | |
| | | 208 | > 50% | BRK | | 4 Outside | 149 | 0 | SE1 | |
| | | 211 | > 50% | BRK | | 5 Outside | 145 | 0 | SE1 | |
| | | | | | | **AVG:** | **146** | | | |
| | | | | | | STD. DEV. | **3** | | | |
| | | | | | | 1 Inside | 154 | 0 | SE1 | |
| | | | | | | 2 Inside | 164 | 0 | SE1 | |
| | | | | | | 3 Inside | 151 | 0 | SE1 | |
| | | | | | | 4 Inside | 153 | 0 | SE1 | |
| | | | | | | 5 Inside | 149 | 0 | SE1 | |
| | **AVG:** | **209** | | | | **AVG:** | **154** | | | |
| | STD. DEV. | **1** | | | | STD. DEV. | **6** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

(End of Table 2)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit

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## TABLE 3.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **25-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220037**

QC'd By: Maria Epitia
TEST METHOD: ASTM D6392
DATE REPORT: 25-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS-43** | **161223** | 184 | > 50% | BRK | | 1 Outside | 127 | 0 | SE1 | |
| **P150/P149** | | 179 | > 50% | BRK | | 2 Outside | 141 | 0 | SE1 | |
| | | 186 | > 50% | BRK | | 3 Outside | 128 | 0 | SE1 | |
| | | 185 | > 50% | BRK | | 4 Outside | 129 | 0 | SE1 | |
| | | 185 | > 50% | BRK | | 5 Outside | 132 | 0 | SE1 | |
| | | | | | | **AVG:** | **131** | | | |
| | | | | | | STD. DEV. | **6** | | | |
| | | | | | | 1 Inside | 141 | 0 | SE1 | |
| | | | | | | 2 Inside | 143 | 0 | SE1 | |
| | | | | | | 3 Inside | 145 | 0 | SE1 | |
| | | | | | | 4 Inside | 133 | 0 | SE1 | |
| | | | | | | 5 Inside | 147 | 0 | SE1 | |
| | **AVG.** | **184** | | | | **AVG:** | **142** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **5** | | | |
| **DS- 44** | **161224** | 183 | > 50% | BRK | | 1 Outside | 143 | 0 | SE1 | |
| **P155/P156** | | 184 | > 50% | BRK | | 2 Outside | 140 | 0 | SE1 | |
| | | 181 | > 50% | BRK | | 3 Outside | 145 | 0 | SE1 | |
| | | 176 | > 50% | BRK | | 4 Outside | 137 | 0 | SE1 | |
| | | 178 | > 50% | BRK | | 5 Outside | 133 | 0 | SE1 | |
| | | | | | | **AVG:** | **140** | | | |
| | | | | | | STD. DEV. | **5** | | | |
| | | | | | | 1 Inside | 132 | 0 | SE1 | |
| | | | | | | 2 Inside | 129 | 0 | SE1 | |
| | | | | | | 3 Inside | 142 | 0 | SE1 | |
| | | | | | | 4 Inside | 125 | 0 | SE1 | |
| | | | | | | 5 Inside | 137 | 0 | SE1 | |
| | **AVG:** | **180** | | | | **AVG:** | **133** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **7** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

(End of Table 3)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 4.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **25-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220037**

QC'd By: Maria Cipitia
TEST METHOD: ASTM D6392
DATE REPORT: 25-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS-46** | **161225** | 189 | > 50% | BRK | | 1 Outside | 133 | 0 | SE1 | |
| **P167P168** | | 189 | > 50% | BRK | | 2 Outside | 154 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 3 Outside | 151 | 0 | SE1 | |
| | | 185 | > 50% | BRK | | 4 Outside | 145 | 0 | SE1 | |
| | | 182 | > 50% | BRK | | 5 Outside | 145 | 0 | SE1 | |
| | | | | | | **AVG:** | **146** | | | |
| | | | | | | STD. DEV. | **8** | | | |
| | | | | | | 1 Inside | 140 | 0 | SE1 | |
| | | | | | | 2 Inside | 137 | 0 | SE1 | |
| | | | | | | 3 Inside | 131 | 0 | SE1 | |
| | | | | | | 4 Inside | 125 | 0 | SE1 | |
| | | | | | | 5 Inside | 116 | 0 | SE1 | |
| | **AVG.** | **187** | | | | **AVG:** | **130** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **10** | | | |
| **DS- 47** | **161226** | 187 | > 50% | BRK | | 1 Outside | 137 | 0 | SE1 | |
| **P170/P169** | | 191 | > 50% | BRK | | 2 Outside | 133 | 0 | SE1 | |
| | | 187 | > 50% | BRK | | 3 Outside | 132 | 0 | SE1 | |
| | | 188 | > 50% | BRK | | 4 Outside | 134 | 0 | SE1 | |
| | | 189 | > 50% | BRK | | 5 Outside | 148 | 0 | SE1 | |
| | | | | | | **AVG:** | **137** | | | |
| | | | | | | STD. DEV. | **7** | | | |
| | | | | | | 1 Inside | 146 | 0 | SE1 | |
| | | | | | | 2 Inside | 144 | 0 | SE1 | |
| | | | | | | 3 Inside | 145 | 0 | SE1 | |
| | | | | | | 4 Inside | 145 | 0 | SE1 | |
| | | | | | | 5 Inside | 146 | 0 | SE1 | |
| | **AVG:** | **188** | | | | **AVG:** | **145** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **1** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 4)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit.

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## TABLE 5.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **25-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220037**

QC'd By: Maria Cipitia
TEST METHOD:
DATE REPORT: 25-Jan-22

| | | Crosshead Speed: 2 in/min — SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min — PEEL EVALUATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS-48** | **161227** | 193 | > 50% | BRK | | 1 Outside | 139 | 0 | SE1 | |
| **P161/P166** | | 197 | > 50% | BRK | | 2 Outside | 163 | 0 | SE1 | |
| | | 197 | > 50% | BRK | | 3 Outside | 163 | 0 | SE1 | |
| | | 200 | > 50% | BRK | | 4 Outside | 148 | 0 | SE1 | |
| | | 190 | > 50% | BRK | | 5 Outside | 135 | 0 | SE1 | |
| | | | | | | **AVG:** | **150** | | | |
| | | | | | | STD. DEV. | **13** | | | |
| | | | | | | 1 Inside | 120 | 0 | SE1 | |
| | | | | | | 2 Inside | 123 | 0 | SE1 | |
| | | | | | | 3 Inside | 139 | 0 | SE1 | |
| | | | | | | 4 Inside | 122 | 0 | SE1 | |
| | | | | | | 5 Inside | 135 | 0 | SE1 | |
| | **AVG.** | **195** | | | | **AVG:** | **128** | | | |
| | STD. DEV. | **4** | | | | STD. DEV. | **9** | | | |
| **DS-49** | **161228** | 183 | > 50% | BRK | | 1 Outside | 133 | 0 | SE1 | |
| **P177/P176** | | 187 | > 50% | BRK | | 2 Outside | 144 | 0 | SE1 | |
| | | 186 | > 50% | BRK | | 3 Outside | 135 | 0 | SE1 | |
| | | 181 | > 50% | BRK | | 4 Outside | 153 | 0 | SE1 | |
| | | 182 | > 50% | BRK | | 5 Outside | 141 | 0 | SE1 | |
| | | | | | | **AVG:** | **141** | | | |
| | | | | | | STD. DEV. | **8** | | | |
| | | | | | | 1 Inside | 138 | 0 | SE1 | |
| | | | | | | 2 Inside | 147 | 0 | SE1 | |
| | | | | | | 3 Inside | 129 | 0 | SE1 | |
| | | | | | | 4 Inside | 140 | 0 | SE1 | |
| | | | | | | 5 Inside | 145 | 0 | SE1 | |
| | **AVG:** | **184** | | | | **AVG:** | **140** | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | **7** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 5)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit

## TABLE 6.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **25-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220037**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 25-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS-50** | **161229** | 184 | > 50% | BRK | | 1 Outside | 138 | 0 | SE1 | |
| **P178/P150** | | 186 | > 50% | BRK | | 2 Outside | 134 | 0 | SE1 | |
| | | 183 | > 50% | BRK | | 3 Outside | 146 | 0 | SE1 | |
| | | 190 | > 50% | BRK | | 4 Outside | 139 | 0 | SE1 | |
| | | 182 | > 50% | BRK | | 5 Outside | 147 | 0 | SE1 | |
| | | | | | | **AVG:** | **141** | | | |
| | | | | | | STD. DEV. | **6** | | | |
| | | | | | | 1 Inside | 152 | 0 | SE1 | |
| | | | | | | 2 Inside | 142 | 0 | SE1 | |
| | | | | | | 3 Inside | 141 | 0 | SE1 | |
| | | | | | | 4 Inside | 146 | 0 | SE1 | |
| | | | | | | 5 Inside | 120 | 0 | SE1 | |
| | **AVG.** | **185** | | | | **AVG:** | **140** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **12** | | | |
| **DS-51** | **161230** | 176 | > 50% | BRK | | 1 Outside | 142 | 0 | SE1 | |
| **P176/P139** | | 176 | > 50% | BRK | | 2 Outside | 158 | 0 | SE1 | |
| | | 174 | > 50% | BRK | | 3 Outside | 149 | 0 | SE1 | |
| | | 175 | > 50% | BRK | | 4 Outside | 154 | 0 | SE1 | |
| | | 175 | > 50% | BRK | | 5 Outside | 156 | 0 | SE1 | |
| | | | | | | **AVG:** | **152** | | | |
| | | | | | | STD. DEV. | **6** | | | |
| | | | | | | 1 Inside | 153 | 0 | SE1 | |
| | | | | | | 2 Inside | 147 | 0 | SE1 | |
| | | | | | | 3 Inside | 152 | 0 | SE1 | |
| | | | | | | 4 Inside | 145 | 0 | SE1 | |
| | | | | | | 5 Inside | 151 | 0 | SE1 | |
| | **AVG:** | **175** | | | | **AVG:** | **149** | | | |
| | STD. DEV. | **1** | | | | STD. DEV. | **4** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 6)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc from and against all liabilities in excess of the aforementioned limit

## TABLE 7.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **25-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion Weld**
TRI JOB #: **CA220037**

QC'd By: Maria Cipitria
TEST METHOD: ASTM D6392
DATE REPORT: 25-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC. (lb/in width) |
| **DS-38** | **161215** | 199 | > 50% | BRK | | 1 Outside | 150 | 0 | SE1 | |
| **P127/P87** | | 197 | > 50% | BRK | | 2 Outside | 138 | 0 | SE1 | |
| | | 202 | > 50% | BRK | | 3 Outside | 145 | 0 | SE1 | |
| | | 197 | > 50% | BRK | | 4 Outside | 143 | 0 | SE1 | |
| | | 192 | > 50% | BRK | | 5 Outside | 145 | 0 | SE1 | |
| | | | | | | **AVG:** | **144** | | | |
| | | | | | | STD. DEV. | **4** | | | |
| | | | | | | 1 Inside | 135 | 0 | SE1 | |
| | | | | | | 2 Inside | 141 | 0 | SE1 | |
| | | | | | | 3 Inside | 157 | 0 | SE1 | |
| | | | | | | 4 Inside | 147 | 0 | SE1 | |
| | | | | | | 5 Inside | 133 | 0 | SE1 | |
| | **AVG.** | **198** | | | | **AVG:** | **143** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **10** | | | |
| **DS-41** | **161216** | 207 | > 50% | BRK | | 1 Outside | 174 | 0 | SE1 | |
| **P140/P141** | | 209 | > 50% | BRK | | 2 Outside | 163 | 0 | SE1 | |
| | | 202 | > 50% | BRK | | 3 Outside | 162 | 0 | SE1 | |
| | | 206 | > 50% | BRK | | 4 Outside | 159 | 0 | SE1 | |
| | | 208 | > 50% | BRK | | 5 Outside | 165 | 0 | SE1 | |
| | | | | | | **AVG:** | **165** | | | |
| | | | | | | STD. DEV. | **6** | | | |
| | | | | | | 1 Inside | 140 | 0 | SE1 | |
| | | | | | | 2 Inside | 141 | 0 | SE1 | |
| | | | | | | 3 Inside | 145 | 0 | SE1 | |
| | | | | | | 4 Inside | 139 | 0 | SE1 | |
| | | | | | | 5 Inside | 140 | 0 | SE1 | |
| | **AVG:** | **207** | | | | **AVG:** | **141** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **3** | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE |
| BRK | BREAK IN SHEETING |
| SE1 | BREAK AT OUTER EDGE OF SEAM |
| SE2 | BREAK AT INNER EDGE OF SEAM |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE |
| AD-WLD | BREAK THROUGH THE FILLET |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

(End of Table 7)



By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI Environmental, Inc. from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless TRI Environmental, Inc. from and against all liabilities in excess of the aforementioned limit

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Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

GAI-LAP

## TABLE 8.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **25-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Fusion/Extrusion Weld**
TRI JOB #: **CA220037**

QC'd By: Maria Cipitia
TEST METHOD: ASTM D6392
DATE REPORT: 25-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC (lb/in width) |
| **DS-45** | **161217** | 177 | > 50% | BRK | | 1 Outside | 126 | 0 | SE1 | |
| **P168/P163** | | 180 | > 50% | BRK | | 2 Outside | 145 | 0 | SE1 | |
| | | 178 | > 50% | BRK | | 3 Outside | 145 | 0 | SE1 | |
| | | 181 | > 50% | BRK | | 4 Outside | 124 | 0 | SE1 | |
| | | 186 | > 50% | BRK | | 5 Outside | 148 | 0 | SE1 | |
| **FUS** | | | | | | **AVG:** | **138** | | | |
| | | | | | | STD. DEV. | **12** | | | |
| | | | | | | 1 Inside | 146 | 0 | SE1 | |
| | | | | | | 2 Inside | 146 | 0 | SE1 | |
| | | | | | | 3 Inside | 130 | 0 | SE1 | |
| | | | | | | 4 Inside | 151 | 0 | SE1 | |
| | | | | | | 5 Inside | 131 | 0 | SE1 | |
| | **AVG.** | **181** | | | | **AVG:** | **141** | | | |
| | STD. DEV. | **3** | | | | STD. DEV. | **10** | | | |
| **DX-6** | **161218** | 181 | > 50% | BRK | | 1 Outside | 107 | 0 | SE3 | |
| **P86/R177** | | 182 | > 50% | BRK | | 2 Outside | 118 | 0 | SE3 | |
| | | 182 | > 50% | BRK | | 3 Outside | 105 | 0 | SE3 | |
| | | 178 | > 50% | BRK | | 4 Outside | 121 | 0 | SE3 | |
| **EXT** | | 182 | > 50% | BRK | | 5 Outside | 118 | 0 | SE3 | |
| | | | | | | **AVG:** | **114** | | | |
| | | | | | | STD. DEV. | **7** | | | |
| | | | | | | 1 Inside | N/A | | | |
| | | | | | | 2 Inside | | | | |
| | | | | | | 3 Inside | | | | |
| | | | | | | 4 Inside | | | | |
| | | | | | | 5 Inside | | | | |
| | **AVG:** | **181** | | | | **AVG:** | | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE |
| BRK | BREAK IN SHEETING |
| SE1 | BREAK AT OUTER EDGE OF SEAM |
| SE2 | BREAK AT INNER EDGE OF SEAM |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING |
| BRK2 | BREAK IN TOP SHEETING |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET |

(End of Table 8)



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GAI-LAP
Initial: CVZ #:0.13
DATE: 1/26/2022

January 26, 2022

Sam Franco
***SCS Engineers***
12651 Briar Forest Dr. Suite 205
Houston, TX, 77077

**Re:** FINAL LABORATORY TEST REPORT

Dear Mr. Franco:

Thank you for consulting TRI California for your material testing needs.

Enclosed is the *final* laboratory report for the Seam testing of two (2) HDPE Seam samples.

**PROJECT NAME:** Oak Grove Steam Electric Station DATE REPORTED: **January 26, 2022**

**REFERENCE TRI JOB NO.:** CA220042

**DATE RECEIVED:** January 26, 2022

**SAMPLE(S) SENT BY:** SCS Engineers

**SAMPLE IDENTIFICATIONS:**

| *SAMPLE ID* | *TRI-CA CONTROL NUMBER* |
|---|---|
| DX- 7 P177/ R226 | 161249 |
| DX- 8 P168/ R237 | 161250 |

**TESTS REQUIRED / PERFORMED:**

| *TEST METHOD* | *DESCRIPTION* |
|---|---|
| 1. ASTM D6392 | Shear Bond Strength |
| 2. ASTM D6392 | Peel Bond Adhesion |

**TEST RESULTS:** The test results are summarized in the attached Table 1.

Note: The general conditioning and testing of the material samples identified in this report were performed within the range of the laboratory environmental conditions; i.e., 20-24°C and 45-65% RH. Otherwise, the actual environmental conditions are indicated in the respective test method reported.

Respectfully,

**TRI Environmental, Inc. - California**

Maria Espitia
Quality Assurance

Chad Blackwell
TRI-CA Director

*Signatures are on file*

It shall be noted that the **sample/s** tested **is/are** believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is our policy to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.*** On the other hand, should you need us to keep them at a longer period, please advise us in writing.

**2 Pages Total** *(including this sheet)*

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## TABLE 1.
## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **SCS Engineers**
PROJECT: **Oak Grove Steam Electric**
DATE REC'D: **26-Jan-22**

MATERIAL: **HDPE SEAM**
SEAM TYPE: **Extrusion Weld**
TRI JOB #: **CA220042**

QC'd By: Maria Espitia
TEST METHOD: ASTM D6392
DATE REPORT: 26-Jan-22

| Crosshead Speed: 2 in/min | | SHEAR EVALUATION | | | | Crosshead Speed: 2 in/min | PEEL EVALUATION | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | TRI CONTROL # | MAXIMUM STRENGTH (lb/in width) | % Elongation | Locus of Break | PROJECT SPEC. (lb/in width) | SPECIMEN NUMBER | MAXIMUM STRENGTH (lb/in width) | % INCURSION (%) | LOCUS OF BREAK | PROJECT SPEC (lb/in width) |
| **DX- 7** | **161249** | 200 | > 50% | BRK | | 1 Outside | 123 | 0 | SE3 | |
| **P177/ R226** | | 205 | > 50% | BRK | | 2 Outside | 134 | 0 | SE3 | |
| | | 203 | > 50% | BRK | | 3 Outside | 135 | 0 | SE3 | |
| | | 201 | > 50% | BRK | | 4 Outside | 148 | 0 | SE3 | |
| | | 203 | > 50% | BRK | | 5 Outside | 131 | 0 | SE3 | |
| | | | | | | **AVG:** | **134** | | | |
| | | | | | | STD. DEV. | **9** | | | |
| | | | | | | 1 Inside | N/A | | | |
| | | | | | | 2 Inside | | | | |
| | | | | | | 3 Inside | | | | |
| | | | | | | 4 Inside | | | | |
| | | | | | | 5 Inside | | | | |
| | **AVG.** | **202** | | | | **AVG:** | | | | |
| | STD. DEV. | **2** | | | | STD. DEV. | | | | |
| **DX- 8** | **161250** | 185 | > 50% | BRK | | 1 Outside | 133 | 0 | SE3 | |
| **P168/ R237** | | 184 | > 50% | BRK | | 2 Outside | 122 | 0 | SE3 | |
| | | 187 | > 50% | BRK | | 3 Outside | 131 | 0 | SE3 | |
| | | 179 | > 50% | BRK | | 4 Outside | 132 | 0 | SE3 | |
| | | 178 | > 50% | BRK | | 5 Outside | 139 | 0 | SE3 | |
| | | | | | | **AVG:** | **131** | | | |
| | | | | | | STD. DEV. | **6** | | | |
| | | | | | | 1 Inside | N/A | | | |
| | | | | | | 2 Inside | | | | |
| | | | | | | 3 Inside | | | | |
| | | | | | | 4 Inside | | | | |
| | | | | | | 5 Inside | | | | |
| | **AVG:** | **183** | | | | **AVG:** | | | | |
| | STD. DEV. | **4** | | | | STD. DEV. | | | | |

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

| | |
|---|---|
| AD | ADHESION FAILURE. |
| BRK | BREAK IN SHEETING. |
| SE1 | BREAK AT OUTER EDGE OF SEAM. |
| SE2 | BREAK AT INNER EDGE OF SEAM. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

**EXTRUSION:**

| | |
|---|---|
| AD1 | ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD. |
| AD2 | ADHESION FAILURE. |
| AD-WLD | BREAK THROUGH THE FILLET. |
| SE1 | BREAK AT BOTTOM EDGE OF SEAM. |
| SE2 | BREAK AT TOP EDGE OF SEAM. |
| SE3 | BREAK AT BOTTOM EDGE OF SEAM (for PEEL only) |
| BRK1 | BREAK IN BOTTOM SHEETING. |
| BRK2 | BREAK IN TOP SHEETING. |
| AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. |
| HT | BREAK AT EDGE OF HOT TACK |
| SIP | SEPARATION IN THE PLANE OF THE SHEET. |

(End of Table 1)



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# Repairs

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Repairs**

| Repair Number | Repair Date | Repair Time | Seam/ Panel ID | Station | Description of Damage | Type/Size of Repair | Material Welded | Repair Crew & Machine | Repair Test Data | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Test Date | Test Crew | Pass/ Fail | CQA Tech. | |
| 1 | 1/12/2022 | 0800 | 1/2 | 80 | DS-1 | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 2 | 1/12/2022 | 0805 | 2/3 | 80 | DS-2 | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 3 | 1/12/2022 | 0810 | 4/5/6 | 39 | INT | 2x3 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 4 | 1/12/2022 | 0822 | 8/9 | 3 | HOLE | 2x3 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 5 | 1/12/2022 | 0826 | 12 | 2 | HOLE | 2x2 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 6 | 1/12/2022 | 0832 | 12/13 | 2 | HOLE | 2x2 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 7 | 1/12/2022 | 0840 | 11/12/13 | 42 | INT | 2x2 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 8 | 1/12/2022 | 0848 | 11/13 | 82 | DS-3 | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 9 | 1/12/2022 | 0855 | 13/14 | 89 | DS-4 | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | DX1 @ 89 R9/14 |
| 10 | 1/12/2022 | 0922 | R9/14 | 89 | DX-1 | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 11 | 1/12/2022 | 0931 | 18/19 | 20 | HOLE | 2x2 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 12 | 1/12/2022 | 0935 | 17/18/19 | 44 | INT | 2x3 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 13 | 1/12/2022 | 0945 | 22/23/24 | 37 | INT | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 14 | 1/12/2022 | 0954 | 25/26 | 78 | DS-5 | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 15 | 1/12/2022 | 0959 | 26/27 | 78 | DS-6 | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 16 | 1/12/2022 | 1003 | 32/33/34 | 44 | INT | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 17 | 1/12/2022 | 1015 | 36/38 | 45 | DS-7 | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 18 | 1/12/2022 | 1020 | 36/37/38 | 43 | INT | 2x3 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 19 | 1/12/2022 | 1025 | 37/38 | 2 | HOLE | 2x2 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 20 | 1/12/2022 | 1033 | 38/39 | 43 | DS-8 | 2x4 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 21 | 1/12/2022 | 1045 | 40/41/42 | 44 | INT | 2x3 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 22 | 1/15/2022 | 1000 | 48/49 | 1 | HOLE | 2x3 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 23 | 1/15/2022 | 1013 | 47 | 83 | HOLE | 2x8 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 24 | 1/15/2022 | 1020 | 47/48 | 83 | DS-9 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 25 | 1/15/2022 | 1033 | 51 | 89 | HOLE | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 26 | 1/15/2022 | 1043 | 50/51 | 76 | DS-10 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 27 | 1/15/2022 | 1047 | 44/45/46 | 45 | INT | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 28 | 1/15/2022 | 1059 | 70/71 | 307 | DS-14 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 29 | 1/15/2022 | 1100 | 71/73 | 312 | DS-16 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | DX 2 @ 312 R29/73 |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Repairs**

| Repair Number | Repair Date | Repair Time | Seam/ Panel ID | Station | Description of Damage | Type/Size of Repair | Material Welded | Repair Crew & Machine | Repair Test Data | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Test Date | Test Crew | Pass/ Fail | CQA Tech. | |
| 30 | 1/15/2022 | 1109 | 42/43/70/71 | 396-400 | INT/ CAP | 2x6 | T/T | FM/690 | 1/15/2022 | MS | P | DR | Caps seam 43/71 |
| 31 | 1/15/2022 | 1112 | 43/44/70 | 95 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 32 | 1/15/2022 | 1117 | 44/46/70 | 89 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 33 | 1/15/2022 | 1030 | 47/48 | 50 | Boot | 16x16 | T/T | DL/1063 | 1/15/2022 | MS | P | DR | |
| 34 | 1/15/2022 | 1125 | 46/47/70 | 89 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 35 | 1/15/2022 | 1127 | 47/48/70 | 92 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 36 | 1/15/2022 | 1131 | 48/49/70 | 92 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 37 | 1/15/2022 | 1137 | 49/70 | 291-293 | BO | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 38 | 1/15/2022 | 1141 | 49/50/70 | 288 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 39 | 1/15/2022 | 1145 | 50/51/70 | 91 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 40 | 1/15/2022 | 1148 | 51/52/70 | 91 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 41 | 1/15/2022 | 1152 | 52/53/70 | 91 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 42 | 1/15/2022 | 1157 | 53/59/70 | 199 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 43 | 1/15/2022 | 1347 | 54/55/70 | 176 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 44 | 1/15/2022 | 1353 | 55/56/70 | 153 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 45 | 1/15/2022 | 1400 | 56/57/70 | 131 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 46 | 1/15/2022 | 1404 | 57/58/70 | 109 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 47 | 1/15/2022 | 1407 | 58/59/70 | 86 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 48 | 1/15/2022 | 1412 | 57/58 | 85 | DS-11 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 49 | 1/15/2022 | 1415 | 59/60/70 | 64 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 50 | 1/15/2022 | 1420 | 60/61 | 84 | DS-12 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 51 | 1/15/2022 | 1422 | 60/61/70 | 41 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 52 | 1/15/2022 | 1430 | 61/62/70 | 22 | DS-13/ INT | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 53 | 1/15/2022 | 1435 | 62/64/66/70 | 7-11 | INT/CAP | 2x6 | T/T | FM/690 | 1/15/2022 | MS | P | DR | Caps Seam 64/70 |
| 54 | 1/15/2022 | 1440 | 66/69/70 | 92 | INT | 2x3 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 55 | 1/15/2022 | 1445 | 64/65/66 | 41 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 56 | 1/15/2022 | 1445 | 66/67/68/69 | 43 | INT | 2x3 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 57 | 1/15/2022 | 1503 | 67/68 | 40 | DS-15 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 58 | 1/15/2022 | 1505 | 65/66 | 1 | HOLE | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Repairs**

| Repair Number | Repair Date | Repair Time | Seam/ Panel ID | Station | Description of Damage | Type/Size of Repair | Material Welded | Repair Crew & Machine | Repair Test Data | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Test Date | Test Crew | Pass/ Fail | CQA Tech. | |
| 59 | 1/15/2022 | 1515 | 62/63/64 | 40 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 60 | 1/15/2022 | 1520 | 74/75 | 99 | HOLE | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 61 | 1/15/2022 | 1536 | 74/75 | 287 | DS-18 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 62 | 1/15/2022 | 1540 | R29/73 | 312 | DX2 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 63 | 1/15/2022 | 1547 | 76/81 | 347 | DS-20 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 64 | 1/15/2022 | 1553 | 75/76 | 367 | DS-19 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 65 | 1/15/2022 | 1600 | 73/74 | 413 | DS-17 | 2x4 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 66 | 1/15/2022 | 1608 | 71/72/73 | 489 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 67 | 1/15/2022 | 1610 | 42/71/72 | 417 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 68 | 1/15/2022 | 1613 | 40/42/72 | 93 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 69 | 1/15/2022 | 1620 | 39/40/72/73 | 3-7 | INT/CAP | 2x5 | T/T | FM/690 | 1/15/2022 | MS | P | DR | Caps Seam 39/72 |
| 70 | 1/15/2022 | 1624 | 39/73 | 506 | HOLE | 2x3 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 71 | 1/15/2022 | 1630 | 38/39/77 | 91 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 72 | 1/15/2022 | 1636 | 73/74/77/78 | 506 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 73 | 1/15/2022 | 1638 | 38/77/78 | 91 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 74 | 1/15/2022 | 1639 | 36/38/78 | 91 | INT | 2x2 | T/T | FM/690 | 1/15/2022 | MS | P | DR | |
| 75 | 1/15/2022 | 1646 | 35/36/78 | 91 | INT | 2x2 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 76 | 1/15/2022 | 1651 | 35/78/79 | 94 | INT | 2x2 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 77 | 1/15/2022 | 1655 | 34/35/79 | 88 | INT | 2x2 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 78 | 1/15/2022 | 1658 | 34/79/80 | 88 | INT | 2x2 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 79 | 1/15/2022 | 1700 | 32/34/80 | 88 | INT | 2x2 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 80 | 1/15/2022 | 1707 | 80/82 | 546 | DS-21 | 2x4 | T/T | FM/690 | 1/19/2022 | MS | P | DR | DX3 @ 546 R80/82 |
| 81 | 1/15/2022 | 1710 | 31/32/80 | 91 | INT | 2x2 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 82 | 1/15/2022 | 1714 | 31/80/82 | 91 | INT | 2x2 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 83 | 1/15/2022 | 1717 | 30/31/82 | 91 | INT | 2x2 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 84 | 1/15/2022 | 1720 | 76/80/81/82 | 501 | INT | 2x6 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 85 | 1/15/2022 | 1728 | 75/76/79/80 | 500 | INT | 3x3 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 86 | 1/15/2022 | 1732 | 74/75/78/79 | 502 | INT | 2x2 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |
| 87 | 1/15/2022 | 1736 | R80/82 | 546 | DX-3 | 2x4 | T/T | FM/690 | 1/19/2022 | MS | P | DR | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Repairs**

| Repair Number | Repair Date | Repair Time | Seam/ Panel ID | Station | Description of Damage | Type/Size of Repair | Material Welded | Repair Crew & Machine | Repair Test Data | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Test Date | Test Crew | Pass/ Fail | CQA Tech. | |
| 88 | 1/18/2022 | 1404 | 81/82/83/88 | 501 | INT | 2x5 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 89 | 1/18/2022 | 1408 | 83/84/88/89 | 502 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 90 | 1/18/2022 | 1414 | 86/91 | 10 | DS-26 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 91 | 1/18/2022 | 1418 | 86/91/92 | 507 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 92 | 1/18/2022 | 1424 | 84/85/89 | 500 | INT | 2x3 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 93 | 1/18/2022 | 1427 | 85/89/90 | 505 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 94 | 1/18/2022 | 1433 | 85/86/90/91 | 507 | INT | 2x3 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 95 | 1/18/2022 | 1440 | 26/91/92 | 557 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 96 | 1/18/2022 | 1444 | 25/26/92 | 88 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 97 | 1/18/2022 | 1447 | 25/92/94 | 533 | INT | 2x3 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 98 | 1/18/2022 | 1450 | 24/25/94 | 89 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 99 | 1/18/2022 | 1455 | 94/96 | 520 | DS-28 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 100 | 1/18/2022 | 1500 | 24/94/96 | 89 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 101 | 1/18/2022 | 1502 | 22/24/96 | 83 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 102 | 1/18/2022 | 1511 | 21/22/96/97 | 0-3 | INT/CAP | 2x5 | T/T | FM/690 | 1/20/2022 | AT | P | DR | Caps Seam 22/97 |
| 103 | 1/18/2022 | 1515 | 20/21/97/98 | 553 | INT | 2x3 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 104 | 1/18/2022 | 1518 | 98 | 502 | HOLE | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 105 | 1/18/2022 | 1524 | 19/20/98/100 | 18-21 | INT/CAP | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | Caps Seam 19/98 |
| 106 | 1/18/2022 | 1533 | 16/17/19/100/102 | 2-6/ 19-22 | INT/CAP | 2x8 | T/T | FM/690 | 1/20/2022 | AT | P | DR | Caps Seams 17/100 & 17/102 |
| 107 | 1/18/2022 | 1540 | 15/16/102/104 | 18-22 | INT/CAP | 2x6 | T/T | FM/690 | 1/20/2022 | AT | P | DR | Caps Seam 16/104 |
| 108 | 1/18/2022 | 1546 | 14/15/104/105/106 | 19-22 | INT/CAP | 2x5 | T/T | FM/690 | 1/20/2022 | AT | P | DR | Caps Seam 15/106 |
| 109 | 1/18/2022 | 1554 | 104/106 | 295 | INT/DS-32 | 2x6 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 110 | 1/18/2022 | 1600 | 13/14/105/106/107 | 294 | INT | 3x3 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 111 | 1/18/2022 | 1604 | 107/109 | 243 | DS-33 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 112 | 1/18/2022 | 1615 | 110/112 | 195 | DS-34 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 113 | 1/18/2022 | 1624 | 84/85 | 305 | DS-24 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 114 | 1/18/2022 | 1629 | 85/86 | 302 | DS-25 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 115 | 1/18/2022 | 1634 | 83/84 | 346 | DS-23 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 116 | 1/18/2022 | 1638 | 81/83 | 325 | DS-22 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Repairs**

| Repair Number | Repair Date | Repair Time | Seam/ Panel ID | Station | Description of Damage | Type/Size of Repair | Material Welded | Repair Crew & Machine | Repair Test Data | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Test Date | Test Crew | Pass/ Fail | CQA Tech. | |
| 117 | 1/18/2022 | 1645 | 92/94 | 351 | DS-27 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 118 | 1/18/2022 | 1702 | 103/104/105 | 203 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 119 | 1/18/2022 | 1705 | 107/108/109 | 190 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 120 | 1/18/2022 | 1710 | 108/109/110 | 201 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 121 | 1/18/2022 | 1714 | 110/111/112 | 163 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 122 | 1/18/2022 | 1717 | 111/112/113 | 165 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 123 | 1/18/2022 | 1726 | 101/102/104 | 212 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 124 | 1/18/2022 | 1730 | 100/101/102 | 212 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 125 | 1/18/2022 | 1735 | 101/103 | 88 | DS-31 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | DX 4 @ 164 R125/101 |
| 126 | 1/18/2022 | 1742 | 99/101 | 151 | DS-30 | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 127 | 1/18/2022 | 1745 | 99/100/101 | 167 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 128 | 1/18/2022 | 1752 | 98/99/100 | 127 | INT | 2x2 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 129 | 1/18/2022 | 1800 | 95/96/97 | 417 | INT | 2x4 | T/T | FM/690 | 1/20/2022 | AT | P | DR | |
| 130 | 1/19/2022 | 1118 | 10/11/13/107/109 | 0-3 | INT/CAP | 2x10 | T/T | DL/690 | 1/20/2022 | AT | P | DR | Caps Seams 11/107 & 11/109 |
| 131 | 1/19/2022 | 1125 | 9/10/109/110 | 0-3 | INT/CAP | 2x5 | T/T | DL/690 | 1/20/2022 | AT | P | DR | Caps Seam 9/109 |
| 132 | 1/19/2022 | 1132 | 8/9/110 | 22 | DS-35/ INT | 2x6 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 133 | 1/19/2022 | 1133 | 8/110/112 | 13 | INT | 2x3 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 134 | 1/19/2022 | 1140 | 7/8/112 | 90 | INT | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 135 | 1/19/2022 | 1146 | 6/7/112 | 22 | INT | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 136 | 1/19/2022 | 1149 | 6/112/113 | 10 | INT | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 137 | 1/19/2022 | 1152 | 4/6/113 | 22 | INT | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 138 | 1/19/2022 | 1155 | 3/4/113 | 6 | INT | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 139 | 1/19/2022 | 1340 | 2/3/113 | 22 | INT | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 140 | 1/19/2022 | 1344 | 2/113 | 6 | BO | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 141 | 1/19/2022 | 1348 | 2/113 | 11 | BO | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 142 | 1/19/2022 | 1400 | 1/2/113/114 | 18 | INT | 2x7 | T/T | DL/690 | 1/20/2022 | AT | P | DR | DX 5 @ 18 R142/113 |
| 143 | 1/19/2022 | 1405 | 1/113/114/115/122 | 113 | INT | 4x4 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 144 | 1/19/2022 | 1410 | 115/122 | 105 | BO | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 145 | 1/19/2022 | 1419 | 115/116/121/122 | 90-93 | INT/ CAP | 4x4 | T/T | DL/690 | 1/20/2022 | AT | P | DR | Caps Seam 115/121 |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Repairs**

| Repair Number | Repair Date | Repair Time | Seam/ Panel ID | Station | Description of Damage | Type/Size of Repair | Material Welded | Repair Crew & Machine | Repair Test Data | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Test Date | Test Crew | Pass/ Fail | CQA Tech. | |
| 146 | 1/19/2022 | 1430 | 116/117/120/121 | 65-68 | INT/CAP | 2x5 | T/T | DL/690 | 1/20/2022 | AT | P | DR | Caps seam 116/120 |
| 147 | 1/19/2022 | 1437 | 117/118/119/120 | 28-31 | INT | 2x5 | T/T | DL/690 | 1/20/2022 | AT | P | DR | Caps Seam 117/119 |
| 148 | 1/20/2022 | 0830 | 115/116 | 29 | DS-36 | 2x4 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 149 | 1/20/2022 | 0835 | R142/113 | 18 | DX-5 | 2x5 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 150 | 1/20/2022 | 0840 | 101/103/104 | 202 | INT | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 151 | 1/20/2022 | 0855 | R125/101 | 88 | DX-4 | 2x4 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 152 | 1/20/2022 | 0905 | 98/99 | 49 | DS-29 | 2x4 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 153 | 1/20/2022 | 0915 | 92/93/94 | 321 | INT | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 154 | 1/20/2022 | 0925 | 86/92/93 | 322 | INT | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 155 | 1/20/2022 | 0930 | 111/113 | 52 | BO | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 156 | 1/20/2022 | 0940 | 94/95/96 | 416 | INT | 2x2 | T/T | DL/690 | 1/20/2022 | AT | P | DR | |
| 157 | 1/23/2022 | 1130 | 147/148 | 40 | Boot | 4x4 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 158 | 1/23/2022 | 1121 | 133/134/170/171 | 132 | INT | 2x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 159 | 1/23/2022 | 1124 | 169/170 | 113 | DS-47 | 2x4 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 160 | 1/23/2022 | 1129 | 132/133/169/170 | 131 | INT | 2x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 161 | 1/23/2022 | 1136 | 131/132/160/169 | 129 | INT | 2x8 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 162 | 1/23/2022 | 1140 | 131/132 | 47 | BO | 2x4 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 163 | 1/23/2022 | 1145 | 130/131/167/168 | 127 | INT | 2x4 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 164 | 1/23/2022 | 1155 | 163/167/168 | 90 | DS-45/ INT | 2x6 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 165 | 1/23/2022 | 1200 | 162/166/167 | 12 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 166 | 1/23/2022 | 1205 | 162/163/168 | 67 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 167 | 1/23/2022 | 1210 | 162/163/167 | 9 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 168 | 1/23/2022 | 1337 | 161/162/166 | 2 | DS-48/ INT | 2x6 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 169 | 1/23/2022 | 1342 | 161/165/166 | 15 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 170 | 1/23/2022 | 1347 | 160/161/165 | 20 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 171 | 1/23/2022 | 1350 | 129/130/166/167 | 0-2 | INT | 2x2 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 172 | 1/23/2022 | 1352 | 128/129/165/166 | 22 | INT | 2x2 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 173 | 1/23/2022 | 1355 | 128/129 | 96 | DS-40 | 2x4 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 174 | 1/23/2022 | 1358 | 127/128/164/165 | 0 | INT | 2x2 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Repairs**

| Repair Number | Repair Date | Repair Time | Seam/ Panel ID | Station | Description of Damage | Type/Size of Repair | Material Welded | Repair Crew & Machine | Repair Test Data | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Test Date | Test Crew | Pass/ Fail | CQA Tech. | |
| 175 | 1/23/2022 | 1400 | 127/128 | 96 | DS-39 | 2x4 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 176 | 1/23/2022 | 1405 | 127/164 | 14 | BO | 2x2 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 177 | 1/23/2022 | 1408 | 86/87/127/164 | 93 | INT | 2x8 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | DX6 @ 93 R177/86 |
| 178 | 1/23/2022 | 1413 | 159/160/164/165 | 20 | INT | 2x3 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 179 | 1/23/2022 | 1415 | 148 | 40 | Boot | 10x10 | T/T | DL/690 | 1/26/2022 | AT | P | DR | |
| 180 | 1/23/2022 | 1421 | 158/159/164 | 99 | INT | 2x2 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 181 | 1/23/2022 | 1424 | 86/158/164 | 175 | INT | 2x2 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 182 | 1/23/2022 | 1426 | 86/157/158 | 98 | INT | 2x2 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 183 | 1/23/2022 | 1430 | 157/158 | 20 | HOLE | 2x3 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 184 | 1/23/2022 | 1436 | 86/156/157 | 20 | INT | 2x2 | T/T | FM/1063 | 1/26/2022 | AT | P | DR | |
| 185 | 1/23/2022 | 1440 | 86/93/156 | 6 | INT | 4x4 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 186 | 1/23/2022 | 1446 | 93/155/156 | 80 | DS-44/ INT | 2x8 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 187 | 1/23/2022 | 1448 | 154/155/156 | 44 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 188 | 1/23/2022 | 1506 | 93/154/155 | 20 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 189 | 1/23/2022 | 1508 | 93/126/154 | 92 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 190 | 1/23/2022 | 1511 | 93/94/126 | 8 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 191 | 1/23/2022 | 1515 | 94/125/126 | 10 | INT | 2x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 192 | 1/23/2022 | 1518 | 125/126 | 35 | DS-37 | 2x4 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 193 | 1/23/2022 | 1520 | 125/126 | 10 | HOLE | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 194 | 1/23/2022 | 1522 | 125 | 8 | HOLE | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 195 | 1/23/2022 | 1525 | 125/126/154 | 49 | INT | 2x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 196 | 1/23/2022 | 1535 | 94/95/124/125 | 19-22 | INT/CAP | 2x7 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | Caps Seam 95/125 |
| 197 | 1/23/2022 | 1543 | 95/97/123/124 | 19 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 198 | 1/23/2022 | 1552 | 97/98/123 | 90 | INT | 3x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 199 | 1/23/2022 | 1544 | 123/124/125 | 44 | INT | 2x2 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 200 | 1/23/2022 | 1610 | 97/98/123/125/154/156/157/158/159/160/161/162/168 | 0 | INT | 6x8 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 201 | 1/23/2022 | 1625 | 134/135/171/172 | 132 | INT | 2x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 202 | 1/23/2022 | 1540 | 147 | 74 | Boot | 15x15 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Repairs**

| Repair Number | Repair Date | Repair Time | Seam/ Panel ID | Station | Description of Damage | Type/Size of Repair | Material Welded | Repair Crew & Machine | Repair Test Data | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Test Date | Test Crew | Pass/ Fail | CQA Tech. | |
| 203 | 1/23/2022 | 1620 | 147/148 | 64 | DS-42 | 2x2 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 204 | 1/23/2022 | 1625 | 147/148 | 44 | AT | 2x2 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 205 | 1/23/2022 | 1630 | 147/148 | 37 | AT | 2x2 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 206 | 1/23/2022 | 1633 | 139/140/176/177 | 95 | INT | 2x3 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 207 | 1/23/2022 | 1628 | 135/136/172/173 | 94 | INT | 2x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 208 | 1/23/2022 | 1631 | 136/137/173/174 | 95 | INT | 2x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 209 | 1/23/2022 | 1634 | 137/138/174/175 | 95 | INT | 2x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 210 | 1/23/2022 | 1640 | 138/139/175/176 | 137 | INT | 2x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 211 | 1/23/2022 | 1643 | 139/176 | 41 | DS-51 | 2x4 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 212 | 1/23/2022 | 1648 | 176/177 | 104 | DS-49 | 2x4 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 213 | 1/23/2022 | 1653 | 148/149/177/182/183 | 115 | INT | 3x3 | T/T | FM/1063 | 1/24/2022 | AT | P | DR | |
| 214 | 1/23/2022 | 1655 | /141/147/148/177/137/ | 115 | INT | 4x8 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 215 | 1/23/2022 | 1700 | 150/178 | 100 | DS-50 | 2x4 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 216 | 1/23/2022 | 1715 | 149/150 | 80 | DS-43 | 2x4 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 217 | 1/23/2022 | 1720 | 149 | 78 | HOLE | 2x2 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 218 | 1/23/2022 | 1730 | 149/150/177/178/182 | 109 | INT | 3x8 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 219 | 1/24/2022 | 0744 | R177/86 | 93 | DX-6 | 2x4 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 220 | 1/24/2022 | 0800 | 87/127 | 51 | DS-38 | 2x4 | T/T | DL/690 | 1/24/2022 | AT | P | DR | |
| 221 | 1/25/2022 | 0825 | 168/169 | 0 | AT | 2x2 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 222 | 1/25/2022 | 0830 | 169/170 | 2 | AT | 2x2 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 223 | 1/25/2022 | 0836 | 170/171 | 1 | AT | 2x2 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 224 | 1/25/2022 | 0843 | 171/172 | 1 | AT | 2x2 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 225 | 1/25/2022 | 0850 | 172/173 | 1 | AT | 2x3 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 226 | 1/25/2022 | 0900 | 177/178 | 1 | AT | 2x4 | T/T | DL/690 | 1/25/2022 | AT | P | DR | DX 7 @ 1 R226/177 |
| 227 | 1/25/2022 | 0910 | 179/180 | 1 | AT | 2x2 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 228 | 1/25/2022 | 0916 | 152/153/180/181 | 21 | INT | 2x4 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 229 | 1/25/2022 | 0922 | 151/152/179/180 | 53 | INT | 2x3 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 230 | 1/25/2022 | 0930 | R226/177 | 1 | DX-7 | 2x4 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 231 | 1/25/2022 | 0935 | 141/142/146/147 | 64-67 | INT | 2x5 | T/T | DL/690 | 1/25/2022 | AT | P | DR | Caps Seam 141/146 |

**Oak Grove Steam Electric Station**

**FGD-A Pond Retrofit**

**Repairs**

| Repair Number | Repair Date | Repair Time | Seam/ Panel ID | Station | Description of Damage | Type/Size of Repair | Material Welded | Repair Crew & Machine | Repair Test Data | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Test Date | Test Crew | Pass/ Fail | CQA Tech. | |
| 232 | 1/25/2022 | 0940 | 140/141 | 58 | DS-41 | 2x4 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 233 | 1/25/2022 | 0945 | 142/143/145/146 | 31-33 | INT | 2x5 | T/T | DL/690 | 1/25/2022 | AT | P | DR | Caps Seam 142/145 |
| 234 | 1/25/2022 | 0950 | 143/144/145 | 3 | INT | 2x2 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 235 | 1/25/2022 | 1000 | 150/151/178/179 | 67 | INT | 2x4 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 236 | 1/25/2022 | 1020 | 87/127 | 2 | AT | 2x3 | T/T | DL/690 | 1/25/2022 | AT | P | DR | |
| 237 | 1/25/2022 | 1100 | 168/169 | 66 | DS-46 | 2x4 | T/T | FM/1063 | 1/25/2022 | AT | P | DR | DX 8 @ 66 R237/168 |
| 238 | 1/25/2022 | 1110 | R237/168 | 66 | DX-8 | 2x4 | T/T | FM/1063 | 1/25/2022 | AT | P | DR | |
| 239 | 1/25/2022 | 1130 | 118/119 | 1 | HOLE | 6x6 | T/T | FM/1063 | 1/25/2022 | AT | P | DR | |
| 240 | 1/25/2022 | 1150 | 68/69 | 1 | AT | 5x5 | T/T | FM/1063 | 1/25/2022 | AT | P | DR | |
| 241 | 1/27/2022 | 0920 | 90/91 | 507 | HOLE | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 242 | 1/27/2022 | 0925 | 89/90 | 505 | HOLE | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 243 | 1/27/2022 | 0930 | 88/89 | 502 | HOLE | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 244 | 1/27/2022 | 0945 | 82/88 | 501 | HOLE | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 245 | 1/27/2022 | 1050 | 26/27/91 | 21 | INT | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 246 | 1/27/2022 | 1110 | 27/91/90 | 7 | INT | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 247 | 1/27/2022 | 1115 | 27/28/90 | 21 | INT | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 248 | 1/27/2022 | 1120 | 28/89/90 | 8 | INT | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 249 | 1/27/2022 | 1125 | 28/29/89 | 0 | INT | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 250 | 1/27/2022 | 1130 | 29/88/89 | 5 | INT | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 251 | 1/27/2022 | 1135 | 29/30/88 | 21 | INT | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 252 | 1/27/2022 | 1140 | 30/88/82 | 6 | INT | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 253 | 1/27/2022 | 1145 | 30/31/82 | 22 | INT | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 254 | 1/27/2022 | 1200 | 85/86/87 | 93 | INT | 2x2 | T/T | DL/690 | 1/27/2022 | VT | P | DR | |
| 255 | 2/18/2022 | 1030 | 119 | 1 | HOLE | 2x3 | T/T | DL/690 | 2/18/2022 | MP | P | DR | |
| 256 | 2/18/2022 | 1040 | 118 | 1 | HOLE | 3x4 | T/T | DL/690 | 2/18/2022 | MP | P | DR | |

# APPENDIX - E

## Resumes

# CQA

# JAMES ROY MURRAY III, P.E.

Vice President/Satellite Office Manager

## Education

Texas A&M University, Bachelor of Science in Civil Engineering

## Professional Licenses

Registered Professional Engineer, Maryland (No. 17665)
Registered Professional Engineer, Texas (No. 73860)

## Professional Affiliations

Solid Waste Association of North America
Texas Solid Waste Association of North America

## Professional Experience

Mr. Murray has over 35 years of experience in civil and environmental permitting, design and construction including municipal solid waste landfills and associated systems, liner systems, leachate collection systems, utilities, roadways, hydrologic analysis and hydraulic design including open channel systems, storm drainage pipe systems, culverts, bridges, basins, and other systems for the conveyance and control of stormwater. Mr. Murray has served as Certifying Engineer for over 47 liner construction projects. Mr. Murray also has extensive experience in landfill design, operation and construction having served for over 20 years as a consultant preparing landfill expansion permit applications. Mr. Murray has served as an expert witness and provided legal support for landfill permits. Mr. Murray also served as an engineer for several landfill facilities in Texas. Responsibilities included project management of permit amendments and modifications, compliance and construction. Selected projects representative of Mr. Murray's experience include:

### Landfill Design/Permit Application

- Design Engineer and project manager for the preparation of a vertical and horizontal expansion permit application for a landfill in Houston, Texas.
- Design Engineer and project manager for the preparation of a vertical and horizontal expansion permit application for a landfill in Hutto, Texas.
- Design Engineer and project manager for the preparation of a greenfield site permit application for a landfill in Laredo, Texas.
- Design Engineer and project manager for the preparation of a horizontal and vertical expansion permit application for a landfill in League City, Texas.
- Design Engineer and project manager for the preparation of a horizontal and vertical expansion permit application for a landfill in Brownsville, Texas.

- Project Manager for the preparation of a 30 foot vertical expansion permit application for a landfill in Cnverse, Texas.
- Project Manager for the preparation of a 700 acre horizontal expansion permit application for a landfill in Converse, Texas.
- Design Engineer and project manager for the preparation of a limited scope permit amendment to add Class 1 waste disposal at a landfill in Laredo, Texas.
- Design engineer and project manager for a grit trap waste permit application at a waste water treatment facility in Victoria, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for an initial oil and gas landfill development, including: roads; drainage channels, ponds, culverts, 2 receiving pits, a truck wash and settling basin, site utilities; perimeter fencing; and a 12-acre landfill disposal cell for a landfill near Nordheim, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for an initial oil and gas landfill development, including: roads; drainage channels, ponds, culverts, 3 receiving pits, 1 contaminated storm water pond, a truck wash and settling basin, site utilities; perimeter fencing; and a 12-acre landfill disposal cell for a landfill in Reeves County, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for an initial oil and gas landfill development, including: roads; drainage channels, ponds, culverts, 2 receiving pits, 1 collecting pit, a truck wash and settling basin, site utilities; perimeter fencing; and a 9-acre landfill disposal cell for a landfill in Reagan County, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for an initial oil and gas landfill development, including: roads; drainage channels, ponds, culverts, 3 receiving pits, 1 collecting pit, a truck wash and settling basin, scalehouse and associated facilities, site utilities; perimeter fencing; and an 8-acre landfill disposal cell for a landfill in Howard County, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for an initial landfill development, including: roads; drainage channels, ponds, culverts and other structures; scalehouse and associated facilities; site utilities; perimeter fencing; and two 8-acre landfill disposal cells for a landfill in Laredo, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for an 6-acre landfill disposal cells for a landfill in Reeves County, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for an 8-acre landfill disposal cells for a landfill in Brownsville, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 5-acre landfill disposal cell for a landfill in Austin, Texas.
- Project manager for the preparation of design plans and technical specifications for a 4-acre landfill disposal cell for a landfill in Hardin County, Texas.

- Design Engineer and project manager for the preparation of design plans and technical specifications for an 11-acre landfill disposal cell for a landfill in Hutto, Texas.
- Project manager for the preparation of design plans and technical specifications for a 5-acre landfill disposal cell for a landfill in Austin, Texas.
- Project manager for the preparation of design plans and technical specifications for a 4-acre landfill disposal cell for a landfill in Hardin County, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 9-acre landfill disposal cell for a landfill in Kingsville, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 4-acre landfill disposal cell for a landfill in Hardin County, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 7-acre landfill disposal cell for a landfill in Austin, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 6-acre landfill disposal cell for a landfill in Brownsville, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 14-acre landfill disposal cells for a landfill in Austin, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 12-acre landfill Pre-Subtitle D final cover for a landfill in Austin, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 13-acre landfill Pre-Subtitle D final cover for a landfill in Austin, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 22-acre landfill disposal cell for a landfill in Jaltipan, Vera Cruz.
- Design Engineer and project manager for the preparation of design plans and technical specifications for an 8-acre landfill disposal cell for a landfill in Brownsville, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for two 14-acre landfill disposal cells for a landfill in San Antonio, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 7-acre landfill disposal cells for a landfill in Austin, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for a 9-acre landfill disposal cell for a landfill in Austin, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for two 8-acre landfill disposal cells for a landfill in Brownsville, Texas.
- Design Engineer and project manager for the preparation of design plans and technical specifications for an 11-acre Type I and a 5.4-acre Type IV landfill disposal cells for a landfill in Kingsville, Texas.

- Design Engineer and project manager for the design and preparation of construction plans, specifications, and construction documents for temporary external embankment and top dome surface erosion and sediment controls for a landfill in Brownsville, Texas.

- Design Engineer and project manager for the design and preparation of construction plans, specifications, and construction documents for final cover maintenance plans for a landfill in Austin, Texas.

- Design Engineer for the design and preparation of construction plans, specifications, and construction documents for temporary stormwater facilities associated with three 8-acre low level radioactive material disposal cells in Fernald, Ohio.

- Project Manager for the preparation of detailed construction phasing plans for a landfill in Carson City, Nevada.

- Project manager for the preparation of design plans and technical specifications for a 0.9-acre leachate evaporation pond and 105 feet of leachate forcemain for a landfill in Lacy Lakeview, Texas.

- Project manager for the preparation of design plans and technical specifications for a 1.8-acre leachate evaporation pond for a landfill in La Gloria, Texas.

- Project manager for the preparation of design plans and technical specifications for a 0.7-acre leachate evaporation pond and 370 feet of leachate forcemain for a landfill in Hutto, Texas.

- Project Manager and Design Engineer for the preparation of construction plans for a 35-acre landfill cell, and leachate forcemain system for a landfill in San Antonio, Texas.

- Design Engineer and project manager for the preparation of design plans and technical specifications for two one-acre leachate evaporation ponds and 4,000 feet of leachate forcemain for a landfill in Brownsville, Texas.

- Design Engineer for the leachate distribution and storage facilities for a landfill in San Antonio, Texas.

- Design Engineer and project manager for the preparation of design plans for a 10-acre industrial waste landfill cap for an industrial waste site in Travis County, Texas.

- Design Engineer and project manager for the preparation of Site Operating Plans in accordance with the TCEQ Site Operating Plan call-in for seven (7) landfills in Texas.

- Design Engineer for the preparation of permit plans, specifications, and design report for a landfill expansion in Nantucket, Massachusetts.

- Project Manager for the preparation of a variety of landfill design and permit modifications. These included the design of alternate liner systems, alternate final cover system, leachate collection systems, leachate evaporation ponds, site stormwater drainage systems, site roadways and facility designs, site sediment and erosion control systems, gas monitoring systems, groundwater monitoring systems, liner construction, final cover construction, site operating plans, and other environmental protection and monitoring plans.

## Construction Quality Assurance/Construction Quality Control

- Certifying engineer for a 12-acre Texas Railroad Commission waste facility in DeWitt County, Texas.
- Certifying engineer for a 1.8-acre Texas Railroad Commission contact water pond retrofit in Reeves County, Texas.
- Certifying engineer for an 8-acre Class 1 Subtitle D cell for a landfill in Laredo, Texas.
- Certifying engineer for two 6-acre Texas Railroad Commission waste disposal cell in Reeves County, Texas.
- Certifying engineer for an 8-acre Subtitle D cell for a landfill in Brownsville, Texas.
- Certifying engineer for a 12-acre Texas Railroad Commission waste facility in DeWitt County, Texas.
- Certifying engineer for a 9-acre Texas Railroad Commission waste facility in Howard County, Texas.
- Certifying engineer for a 4-acre Type IV cell for a landfill in Austin, Texas.
- Certifying engineer for a 12-acre Texas Railroad Commission waste facility in Reeves County, Texas.
- Certifying engineer for a 9-acre Texas Railroad Commission waste facility in Reagan County, Texas.
- Certifying engineer for an 8-acre Texas Railroad Commission waste facility in Reeves County, Texas.
- Certifying engineer for a 9-acre Texas Railroad Commission waste facility in Howard County, Texas.
- Certifying engineer for a 15-acre Class 1 Subtitle D cell for a landfill in Laredo, Texas.
- Certifying engineer for a 50-acre GCL and geomembrane lined evaporation pond for a coal power plant in Wilbarger County, Texas.
- Certifying engineer for an 11-acre Subtitle D cell for a landfill in Hutto, Texas.
- Certifying engineer for a 16-acre pre-Subtitle D and Subtitle D final cover for a landfill in Hutto, Texas.
- Certifying engineer for a 7-acre Subtitle D cell for a landfill in Lacy Lakeview, Texas.
- Certifying engineer for a 14-acre pre-Subtitle D and Subtitle D final cover for a landfill in Lacy Lakeview, Texas.
- Certifying engineer for a 4-acre Type IV cell for a landfill in Austin, Texas.
- Certifying engineer for a 1-acre Type IV cell for a landfill in Austin, Texas.
- Certifying engineer for a 3-acre Type IV cell for a landfill in Austin, Texas.

- Certifying engineer for a 3-acre Type IV cell for a landfill in Austin, Texas.
- Certifying engineer for a 5-acre Type IV cell for a landfill in Austin, Texas.
- Certifying engineer for a 9-acre Subtitle D cell for a landfill in Kingsville, Texas.
- Certifying engineer for a 6-acre Subtitle D cell for a landfill in Brownsville, Texas.
- Certifying engineer for a 7-acre Type IV cell for a landfill in Austin, Texas.
- Certifying engineer for a 14-acre Subtitle D cell for a landfill in Austin, Texas.
- Certifying engineer for a 13-acre Subtitle D and Pre-Subtitle D final cover for a landfill in Austin, Texas.
- Certifying engineer for a 12-acre Pre-Subtitle D final cover for a landfill in Austin, Texas.
- Certifying engineer for two 1-acre leachate evaporation ponds for a landfill in Brownsville, Texas.
- Certifying engineer for a 5-acre Subtitle D cell for a landfill in Kingsville, Texas.
- Certifying engineer for a 6-acre Type IV cells for a landfill in Austin, Texas.
- Certifying engineer for a 6-acre Type IV cells for a landfill in Austin, Texas.
- Certifying engineer for a 5-acre Type IV cells for a landfill in Austin, Texas.
- Certifying engineer for a 3-acre Subtitle D cell for a landfill in Hutto, Texas.
- Certifying engineer for an 11-acre Subtitle D cell for a landfill in Kingsville, Texas.
- Certifying engineer for a 7-acre Subtitle D cell for a landfill in Hutto, Texas.
- Certifying engineer for three 8-acre Subtitle D cells for a landfill in Brownsville, Texas.
- Certifying engineer for a 9-acre Subtitle D cell for a landfill in Austin, Texas.
- Certifying engineer for a 4-acre Type IV cell for a landfill in League City, Texas.
- Certifying engineer for a 7-acre Subtitle D cell for a landfill in Austin, Texas.
- Certifying engineer for a 6-acre Subtitle D cell for a landfill in Sherman, Texas.
- Certifying engineer for two 5-acre Type IV cells for a landfill in Austin, Texas.
- Certifying engineer for a 1.5 and 1.6 acre Type IV cells for a landfill in Austin, Texas.

## Hydrologic Analysis

- Project Manager for the study of the ultimate development condition of the 93 square mile drainage area for a Bayou in Houston, Texas. Study included modifying the current FEMA hydrologic model (HEC-1) to reflect the impact of the ultimate developed condition on the drainage basin hydrologic characteristics. These included the ultimate developed effect on rainfall loss rates, time of concentrations, basin storage volumes, bayou storage characteristics, off channel detention effects, and other hydrologic variants. This study was prepared as a guide for determining future basin improvements and to serve as the basis for a Conditional Letter of Map Revision from FEMA. The study also included the design of 4 regional stormwater detention basins.

- Project Engineer for the study of a 3,798-acre drainage area in Boling, Texas. The drainage area was modeled for the 25 and 100-year, 24 hour storm events, utilizing the Clark Unit Hydrograph Technique for design storm hydrographs and rainfall loss rates. This study was utilized to determine the effects of severe storm events on the site and as the basis for designing channel improvements, culverts, bridges, and other drainage systems included in the project.

- Project Manager for the hydrologic analysis of 6 drainage basins ranging in size from 33 acres to 426 acres for a landfill in Converse, Texas. The drainage areas were modeled for the pre-developed, current, and post-development conditions for the 25 and 100-year, 24-hour storm events, utilizing the Rational Method for drainage areas less than 200 acres and the Soil Conservation Service method for design storm hydrographs and rainfall loss rates. Once the design peak flows were determined, 3 stormwater detention ponds were designed to attenuate the peak 25-year, 24-hour storm from the developed condition to the lesser of the pre-developed or current conditions.

- Project Manager for a Conditional Letter of Map Revision from FEMA for a 845 acre landfill in Angleton, Texas.

- Design Engineer for a landfill final cover and perimeter drainage system for a landfill near Carlsbad, New Mexico.

## Hydraulic Design

- Project Manager for the hydraulic design and preparation of permit and construction plans for over 12,000 linear feet of drainage channels and over 24 single and multiple barrel culverts for a landfill in Converse, Texas.

- Project Manager on the hydraulic analysis of over 23 miles of bayou in Houston, TX. The study initiates the bayou's confluence with Buffalo Bayou and proceeds upstream through 49 bridges through a variety of improved and non-improved channel sections.

- Project Manager on the design of a 60,000 gallon per minute stormwater pumping station for Fort Bend Levee Improvements District No. 7 in Sugarland, Texas.

- Project Manager on the planning and design of roadways and their associated stormwater systems. These systems included the layout of piped storm drainage systems including a variety of stormwater inlets, manholes, outlet structures. These conduits included reinforced concrete pipe, corrugated metal pipe, and various plastic pipes, all ranging in size from 8" to 72" in diameter.

Also designed culvert ranging in size from single barrel 24" pipes to multiple barrel 8'x8' box culverts. A partial list of Mr. Murray's roadway and associated stormwater system design includes the following:

1. Willow Hills Subdivision - Anne Arundel County, Maryland
2. Yorktown Manor Subdivision - Prince George's County, Maryland
3. Bishops Bequest Subdivision - Prince George's County, Maryland
4. Bel Air Estates Subdivision - Prince George's County, Maryland
5. Summerfield Subdivision - Prince George's County, Maryland
6. Churchill's Choice Subdivision - Prince George's County, Maryland
7. Clayton's Bend Subdivision - Sugarland, Texas
8. Lackland City Subdivision - San Antonio, Texas
9. Ventura Subdivision - San Antonio, Texas
10. Heritage Park Subdivision - San Antonio, Texas
11. Lackland City Subdivision - San Antonio, Texas
12. Collington Corporate Center - Prince George's County, Maryland
13. Chesapeake Centre - Anne Arundel County, Maryland
14. Westinghouse ATL - Anne Arundel County, Maryland
15. Largo Town Center - Prince George's County, Maryland
16. La Cantera, Fiesta Texas Theme Park - San Antonio, Texas

## Expert Witness and Legal Support

- Provide expert witness services in an administrative hearing in support of a 499-acre greenfield landfill permit amendment in Laredo, Texas. Mr. Murray provided testimony in support of many aspects of the proposed facility's location and design. This included testimony on traffic, flood plains, landfill layout, stormwater analysis and design, landfill gas monitoring system, leachate collection system, and site operating plan.

- Provide expert witness services in an administrative hearing in support of a 373-acre landfill expansion permit amendment in Hutto, Texas. Mr. Murray provided testimony in support of many aspects of the proposed facility's location and design. This included testimony on surrounding land use, traffic, flood plains, landfill layout, stormwater analysis and design, landfill gas monitoring system, leachate collection system, and site operating plan.

- Provide expert witness services in an administrative hearing in support of a landfill expansion permit amendment in Austin, Texas. Mr. Murray provide expert witness support for the landfill stormwater analysis and design.

## Publications and Presentations

- Murray, J. R., "Manual De Protocolo De Construccion Nuevos Rellenos Sanitarios Con Revestimientos Compuestos (Construction of New Sanitary Landfills with Composite Liners)", Comision Centroamericana de Ambiente Y Desarrollo and United States International Development (USAID), November 30, 2010.

- Murray, J. R., "Manual De Protocolo De Operacion Nuevos Rellenos Sanitarios Para Desechos Solidos (Inspection Protocol for Construction and Operation of Landfills, Operation of New Sanitary Solid Waste Landfills)", Comision Centroamericana de Ambiente Y Desarrollo and United States International Development (USAID), September 2011.

SCS ENGINEERS

# SAMUEL A. FRANCO, P.E.

## Education

BS – Environmental Engineering, Texas A&M University – Kingsville, 2015

## Specialty Certifications

Registered Professional Engineer, Texas, 2020
APNGA Certified - Training Course Regarding Nuclear Density Testing Equipment and Radiology Safety
Radiation Safety Officer (RSO) - Troxler Radiation Safety Officer Certification

## Professional Experience

As a Project Professional, Mr. Franco is responsible for supporting SCS's Texas engineering practice. Mr. Franco has over 7 years of experience providing support for a variety of solid waste projects for both private and municipal facilities in Texas. Mr. Franco has participated in the permitting and design of landfills, transfer stations, and storm water protection and drainage systems.

Mr. Franco's responsibilities have included construction quality assurance (CQA), including performing as the on-site lead CQA technician for soil and geosynthetic liner systems; hydrologic analysis of landfill drainage and erosion control systems; development of construction plans and specifications; analysis of landfill operation and developmental costs; and permit application, modification, and amendment preparation. He is familiar with ASTM procedures concerning testing and inspection of soils and geosynthetics. His involvement with soils includes determining moisture/density relationships, Atterberg limits, sieve analysis, and permeability testing. His involvement with geosynthetics includes oversight of testing methods for geosynthetic clay liner (GCL), HDPE geomembrane, and geotextiles.

Mr. Franco is trained and certified to operate Troxler 3400 series nuclear density gauges for testing soil density and moisture content.

The following are representative of the projects in which Mr. Franco has participated.

### Landfill Engineering

- Staff Engineer for the preparation of compost facility permit modifications to the site development plans and site operating plans for multiple municipal solid waste landfills in Fort Bend County and Harris County.
- Staff Engineer for the preparation of a permit modification to the site development plan and site operating plan for a municipal solid waste landfill in Williamson County.
- Staff Engineer for the air permit preparation for a liquid solidification operation at a municipal solid waste landfill in Laredo, Texas.
- Participated in the permit registration for a transfer station in Bastrop County, Texas.
- Staff Engineer for the annual preparation of financial assurance letters for two MSW landfills in Texas.
- Staff Engineer for the preparation of temporary authorizations and permit modifications for alternative daily cover for two MSW landfills in Texas.

- Staff Engineer for the preparation of construction plans, bid documents, and specifications for the initial facility development for six oil and gas waste facilities. These plans also included construction of the perimeter fence, roads, scale house, and storm water control features.
- Staff Engineer for the preparation of a SWP3 for compliance with the National Pollutant Discharge Elimination System/ Texas Pollutant Discharge Elimination System (NPDES/TPDES) General Permits related to discharge from industrial activities and construction activities. Assisted a landfill in Laredo, Texas with compliance, monitoring, and reporting activities required by the SWP3 plan.
- Staff Engineer for the preparation of construction plans, bid documents, and specifications for a 8.6 acre cell at a municipal solid waste landfill in Cameron County, Texas. These plans also included construction of roads, stormwater control features, erosion control features, and culvert analysis.
- Staff Engineer for the preparation of construction plans, bid documents, and specifications for a 6.2 acre cell at a municipal C&D landfill in Erath County, Texas.
- Staff Engineer for the preparation of a Citizens' Collection Station submittal in Erath County, Texas.
- Staff Engineer for the preparation of construction plans, bid documents, and specifications for a 7.5 acre cell at a private solid waste landfill near Laredo, Texas.
- Staff Engineer for the preparation of Geomembrane Liner Evaluation Reports (GLER) and Soil Liner Evaluation Reports (SLER) for various solid waste landfills.
- Staff Engineer for the preparation of Title V semi-annual deviation reports for two MSW landfills in Texas.
- Participated in the preparation of cost estimated for solid waste landfills. Conducted analysis and cost estimate for the construction of two cells for a privately owned landfill.
- Participated in the preparation of airspace calculations for various solid waste landfills. Conducted analysis and prepared reports for conceptual final and base grade alterations, waste footprint expansions, projected airspace gains, airspace consumed, and airspace remaining using AutoCAD software.
- Staff Engineer for the preparation of a permit modification to revise the maximum closure area and closure costs for a privately owned landfill in Laredo, Texas.

**Construction Quality Assurance**

- Field Construction Quality Assurance Technician for a Subtitle D geomembrane liner at a 15 acre MSW acre landfill near Laredo, Texas.
- Field Construction Quality Assurance Technician for a Subtitle D geomembrane liner at a 4 acre MSW landfill in Port Arthur, Texas.
- Field Construction Quality Assurance Technician for a Subtitle D geomembrane liner at a 9 acre MSW landfill in Nacogdoches, Texas.
- Field Construction Quality Assurance Technician for a Subtitle D geomembrane liner at a 4 acre MSW landfill near Paris, Texas.
- Field Construction Quality Assurance Technician for a Subtitle D geomembrane liner at a power station for a 50 acre evaporation pond in Wilbarger County, Texas.
- Field Construction Quality Assurance Technician for a Subtitle D geomembrane liner at a 10 acre MSW landfill in Fort Bend County, Texas.

- Field Construction Quality Assurance Technician for a Subtitle D geomembrane liner at an 11 acre MSW landfill near Waco, TX.
- Field Construction Quality Assurance Technician for a Subtitle D geomembrane liner at a 9 acre MSW landfill near Livingston, TX.
- Field Construction Quality Assurance Technician for a leak detection and leachate collection geomembrane liner system at a 12 acre landfill near Orla, TX.
- Field Construction Quality Assurance Technician for a Subtitle D geomembrane liner at a 10 acre landfill near Hutto, TX.
- Field Construction Quality Assurance Technician for a Subtitle D geomembrane liner at a 10 acre landfill near Angleton, TX
- Field Construction Quality Assurance Technician for a leak detection and leachate collection geomembrane liner system at a 12 acre landfill near Big Spring, TX.
- Field Construction Quality Assurance Technician for a leak detection and leachate collection geomembrane liner system at a 24 acre landfill near Nordheim, TX.

**Other Experience**

- Previously employed by waste hauling company in Laredo, Texas as a Customer Relations Specialist.

ATLANTIC COAST CONSULTING, INC.

# Danny Rennicks

## Senior Construction Quality Assurance Monitor

6 Years of Experience

**Education:** Cobb County High School, Cobb County, Georgia (1978)

**Certifications:** OSHA 40 Hour HAZWOPER

Mr. Rennicks is a Senior Construction Quality Assurance (CQA) Monitor who specializes in the construction of solid waste landfills, waste impoundments, leachate collection systems, and landfill closures. His experience includes on-site management of numerous solid waste cell and closure certification projects which involved the placement of structural fill, clay liner and geosynthetic materials throughout the United States.

### Project Experience

- ***Resident Soils Monitor & Lead Geosynthetics Monitor*** for the construction of a 12-acre double lined Subtitle D sanitary landfill cell and associated double lined leachate collection ponds located near Nordheim, Texas. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Lead Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 25 acres located in Augusta, Georgia. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Lead Geosynthetics Monitor*** for the construction of a double lined Subtitle D sanitary landfill cell totaling approximately 11 acres located in Randolph County, North Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Lead Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 15 acres located near Laredo, Texas. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Lead Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 20 acres located in Ball Ground, Georgia. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Lead Geosynthetics Monitor*** for the construction of two double lined Subtitle D sanitary landfill cell totaling approximately 15.5 acres located in Randolph County, North Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data. In addition, this Greenfield project included the oversight construction for numerous roads, a bridge, a maintenance building, a scale house building, additional site facility structures, leachate containment structures and tanks, and leachate forcemain pipelines.
- ***Resident Soils Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 11 acres located in Williamson County, Texas. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils and Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 20 acres located in Hampton, Virginia. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.

- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of a 25-acre Subtitle D sanitary landfill closure project located near Ball Ground, Georgia. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 10 acres located in Randolph County, North Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Lead Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 10 acres located in Ball Ground, Georgia. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 14 acres located near Rome, Georgia. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Lead Geosynthetics Monitor*** for the construction of a 12-acre Subtitle D sanitary landfill cell located near Ballground, Georgia. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Lead Geosynthetics Monitor*** for the construction of a 12-acre Subtitle D sanitary landfill closure project located in Cumberland County, North Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils & Lead Geosynthetics Monitor*** for the construction of a 9-acre Subtitle D sanitary landfill cell located near Iowa Park, Texas. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Lead Geosynthetics Monitor*** for the construction of a double lined Subtitle D sanitary landfill cell totaling approximately 5.2 acres located in Welsh, Louisiana. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils & Geosynthetics Monitor*** for the construction of a 7.5-acre Subtitle D sanitary landfill cell located near Thomasville, Georgia. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils & Geosynthetics Monitor*** for the construction of a 6-acre Subtitle D sanitary landfill cell located in Butler County, Nebraska. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils & Lead Geosynthetics Monitor*** for the construction of a 6-acre Subtitle D sanitary landfill cell located in Gordon County, Georgia. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Lead Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 3 acres located near Weatherford, Texas. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.

- ***Resident Soils and Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 6 acres located in Berkeley County, South Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 7 acres located in Montgomery County, North Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 4.4 acres located in Banks County, Georgia. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 3 acres located near Vail, Colorado. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a clay lined retention wall located in Travis County, Texas. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Building Monitor*** for the construction of a landfill operations building located in Hernando County, Florida. Responsibilities included technical guidance to site personnel and monitoring of the overall building construction.

# Paul Vaillancourt

## Senior Construction Quality Assurance Monitor

11 Years of Experience

**Education:** B.S. Industrial Technology, Memphis State University (1965)

**Certifications:** GCI-ICP – Soils Technician
GCI-ICP – Geosynthetic Technician
OSHA 40 Hour HAZWOPER

Mr. Vaillancourt is a Senior Construction Quality Assurance (CQA) Monitor who specializes in the construction of solid waste landfills, waste impoundments, leachate collection systems, and landfill closures. His experience includes on-site management of numerous solid waste cell and closure construction projects which involved the placement of structural fill, clay liner and geosynthetic materials throughout the United States.

### Project Experience

- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of a triple geomembrane layer, composite municipal solid waste landfill closure totaling approximately 15 acres located in Hardee County, Florida. This project also included some landfill gas system repairs and installation work. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of a 10-acre Subtitle D sanitary landfill cell located near Randleman, North Carolina. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a 15-acre Subtitle D sanitary landfill cell located near Ball Ground, Georgia. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of two Subtitle D municipal solid waste landfill cell totaling approximately 11.3 acres located in Bradley County, Tennessee. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of a protective cover soil layer for an 11-acre Subtitle D sanitary landfill cell located in Jefferson County, Alabama. Responsibilities included technical guidance to site personnel, monitoring of soil and geosynthetics materials and review of collected data.
- ***Resident Soils Monitor & Lead Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling over 8 acres located in Harper Kansas. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling over 8.2 acres located near Enoree, South Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of an 8-acre Subtitle D sanitary landfill cell located near Aulander, North Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of two Subtitle D sanitary landfill cells totaling over 15 acres located in McAllen, Texas. Responsibilities included technical

guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.

- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell and closure totaling over 16 acres located in Springdale, Arkansas. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils and Geosynthetics Monitor*** for the construction of a double lined Subtitle D sanitary landfill cell totaling approximately 11 acres located in Randolph County, North Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling over 6.5 acres located near Ridgely, Tennessee. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 15 acres located near Charlotte, North Carolina. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 11 acres located in Williamson County, Texas. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a 7-acre Subtitle D sanitary landfill cell located in Butler County, Nebraska. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 6 acres located near Pecos, Texas. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 8 acres located near Houston, Texas. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 7.5 acres located near Thomasville, Georgia. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soil Monitor & Geosynthetics Manager*** for the construction of a soil liner landfill closure project totaling approximately 7 acres located in Bartow County, Georgia. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a composite municipal solid waste landfill cell project totaling approximately 9 acres located near Dillon, Colorado. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soil Monitor & Geosynthetics Manager*** for the construction of a 3-acre Subtitle D sanitary landfill cell located near Meno, Oklahoma. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.

- ***Resident Soils Monitor*** for the construction of a Subtitle D sanitary holding pond totaling over 6 acres located near Pecos, Texas. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soil Monitor & Geosynthetics Monitor*** for the construction of a C&D landfill closure project totaling approximately 14 acres located in Milton, Georgia. Responsibilities included technical guidance to site personnel, monitoring and testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soil Monitor, Geosynthetics Monitor & Gas Systems Monitor*** for the construction of a 9-acre Subtitle D sanitary landfill cell and a landfill gas system located near Sand Springs, Oklahoma. Responsibilities included technical guidance to site personnel, testing of the pipeline system and review of collected data.
- ***Resident Soil Monitor & Geosynthetics Monitor*** for the construction of a Subtitle D municipal solid waste landfill cell totaling approximately 10 acres located in Columbia, South Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a 4.4-acre Subtitle D sanitary landfill cell located in Banks County, Georgia. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Gas Systems Monitor*** for the construction of a landfill gas system located near Sand Springs, Oklahoma. Responsibilities included technical guidance to site personnel, testing of the pipeline system and review of collected data.
- ***Resident Soils Monitor*** for the construction of a 4-acre Subtitle D sanitary landfill cell located in Banks County, Georgia. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a Subtitle D sanitary landfill cell totaling approximately 3 acres located near Abilene, Texas. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a 10-acre Subtitle D sanitary landfill cell located near Houston, Texas. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a soil liner landfill closure project totaling approximately 28 acres located near Clinton, Iowa. Responsibilities included technical guidance to site personnel, testing of all soil materials and review of collected data.
- ***Resident Soils Monitor*** for the construction of a soil liner landfill closure project totaling approximately 7 acres located in Walton County, Georgia. Responsibilities included technical guidance to site personnel, testing of all soil materials and review of collected data.
- ***Resident Gas Systems Monitor*** for the construction of a landfill gas system located near Columbia, South Carolina. Responsibilities included technical guidance to site personnel, testing of the pipeline system and review of collected data.
- ***Resident Soils Monitor*** for the construction of an approximately 5-acre C&D landfill cell located in Stanley, North Carolina. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.

- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of a 9.5-acre Subtitle D sanitary landfill cell located in Houston County, Georgia. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Soil Monitor*** for the construction of an approximately 6-acre C&D landfill cell located near Houston, Texas. Responsibilities included technical guidance to site personnel, monitoring and testing of soils materials and review of collected data.
- ***Resident Gas Systems Monitor*** for the construction of a landfill gas system located in Houston County, Georgia. Responsibilities included technical guidance to site personnel, testing of the pipeline system and review of collected data.
- ***Soils Monitor & Geosynthetics Monitor*** for the construction of a 21-acre Subtitle D sanitary landfill cell located in Augusta, Georgia. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Gas Systems Monitor*** for the construction of a landfill gas system located in Augusta, Georgia. Responsibilities included technical guidance to site personnel, testing of the pipeline system and review of collected data.
- ***Soils Monitor*** for the construction of a 20-acre Subtitle D sanitary landfill cell located in DeKalb County, Georgia. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Soils Monitor & Geosynthetics Monitor*** for the construction of a composite municipal solid waste landfill closure totaling approximately 14 acres located in Spartanburg County, South Carolina. Responsibilities included technical guidance to site personnel, testing of soil and geosynthetics materials and review of collected data.
- ***Resident Monitor*** for the construction of a landfill methane gas conversion and refueling station project located in Augusta, Georgia. Responsibilities included technical guidance to site personnel, monitoring of pipeline construction and material placement and the review of the collected as-built system data.
- ***Resident Monitor*** for the removal of waste material and backfilling with clean structural fill material at the Carrie Mays Park Improvements project located in Augusta, Georgia. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.
- ***Resident Monitor*** for the emergency repair construction for various elements of a Subtitle D municipal solid waste landfill facility located in Augusta, Georgia. Responsibilities included technical guidance to site personnel, testing of soil materials and review of collected data.

# Geosynthetic

# Lone Star Lining Company Partial Experience Resume for Mariano P. Tello

**Project:** Williams Pond 1 Re-line
**Location:** McPherson, Kansas
**Material:** 40 mil HDPE, geonet, 60 mil HDPE
**Size/Layer:** 177,000 sf
**Title:** Project Supervisor

**Project:** Deffenbaugh Phase 1M - Stage C
**Location:** Shawnee, Kansas
**Material:** 60 mil HDT, GCL, geotextile
**Size/Layer:** 466,000 sf
**Title:** Project Supervisor

**Project:** Cefe Valenzuela Sector 1B and 1C
**Location:** Corpus Christi, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 831,000 sf
**Title:** Project Supervisor

**Project:** Feagins Recycle Pit
**Location:** Kingfisher County, Oklahoma
**Material:** 60 mil HDPE, geonet
**Size/Layer:** 662,000 sf
**Title:** Project Supervisor

**Project:** Osage Landfill Sector 1B-2B
**Location:** Bartlesville, Oklahoma
**Material:** 60 mil HDPE/HDT
**Size/Layer:** 188,000 sf
**Title:** Project Supervisor

**Project:** Southside Landfill Cell E
**Location:** Pueblo, Colorado
**Material:** 60 mil HDPE, geocomposite
**Size/Layer:** 89,000 sf
**Title:** Project Supervisor

**Project:** City of Enid 9A9B10A10B
**Location:** Enid, Oklahoma
**Material:** 60 mil HDPE, geotextile
**Size/Layer:** 155,000 sf
**Title:** Project Supervisor

**Project:** Jefferson City Landfill
**Location:** Jefferson City, Missouri
**Material:** geocomposite
**Size/Layer:** 149,000 sf
**Title:** Project Supervisor

**Project:** Williamson County Cell 3A
**Location:** Hutto, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 510,000 sf
**Title:** Project Supervisor

**Project:** U.S. Ecology Cells 50-4 and 50-5
**Location:** Robstown, Texas
**Material:** 60 mil HDPE, geonet, geocomposite
**Size/Layer:** 828,000 sf
**Title:** Project Supervisor

**Project:** Luminant Oak FGD-C Pond
**Location:** Franklin, Texas
**Material:** 60 mil HDT
**Size/Layer:** 751,000 sf
**Title:** Project Supervisor

**Project:** Seabreeze Landfill Cell 10
**Location:** Angleton, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 314,000 sf
**Title:** Project Supervisor

**Project:** Skyline Landfill Cell 13C
**Location:** Ferris, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 203,000 sf
**Title:** Project Supervisor

**Project:** Camino Real Cell 10B
**Location:** El Paso, Texas
**Material:** 60 mil HDPE/HDT, GCL
**Size/Layer:** 216,000 sf
**Title:** Project Supervisor

**Project:** Fort Hood Area 4, Cell 4
**Location:** Fort Hood, Texas
**Material:** 60 mil HDPE/HDT, GCL, geocomposite
**Size/Layer:** 431,000 sf
**Title:** Project Supervisor

**Project:** Martin Lake PDP4 Closure
**Location:** Tatum, Texas
**Material:** 40 mil LLT
**Size/Layer:** 148,000 sf
**Title:** Project Supervisor

# Lone Star Lining Company Partial Experience Resume for Mariano P. Tello

**Project:** Southwest Regional Landfill
**Location:** Buckeye, Arizona
**Material:** 60 mil HDPE/HDT White/Black
**Size/Layer:** 251,000 sf
**Title:** Master Seamer

**Project:** Raney Landfill
**Location:** Sachse, Texas
**Material:** 60 mil HDPE & HDT, composite
**Size/Layer:** 730,000 sf
**Title:** Master Seamer

**Project:** Sinton Landfill
**Location:** Sinton, Texas
**Material:** 60 mil HDPE & HDT
**Size/Layer:** 172,000 sf
**Title:** Master Seamer

**Project:** Livingston Landfill
**Location:** Pontiac, Illinois
**Material:** 40 mil LLDPE and LLR, composite
**Size/Layer:** 1,500,000 sf
**Title:** Master Seamer

**Project:** Greenwood Farms
**Location:** Tyler, Texas
**Material:** 60 mil HDPE, GCL
**Size/Layer:** 230,000 sf
**Title:** Master Seamer

**Project:** City of Laredo Landfill
**Location:** Laredo, Texas
**Material:** 60 mil HDPE/HDT, GCL
**Size/Layer:** 370,000 sf
**Title:** Master Seamer

**Project:** Butler County Landfill
**Location:** David City, Nebraska
**Material:** 60 mil HDPE/HDT, GCL
**Size/Layer:** 239,560 sf
**Title:** Master Seamer

**Project:** Wireway Addition
**Location:** Dallas, Texas
**Material:** 60 mil HDPE, geotextile
**Size/Layer:** 14,000 sf
**Title:** Master Seamer

**Project:** Livingston Landfill
**Location:** Pontiac, Illinois
**Material:** 60 mil HDPE/HDT
**Size/Layer:** 1,100,000 sf
**Title:** Master Seamer

**Project:** Hickory Ridge Landfill
**Location:** Conley, Georgia
**Material:** 60 mil HDT, composite, GCL
**Size/Layer:** 500,000 sf
**Title:** Master Seamer

**Project:** Timberlands Sanitary Landfill
**Location:** Brewton, Alabama
**Material:** 60 mil HDPE & HDT, composite
**Size/Layer:** 500,000 sf
**Title:** Master Seamer

**Project:** Morris Farms Landfill
**Location:** Hillsboro, Alabama
**Material:** 40 mil LLDPE & LLR; 60 mil HDPE & HDT
**Size/Layer:** 530,000 sf
**Title:** Master Seamer

**Project:** Queen Creek Landfill
**Location:** Queen Creek, Arizona
**Material:** 60 mil HDT - White/Black/GCL
**Size/Layer:** 270,000 sf
**Title:** Master Seamer

**Project:** Newton County Landfill
**Location:** Brook, Indiana
**Material:** 60 HDPE/HDT
**Size/Layer:** 471,000 sf
**Title:** Master Seamer

**Project:** Galveston County
**Location:** Santa Fe, Texas
**Material:** 60 mil HDPE & HDT
**Size/Layer:** 283,000 sf
**Title:** Master Seamer

**Project:** CSC Repair
**Location:** Avalon, Texas
**Material:** 60 mil HDT, Geocomposite
**Size/Layer:** 15,000 sf
**Title:** Master Seamer

# Lone Star Lining Company Partial Experience Resume for Moises Perez

**Project:** Williamson County Cell 3A
**Location:** Hutto, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 510,000 sf
**Title:** QC Technician

**Project:** Southside Landfill Cell E
**Location:** Pueblo, Colorado
**Material:** 60 mil HDPE, geocomposite
**Size/Layer:** 89,000 sf
**Title:** Project Supervisor

**Project:** City of Enid 9A9B10A10B
**Location:** Enid, Oklahoma
**Material:** 60 mil HDPE, geotextile
**Size/Layer:** 155,000 sf
**Title:** QC Technician

**Project:** Chevron Sweetwater
**Location:** Sweetwater, Texas
**Material:** 40 mil LLDPE, geotextile
**Size/Layer:** 109,000 sf
**Title:** QC Technician

**Project:** Skyline Sanitary Landfill Cell 13A
**Location:** Ferris, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 399,000 sf
**Title:** QC Technician

**Project:** Jefferson City Landfill
**Location:** Jefferson City, Missouri
**Material:** geocomposite
**Size/Layer:** 149,000 sf
**Title:** QC Technician

**Project:** Skyline Sanitary Landfills 12B & 13B
**Location:** Ferris, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 209,000 sf
**Title:** QC Technician

**Project:** Lacy Lakeview Cell 3-5
**Location:** Lacy Lakeview, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 312,000 sf
**Title:** QC Technician

**Project:** U.S. Ecology Cells 50-4 and 50-5
**Location:** Robstown, Texas
**Material:** 60 mil HDPE, geonet, geocomposite
**Size/Layer:** 828,000 sf
**Title:** QC Technician

**Project:** Camino Real Cell 10B
**Location:** El Paso, Texas
**Material:** 60 mil HDPE/HDT, GCL
**Size/Layer:** 216,000 sf
**Title:** Project Supervisor

**Project:** Fort Hood Area 4, Cell 4
**Location:** Fort Hood, Texas
**Material:** 60 mil HDPE/HDT, GCL, geocomposite
**Size/Layer:** 431,000 sf
**Title:** QC Technician

**Project:** Aleris Recycling
**Location:** Sapupla, Oklahoma
**Material:** 73,000 sf
**Size/Layer:** 40 mil LLT, geocomposite, geotextile
**Title:** QC Technician

**Project:** Skyline Landfill Cell 13C
**Location:** Ferris, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 203,000 sf
**Title:** QC Technician

**Project:** Muskogee Sanitary Landfill 11A
**Location:** Muskogee, Oklahoma
**Material:** 60 mil HDPE/HDT, geotextile
**Size/Layer:** 173,000 sf
**Title:** QC Technician

**Project:** Front Range Landfill Cell 12
**Location:** Erie, Colorado
**Material:** 60 mil HDPE, geocomposite
**Size/Layer:** 677,000 sf
**Title:** QC Technician

**Project:** Williams Pond 6 Re-line
**Location:** McPherson, KS
**Material:** 40 mil HDPE, geonet, 60 mil HDPE
**Size/Layer:** 275,000 sf
**Title:** QC Technician

# Lone Star Lining Company Partial Experience Resume for Moises Perez

**Project:** SKB Landfill Cell 4-F
**Location:** Rosemount, Minnesota
**Material:** 60 mil HDT, GCL, geocomposite
**Size/Layer:** 145,000 sf
**Title:** QC Technician

**Project:** Austin Community Landfill 12A
**Location:** Austin, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 277,000 sf
**Title:** QC Technician

**Project:** Enterprise - Adamana Facility
**Location:** Holbrook, Arizona
**Material:** 40 mil HDPE; 60 mil HDT; geonet
**Size/Layer:** 450,000 sf
**Title:** QC Technician

**Project:** Enterprise - Adamana Facility
**Location:** Holbrook, Arizona
**Material:** 40 mil HDPE, 60 mil HDPE, geonet
**Size/Layer:** 450,000 sf
**Title:** QC Technician

**Project:** Plumb Thicket
**Location:** Harper, Kansas
**Material:** 60 mil HDPE
**Size/Layer:** 250,000 sf
**Title:** QC Technician

**Project:** City of Fredericksburg
**Location:** Fredericksburg, Texas
**Material:** 60 mil HDPE & HDT, GCL, geocomposite
**Size/Layer:** 160,000 sf
**Title:** QC Technician

**Project:** Tower Landfill
**Location:** Commerce City, Colorado
**Material:** Geocomposite
**Size/Layer:** 126,000 sf
**Title:** QC Technician

**Project:** Fort Worth Southeast
**Location:** Kennedale, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 450,000 sf
**Title:** QC Technician

**Project:** Osage Landfill Sector 1B-2B
**Location:** Bartlesville, Oklahoma
**Material:** 60 mil HDPE/HDT
**Size/Layer:** 188,000 sf
**Title:** QC Technician

**Project:** Blossom Prairie LF
**Location:** Blossom,Texas
**Material:** 60HDPE/HDT, geocomposite
**Size/Layer:** 180,000 sf
**Title:** QC Technician

**Project:** Apache Junction Cell 3B
**Location:** Apache Junction, Arizona
**Material:** 60 mil HDT, GCL, geocomposite
**Size/Layer:** 150,000 sf
**Title:** QC Technician

**Project:** Quarry Landfill Cell 22
**Location:** Tulsa, Oklahoma
**Material:** 60 mil HDT, GCL, geotextile
**Size/Layer:** 579,000 sf
**Title:** QC Technician

**Project:** Blue Ridge Landfill
**Location:** Fresno, Texas
**Material:** 60 mil HDPE
**Size/Layer:** 585,000 sf
**Title:** QC Technician

**Project:** Deffenbaugh Phase VI
**Location:** Shawnee, Kansas
**Material:** 60 mil HDT, GCL, geocomposite
**Size/Layer:** 1,643,000 sf
**Title:** QC Technician

**Project:** El Centro Landfill
**Location:** Robstown, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 250,000 sf
**Title:** QC Technician

**Project:** Copper Mountain Landfill
**Location:** Wellton, Arizona
**Material:** 60 mil HDT, GCL, geocomposite
**Size/Layer:** 321,000 sf
**Title:** QC Technician

# Lone Star Lining Company Partial Experience Resume for Valentin Tello

**Project:** Williamson County Cell 3A
**Location:** Hutto, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 510,000 sf
**Title:** Master Seamer

**Project:** Camino Real Cell 10B
**Location:** El Paso, Texas
**Material:** 60 mil HDPE/HDT, GCL
**Size/Layer:** 216,000 sf
**Title:** Master Seamer

**Project:** City of Enid 9A9B10A10B
**Location:** Enid, Oklahoma
**Material:** 60 mil HDPE, geotextile
**Size/Layer:** 155,000 sf
**Title:** Master Seamer

**Project:** Security Landfill Phase V, Cell 4
**Location:** Cleveland, Texas
**Material:** 60 mil HDPE/HDT, GCL, geocomposite
**Size/Layer:** 388,000 sf
**Title:** Master Seamer

**Project:** Jefferson City Landfill
**Location:** Jefferson City, Missouri
**Material:** geocomposite
**Size/Layer:** 149,000 sf
**Title:** Master Seamer

**Project:** Cefe Valenzuela Sector 1B and 1C
**Location:** Corpus Christi, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 831,000 sf
**Title:** Master Seamer

**Project:** Martin Lake PDP4 Closure
**Location:** Tatum, Texas
**Material:** 40 mil LLT
**Size/Layer:** 148,000 sf
**Title:** Master Seamer

**Project:** Osage Landfill Sector 1B-2B
**Location:** Bartlesville, Oklahoma
**Material:** 60 mil HDPE/HDT
**Size/Layer:** 188,000 sf
**Title:** Master Seamer

**Project:** U.S. Ecology Cells 50-4 and 50-5
**Location:** Robstown, Texas
**Material:** 60 mil HDPE, geonet, geocomposite
**Size/Layer:** 828,000 sf
**Title:** Master Seamer

**Project:** Williams Pond 1 Re-line
**Location:** McPherson, Kansas
**Material:** 40 mil HDPE, geonet, 60 mil HDPE
**Size/Layer:** 177,000 sf
**Title:** Master Seamer

**Project:** Fort Hood Area 4, Cell 4
**Location:** Fort Hood, Texas
**Material:** 60 mil HDPE/HDT, GCL, geocomposite
**Size/Layer:** 431,000 sf
**Title:** Master Seamer

**Project:** Aleris Recycling
**Location:** Sapupla, Oklahoma
**Material:** 73,000 sf
**Size/Layer:** 40 mil LLT, geocomposite, geotextile
**Title:** Master Seamer

**Project:** Skyline Sanitary Landfills 13A
**Location:** Ferris, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 399,000 sf
**Title:** Master Seamer

**Project:** Deffenbaugh Phase 1M - Stage C
**Location:** Shawnee, Kansas
**Material:** 60 mil HDT, GCL, geotextile
**Size/Layer:** 466,000 sf
**Title:** Master Seamer

**Project:** Atascocita Cell 5 Phase 4
**Location:** Atascocita, Texas
**Material:** 60 mil HDPE.geocomposite
**Size/Layer:** 475,000 sf
**Title:** Master Seamer

**Project:** Skyline Landfill Cell 13C
**Location:** Ferris, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 203,000 sf
**Title:** Master Seamer

# Lone Star Lining Company Partial Experience Resume for Valentin Tello

**Project:** Williams Pond 6 Re-line
**Location:** McPherson, KS
**Material:** 40 mil HDPE, geonet, 60 mil HDPE
**Size/Layer:** 275,000 sf
**Title:** Master Seamer

**Project:** Seabreeze Landfill Cell 10
**Location:** Angleton, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 314,000 sf
**Title:** Master Seamer

**Project:** Luminant Oak FGD-C Pond
**Location:** Franklin, Texas
**Material:** 60 mil HDT
**Size/Layer:** 751,000 sf
**Title:** Master Seamer

**Project:** Front Range Landfill Cell 12
**Location:** Erie, Colorado
**Material:** 60 mil HDPE, geocomposite
**Size/Layer:** 677,000 sf
**Title:** Master Seamer

**Project:** Rio Grande Landfill
**Location:** Fresno, Texas
**Material:** 60 mil HDPE
**Size/Layer:** 585,000 sf
**Title:** Master Seamer

**Project:** Sunset Farms Landfill
**Location:** Manor, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 440,000 sf
**Title:** Master Seamer

**Project:** CC&V
**Location:** Victor, Colorado
**Material:** 80 mil LLT
**Size/Layer:** 1,271,416 sf
**Title:** Master Seamer

**Project:** Williams-Mitchell Pond 4
**Location:** Mitchell, Kansas
**Material:** 60 mil HDPE/HDT, geotextile
**Size/Layer:** 408,000 sf
**Title:** Master Seamer

**Project:** Austin Community Landfill 12A
**Location:** Austin, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 277,000 sf
**Title:** Master Seamer

**Project:** Feagins Recycle Pit
**Location:** Kingfisher County, Oklahoma
**Material:** 60 mil HDPE, geonet
**Size/Layer:** 662,000 sf
**Title:** Master Seamer

**Project:** Covel Gardens Phase VIII East
**Location:** San Antonio, Texas
**Material:** 60 mil HDPE, geocomposite
**Size/Layer:** 289,000 sf
**Title:** Master Seamer

**Project:** DFW Landfill Cell D1C2
**Location:** Lewisville, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 425,000 sf
**Title:** Master Seamer

**Project:** Apache Junction Landfill, Cells 3C & 7A
**Location:** Apache Junction, Arizona
**Material:** 60 mil HDT, GCL
**Size/Layer:** 390,000 sf
**Title:** Master Seamer

**Project:** Itasca Landfill Phase 4
**Location:** Itasca, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 440,000 sf
**Title:** Master Seamer

**Project:** Quarry Landfill
**Location:** Tulsa, Oklahoma
**Material:** 60 HDPE/HDT, Geotextile, GCL
**Size/Layer:** 400,000 sf
**Title:** Master Seamer

**Project:** San Angelo Landfill
**Location:** San Angelo, Texas
**Material:** 60 mil HDPE/HDT
**Size/Layer:** 136,000 sf
**Title:** Master Seamer

# Lone Star Lining Company Partial Experience Resume
# for
# Miguel Sandoval

**Project:** Asheville Airport Phase 2
**Location:** Arden, North Carolina
**Material:** 30 mil HDT
**Size/Layer:** 217,800 sf
**Title:** Technician

**Project:** Zion Landfill Cap
**Location:** Zion, Illinois
**Material:** 40 mil LLT, geocomposite
**Size/Layer:** 847,500 sf
**Title:** Technician

**Project:** Oak Ridge Landfill Cap
**Location:** Ballwin, Missouri
**Material:** 40 mil LLT, geocomposite
**Size/layer:** 1,829,500 sf
**Title:** Technician

**Project:** Plum Point Cell
**Location:** Osceola, Arkansas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/layer:** 617,000 sf
**Title:** Technician

**Project:** Hutsonville Ash Pond
**Location:** Crawford County, Illinois
**Material:** 60 mil HDT
**Size/Layer:** 1,005,000 sf
**Title:** Technician

**Project:** Medora Landfill Cell 1 and 2
**Location:** Medora, Indiana
**Material:** 40 mil LLT
**Size/layer:** 860,000 sf
**Title:** Technician

**Project:** Ghent Landfill
**Location:** Ghent, Kentucky
**Material:** 60 mil LLT, geotextile
**Size/layer:** 2,516,000 sf
**Title:** Technician

**Project:** Pendleton Landfill
**Location:** Butler, Kentucky
**Material:** 60 mil HDPE, geocomposite, geotextile
**Size/layer:** 400,000 sf
**Title:** Technician

# Lone Star Lining Company Partial Experience Resume for Mateo Aguilar

**Project:** Williamson County Cell 3A
**Location:** Hutto, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/layer:** 510,000 sf
**Title:** Technician

**Project:** U.S. Ecology Cells 50-4 and 50-5
**Location:** Robstown, Texas
**Material:** 60 mil HDPE, geonet, geocomposite
**Size/Layer:** 828,000 sf
**Title:** Technician

**Project:** Security Landfill Phase V, Cell 4
**Location:** Cleveland, Texas
**Material:** 60 mil HDPE/HDT, GCL, geocomposite
**Size/Layer:** 388,000 sf
**Title:** Technician

**Project:** Beaumont Landfill Cell 2
**Location:** Beaumont, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/layer:** 422,000 sf
**Title:** Technician

**Project:** Skyline Landfill Cell 13C
**Location:** Ferris, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 203,000 sf
**Title:** Technician

**Project:** Osage Landfill Sector 1B-2B
**Location:** Bartlesville, Oklahoma
**Material:** 60 mil HDPE/HDT
**Size/Layer:** 188,000 sf
**Title:** Technician

**Project:** Lansing Phase 3
**Location:** Austin, Minnesota
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 165,000 sf
**Title:** Technician

**Project:** Luminant Sandow A-1 Closure
**Location:** Rockdale, Texas
**Material:** 40 mil LLT, GCL, geocomposite
**Size/Layer:** 875,000 sf
**Title:** Technician

**Project:** Southside Landfill Cell E
**Location:** Pueblo, Colorado
**Material:** 60 mil HDPE, geocomposite
**Size/layer:** 89,000 sf
**Title:** Technician

**Project:** Red Gate Evaporation Pond
**Location:** Edinburg, Texas
**Material:** 40 mil PVC
**Size/Layer:** 40,000 sf
**Title:** Technician

**Project:** Jefferson City Landfill
**Location:** Jefferson City, Missouri
**Material:** geocomposite
**Size/Layer:** 149,000 sf
**Title:** Technician

**Project:** SKB Landfill Cell 4-F
**Location:** Rosemount, Minnesota
**Material:** 60 mil HDT, GCL, geocomposite
**Size/layer:** 145,000 sf
**Title:** Technician

**Project:** Williams Pond 6 Re-line
**Location:** McPherson, KS
**Material:** 40 mil HDPE, geonet, 60 mil HDPE
**Size/Layer:** 275,000 sf
**Title:** Technician

**Project:** Lacy Lakeview Cell 3-5
**Location:** Lacy Lakeview, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 312,000 sf
**Title:** Technician

**Project:** Seabreeze Landfill Cell 10
**Location:** Angleton, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 314,000 sf
**Title:** Technician

**Project:** New Franklin WTP
**Location:** New Franklin, Missouri
**Material:** 80 mil HDT
**Size/Layer:** 38,000 sf
**Title:** Technician

# Lone Star Lining Company Partial Experience Resume for Mateo Aguilar

**Project:** Arlington Landfill Sector 5
**Location:** Arlington, Texas
**Material:** 60HDPE/HDT, geocomposite
**Size/Layer:** 343,000 sf
**Title:** Technician

**Project** Tessman Road Landfill
**Location** San Antonio, Texas
**Mil/Spec** 60HDPE/HDT, geocomposite
**Size/Layer** 522,000 sf
**Title** Technician

**Project:** Blossom Prairie Landfill
**Location:** Blossom,Texas
**Material:** 60HDPE/HDT, geocomposite
**Size/Layer:** 180,000 sf
**Title:** Technician

**Project** GE Transportation
**Location** Fort Worth, Texas
**Mil/Spec** 30 mil HDPE
**Size/Layer** 300,000 sf
**Title** Technician

**Project:** IESI/Champ Landfill
**Location:** Maryland Heights, Missouri
**Material:** 60HDT, Geotextile
**Size/Layer:** 150,000 sf
**Title:** Technician

**Project:** Blossom Prairie Landfill
**Location:** Blossom, Texas
**Material:** 60HDT, Geocomposite
**Size/Layer:** 167,000 sf
**Title:** Technician

**Project:** Enterprise Adamana
**Location:** Holdbrook, Arizona
**Material:** 40 mil HDPE, geonet, 60 mil HDPE
**Size/Layer:** 408,000 sf
**Title:** Technician

**Project:** Ford County Landfill
**Location:** Dodge City Kansas
**Material:** 40 HDPE/HDT
**Size/Layer:** 390,000 sf
**Title:** Technician

**Project:** San Angelo Landfill
**Location:** San Angelo, Texas
**Material:** 40 HDPE/HDT
**Size/Layer:** 136,000 sf
**Title:** Technician

**Project** TASWA
**Location** Whitesboro, Texas
**Mil/Spec** 60HDPE/HDT, geotextile
**Size/Layer** 489,000 sf
**Title** Technician

**Project:** East Oak Landfill
**Location:** Oklahoma City, Oklahoma
**Material:** 60HDPE/HDT, geotextile
**Size/Layer:** 160,000 sf
**Title:** Technician

**Project** IESI/Buffalo Creek Landfill
**Location** Iowa Park, Texas
**Mil/Spec** 60HDPE/HDT, geocomposite
**Size/Layer** 143,000
**Title** Technician

**Project:** IESI/Timber Ridge Landfill
**Location:** Richwoods, Missouri
**Material:** 60 HDPE, Geotextile
**Size/Layer:** 200,000 sf
**Title:** Technician

**Project:** San Angelo Landfill
**Location:** San Angelo, Texas
**Material:** 40 HDPE/HDT
**Size/Layer:** 136,000 sf
**Title:** Technician

**Project:** Pioneer
**Location:** Bridgeport,Texas
**Material:** 40 mil HDPE, geonet, 60 mil HDPE
**Size/Layer:** 45,000 sf
**Title:** Technician

**Project:** Timber Ridge Landfill
**Location:** Richwoods, Missouri
**Material:** 40HDPE, 60HDPE, geotextile
**Size/Layer:** 220,000 sf
**Title:** Technician

# Lone Star Lining Company Experience Resume for Francisco Moran

**Project:** Oneok Mt. Belvieu North Pond 6
**Location:** Baytown, Texas
**Material:** Geotextile, geonet, 60 mil HDPE/HDT
**Size/Layer:** 800,000 sf
**Title:** Technician

**Project:** Front Range Landfill Cell 14
**Location:** Erie, Colorado
**Material:** 60 mil HDPE, Geocomposite
**Size/Layer:** 680,000 sf
**Title:** Technician

**Project:** Weatherford Landfill
**Location:** Weatherford, Texas
**Material:** GCL, 60 mil HDT, Geocomposite
**Size/Layer:** 190,000 sf
**Title:** Technician

**Project:** Skyline Landfill Cell 14B/15B
**Location:** Ferris, Texas
**Material:** 60 mil HDT, geocomposite
**Size/Layer:** 550,000 sf
**Title:** Technician

**Project:** New Boston Cells 1A and 2A
**Location:** New Boston, Texas
**Material:** 50 mil HDPE Drain Liner, geotextile
**Size/Layer:** 460,000 sf
**Title:** Technician

**Project:**
**Location:**
**Material:**
**Size/Layer:**
**Title:** Technician

**Project:** Buffalo Creek Landfill
**Location:** Iowa Park, Texas
**Material:** 60 mil HDT, Geocomposite
**Size/Layer:** 250,000 sf
**Title:** Technician

**Project:** Osage LandfilL Sector 1C
**Location:** Bartlesville, Oklahoma
**Material:** 60 mil HDPE, Geotextile
**Size/Layer:** 140,000 sf
**Title:** Technician

**Project:** Western Plains Regional Area 6A
**Location:** Garden City, Kansas
**Material:** 60 mil HDPE, Geocomposite
**Size/Layer** 110,000 sf
**Title:** Technician

**Project:** Turkey Creek Sector 11A
**Location:** Alvarado, Texas
**Material:** 60 mil HDPE, Geocomposite
**Size/Layer:** 188,000 sf
**Title:** Technician

**Project:**
**Location:**
**Material:**
**Size/Layer:**
**Title:** Technician

**Project:**
**Location:**
**Material:**
**Size/Layer:**
**Title:** Technician

# Lone Star Lining Company Partial Experience Resume for Filogonio Velasquez

**Project:** U.S. Ecology Cells 50-4 and 50-5
**Location:** Robstown, Texas
**Material:** 60 mil HDPE, geonet, geocomposite
**Size:** 828,000 sf
**Title:** Technician

**Project:** City of Enid 9A9B10A10B
**Location:** Enid, Oklahoma
**Material:** 60 mil HDPE, geotextile
**Size/Layer:** 155,000 sf
**Title:** Technician

**Project:** Williams Pond 1 Re-line
**Location:** McPherson, Kansas
**Material:** 40 mil HDPE, geonet, 60 mil HDPE
**Size/layer:** 177,000 sf
**Title:** Technician

**Project:** Deffenbaugh Phase 1M - Stage C
**Location:** Shawnee, Kansas
**Material:** 60 mil HDT, GCL, geotextile
**Size/layer:** 466,000 sf
**Title:**

**Project:** Atascocita Landfill Phase 5 Cell 4
**Location:** Humble, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/layer:** 458,000 sf
**Title:** Technician

**Project:** Williams Pond 6 Re-line
**Location:** McPherson, KS
**Material:** 40 mil HDPE, geonet, 60 mil HDPE
**Size/layer:** 275,000 sf
**Title:** Technician

**Project:** Front Range Landfill Cell 12
**Location:** Erie, Colorado
**Material:** 60 mil HDPE, geocomposite
**Size/layer:** 677,000 sf
**Title:** Technician

**Project:** Blossom Prairie Landfill Cell I-2B
**Location:** Blossom,Texas
**Material:** 60HDPE/HDT, geocomposite
**Size:** 180,000 sf
**Title:** Technician

**Project:** Camino Real Cell 10B
**Location:** El Paso, Texas
**Material:** 60 mil HDPE/HDT, GCL
**Size:** 216,000 sf
**Title:** Technician

**Project:** Fort Hood Area 4, Cell 4
**Location:** Fort Hood, Texas
**Material:** 60 mil HDPE/HDT, GCL, geocomposite
**Size/Layer:** 431,000 sf
**Title:** Technician

**Project:** Cefe Valenzuela Sector 1B and 1C
**Location:** Corpus Christi, Texas
**Material:** 60 mil HDT, geocomposite
**Size/layer:** 831,000 sf
**Title:** Technician

**Project:** Skyline Landfill Cell 13C
**Location:** Ferris, Texas
**Material:** 60 mil HDT, geocomposite
**Size/layer:** 203,000 sf
**Title:**

**Project:** Feagins Recycle Pit
**Location:** Kingfisher County, Oklahoma
**Material:** 60 mil HDPE, geonet
**Size/layer:** 662,000 sf
**Title:** Technician

**Project:** DFW Landfill Cell D1C2
**Location:** Lewisville, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/layer:** 425,000 sf
**Title:** Technician

**Project:** Chevron Sweetwater
**Location:** Sweetwater, Texas
**Material:** 40 mil LLDPE, geotextile
**Size/Layer:** 109,000 sf
**Title:** Technician

**Project:** Union Pacific
**Location:** Mesquite, Texas
**Material:** 80 HDPE
**Size:** 24,000 sf
**Title:** Technician

# Lone Star Lining Company Partial Experience Resume for Filogonio Velasquez

**Project:** Laredo Landfill
**Location:** Laredo, Texas
**Material:** 60 HDPE/HDT, GCL, Geocomposite
**Size/Layer:** 320,000 sf
**Title:** Technician

**Project:** Luminant A1 Closure
**Location:** Rockdale, Texas
**Material:** 40 LLT, GCL, Geocomposite
**Size/layer:** 900,000 sf
**Title:** Technician

**Project:** Austin Community Landfill
**Location:** Manor, Texas
**Material:** 60 HDT, geocomposite
**Size/layer:** 700,000 sf
**Title:** Technician

**Project:** Cefe Valenzuela Landill
**Location:** Robstown, Texas
**Material:** 60 HDT, geocomposite
**Size/layer:** 900,000 sf
**Title:** Technician

**Project:** Granger Waste Cell 11-08
**Location:** Lansing, Michigan
**Material:** 60 mil HDPE/HDT, GCL, geotextile
**Size/layer:** 445,000 sf
**Title:** Technician

**Project:** Winstar Pond
**Location:** Thackerville, Oklahoma
**Material:** 60 mil HDPE, geotextile
**Size/layer:** 107,000 sf
**Title:** Technician

**Project:** DFW Landfill Cell D1C2
**Location:** Lewisville, Texas
**Material:** 60 mil HDPE/HDT, geocomposite
**Size/Layer:** 425,000 sf
**Title:** Technician

**Project:** Mesquite Creek Landfill Phase III East
**Location:** New Braunfels, Texas
**Material:** 60 HD/HDT, geocomposite
**Size:** 437,000 sf
**Title:** Technician

**Project:** Expressway Village
**Location:** Wichita Falls, Texas
**Material:** GCL
**Size/layer:** 20,000 sf
**Title:** Technician

**Project:** Skyline Landfill
**Location:** Ferris, Texas
**Material:** 60 HDT, Geocomposite
**Size/layer:** 350,000 sf
**Title:** Technician

**Project:** Lunimant AX Landfill Cell 2
**Location:** Rockdale, Texas
**Material:** 30 mil Gundeal
**Size/layer:** 1,200,000 sf
**Title:** Technician

**Project:** Enterprise - Petal
**Location:** Petal, MS
**Material:** 40 & 60 mil HDPE/HDT, geonet
**Size/layer:** 80,000 sf
**Title:** Technician

**Project:** Ruppe Road Ponds
**Location:** Pauls Valley, Oklahoma
**Material:** 60 mil HDPE
**Size/layer:** 198,000 sf
**Title:** Technician

**Project:** EPCO Pond 5
**Location:** Mont Belvieu, Texas
**Material:** geotextile, 60 HD conductive, geonet
**Size:** 1,400,000 sf
**Title:** Technician

**Project:** Edinburg Unit 6, Cell 5B
**Location:** Edinburgh, Texas
**Material:** GCL, 60 HD/HDT, geocomposite
**Size:** 355,000 sf
**Title:** Technician

**Project:** NTMWD 121 RDF
**Location:** Melissa, Texas
**Material:** 60 mil HDPE, Geocomposite
**Size:** 600,000 sf
**Title:** Technician

# Lone Star Lining Company Partial Experience Resume for Dionicio Ledesma

**Project** Cripple Creek
**Location** Victor, Co.
**Mil/Spec** 80mil LLDPE
**Size/Layer** 104,000sf
**Title** Technician

**Project** CC&V
**Location** Victor, Co.
**Mil/Spec** 80 LLR
**Size/Layer** 1,271,416 sf
**Title** Technician

**Project** Champ LF
**Location** Maryland Heights, MO
**Mil/Spec** 40HDPE,HDT
**Size/Layer** 130,000 sf
**Title** Technician

**Project:** EPCO Pond 5
**Location:** Mont Belvieu, Texas
**Material:** geotextile, 60 HD conductive, geonet
**Size:** 1,400,000 sf
**Title:** Technician

**Project:** New Boston Area 5 Cover
**Location:** New Boston, Texas
**Material:** 60 mil HDPE/HDT, Geocomposite
**Size:** 450,000 sf
**Title:** Technician

**Project:** Austin Community Landfill WD-13N
**Location:** Austin, Texas
**Material:** 60 mil HDT, geocomposite
**Size:** 750,000 sf
**Title:** Technician

**Project:** Orchard Ridge Landfill Cap
**Location:** Menomomee Falls, Wisconsin
**Material:** 40 mil LLT, Geocomposite
**Size:** 915,000 sf
**Title:** Technician

**Project:** SORD Landfill Cells 5-6
**Location:** Ardmore, Oklahoma
**Material:** 60 mil HDPE/HDT, Geocomposite
**Size:** 500,000 sf
**Title:** Technician

**Project** Greenridge Reclamation
**Location** Scottdale, PA
**Mil/Spec** 60HDR, Comp., Text.
**Size/Layer** 350,000
**Title** Technician

**Project** Pioneer
**Location** Bridgeport,TX
**Mil/Spec** 40HDPE,60HDPE,geonet,HDT
**Size/Layer** 45,000 sf
**Title** Technician

**Project** Blossom Prairie LF
**Location** Blossom, TX
**Mil/Spec** 60HDPE,HDT,geotex,geocomp.
**Size/Layer** 189,000 sf
**Title** Technician

**Project:** Absolute Waste Cell 2
**Location:** Tecumseh, Oklahoma
**Material:** 60 mil HDT, geotextile
**Size:** 257,000 sf
**Title:** Technician

**Project:** SKB Lansing Phase 4
**Location:** Austin, Minnesota
**Material:** GCL, 60 mil HDPE, Geocomposite
**Size:** 150,000 sf
**Title:** Technician

**Project:** SKB Cell 3-E
**Location:** Rosemount, Minnesota
**Material:** GCL, 80 mil HDT, Geocomposite
**Size:** 315,000 sf
**Title:** Technician

**Project:** Mesquite Creek Landfill Unit 2 Phase IVN
**Location:** New Braunfels, Texas
**Material:** 60 mil HDT, geocomposite
**Size:** 365,000 sf
**Title:** Technician

**Project:** EPCO Pond 2
**Location:** Hutchinson, Kansas
**Material:** 40 mil HDPE, geonet, 60 mil HDPE/HDT
**Size:** 380,000 sf
**Title:** Technician

# Lone Star Lining Company Partial Experience Resume for Dionicio Ledesma

**Project:** Exxon Mobil Pond Reline
**Location:** Port Allen, Louisiana
**Material:** 60 mil HDPE
**Size:** 36,000 sf
**Title:** Technician

**Project:** Seabreeze Landfill Pond
**Location:** Angleton, Texas
**Material:** 60 mil HDPE, Geocomposite
**Size:** 150,000 sf
**Title:** Technician

**Project:** Jefferson Parish Cell 24 South
**Location:** Avondale, Louisiana
**Material:** GCL, 40, 60 mil HDPE, Geocomposite
**Size:** 170,000 sf
**Title:** Technician

**Project:** Timberlane Cell 9
**Location:** Oakdale, Louisiana
**Material:** 60 mil HDPE/HDT, Geocomposite
**Size:** 220,000 sf
**Title:** Technician

**Project:** SKB Cell 3-G
**Location:** Rosemount, Minnesota
**Material:** GCL, 80 mil HDT, Geocomposite
**Size:** 366,000 sf
**Title:** Technician

**Project:** Eco Vista Landfill 11A, South 12
**Location:** Springdale, Arkansas
**Material:** GCL, 60 mil HDT, Geocomposite
**Size:** 300,000 sf
**Title:** Technician

**Project:** Luminant Oak Grove Cell 2 Cap
**Location:** Franklin, Texas
**Material:** 40 mil LLDT/geocomposite
**Size:** 1,100,000 sf
**Title:** Technician

**Project:** Oklahoma Landfill Phase V, Sector I
**Location:** Oklahoma City, Oklahoma
**Material:** GCL, 60 mil HDT, Geotextile
**Size:** 550,000 sf
**Title:** Technician

**Project:** SKB Cell 3-G
**Location:** Rosemount, Minnesota
**Material:** GCL, 80 mil HDT, Geocomposite
**Size:** 366,000 sf
**Title:** Technician

**Project:** SKB Cell 3-G
**Location:** Rosemount, Minnesota
**Material:** GCL, 80 mil HDT, Geocomposite
**Size:** 366,000 sf
**Title:** Technician

**Project:** Timberlane Cell 9
**Location:** Oakdale, Louisiana
**Material:** 60 mil HDPE/HDT, Geocomposite
**Size:** 220,000 sf
**Title:** Technician

# Lone Star Lining Company Partial Experience Resume for Alex Tello

**Project:** City of Enid Cell 11E
**Location:** Enid, Oklahoma
**Material:** 60 mil HDPE/HDT/Geotextile
**Size:** 220,000 sf
**Title:** Technician

**Project:** Buffalo Creek Landfill
**Location:** Iowa Park, Texas
**Material:** 60 mil HDT, Geocomposite
**Size/Layer:** 250,000 sf
**Title:** Technician

**Project:** Weatherford Landfill
**Location:** Weatherford, Texas
**Material:** GCL, 60 mil HDT, Geocomposite
**Size/Layer:** 190,000 sf
**Title:** Technician

**Project:** New Boston Cells 1A and 2A
**Location:** New Boston, Texas
**Material:** 50 mil HDPE Drain Liner, geotextile
**Size/Layer:** 460,000 sf
**Title:** Technician

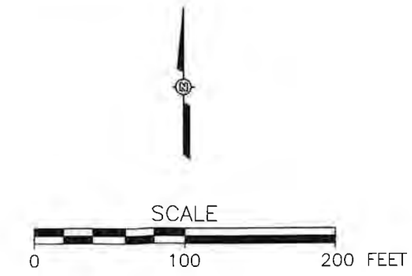
**Project:** Oneok Mt. Belvieu North Pond 6
**Location:** Baytown, Texas
**Material:** Geotextile, geonet, 60 mil HDPE/HDT
**Size:** 800,000 sf
**Title:** Technician

**Project:** Turkey Creek Sector 11A
**Location:** Alvarado, Texas
**Material:** 60 mil HDPE, Geocomposite
**Size/Layer:** 188,000 sf
**Title:** Technician

**Project:** Western Plains Regional Area 6A
**Location:** Garden City, Kansas
**Material:** 60 mil HDPE, Geocomposite
**Size/Layer** 110,000 sf
**Title:** Technician

**Project:** US Ecology Cell 51 Phase 2
**Location:** Robstown, Texas
**Material:** 60 mil HDPE/HDT, composite, textile
**Size/Layer:** 880,000 sf
**Title:** Technician

# Record Drawings




## LEGEND

- GCL PANEL
- (296) GCL PANEL NUMBER
- BREAKLINES

07-14-22

STATE OF TEXAS
SAMUEL A. FRANCO
137046
LICENSED
PROFESSIONAL ENGINEER

NOTE:

1. GCL PANEL PLACEMENT AS BUILT WAS PREPARED USING FIELD GEOSYNTHETIC INSTALLATION LOGS. GCL PANELS DO NOT REPRESENT SURVEYED LOCATIONS.

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

TEXAS BOARD OF PROFESSIONAL ENGINEERS REG. NO. F-3407

DRAWING TITLE: GCL PANEL PLACEMENT AS BUILT

PROJECT TITLE: FGD-A POND RETROFIT

CLIENT: OAK GROVE STEAM ELECTRIC STATION
LUMINANT
ROBERTSON COUNTY, TEXAS

**SCS ENGINEERS**
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
12651 BRIAR FOREST, SUITE 265, HOUSTON, TX 77077
PH (281) 293-8494 FAX NO. (281) 293-7676

PROJ. NO. 16221045.010 | DSN BY: SF | DWN BY: SF | CHK BY: JRM | QA/QC BY: JRM | APP'D BY: JRM

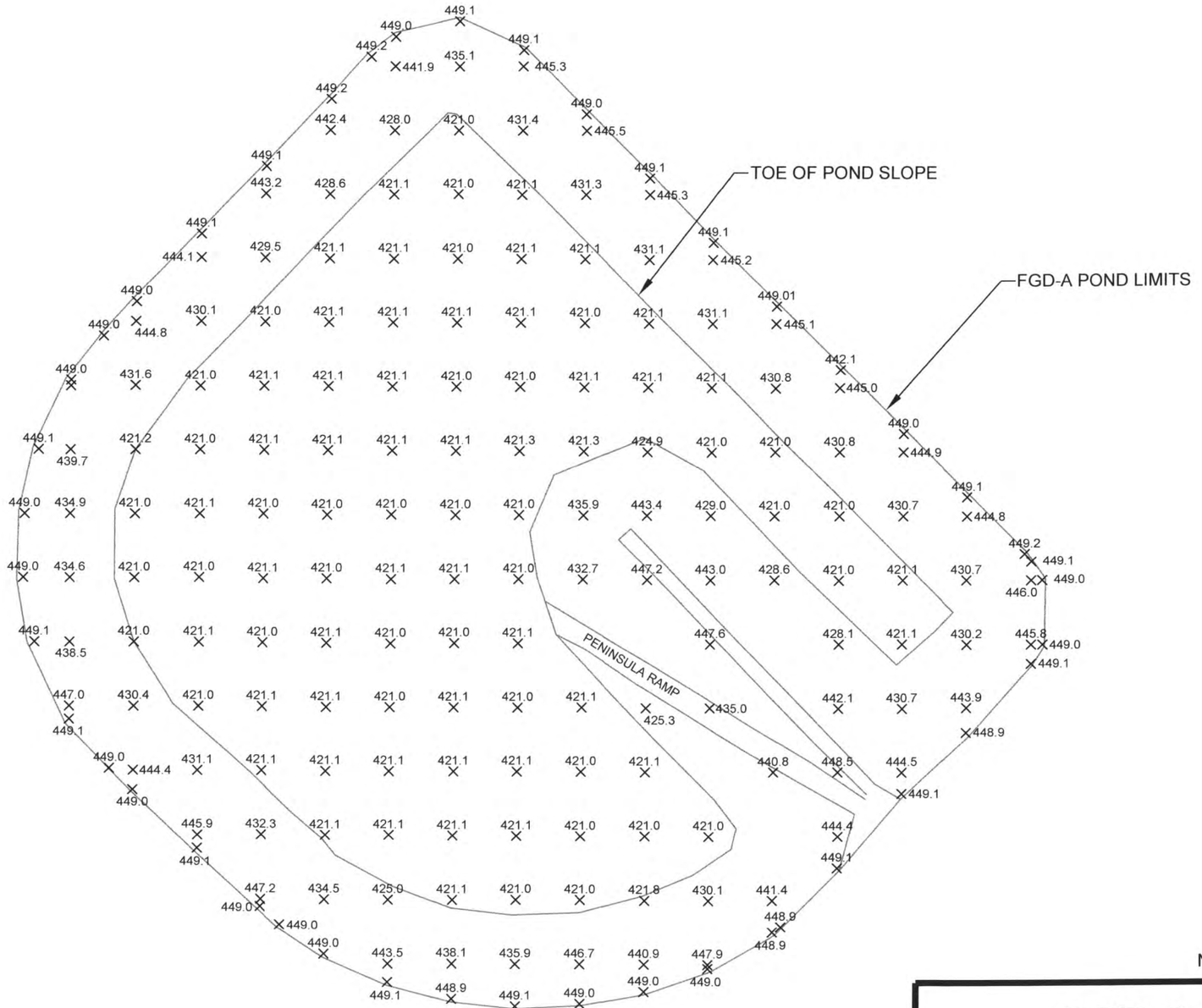
CADD FILE: GCL PANEL PLACEMENT AS BUILT

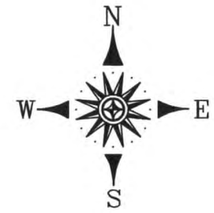
DATE: 07/2021

SCALE: AS SHOWN

FIGURE NO. 1

7/14/2022 10:02 AM Z:\MR\Projects\16221045.000\Deliverables\Technical\Bid Book\2021 FGD-A General Contractor CAD Fi




0 100 200

GRAPHIC SCALE: 1" = 100'

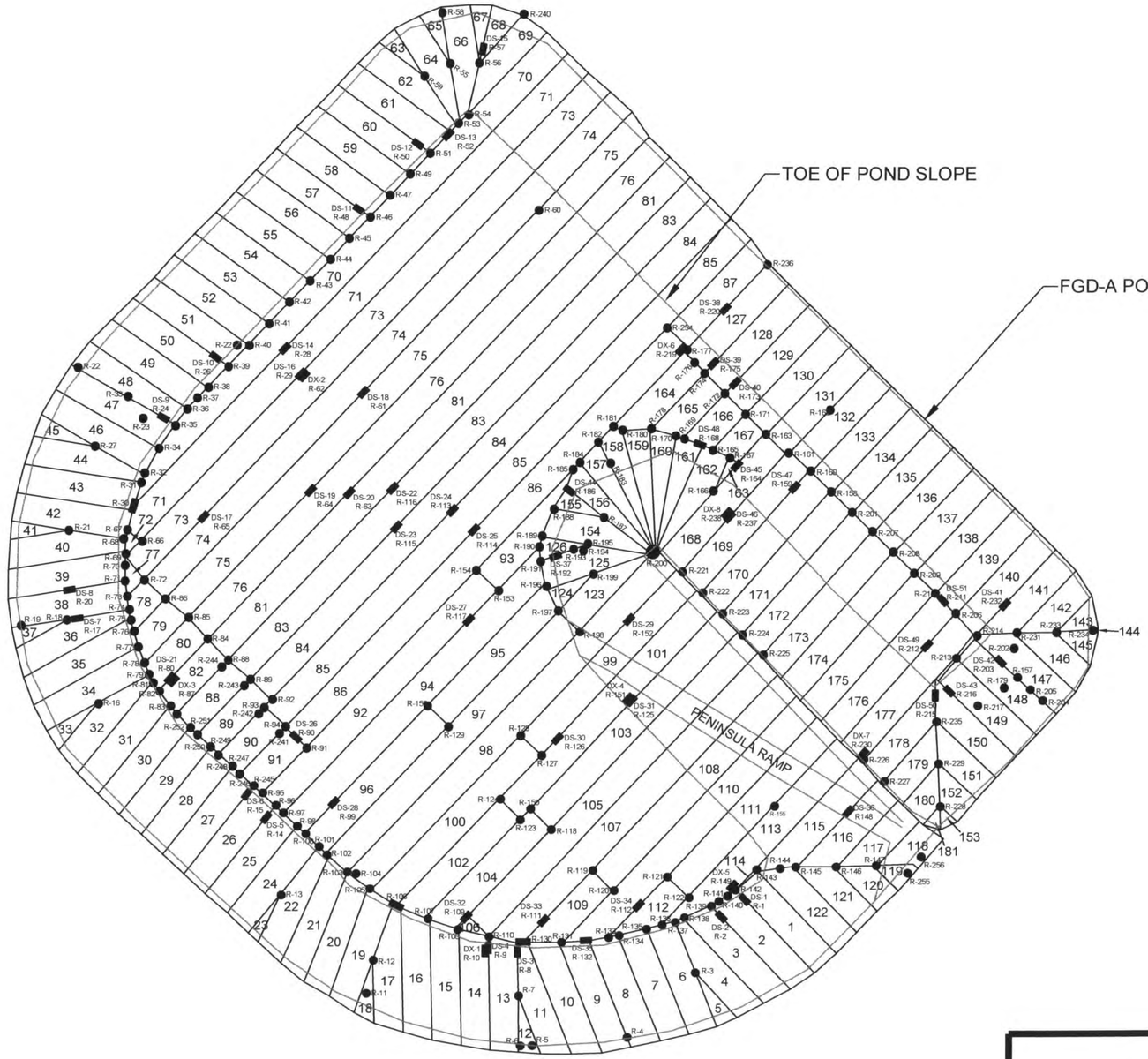
LEGEND

449.1 TOP OF SUBGRADE ELEVATION

NOTE: SURVEY CONTROL BASED ON OAK GROVE PLANT CONTROL

# FGD-A POND TOP OF SUBGRADE AS-BUILT SURVEY

Ray W. Davis Consulting Engineers, Inc.
Civil Engineering/Land Surveying
208 CR 449 903.693.1711 (Ray)
Carthage, TX 75633 903.693.1269 (Jeremy)
Firm Reg. # - 10018000 (TBPLS)
Firm Reg. # - 8732 (TBPE)



0 100 200

GRAPHIC SCALE: 1" = 100'

LEGEND

| | |
|---|---|
| 129 | PANEL NUMBER |
| DS-50 | DESTRUCTIVE LOCATION |
| R-10 | REPAIR LOCATION |

4/5/22

STATE OF TEXAS
REGISTERED
JEREMY R DAVIS
6259
PROFESSIONAL
LAND SURVEYOR

Jeremy R Davis

NOTE: SURVEY CONTROL BASED ON OAK GROVE PLANT CONTROL

# FGD-A POND GEOMEMBRANE LINER AS-BUILT SURVEY

Ray W. Davis Consulting Engineers, Inc.
Civil Engineering/Land Surveying
101 Bryanhurst St. 903.693.1269
Henderson, TX 75654
Firm Reg. # - 10018000 (TBPLS)
Firm Reg. # - 8732 (TBPE)

REPORT

# LINER EVALUATION REPORT

## Oak Grove SES
## FGD-B Pond
## Robertson County, Texas

**Submitted To:** Luminant Power
Lincoln Plaza, 9th Floor
500 N. Akard Street
Dallas, Texas 75201-3411

**Submitted By:** Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

Golder Associates Inc.
F-2578

**Distribution:** 4 Hard Copies - Luminant Power
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1 Hard Copy - Golder Associates Inc.

**January 2012**

**113-94788.01**

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STATE OF TEXAS
CHARLES FRED RICKERT
62392
REGISTERED PROFESSIONAL ENGINEER

Golder Associates Inc.
F-2578

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Golder Associates Inc.
F-2578

# 1.0 INTRODUCTION

## 1.1 Purpose and Scope

The Oak Grove SES Power Station is located in Robertson County, Texas. The FGD-B Pond is the subject of this Liner Evaluation Report (LER). The location of the Oak Grove SES Power Station is presented on Figure 1. The FGD-B Pond is located on the northern portion of the facility presented on Figure 2. The FGD-B Pond in plan view is approximately 492,900 square feet or 11.3 acres.

Golder Associates Inc. (Golder) was retained by Luminant Power (Luminant) to provide third party Construction Quality Assurance (CQA) monitoring and testing services during the construction of the composite liner for the FGD-B Pond. This report summarizes the CQA monitoring activities, observations and the results of the tests conducted by Golder during the preparation of the subgrade and installation of the clay and geomembrane liners. It is Golder's opinion that the FGD-B Pond was constructed in compliance with the project plans, specifications and Quality Control Plan (QCP).

## 1.2 Project Team

Golder Associates Inc. (Golder) of Houston, Texas prepared the project drawings for the FGD-B Pond. Ranger Excavating (Ranger) of Austin, Texas performed the construction of the clay liner. The installation of the geomembrane liner was performed by Texas Environmental Plastics, Inc. (TEP) of Houston, Texas. Record surveying services for lines and grades, including clay liner and protective cover thickness verification, were provided by Survey and Mapping, Inc. (SAM) of Austin, Texas.

Golder monitored structural fill placement and clay and geomembrane liner construction activities. Golder's field personnel consisted of a resident CQA manager who was on-site full time during construction. Mr. Greg McQuaid and Mr. Mark Day fulfilled the resident CQA manager duties during the FGD-B Pond composite liner construction. They were assisted by Mr. Andrew Keeton and Mr. Allen Burks during portions of the project. A resume detailing their experience is provided in Appendix A. In addition to the presence of a CQA monitor, the professional of record made regular site visits during the course of the project.

The professional of record for the construction of the FGD-B Pond clay liner was Mr. Charles F. Rickert, P.E. Mr. Rickert is a registered professional engineer in the State of Texas (PE 62392). He has over 30 years of civil engineering and extensive earthwork construction experience, having been directly involved with numerous CQA earthwork projects. A resume detailing Mr. Rickert's experience is presented in Appendix A. The lines of communication between Mr. Rickert and Golder's field personnel were maintained regularly by telephone. Mr. Rickert visited the Oak Grove SES Power Station site frequently during clay liner construction and was in attendance at weekly progress meetings held on site. Mr.

Rickert made visits to the site on April 21, May 17, 24, 31, June 7, 14, 21, 28, July 12, 19, 28, August 2, 9, 16, 23, 30, September 13, 20, 27, October 4, 11, 25, November 1, 7, 15, and 29, 2011.

## 1.3 Project Work Schedule

Construction of the FGD-B Pond clay liner system took place between October 7 and November 9, 2011. Prior to that period CQA monitoring activities included preconstruction sampling and testing, and CQA activities associated with monitoring of the subgrade preparation. Ranger personnel typically worked 10 to 12 hours per day, 6 to 7 days per week.

# 2.0 PROJECT DOCUMENTS AND DESCRIPTION

## 2.1 Project Specifications and Drawings

Golder monitored the composite clay and geomembrane liner construction for FGD-B Pond at the Oak Grove SES Power Station utilizing construction drawings and quality assurance documents prepared by Golder.

## 2.2 Project Description

The liner area in plan view is approximately 492,900 square feet or 11.3 acres. The project specifications required the construction of a minimum 2-foot thick clay liner on the FGD-B Pond floor and slopes [3(H):1(V)] overlain by a textured 60-mil high-density polyethylene (HDPE) geomembrane and a 1-foot thick protective cover soil layer. The certification drawing provided by SAM is included as Figure 12. CQA soil testing was performed according to the project plans, specifications and QCP.

An overflow pipe consisting of a 12-inch diameter HDPE SDR17 pipe was installed between the FGD-A and FGB-B Ponds. The pipe inlet in FGD-A Pond is at elevation 442 feet, MSL and details are presented on Figure 9. Photographs are included in Appendix N.

# 3.0 EARTHWORKS CONSTRUCTION QUALITY ASSURANCE ACTIVITIES

The CQA monitoring and testing performed by Golder for the structural fill and clay liner construction consisted of the following activities:

- Participation in the preconstruction and weekly progress meetings between Luminant, Ranger, and Golder, prior to and during construction of the clay liner;
- Collection of preconstruction samples of potential material to be used for the construction of the structural fill and clay liner;
- Observation and documentation of construction procedures during construction of the structural fill and clay liner;
- Performance of field moisture/density tests on the structural fill and clay liner;
- Acquisition of thin wall tube samples and performance of hydraulic conductivity tests on each lift during clay liner construction;
- Determination of Atterberg limits and particle size distribution (sieve analysis) of clay liner material; and
- Review of survey data for grade control and clay liner thickness verification.

A description of each of the above activities with a summary of the observations is presented in the following sections. A photograph log showing various construction activities is included in Appendix N. The actual number of quality assurance tests performed for this project met or exceeded the minimum number required for compliance with the QCP.

## 3.1 Preconstruction and Construction Sampling and Laboratory Testing

Prior to the use of site soils for the construction of the FGD-B Pond clay liner, samples were obtained from on-site borrow areas in conjunction with the FGD-B Pond clay liner construction. The soil tests were performed in Golder Associates Inc. geotechnical laboratory in Houston, Texas or Atlanta, Georgia. Testing included moisture content (ASTM D2216), particle size analyses (ASTM D 422) and Atterberg limits (ASTM D 4318). Moisture/density relationships (ASTM D 698) were developed for use during construction to document that the percent compaction and moisture content achieved in the field met the requirements of the project specifications and QCP. Hydraulic conductivity tests ASTM D 5084 - Method F (Houston) were performed on remolded specimens as required by the QCP. The test results showed the proposed material was suitable for clay liner construction. The laboratory preconstruction test results are provided in Appendix B.

## 3.2 Structural Fill

Field moisture/density tests were performed using a nuclear density gauge (ASTM D 2922 and ASTM D 3017) to determine whether the project specifications for compaction had been achieved. The minimum number of density tests required for compliance with the project specifications was one test per 5,000

cubic yards of fill material. A total of 434 field moisture/density tests were performed on the structural fill exceeding the minimum requirement for approximately 150,000 cubic yards of material.

The degree of compaction achieved in the field was computed on the basis of the dry density of the soil tested in the fill and the appropriate density standard developed in the laboratory for the subgrade material. The initial 6 lifts of structural fill were placed at a minimum of 95 percent of the maximum dry density (MDD) to bridge over soft subgrade soils. The remaining structural fill was placed at a minimum of 95 percent MDD and +3 to -3 percent of the optimum moisture content. Holes in the subgrade formed by the mandrel used for the nuclear density test were backfilled with bentonite powder. A summary of the structural fill density test data is included in Appendix C.

## 3.3 Clay Liner Construction Procedures

Construction of the FGD-B Pond clay liner generally progressed in the following manner:

- Clay liner material was excavated from the on-site clay borrow source with track-mounted excavators and hauled to the placement area in articulated dump trucks. Material was dumped and spread in loose lifts of approximately 8-inches thick. Loose lift thickness was monitored by Golder;
- Soil clods were broken down by the blade and tracks of the bulldozer as the lift was struck to the proper thickness. A water wagon was used to moisture condition the soils when it was necessary to add water following placement in the impoundment;
- The clay was compacted using a CAT 815B tamping-foot roller;
- Prior to placement of subsequent lifts, the soil surface was watered as needed and then roughened by the cleats of the compactor to facilitate a good interlift bond; and
- Throughout construction of the clay liner, water was added as necessary to the surface of previous lifts to prevent excessive drying under the elements of weather.

The above procedures were followed for each lift of the FGD-B Pond clay liner. Four complete lifts were placed across the impoundment for the compacted clay liner with each compacted lift being approximately 6-inches thick. The final surface of the uppermost lift was smoothed using a steel drum roller after the required density had been achieved. A final survey was performed of the prepared clay liner surface for the purpose of thickness verification.

## 3.4 Field Moisture/Density Tests

The field moisture/density tests were performed using a nuclear density gauge (ASTM D 2922 and ASTM D 3017) to determine whether the project specifications for compaction and moisture content had been achieved. Additional field moisture/density tests were performed using a drive ring (ASTM D 2937) method. The drive ring tests were periodically performed in conjunction with the nuclear density gauge to verify the results. The degree of compaction achieved in the field was computed on the basis of the dry density of the soil tested in the fill and the appropriate density standard developed in the laboratory for the

clay material. Holes in the clay liner formed by the mandrel used for the nuclear density test were backfilled with bentonite powder, and holes formed by the drive cylinder were backfilled and compacted with a bentonite/clay mixture.

Project specifications for the construction of the FGD-B Pond clay liner required that the material be placed between 2 to 6 percent above the optimum moisture content and compacted to a minimum of 95 percent of the maximum dry density as determined by the standard Proctor moisture/density test (ASTM D 698). The minimum number of density tests required for compliance with the QCP was 62 tests per lift via the nuclear gauge method and a total of 4 via the drive ring method. A minimum of 67 field moisture/density tests per lift were performed via the nuclear gauge method. A total of 12 field moisture/density tests via the drive ring method were performed.

A summary of the clay liner density test data is included in Appendix D. The moisture/density reference curves (standard Proctor) are presented in Appendix B. The locations of each clay liner field moisture/density test are presented on Figures 3 through 6 for Lifts 1 through 4, respectively.

In accordance with the QCP, nuclear density gauge moisture content measurements were compared with oven/microwave moisture contents. The results are provided in Appendix E.

Additionally the trench backfill for the overflow pipe consisting installed between the FGD-A and FGB-B Ponds was placed and tested in accordance with clay liner specifications. The density test data is also included in Appendix D.

## 3.5 Hydraulic Conductivity Sampling and Testing

To comply with the project specifications and permit requirements, one hydraulic conductivity test was required for every 40,000 square feet of compacted clay liner, for each 6-inch (compacted) lift. This equates to 13 tests per lift. A minimum of 13 hydraulic conductivity tests were performed on samples collected from each of Lifts 1 through 4. The samples were obtained by pushing a thin-walled tube (ASTM D1587) into the clay liner. The sample was sent to and tested at Golder's Atlanta, Georgia or Houston, Texas geotechnical laboratory. The coefficient of hydraulic conductivity was determined according to ASTM D 5084 -Method D (Atlanta) or Method F (Houston). The holes formed in the clay liner by the thin-walled tubes were backfilled with a bentonite/clay mixture and compacted. Project specifications for the construction of the FGD-B Pond clay liner required in-place material to have a hydraulic conductivity of no greater than $1.0 \times 10^{-7}$ centimeters per second (cm/sec).

The laboratory data for the clay liner hydraulic conductivity for the FGD-B Pond are provided in Appendix B.

## 3.6 Atterberg Limits/Sieve Analysis Sampling and Testing

To comply with the project specifications and permit requirements, one Atterberg limits (ASTM D 4318) and sieve analysis (ASTM D 422) were required for every 50,000 square feet of compacted clay liner, for each 6-inch (compacted) lift. This equates to 10 tests per lift. A minimum of 13 Atterberg limits and sieve analysis were performed on samples collected from each of Lifts 1 through 4. Project specifications for the clay liner required that the material used exhibit a liquid limit of no less than 30 percent, a plasticity index of no less than 15 percent, and that the soil fraction passing the No. 200 sieve be no less than 30 percent.

The clay liner Atterberg limits and percentage of fines (soil fraction smaller than 0.074 mm, which corresponds to the No. 200 sieve) laboratory test results are provided in Appendix B.

## 3.7 Thickness Verification

Clay liner thickness was verified by means of an engineering survey, performed by SAM, at points located on a 50-foot grid. Additional data was collected at break lines in the grade of the impoundment floor and at other points which would have otherwise fallen between the points on the grid. These points were compared to the bottom of liner points surveyed on the surface of the subgrade prior to clay liner construction. The SAM thickness verification survey drawing for the FGD-B Pond clay liner is presented as Figure 12.

## 4.0 GEOMEMBRANE QUALITY ASSURANCE ACTIVITIES

The quality assurance monitoring and testing performed by Golder Associates Inc. for geomembrane installation consisted of the following activities:

- Participating in the weekly progress meetings prior to and during installation of the geomembrane;
- Reviewing manufacturer's raw materials and geomembrane roll quality control documents;
- Observing the soil liner surface to verify that the surface was generally free of irregularities, protrusions and loose soil;
- Observing the anchor trench excavation to verify that the surface was free of loose soil;
- Observing and documenting geomembrane panel placement and verifying thickness during panel deployment;
- Observing and documenting trial seam procedures and evaluating test results;
- Observing and documenting field seams and seaming operations;
- Observing and documenting non-destructive seam continuity testing;
- Locating and documenting seam strength destructive test locations;
- Performing destructive tests on geomembrane seams and evaluation of the test results;
- Locating geomembrane panel and seam defects, and observing and documenting repairs;
- Observing and documenting non-destructive continuity testing of repairs;
- Observing backfill placed in the anchor trenches; and
- Observing protective soil cover placement to ensure that no damage was done to the underlying geomembrane.

A description of the CQA activities and a summary of the observations are presented in the following sections.

### 4.1 Geomembrane Material

The geomembrane liner material installed at this site consisted of a nominal 60-mil textured high density polyethylene (HDPE) geomembrane manufactured in approximately 23 foot wide rolls by Poly-Flex, Inc. (Poly-Flex) A total area of approximately 492,900 square feet of this geomembrane was deployed. Golder Associates' personnel inventoried all of the geomembrane material, and a complete inventory list is presented in Appendix F. Copies of the geomembrane resin and roll quality control documents from Poly-Flex are included in Appendix G. All test values reported by Poly-Flex for the geomembrane met the project specifications.

### 4.2 Soil Liner Surface

Prior to deployment of the geomembrane, Ranger, who had constructed the clay liner, maintained the soil liner surface. The surface of the soil liner was rolled smooth with a steel drum roller and maintained in a

moist condition by a water truck to prevent desiccation. Prior to deployment of the geomembrane the surface was examined by Golder and TEP personnel for any objects that could potentially damage the geomembrane, and any such objects found were removed. Subgrade acceptance certificates are presented in Appendix H.

## 4.3 Geomembrane Deployment

Geomembrane panels were deployed using a rubber tired front end loader with a spreader bar to unroll the geomembrane, and the panels were placed into final position by use of man power. Panels were aligned with a minimum 6 inch overlap. Free edges of the geomembrane were temporarily secured with sand bags.

Each geomembrane panel was marked with a field identification number by Golder Associates' CQA personnel. These numbers indicate the order of panel deployment and can be correlated to the manufacturer's roll number using the panel deployment summary in Appendix I. A plan view of the geomembrane panel layout is shown on Figures 7 and 8.

Each panel was visually examined for manufacturing defects and installation damage. Defects were marked, recorded and subsequently repaired. Panel thickness measurements were taken by Golder Associates' CQA personnel with a micrometer at locations on the leading edge of each panel. Results of field thickness measurements are included in Appendix I. All measured thickness values were within the range defined in the project specifications.

## 4.4 Geomembrane Trial Seams

The seaming methods used on this project were the dual track fusion welding process and the extrusion welding process. Geomembrane trial seams were made by TEP technicians to test the seaming apparatus (welding machines) and operator's performance under daily site conditions. Trial seams were made each day prior to the start of field seaming in the morning and following the mid-day break.

Specimens from each trial seam were quantitatively and qualitatively field tested by TEP: 3 for peel adhesion (peel) and 3 for bonded seam strength (shear), using a portable field tensile testing machine. The separation mode for each test specimen was classified and documented according to the codes shown on Figures 10 and 11, for dual track fusion and extrusion welds respectively. A summary of the trial seam test results is presented in Appendix J. In the event of a failing test, a second trial seam was made and tested prior to implementation of the welding machine. If the second trial seam failed, two consecutive passing trial seams were required prior to the start of field production seaming.

Golder Associates' personnel observed trial seaming procedures and the testing of all specimens from the trial seams.

## 4.5 Geomembrane Seaming

The principal seaming method used on this project was the dual track fusion welding process. The extrusion welding process was used for making repairs, and capping inadequate fusion welds.

Golder Associates' personnel observed seaming operations on a routine basis. The observations consisted of checking for proper sheet overlap and periodically checking the seam area to verify that the surface was prepared properly and that the surface area was kept free of moisture, dust, dirt, and debris. All seams were examined for visual quality and seam completion. Visually detected imperfections were marked and subsequently repaired. A summary of the geomembrane seaming data collected by Golder Associates' CQA personnel is presented in Appendix K.

## 4.6 Seam Strength Destructive Testing

Geomembrane seam strength destructive test samples were taken at a frequency of at least one per 500 lineal feet of seam. Test locations were selected by Golder Associates' CQA personnel based on the progress of each welding machine and observations of the welding operations. After the sample was obtained in the field, specimens were removed from a portion of each sample for preliminary field tests and the remainder of the sample was held for subsequent testing. If the preliminary field tests met the project requirements, the sample was then tested for seam strength by TEP. These samples were also tested by Golder in the Golder Associates laboratory in Atlanta, Ga. If the preliminary field tests failed to meet the project requirements, additional locations were identified for destructive test samples as part of the procedure for tracking a below specification seam. Portions of each destructive sample were retained for the RSI archives. For each of the destructive samples, 10 specimens were removed for testing. Five (5) specimens were tested for peel adhesion (peel) and 5 specimens were tested for bonded seam strength (shear).

The acceptance criteria for both bonded shear strength and peel adhesion was that 4 out of the 5 specimens tested under each condition had to meet the minimum specified strength value and that the average strength values of each set of 5 specimens must meet the specifications. The strength criteria for an acceptable shear test was that the specimen had to exhibit a strength greater than 120 pounds per inch; further, the strain at break greater than 50 percent. Additionally, the specimen had to exhibit an acceptable break code. The criterion for an acceptable peel test was that the specimen had to exhibit a strength greater than 78 pounds per inch for an extrusion weld and a strength greater than 91 pounds per inch for an fusion weld, and also exhibit an acceptable break code. Both tracks of dual track fusion welded seams were tested in peel. Separation modes for the test specimens were reported according to the modes shown on Figures 10 and 11.

The total length of fusion welded seams (not including repairs) was approximately 25,017 feet, which corresponds to a minimum number of destructive seam strength tests of 51 at a frequency of one per 500

linear feet of seam. Initially Golder Associates' monitors located 51 areas for destructive seam strength testing. A total of 1,620 feet of extrusion welding was performed in the repairs of defects (greater than 10 feet in length) requiring an additional 4 destructive tests of extrusion welds at a frequency of one per 500 feet. A total of 54 fusion destructive seam tests and 6 extrusion destructive tests were performed for this project.

In the case of a passing destructive test, a patch was welded over the area from which the sample was taken. In the case of a failing test, additional samples were taken from seams or repairs completed by the same seamer and/or seaming apparatus which were seamed before and after the failed area. All destructive seam strength samples were tested by Golder Associates in Golder's Atlanta, Georgia laboratory. A summary of the destructive test results for geomembrane seam samples is included in Appendix L, and the locations are shown on Figure 7.

Failing tests were tracked and bound by performing additional tests performed on samples located a minimum of approximately 10 feet away, (in both directions), from the failing destructive test. Once the failed area was bracketed by passing test, the failed seam length was repaired by capping the seam.

## 4.7 Non-Destructive Seam Continuity Testing

Geomembrane seams and seam repairs were tested for continuity by TEP. The air pressure method was used for dual track fusion welds, and the vacuum box method was used for extrusion welds.

Golder Associates' CQA personnel observed and documented non-destructive testing of seams and seam repairs on a full time basis. A summary of non-destructive testing of seams is included in the geomembrane seam summary presented in Appendix K. All tested seam lengths and repairs passed the project non-destructive testing requirements.

## 4.8 Geomembrane Defects and Repairs

Each geomembrane panel and seam was visually observed for defects. The term "defect" refers to manufacturing blemishes, installation damage including burns and creases, incomplete seaming, wrinkles and fish mouths. Defect identification codes were also assigned to multiple panel intersection points, as the project documents required patches at these locations. These observations were made on an on-going basis throughout the installation process.

Defects were logged by Golder Associates' personnel, who also observed repair operations performed by TEP. These observations were made to verify that all noted defects were repaired and documented. A summary of defects and repairs is contained in Appendix M, and the locations of repairs are shown on Figure 8.

TEP welded patches at destructive seam strength sample locations, at holes created during installation, in areas of insufficient overlap for seaming, and at intersecting fusion-welded seams ("T's"). Spot welds were made by the installer to small isolated manufacturing blemishes, creases and minor scratches on the geomembrane panels. Minor defects in extruded seams were repaired by lightly grinding and rewelding these areas.

## 4.9 Non-Destructive Testing of Repairs

TEP non-destructively tested geomembrane defects, patches and panel repairs for continuity. The vacuum box method was used for all such testing.

Golder Associates' CQA personnel observed and documented non-destructive testing of defects and repairs on a full time basis. A summary of non-destructive testing of defects and repairs is presented in the Repair Summary in Appendix M.

## 5.0 ANCHOR TRENCHES

The geosynthetics were anchored in a trench above the slopes. The anchor trench was approximately 2 feet wide by 2 feet deep. The anchor trench detail is shown on Figure 9. The soil removed from the anchor trench was used as backfill. Soil was placed in loose lifts and compacted using the rubber tires of a backhoe. Care was taken to verify that no damage was inflicted to the geosynthetics in the anchor trenches as a result of the backfilling operations, which was verified by Golder personnel.

## 6.0 PROTECTIVE SOIL COVER

A protective soil cover, consisting of a minimum one foot of soil, was placed over the geomembrane. Placement of the protective soil cover and construction were observed by Golder Associates' personnel to verify that the geosynthetics were not damaged by construction equipment. The SAM thickness verification survey drawing for the FGD-B Pond protective cover is presented as Figure 12.

## 7.0 SUMMARY

Golder Associates Inc. (Golder) was retained by Luminant to provide third party Construction Quality Assurance (CQA) monitoring and testing services during the construction of the composite liner for the FGD-B Pond at the Oak Grove SES Power Plant. The CQA monitoring and testing services consisted of the following activities:

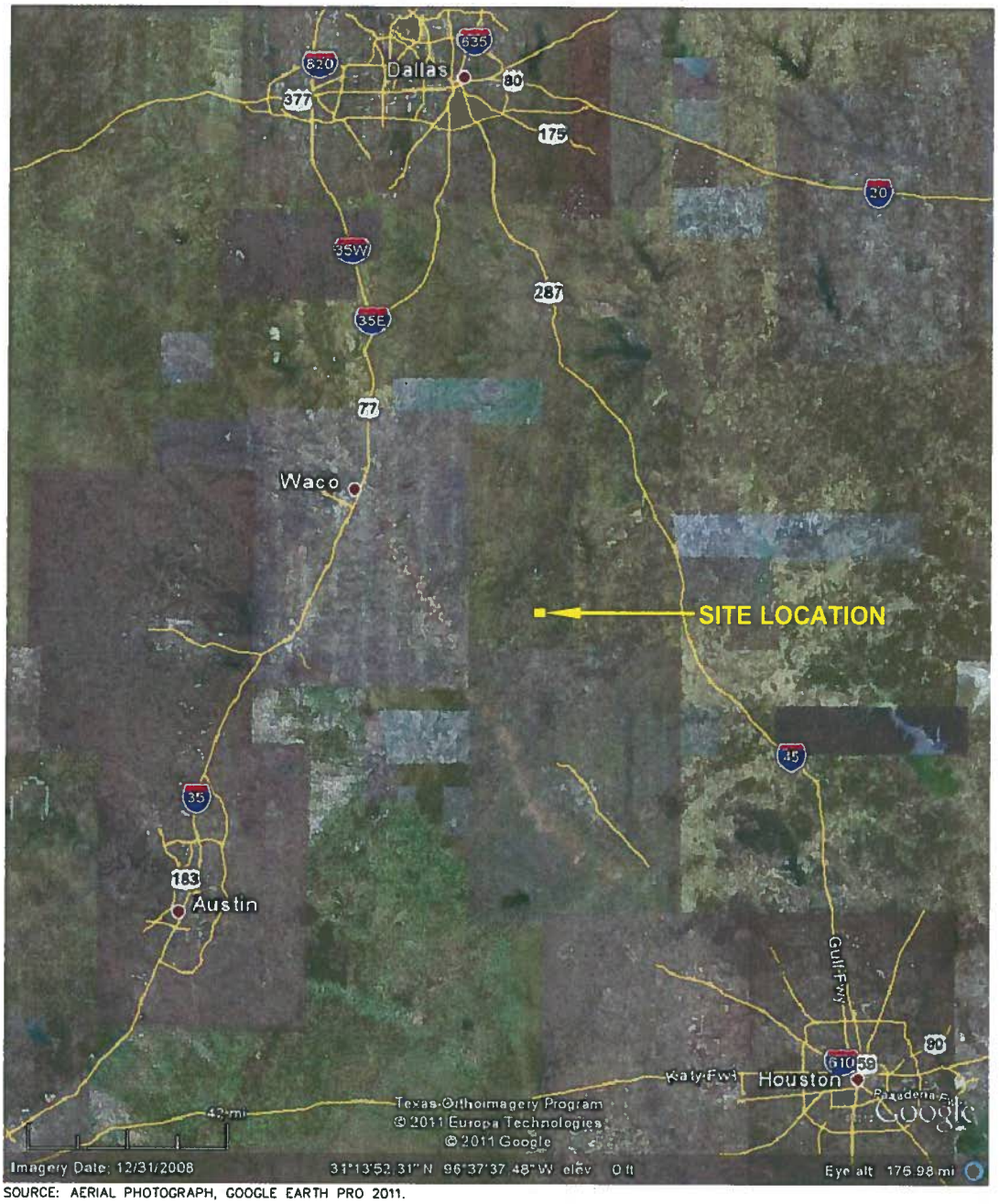
- Participating in and documenting the preconstruction and weekly construction progress meetings;
- Preconstruction sampling and testing of clay materials;
- Monitoring and documenting clay liner subgrade preparation;
- Monitoring and documenting clay liner construction procedures;
- Performing field moisture/density tests (including dive ring tests) on the prepared subgrade;
- Performing field moisture/density tests (including drive ring tests) on the compacted clay liner;
- Collecting and testing clay liner samples for hydraulic conductivity for the compacted clay liner;
- Collecting and testing sets of Atterberg limits and sieve analyses for the compacted clay liner;
- Reviewing survey data for thickness verification;
- Monitoring and documenting soil liner surface preparation;
- Monitoring and documenting geomembrane deployment;
- Monitoring and documenting trial and field seaming;
- Monitoring and documenting non-destructive seam continuity testing;
- Monitoring and documenting geomembrane repair procedures; and
- Monitoring and documenting installation of the protective cover.

Based on the observations and testing performed by Golder during the monitoring of the FGD-B Pond subgrade preparation and clay liner construction, it is in Golder's opinion that the liner was constructed in compliance with the project plans, specifications and Contractors Quality Assurance/Quality Control Plan (QCP).

Sincerely,
**GOLDER ASSOCIATES INC.**

William E. Gordon, P.E.
Senior Engineer

Charles F. Rickert, P.E.
Associate




SOURCE: AERIAL PHOTOGRAPH, GOOGLE EARTH PRO 2011.

Golder Associates

500 Century Plaza Drive, Suite 190
Houston, Texas USA 77073
Tel: (281) 821-6868
Texas Registration Number: F-2578

TITLE

# SITE LOCATION MAP

PROJECT

LUMINANT
OAK GROVE SES
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS
APPENDIX E-Revision 1 November 21, 2022

| | | | | |
|---|---|---|---|---|
| DRAWN | RF | DATE | JANUARY 2012 | FIGURE NUMBER |
| CHECKED | GSG | SCALE | AS SHOWN | 1 |
| REVIEWED | CMJ | JOB NO. | 113-94788 | |
| FILE NO. | | DWG NO. | 11394788G001 | |

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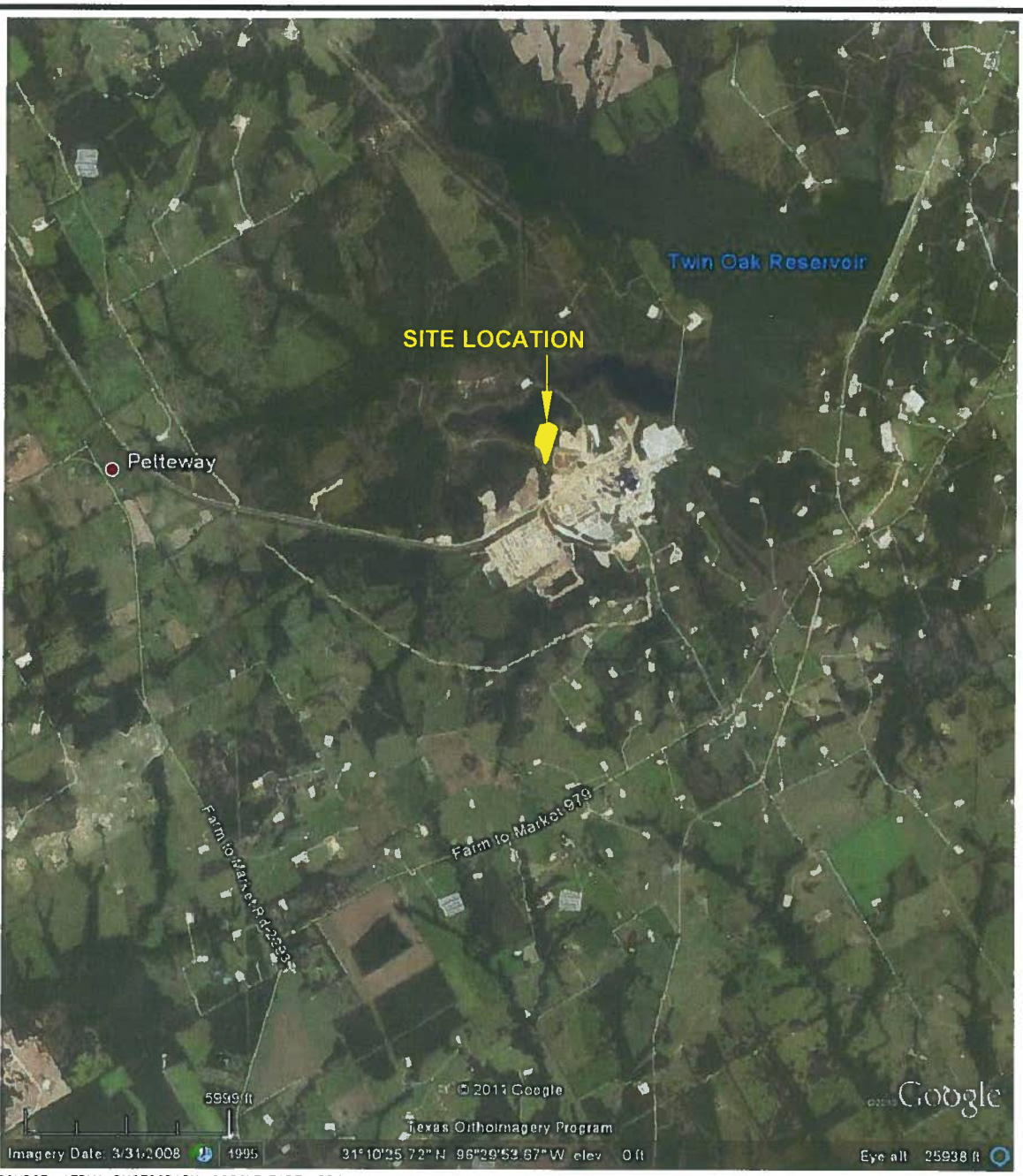


SOURCE: AERIAL PHOTOGRAPH, GOOGLE EARTH PRO 2011.

Golder Associates

500 Century Plaza Drive, Suite 190
Houston, Texas USA 77073
Tel: (281) 821-6888
Texas Registration Number: F-2578

TITLE

# SITE VICINITY MAP

PROJECT

**LUMINANT**
**OAK GROVE SES**
**FGD - B POND CONSTRUCTION**
**ROBERTSON COUNTY, TEXAS**
APPENDIX E-Revision 1 November 21, 2022

| | | | |
|---|---|---|---|
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| CHECKED | WEG. | SCALE | AS SHOWN |
| REVIEWED | CW | JOB NO. | 113-94788 |
| FILE NO. | | DWG NO. | 11394788G002 |

FIGURE NUMBER **2**

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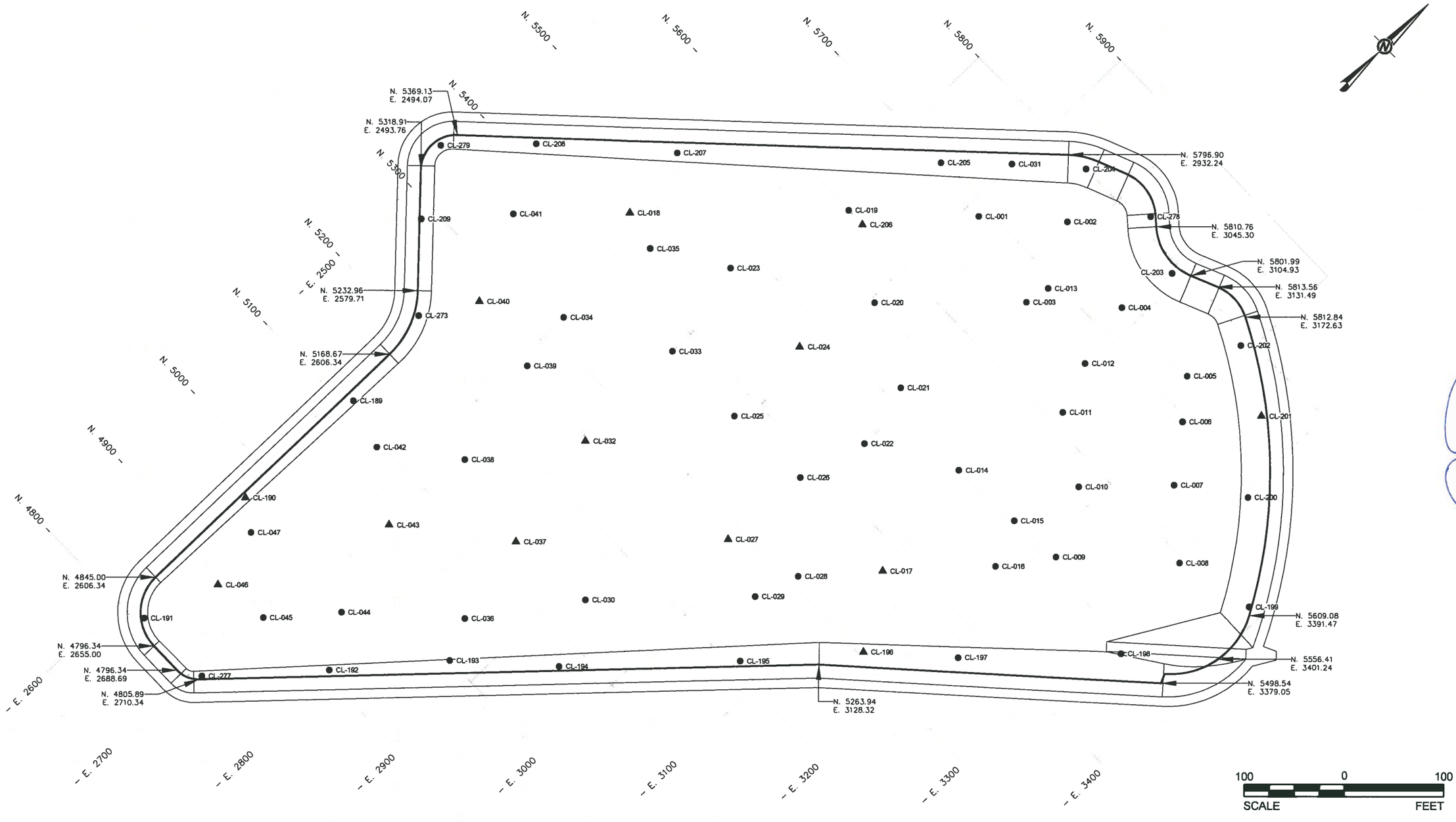


## LEGEND

- ● CL-# MOISTURE/DENSITY TEST LOCATION
- ▲ CL-# MOISTURE/DENSITY TEST AND HYDRAULIC CONDUCTIVITY SAMPLE LOCATION

APPENDIX E-Revision 1 November 21, 2022

Golder Associates

| REV | DATE | DES | REVISION DESCRIPTION | CADD | CHK | RVW |
|---|---|---|---|---|---|---|

GOLDER ASSOCIATES INC.
F-2578

PROJECT
LUMINANT
OAK GROVE SES
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

TITLE
CLAY LINER FIELD TEST
LOCATIONS CELL FLOOR
LIFT 1

| | | |
|---|---|---|
| PROJECT No. | | 113-94744 |
| FILE No. | | 11394788G003 A |
| SCALE | | AS SHOWN |
| DESIGN | | |
| CADD | MIL | 07/2011 |
| CHECK | | |
| REVIEW | | |

3

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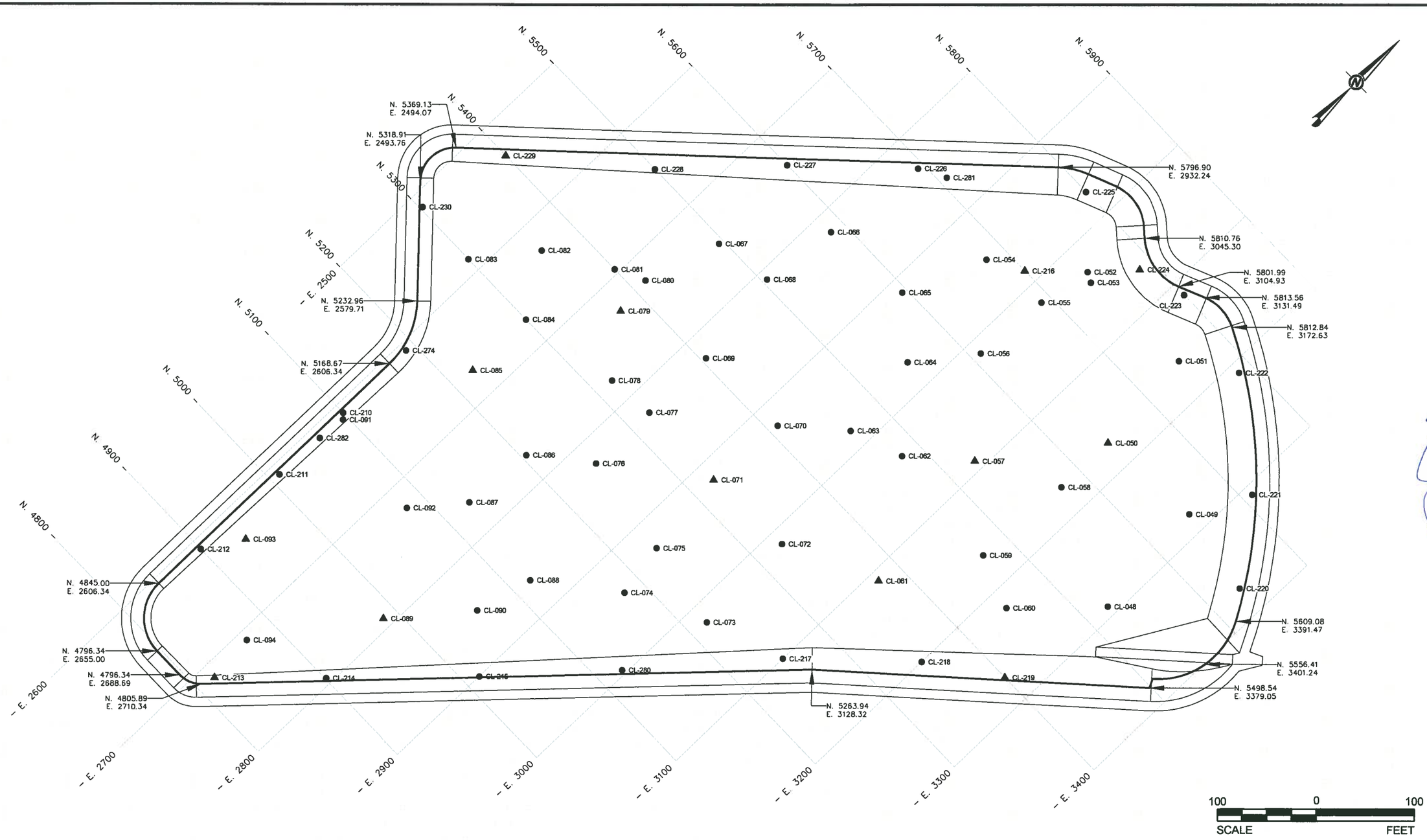


## LEGEND

- ● CL-# MOISTURE/DENSITY TEST LOCATION
- ▲ CL-# MOISTURE/DENSITY TEST AND HYDRAULIC CONDUCTIVITY SAMPLE LOCATION

Golder Associates

REV | DATE | DES | REVISION DESCRIPTION | CADD | CHK | RVW

CHARLES FRED RICKERT 82392 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS

GOLDER ASSOCIATES INC. F-2578

PROJECT
LUMINANT
OAK GROVE SES
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

TITLE
CLAY LINER FIELD TEST LOCATIONS CELL FLOOR LIFT 2

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| PROJECT No. | | 113-94744 |
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| CHECK | | |
| REVIEW | | |

4



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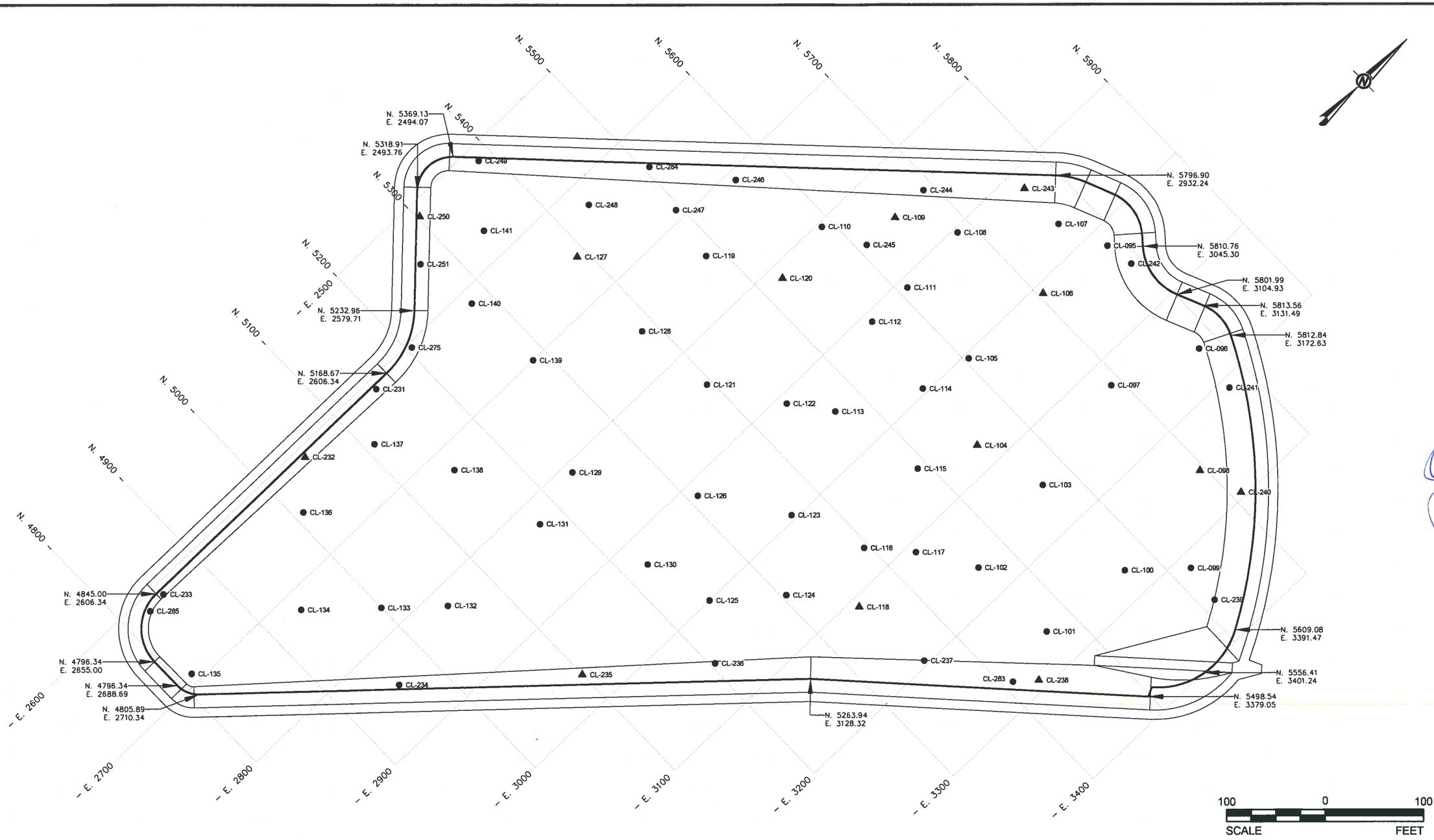


## LEGEND

- ● CL-# MOISTURE/DENSITY TEST LOCATION
- ▲ CL-# MOISTURE/DENSITY TEST AND HYDRAULIC CONDUCTIVITY SAMPLE LOCATION

Golder Associates

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GOLDER ASSOCIATES INC.
F-2578

PROJECT
LUMINANT
OAK GROVE SES
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

TITLE
CLAY LINER FIELD TEST
LOCATIONS CELL FLOOR
LIFT 3

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| CHECK | WEC | |
| REVIEW | | |

5

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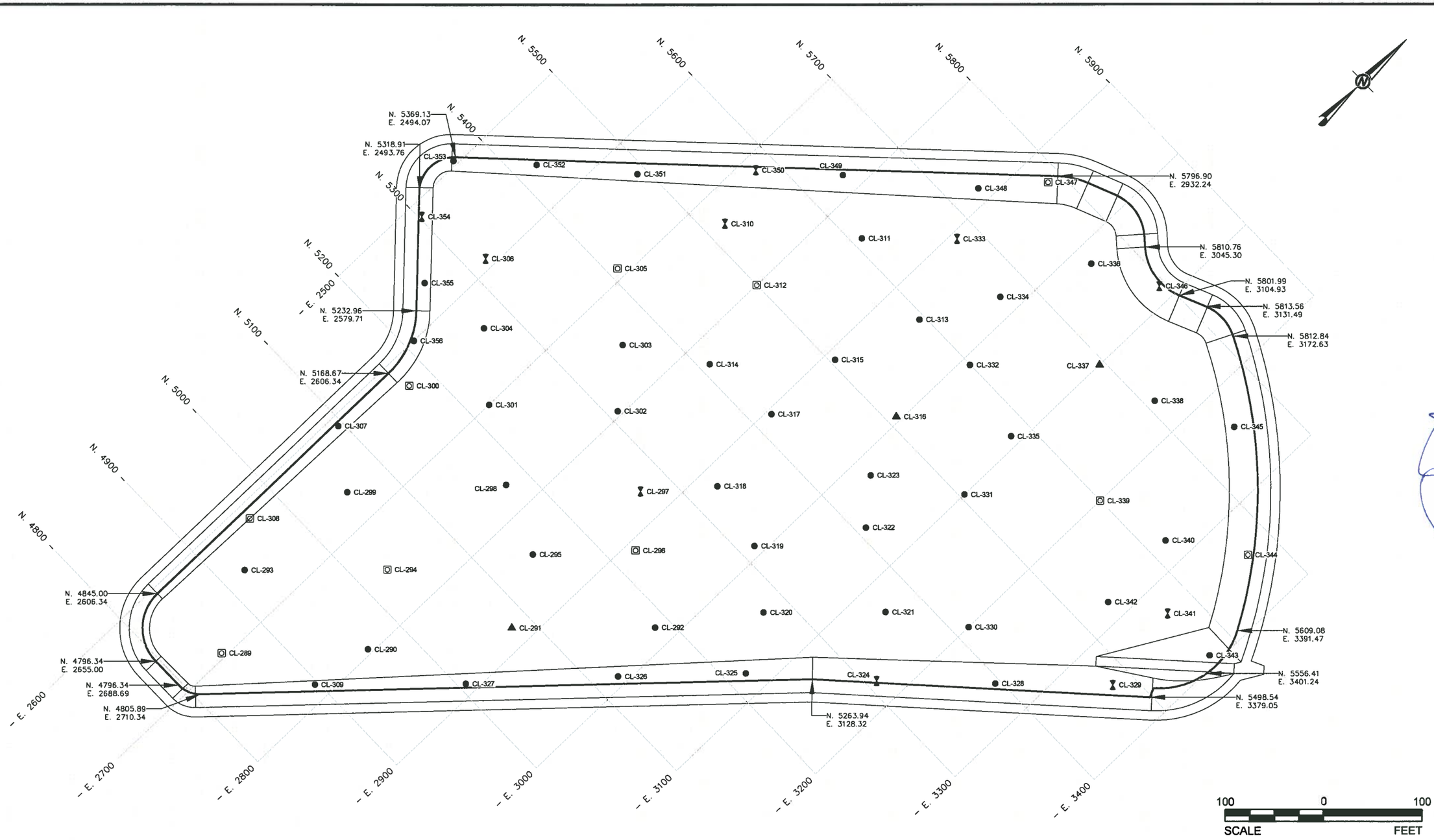


## LEGEND

- ● CL-# MOISTURE/DENSITY TEST LOCATION
- ▲ CL-# MOISTURE/DENSITY TEST AND HYDRAULIC CONDUCTIVITY, AND ATTERBERG/-200 SAMPLE LOCATION
- ⧗ CL-# MOISTURE/DENSITY TEST AND HYDRAULIC CONDUCTIVITY SAMPLE LOCATION
- ▣ CL-# MOISTURE DENSITY TEST AND ATTERBERG/-200 SAMPLE LOCATION

APPENDIX E-Revision 1 November 21, 2022

Golder Associates

| REV | DATE | DES | REVISION DESCRIPTION | CADD | CHK | RVW |
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CHARLES FRED ROMERT 82392 LICENSED PROFESSIONAL ENGINEER 12-19-12 STATE OF TEXAS

GOLDER ASSOCIATES INC. F-2578

PROJECT
LUMINANT
OAK GROVE SES
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

TITLE
CLAY LINER FIELD TEST
LOCATIONS CELL FLOOR
LIFT 4

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| CHECK | | |
| REVIEW | | |

6

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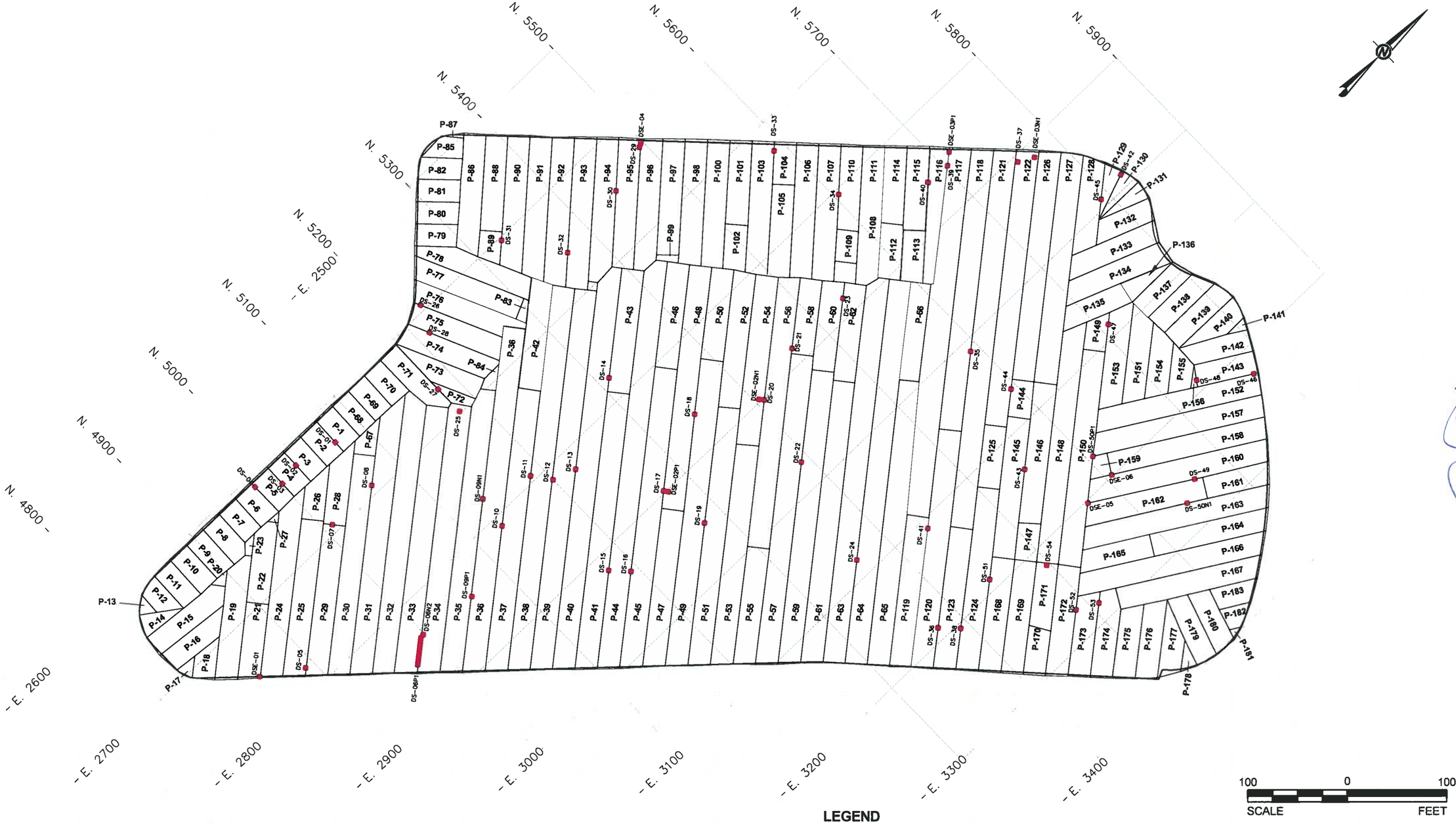


Golder Associates

| REV | DATE | DES | REVISION DESCRIPTION | CADD | CHK | RVW |
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CHARLES FRED ROGERS 82392 LICENSED PROFESSIONAL ENGINEER
GOLDER ASSOCIATES INC. F-2578

PROJECT
LUMINANT
OAK GROVE SES
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

TITLE
RECORD DRAWING OF GEOMEMBRANE LINER PANEL LAYOUT WITH DESTRUCTIVE TEST SAMPLE LOCATIONS

| | |
|---|---|
| PROJECT No. | 113-947880 |
| FILE No. | 11394788G007 |
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| CADD | ML 01/2012 |
| CHECK | |
| REVIEW | |

7

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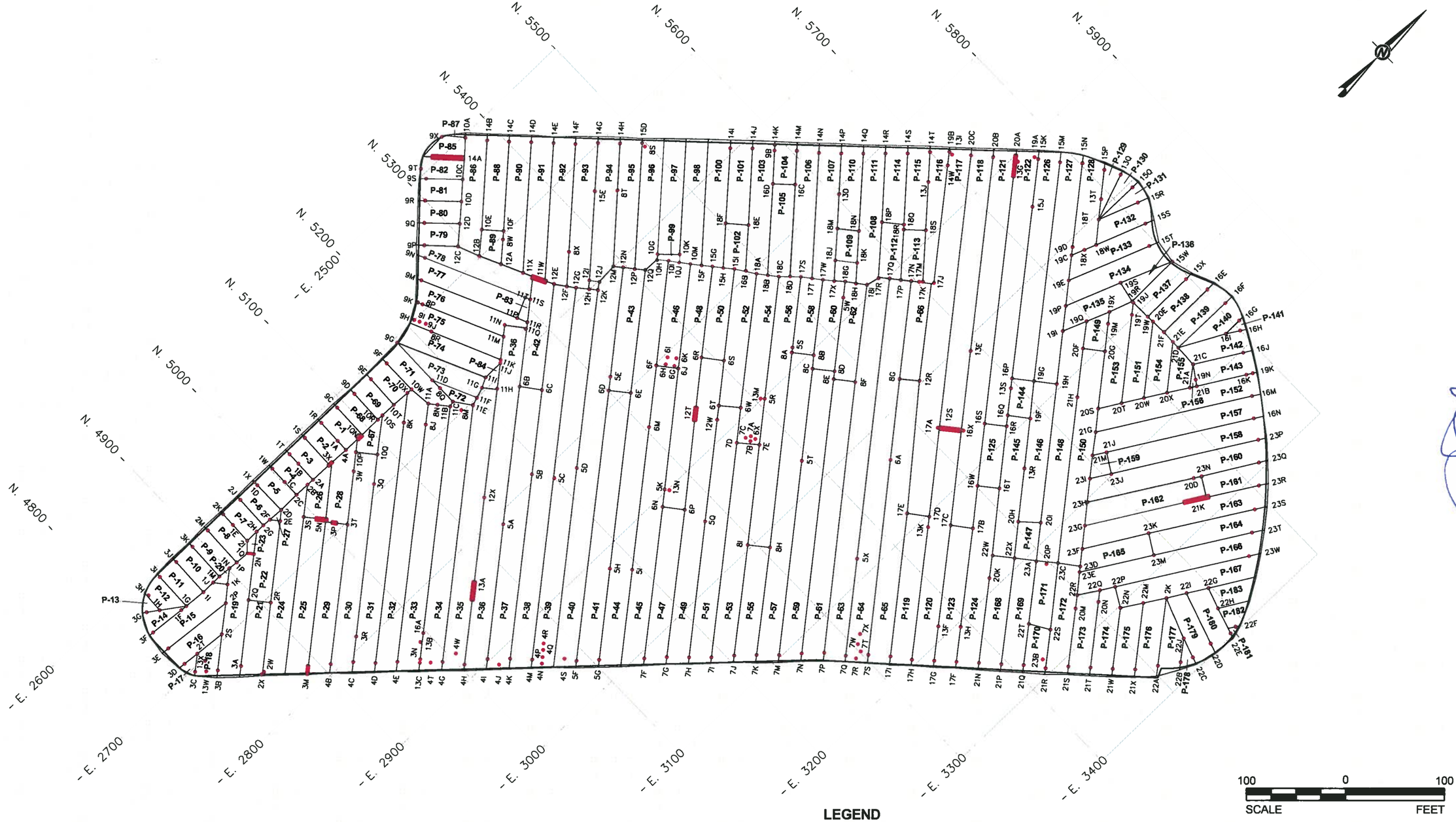


| REPAIR | COVERS |
|---|---|
| 12T | 5M, 6Q |
| 13C | 4F |
| 13A | 4X |
| 14A | 9W, 10B |
| 20A | 15C |
| 20B | 15A |
| 20C | 14X |
| 21K | 20J |
| 21M | 21H |

## LEGEND

- P-27 — GEOMEMBRANE PANEL WITH NUMBER
- FUSION SEAM
- EXTRUSION SEAM
- SLER LIMITS
- 4W — REPAIR TEST LOCATION

Golder Associates

| REV | DATE | DES | REVISION DESCRIPTION | CADD | CHK | RVW |
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GOLDER ASSOCIATES INC.
F-2578

CHARLES FRED RICKERT
82,392
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

PROJECT
LUMINANT
OAK GROVE SES
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

TITLE
RECORD DRAWING OF GEOMEMBRANE LINER
PANEL LAYOUT WITH REPAIR LOCATIONS

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| PROJECT No. | | 113-9478801 |
| FILE No. | | 113947886007 |
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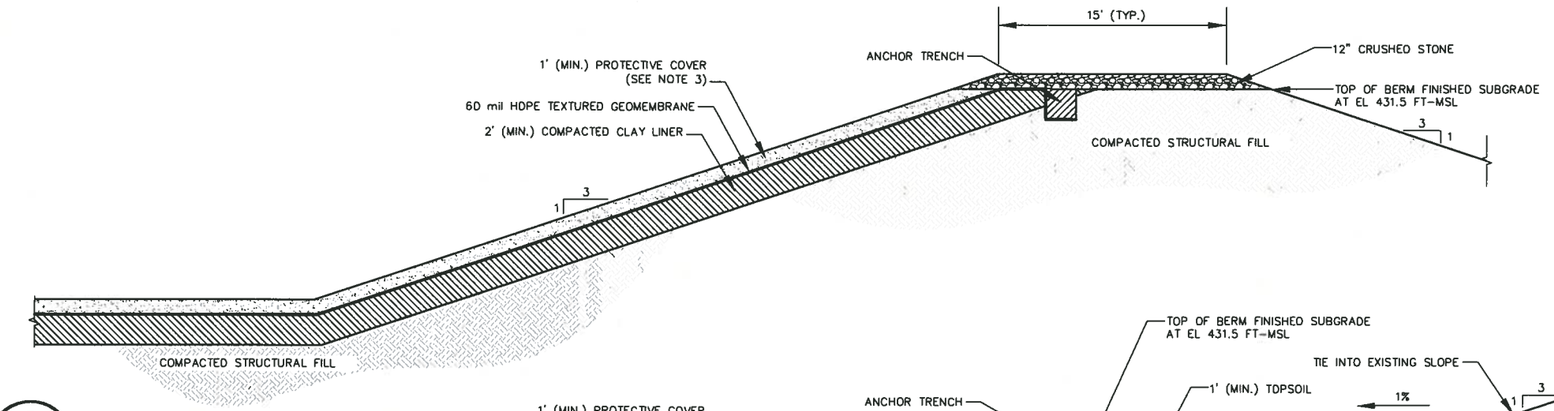


**A/9 SECTION**
**PERIMETER BERM (TYP.)**

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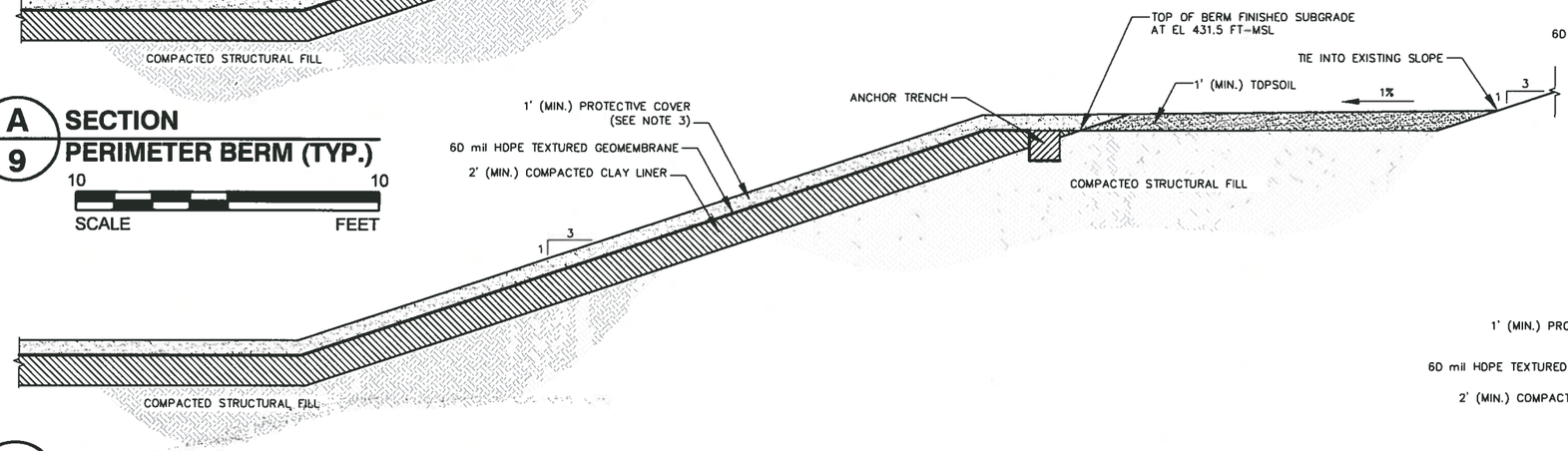
SCALE FEET




**B/9 SECTION**
**SOUTH PERIMETER BERM**

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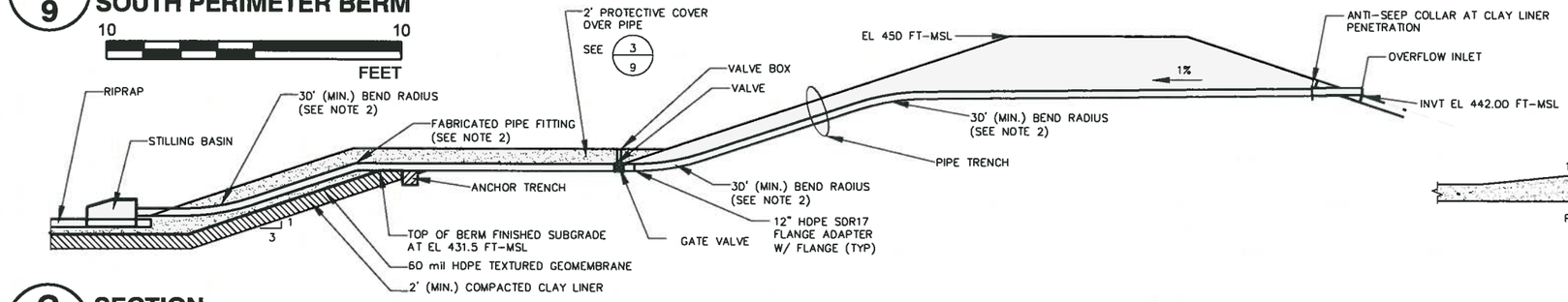
FEET

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**OVERFLOW PIPING**

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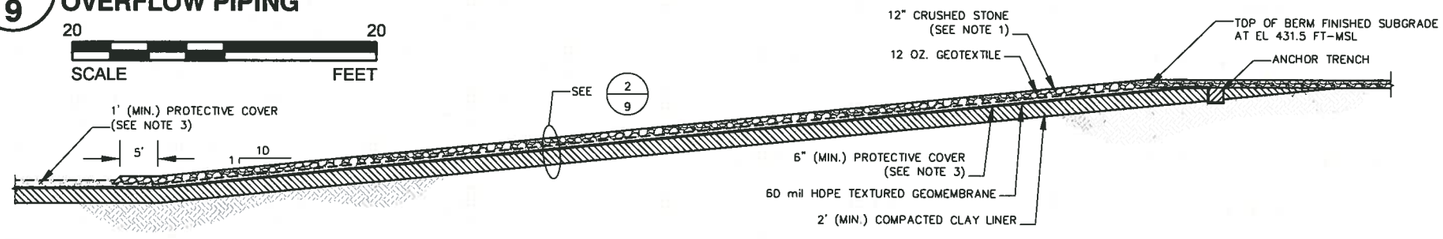


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**ACCESS ROAD**

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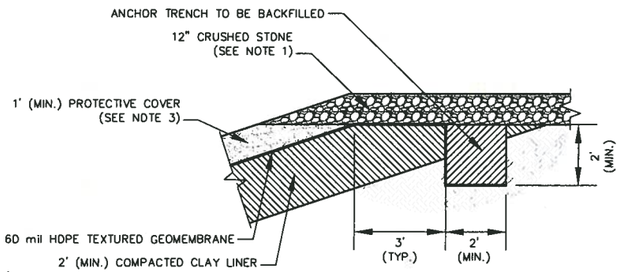
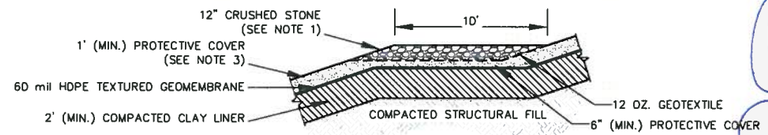


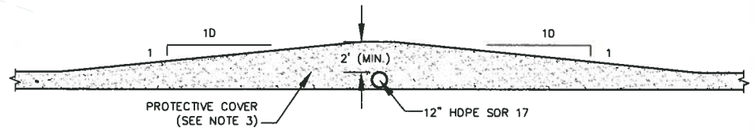

**1/9 DETAIL**
**ANCHOR TRENCH**

5 5
SCALE FEET




**2/9 DETAIL**
**ACCESS ROAD**

10 10
SCALE FEET




**3/9 SECTION**
**OVERFLOW PIPE COVER**

10 10
SCALE FEET

## NOTES

1. COMPACTED CRUSHED STONE ROAD BASE.
2. USE FABRICATED PIPE FITTINGS WHERE 30' (MIN.) BEND RADIUS IS EXCEEDED.
3. PROTECTIVE COVER WILL CONSIST OF ONSITE SOILS.

Golder Associates

| REV | DATE | REVISION DESCRIPTION | DES | CADD | CHK | RVW |
|---|---|---|---|---|---|---|
| 1 | 04/2011 | South Berm Realignment | CED | | | |

CHARLES FRED RICKERT 82392 LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
GOLDER ASSOCIATES INC. F-2578

PROJECT
LUMINANT
OAK GROVE SES
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

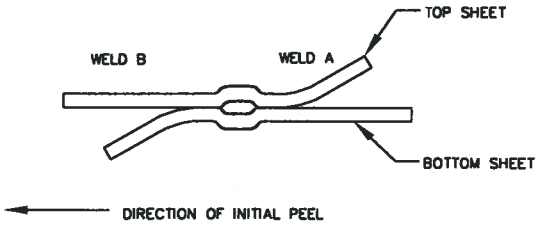
TITLE
LINER DETAILS

| | | |
|---|---|---|
| PROJECT No. | | 113-94788.01 |
| FILE No. | | 1139478BG009 |
| SCALE | | AS SHOWN |
| DESIGN | CEI | 08/2011 |
| CADD | VJE | 09/2011 |
| CHECK | CFR | 09/2011 |
| REVIEW | | 09/2011 |

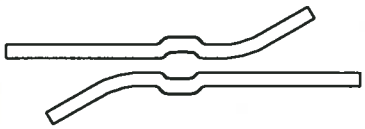
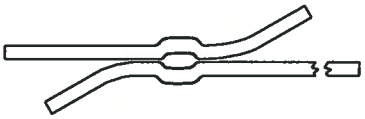
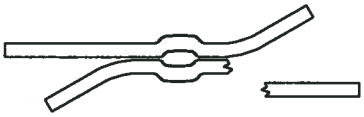
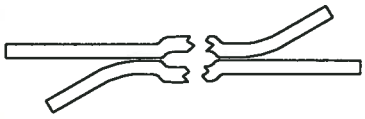
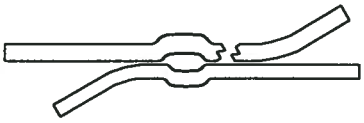
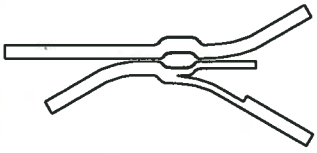
9



Drawing File: J:_2011\113-94788 - Oak Grove_G - SLER - FGD-B Pond \ 1139478BG009.dwg | Layout: 11x17 | Modified: 1/24/2012 2:35:07 PM Mlaskowski | Plotted: Tuesday, January 24, 2012 2:35:21 PM Mlaskowski




## SCHEMATIC OF UNTESTED SPECIMEN

| Types of Failure | Locus-of-Break Code | Break |
|---|---|---|
|  | AD | Adhesion failure. |
|  | BRK | Break in sheeting. Break can be in either top or bottom sheet. |
|  | SE1 | Break at outer edge of seam. Break can be in either top or bottom sheet. |
|  | SE2 | Break at inner edge of seam through both sheets. |
|  | AD-BRK | Break in first seam after some adhesion failure. Break can be in either the top or bottom sheet. |
|  | SIP | Separation in the plane of the sheet. Break can be in either top or bottom sheet. |

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas USA 77073
Tel: (281) 821-6868
Texas Registration Number: F-2578

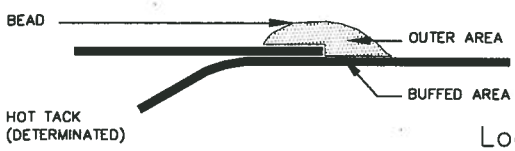
TITLE

**DESTRUCTIVE SAMPLE TEST CODES FOR DUEL HOT WEDGE FUSION WELD**

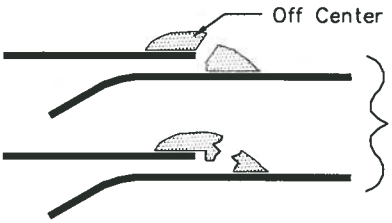
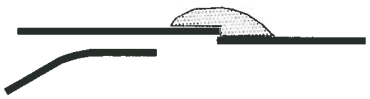
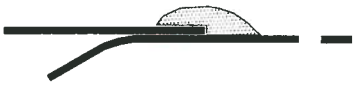
PROJECT

LUMINANT
OAK GROVE SES
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS
APPENDIX E-Revision 1 November 21, 2022

| | | | | |
|---|---|---|---|---|
| DRAWN | ML | DATE | JANUARY 2012 | FIGURE NUMBER |
| CHECKED | CFR | SCALE | NOT TO SCALE | 10 |
| REVIEWED | WEG | JOB NO. | 113-9478801 | |
| FILE NO. | | DWG NO. | 11394788G010 | |




## UNTESTED SPECIMEN
## EXTRUSION WELD WITH LEISTER HEAT SEAM

| Types of Break | Locus-of-Break Code | Break Description |
|---|---|---|
| | AD1 | Failure in adhesion. Specimans may also delaminate under the bead and break through the thin extruded material in the outer area. |
| | AD2 | Failure in Adhesion. |
|   | AD-WLD | Breaks through the fillet. Breaks through the fillet range from breaks starting at the edge of the the top sheet to breaks through the fillet after some adhesion failure between the fillet and the bottom sheet. |
| | SE1 | Break at seam edge in the bottom sheet. Specimens may break anywhere from the bead/outer area edge to the outer area/ buffed area. (Applicable to sheer only). |
| | SE2 | Break at seam edge in the top sheet. Specimens may break anywhere from the bead/ outer area edge to the outer area/buffed area. (Applicable to sheer only). |
|  | SE3 | Break at seam edge in the bottom sheet. (Applicable to peel only). |
|  | BRK1 | Break in the bottom sheeting. A "B" in parenthesis following the code means the specimen broke in the buffed area. (Applicable to sheer only). |
| | BRK2 | Break in the top sheeting. A "B" in parenthesis following the code means the speciman broke in the buffed area. |
| | AD-BRK | Break in the bottom sheeting after some adhesion failure between the fillet and the bottom sheet. (Applicable to peel only). |
| | HT | Break at the edge of the hot tack for specimens which could not be delaminated in the hot tack. |
| | SIP | Separation in the plane of the sheet. |

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas USA 77073
Tel: (281) 821-6888
Texas Registration Number: F-2578

TITLE

**DESTRUCTIVE SAMPLE TEST CODES FOR EXTRUSION WELD WITH LEISTER HEAT SEAM**

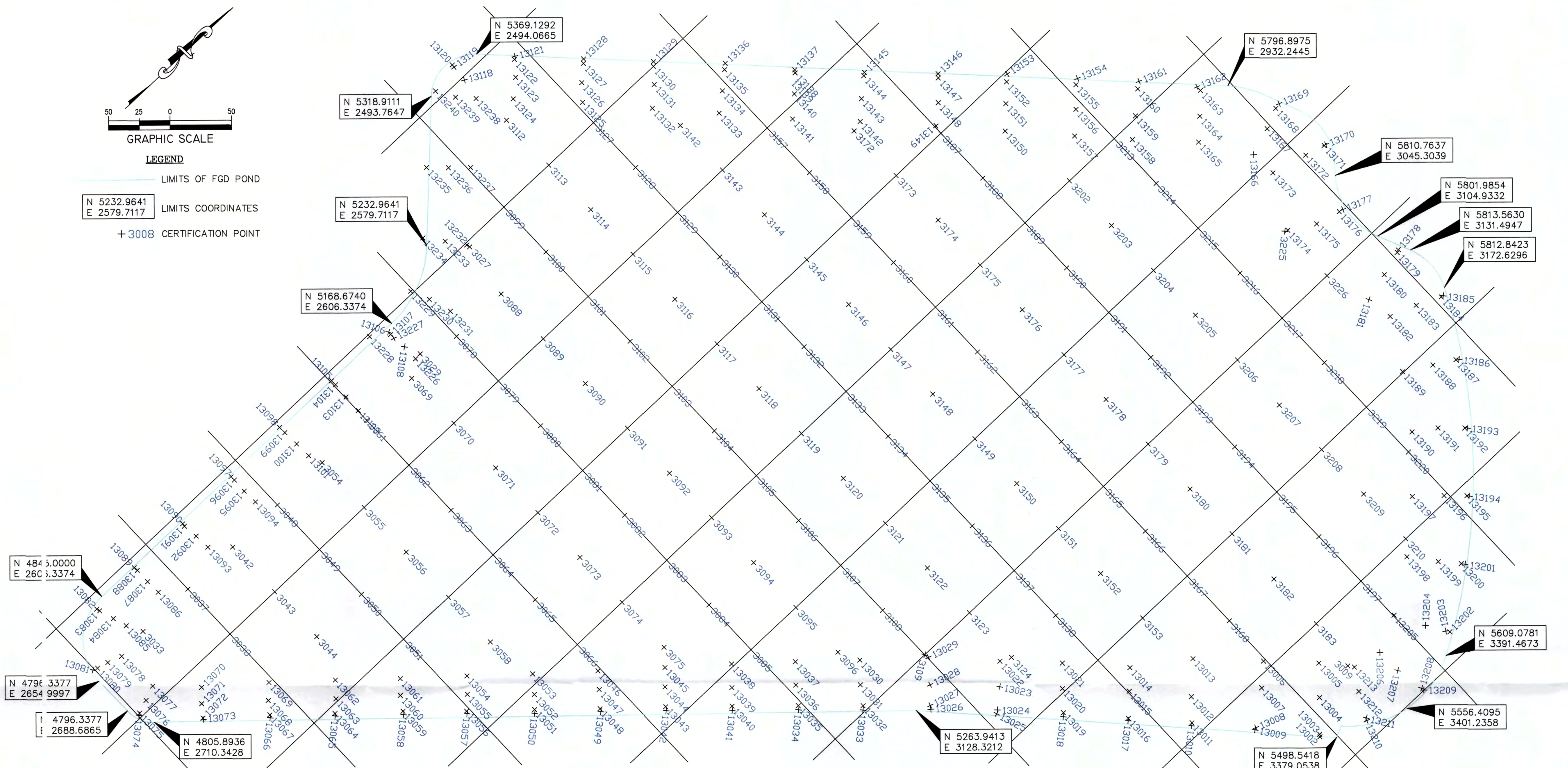
PROJECT

LUMINANT
OAK GROVE SES
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS
APPENDIX E-Revision 1 November 21, 2022

| | | | |
|---|---|---|---|
| DRAWN | ML | DATE | JANUARY 2012 |
| CHECKED | | SCALE | NOT TO SCALE |
| REVIEWED | | JOB NO. | 113-9478801 |
| FILE NO. | | DWG NO. | 11394788G011 |

FIGURE NUMBER **11**

Drawing File: J:_20111113-94788 - Oak Grove_G - SLER - FGD-B Pond\11394788G011.dwg | Layout: — | Modified: 1/19/2012 10:38:07 AM Miaskowski | Plotted: Thursday, January 19, 2012 10:38:29 AM Miaskowski




| POINT | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | COVER THICK |
|---|---|---|---|---|---|---|---|
| 3009 | 554[illegible].05 | 3342.82 | 413.0 | 415.2 | 2.2 | 416.1 | 1.0 |
| 3027 | 525[illegible].61 | 2604.36 | 417.5 | 420.0 | 2.4 | 421.0 | 1.0 |
| 3029 | 516[illegible].67 | 2640.27 | 418.0 | 420.2 | 2.3 | 421.3 | 1.0 |
| 3033 | 4850.00 | 2650.00 | 419.7 | 422.0 | 2.3 | 423.0 | 1.0 |
| 3037 | 4900.00 | 2650.00 | 419.4 | 421.6 | 2.2 | 422.7 | 1.1 |
| 3038 | 4900.00 | 2700.00 | 419.2 | 421.3 | 2.1 | 422.4 | 1.2 |
| 3042 | 4950.00 | 2650.00 | 419.2 | 421.4 | 2.2 | 422.4 | 1.0 |
| 3043 | 4950.00 | 2700.00 | 419.0 | 421.1 | 2.1 | 422.2 | 1.1 |
| 3044 | 4950.00 | 2750.00 | 418.7 | 420.8 | 2.1 | 421.9 | 1.0 |
| 3048 | 5000.00 | 2650.00 | 418.9 | 421.1 | 2.2 | 422.1 | 1.1 |
| 3049 | 5000.00 | 2700.00 | 418.6 | 420.9 | 2.3 | 421.9 | 1.0 |
| 3050 | 5000.00 | 2750.00 | 418.2 | 420.6 | 2.3 | 421.6 | 1.0 |
| 3051 | 5000.00 | 2800.00 | 418.0 | 420.2 | 2.2 | 421.4 | 1.2 |
| 3054 | 5050.00 | 2650.00 | 418.4 | 420.8 | 2.4 | 421.9 | 1.0 |
| 3055 | 5050.00 | 2700.00 | 418.3 | 420.5 | 2.2 | 421.5 | 1.0 |
| 3056 | 5050.00 | 2750.00 | 418.1 | 420.2 | 2.1 | 421.4 | 1.2 |
| 3057 | 5050.00 | 2800.00 | 417.9 | 420.0 | 2.1 | 421.0 | 1.0 |
| 3058 | 5050.00 | 2850.00 | 417.5 | 419.7 | 2.2 | 420.9 | 1.1 |
| 3061 | 5100.00 | 2650.00 | 418.4 | 420.5 | 2.1 | 421.5 | 1.0 |
| 3062 | 5100.00 | 2700.00 | 417.9 | 420.1 | 2.3 | 421.3 | 1.2 |
| 3063 | 5100.00 | 2750.00 | 417.7 | 420.0 | 2.2 | 421.0 | 1.0 |
| 3064 | 5100.00 | 2800.00 | 417.4 | 419.7 | 2.4 | 420.9 | 1.2 |
| 3065 | 5100.00 | 2850.00 | 417.2 | 419.4 | 2.2 | 420.5 | 1.2 |
| 3066 | 5100.00 | 2900.00 | 416.9 | 419.1 | 2.3 | 420.2 | 1.0 |
| 3069 | 5150.00 | 2650.00 | 418.1 | 420.4 | 2.3 | 421.4 | 1.0 |
| 3070 | 5150.00 | 2700.00 | 417.7 | 419.9 | 2.2 | 421.1 | 1.1 |
| 3071 | 5150.00 | 2750.00 | 417.5 | 419.6 | 2.2 | 420.7 | 1.1 |
| 3072 | 5150.00 | 2800.00 | 417.3 | 419.5 | 2.2 | 420.5 | 1.0 |
| 3073 | 5150.00 | 2850.00 | 417.0 | 419.1 | 2.1 | 420.3 | 1.2 |
| 3074 | 5150.00 | 2900.00 | 416.8 | 418.8 | 2.0 | 419.9 | 1.1 |
| 3075 | 5150.00 | 2950.00 | 416.6 | 418.6 | 2.1 | 419.8 | 1.1 |
| 3078 | 5200.00 | 2650.00 | 417.7 | 419.9 | 2.2 | 421.1 | 1.2 |
| 3079 | 5200.00 | 2700.00 | 417.4 | 419.6 | 2.2 | 420.6 | 1.0 |
| 3080 | 5200.00 | 2750.00 | 417.1 | 419.4 | 2.3 | 420.5 | 1.2 |
| 3081 | 5200.00 | 2800.00 | 416.8 | 419.1 | 2.3 | 420.1 | 1.0 |
| 3082 | 5200.00 | 2850.00 | 416.7 | 418.9 | 2.2 | 419.9 | 1.1 |
| 3083 | 5200.00 | 2900.00 | 416.5 | 418.6 | 2.1 | 419.6 | 1.0 |
| 3084 | 5200.00 | 2950.00 | 416.1 | 418.4 | 2.3 | 419.5 | 1.1 |
| 3085 | 5200.00 | 3000.00 | 416.0 | 418.1 | 2.1 | 419.1 | 1.0 |
| 3088 | 5250.00 | 2650.00 | 417.4 | 419.7 | 2.3 | 420.8 | 1.0 |
| 3089 | 5250.00 | 2700.00 | 417.3 | 419.5 | 2.2 | 420.5 | 1.0 |
| 3090 | 5250.00 | 2750.00 | 417.0 | 419.1 | 2.1 | 420.1 | 1.0 |
| 3091 | 5250.00 | 2800.00 | 416.6 | 418.9 | 2.3 | 419.9 | 1.0 |
| 3092 | 5250.00 | 2850.00 | 416.3 | 418.6 | 2.3 | 419.6 | 1.0 |
| 3093 | 5250.00 | 2900.00 | 416.2 | 418.3 | 2.0 | 419.3 | 1.1 |
| 3094 | 5250.00 | 2950.00 | 415.8 | 418.1 | 2.3 | 419.1 | 1.1 |
| 3095 | 5250.00 | 3000.00 | 415.7 | 417.8 | 2.1 | 419.0 | 1.2 |
| 3096 | 5250.00 | 3050.00 | 415.5 | 417.6 | 2.1 | 419.0 | 1.4 |
| 3099 | 5300.00 | 2600.00 | 417.5 | 419.6 | 2.0 | 420.8 | 1.2 |
| 3100 | 5300.00 | 2650.00 | 417.2 | 419.5 | 2.3 | 420.4 | 1.0 |
| 3101 | 5300.00 | 2700.00 | 417.0 | 419.2 | 2.2 | 420.2 | 1.0 |
| 3102 | 5300.00 | 2750.00 | 416.8 | 418.9 | 2.1 | 419.9 | 1.0 |
| 3103 | 5300.00 | 2800.00 | 416.5 | 418.6 | 2.1 | 419.7 | 1.1 |
| 3104 | 5300.00 | 2850.00 | 416.1 | 418.3 | 2.2 | 419.6 | 1.3 |
| 3105 | 5300.00 | 2900.00 | 415.9 | 418.1 | 2.3 | 419.2 | 1.1 |
| 3106 | 5300.00 | 2950.00 | 415.5 | 417.8 | 2.2 | 418.7 | 1.0 |
| 3107 | 5300.00 | 3000.00 | 415.3 | 417.7 | 2.4 | 418.7 | 1.0 |
| 3108 | 5300.00 | 3050.00 | 415.2 | 417.3 | 2.0 | 418.3 | 1.1 |
| 3109 | 5300.00 | 3100.00 | 414.9 | 417.0 | 2.1 | 418.5 | 1.4 |
| 3112 | 5350.00 | 2550.00 | 417.3 | 419.6 | 2.3 | 420.8 | 1.2 |
| 3113 | 5350.00 | 2600.00 | 417.3 | 419.5 | 2.3 | 420.5 | 1.0 |

| POINT | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | COVER THICK |
|---|---|---|---|---|---|---|---|
| 3114 | 5350.00 | 2650.00 | 416.9 | 419.3 | 2.4 | 420.2 | 1.0 |
| 3115 | 5350.00 | 2700.00 | 416.6 | 418.9 | 2.3 | 419.9 | 1.1 |
| 3116 | 5350.00 | 2750.00 | 416.3 | 418.6 | 2.4 | 419.6 | 1.0 |
| 3117 | 5350.00 | 2800.00 | 416.2 | 418.3 | 2.0 | 419.3 | 1.0 |
| 3118 | 5350.00 | 2850.00 | 415.8 | 418.1 | 2.3 | 419.2 | 1.1 |
| 3119 | 5350.00 | 2900.00 | 415.6 | 417.9 | 2.3 | 418.9 | 1.0 |
| 3120 | 5350.00 | 2950.00 | 415.4 | 417.5 | 2.1 | 418.6 | 1.1 |
| 3121 | 5350.00 | 3000.00 | 415.0 | 417.4 | 2.3 | 418.3 | 1.0 |
| 3122 | 5350.00 | 3050.00 | 414.8 | 417.1 | 2.3 | 418.2 | 1.0 |
| 3123 | 5350.00 | 3100.00 | 414.7 | 416.8 | 2.1 | 417.8 | 1.0 |
| 3124 | 5350.00 | 3150.00 | 414.3 | 416.7 | 2.4 | 417.8 | 1.2 |
| 3127 | 5400.00 | 2600.00 | 416.9 | 419.1 | 2.2 | 420.1 | 1.0 |
| 3128 | 5400.00 | 2650.00 | 416.6 | 418.9 | 2.3 | 419.9 | 1.0 |
| 3129 | 5400.00 | 2700.00 | 416.2 | 418.6 | 2.4 | 419.6 | 1.0 |
| 3130 | 5400.00 | 2750.00 | 416.0 | 418.3 | 2.4 | 419.4 | 1.0 |
| 3131 | 5400.00 | 2800.00 | 415.8 | 418.1 | 2.3 | 419.1 | 1.0 |
| 3132 | 5400.00 | 2850.00 | 415.7 | 417.8 | 2.1 | 418.8 | 1.0 |
| 3133 | 5400.00 | 2900.00 | 415.3 | 417.6 | 2.3 | 418.6 | 1.0 |
| 3134 | 5400.00 | 2950.00 | 415.0 | 417.3 | 2.3 | 418.4 | 1.1 |
| 3135 | 5400.00 | 3000.00 | 414.9 | 417.0 | 2.1 | 418.0 | 1.0 |
| 3136 | 5400.00 | 3050.00 | 414.5 | 416.8 | 2.3 | 417.7 | 1.0 |
| 3137 | 5400.00 | 3100.00 | 414.3 | 416.4 | 2.2 | 417.5 | 1.1 |
| 3138 | 5400.00 | 3150.00 | 413.9 | 416.3 | 2.3 | 417.2 | 1.0 |
| 3142 | 5450.00 | 2650.00 | 416.4 | 418.6 | 2.2 | 419.7 | 1.1 |
| 3143 | 5450.00 | 2700.00 | 416.0 | 418.4 | 2.4 | 419.4 | 1.1 |
| 3144 | 5450.00 | 2750.00 | 415.9 | 418.0 | 2.1 | 419.1 | 1.2 |
| 3145 | 5450.00 | 2800.00 | 415.6 | 417.8 | 2.2 | 418.8 | 1.1 |
| 3146 | 5450.00 | 2850.00 | 415.2 | 417.5 | 2.3 | 418.5 | 1.0 |
| 3147 | 5450.00 | 2900.00 | 414.9 | 417.2 | 2.3 | 418.2 | 1.0 |
| 3148 | 5450.00 | 2950.00 | 414.8 | 417.0 | 2.2 | 418.0 | 1.0 |
| 3149 | 5450.00 | 3000.00 | 414.5 | 416.7 | 2.2 | 417.9 | 1.2 |
| 3150 | 5450.00 | 3050.00 | 414.2 | 416.5 | 2.4 | 417.7 | 1.2 |
| 3151 | 5450.00 | 3100.00 | 414.0 | 416.3 | 2.3 | 417.3 | 1.0 |
| 3152 | 5450.00 | 3150.00 | 413.7 | 415.9 | 2.2 | 417.1 | 1.2 |
| 3153 | 5450.00 | 3200.00 | 413.4 | 415.9 | 2.5 | 417.0 | 1.1 |
| 3157 | 5500.00 | 2700.00 | 415.8 | 418.1 | 2.3 | 419.2 | 1.0 |
| 3158 | 5500.00 | 2750.00 | 415.5 | 417.7 | 2.2 | 418.8 | 1.1 |
| 3159 | 5500.00 | 2800.00 | 415.4 | 417.5 | 2.1 | 418.6 | 1.2 |
| 3160 | 5500.00 | 2850.00 | 415.0 | 417.2 | 2.2 | 418.2 | 1.0 |
| 3161 | 5500.00 | 2900.00 | 414.7 | 417.1 | 2.4 | 418.1 | 1.0 |
| 3162 | 5500.00 | 2950.00 | 414.6 | 416.7 | 2.1 | 417.8 | 1.1 |
| 3163 | 5500.00 | 3000.00 | 414.2 | 416.5 | 2.3 | 417.4 | 1.0 |
| 3164 | 5500.00 | 3050.00 | 414.0 | 416.3 | 2.3 | 417.3 | 1.0 |
| 3165 | 5500.00 | 3100.00 | 413.8 | 415.9 | 2.1 | 417.0 | 1.1 |
| 3166 | 5500.00 | 3150.00 | 413.5 | 415.7 | 2.3 | 416.7 | 1.0 |
| 3167 | 5500.00 | 3200.00 | 413.1 | 415.4 | 2.3 | 416.5 | 1.1 |
| 3168 | 5500.00 | 3250.00 | 412.9 | 415.5 | 2.6 | 416.5 | 1.0 |
| 3172 | 5550.00 | 2750.00 | 415.3 | 417.6 | 2.3 | 418.5 | 1.0 |
| 3173 | 5550.00 | 2800.00 | 415.0 | 417.2 | 2.2 | 418.2 | 1.1 |
| 3174 | 5550.00 | 2850.00 | 414.7 | 416.9 | 2.2 | 418.0 | 1.1 |
| 3175 | 5550.00 | 2900.00 | 414.6 | 416.8 | 2.2 | 417.8 | 1.0 |
| 3176 | 5550.00 | 2950.00 | 414.1 | 416.4 | 2.3 | 417.5 | 1.1 |
| 3177 | 5550.00 | 3000.00 | 414.0 | 416.3 | 2.3 | 417.3 | 1.0 |
| 3178 | 5550.00 | 3050.00 | 413.8 | 416.0 | 2.1 | 417.0 | 1.0 |
| 3179 | 5550.00 | 3100.00 | 413.5 | 415.7 | 2.2 | 416.8 | 1.1 |
| 3180 | 5550.00 | 3150.00 | 413.2 | 415.4 | 2.2 | 416.4 | 1.0 |
| 3181 | 5550.00 | 3200.00 | 413.0 | 415.2 | 2.3 | 416.4 | 1.2 |
| 3182 | 5550.00 | 3250.00 | 412.8 | 415.1 | 2.3 | 416.1 | 1.0 |
| 3183 | 5550.00 | 3300.00 | 412.7 | 415.2 | 2.4 | 416.2 | 1.0 |
| 3187 | 5600.00 | 2800.00 | 414.7 | 417.0 | 2.3 | 418.1 | 1.1 |
| 3188 | 5600.00 | 2850.00 | 414.6 | 416.9 | 2.3 | 417.8 | 1.0 |

| POINT | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | COVER THICK |
|---|---|---|---|---|---|---|---|
| 3189 | 5600.00 | 2900.00 | 414.2 | 416.6 | 2.4 | 417.7 | 1.1 |
| 3190 | 5600.00 | 2950.00 | 413.9 | 416.2 | 2.2 | 417.2 | 1.1 |
| 3191 | 5600.00 | 3000.00 | 413.7 | 415.9 | 2.2 | 416.9 | 1.1 |
| 3192 | 5600.00 | 3050.00 | 413.4 | 415.6 | 2.3 | 416.6 | 1.0 |
| 3193 | 5600.00 | 3100.00 | 413.2 | 415.4 | 2.3 | 416.5 | 1.0 |
| 3194 | 5600.00 | 3150.00 | 413.1 | 415.2 | 2.1 | 416.2 | 1.0 |
| 3195 | 5600.00 | 3200.00 | 412.8 | 415.0 | 2.2 | 416.0 | 1.0 |
| 3196 | 5600.00 | 3250.00 | 412.9 | 415.1 | 2.2 | 416.1 | 1.0 |
| 3197 | 5600.00 | 3300.00 | 412.7 | 415.1 | 2.4 | 416.0 | 1.0 |
| 3202 | 5650.00 | 2900.00 | 413.9 | 416.2 | 2.2 | 417.2 | 1.0 |
| 3203 | 5650.00 | 2950.00 | 413.8 | 415.8 | 2.0 | 417.0 | 1.1 |
| 3204 | 5650.00 | 3000.00 | 413.4 | 415.6 | 2.2 | 416.6 | 1.0 |
| 3205 | 5650.00 | 3050.00 | 413.1 | 415.3 | 2.3 | 416.5 | 1.2 |
| 3206 | 5650.00 | 3100.00 | 412.9 | 415.1 | 2.3 | 416.2 | 1.0 |
| 3207 | 5650.00 | 3150.00 | 412.8 | 415.0 | 2.2 | 416.1 | 1.1 |
| 3208 | 5650.00 | 3200.00 | 412.9 | 415.1 | 2.1 | 416.1 | 1.0 |
| 3209 | 5650.00 | 3250.00 | 412.8 | 415.1 | 2.3 | 416.1 | 1.0 |
| 3210 | 5650.00 | 3300.00 | 412.8 | 415.0 | 2.3 | 416.1 | 1.0 |
| 3213 | 5700.00 | 2900.00 | 413.7 | 415.9 | 2.3 | 417.2 | 1.3 |
| 3214 | 5700.00 | 2950.00 | 413.3 | 415.7 | 2.4 | 416.7 | 1.0 |
| 3215 | 5700.00 | 3000.00 | 413.0 | 415.4 | 2.3 | 416.4 | 1.0 |
| 3216 | 5700.00 | 3050.00 | 412.8 | 415.1 | 2.3 | 416.2 | 1.0 |
| 3217 | 5700.00 | 3100.00 | 412.7 | 415.3 | 2.6 | 416.3 | 1.0 |
| 3218 | 5700.00 | 3150.00 | 412.9 | 415.0 | 2.1 | 416.1 | 1.1 |
| 3219 | 5700.00 | 3200.00 | 412.7 | 415.1 | 2.4 | 416.1 | 1.1 |
| 3220 | 5700.00 | 3250.00 | 412.9 | 415.0 | 2.1 | 416.0 | 1.0 |
| 3225 | 5750.00 | 3050.00 | 412.8 | 415.1 | 2.3 | 416.1 | 1.0 |
| 3226 | 5750.00 | 3100.00 | 412.8 | 415.2 | 2.4 | 416.2 | 1.0 |
| 13002 | 5489.11 | 3369.27 | 430.7 | 432.7 | 2.0 | 433.7 | 1.0 |
| 13003 | 5490.24 | 3367.64 | 428.3 | 430.4 | 2.1 | 431.7 | 1.3 |
| 13004 | 5510.72 | 3345.80 | 421.5 | 423.7 | 2.2 | 425.0 | 1.3 |
| 13005 | 5529.63 | 3324.87 | 412.9 | 415.0 | 2.1 | 416.2 | 1.3 |
| 13006 | 5498.03 | 3292.96 | 412.8 | 414.9 | 2.1 | 416.1 | 1.3 |
| 13007 | 5481.89 | 3307.88 | 419.8 | 422.1 | 2.3 | 423.6 | 1.6 |
| 13008 | 5456.25 | 3328.36 | 428.0 | 430.0 | 2.0 | 431.2 | 1.2 |
| 13009 | 5454.65 | 3329.13 | N/A | 430.6 | N/A | 431.7 | 1.1 |
| 13010 | 5419.19 | 3291.37 | N/A | 430.6 | N/A | 431.8 | 1.3 |
| 13011 | 5420.90 | 3289.73 | 427.8 | 429.9 | 2.1 | 431.0 | 1.1 |
| 13012 | 5435.08 | 3273.99 | 420.4 | 422.6 | 2.2 | 423.9 | 1.3 |
| 13013 | 5457.37 | 3252.18 | 413.3 | 415.5 | 2.2 | 417.0 | 1.5 |
| 13014 | 5414.87 | 3222.38 | 413.8 | 416.0 | 2.2 | 417.6 | 1.6 |
| 13015 | 5401.27 | 3236.12 | 420.1 | 422.1 | 2.0 | 423.7 | 1.6 |
| 13016 | 5385.62 | 3251.66 | 427.7 | 429.7 | 2.0 | 431.0 | 1.2 |
| 13017 | 5384.27 | 3252.95 | N/A | 430.3 | N/A | 431.4 | 1.2 |
| 13018 | 5348.17 | 3214.35 | N/A | 430.5 | N/A | 431.6 | 1.1 |
| 13019 | 5350.37 | 3211.99 | 426.8 | 429.0 | 2.2 | 430.7 | 1.8 |
| 13020 | 5363.21 | 3197.15 | 420.4 | 422.6 | 2.2 | 424.0 | 1.3 |
| 13021 | 5377.39 | 3181.89 | 414.2 | 416.2 | 2.0 | 417.7 | 1.6 |
| 13022 | 5341.06 | 3145.94 | 414.6 | 416.6 | 2.0 | 418.2 | 1.6 |
| 13023 | 5326.64 | 3160.93 | 421.1 | 423.1 | 2.0 | 424.8 | 1.8 |
| 13024 | 5312.32 | 3173.36 | 427.0 | 429.2 | 2.2 | 431.1 | 1.9 |
| 13025 | 5309.86 | 3175.27 | N/A | 431.1 | N/A | 432.1 | 1.0 |
| 13026 | 5273.20 | 3135.80 | N/A | 430.7 | N/A | 432.0 | 1.3 |
| 13027 | 5275.08 | 3133.23 | 427.0 | 429.2 | 2.2 | 431.0 | 1.8 |
| 13028 | 5286.48 | 3120.85 | 421.7 | 423.9 | 2.2 | 425.5 | 1.5 |
| 13029 | 5300.91 | 3103.69 | 415.1 | 417.1 | 2.0 | 418.7 | 1.6 |
| 13030 | 5258.72 | 3066.82 | 415.4 | 417.4 | 2.0 | 419.4 | 2.0 |
| 13031 | 5245.19 | 3081.78 | 421.7 | 423.8 | 2.1 | 425.2 | 1.5 |
| 13032 | 5235.16 | 3095.73 | 427.0 | 429.2 | 2.2 | 430.9 | 1.7 |
| 13033 | 5232.74 | 3098.31 | N/A | 431.0 | N/A | 432.1 | 1.1 |
| 13034 | 5194.57 | 3062.14 | N/A | 430.8 | N/A | 432.0 | 1.2 |

| POINT | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | COVER THICK |
|---|---|---|---|---|---|---|---|
| 13035 | 5196.60 | 3059.64 | 427.1 | 429.3 | 2.2 | 430.6 | 1.3 |
| 13036 | 5206.58 | 3046.01 | 421.4 | 423.5 | 2.1 | 424.8 | 1.3 |
| 13037 | 5219.37 | 3031.85 | 415.7 | 417.8 | 2.1 | 419.3 | 1.4 |
| 13038 | 5180.48 | 2997.71 | 416.1 | 418.3 | 2.2 | 419.6 | 1.3 |
| 13039 | 5167.40 | 3012.03 | 421.9 | 423.9 | 2.0 | 425.4 | 1.5 |
| 13040 | 5157.16 | 3023.08 | 426.8 | 429.0 | 2.2 | 430.4 | 1.4 |
| 13041 | 5154.94 | 3025.79 | N/A | 430.6 | N/A | 431.6 | 1.0 |
| 13042 | 5115.85 | 2988.94 | N/A | 430.4 | N/A | 431.5 | 1.0 |
| 13043 | 5117.68 | 2986.29 | 426.7 | 428.9 | 2.2 | 430.0 | 1.1 |
| 13044 | 5128.34 | 2974.26 | 421.3 | 423.5 | 2.2 | 424.9 | 1.4 |
| 13045 | 5139.19 | 2962.55 | 416.7 | 418.8 | 2.1 | 420.2 | 1.4 |
| 13046 | 5097.50 | 2927.25 | 417.0 | 419.2 | 2.2 | 420.3 | 1.1 |
| 13047 | 5087.79 | 2939.10 | 422.0 | 424.1 | 2.1 | 425.1 | 1.0 |
| 13048 | 5077.50 | 2950.93 | 427.0 | 429.1 | 2.1 | 430.7 | 1.6 |
| 13049 | 5076.49 | 2953.06 | N/A | 430.2 | N/A | 431.4 | 1.2 |
| 13050 | 5036.25 | 2917.19 | N/A | 430.7 | N/A | 431.7 | 1.1 |
| 13051 | 5038.30 | 2914.90 | 427.0 | 429.2 | 2.2 | 430.5 | 1.3 |
| 13052 | 5046.60 | 2905.90 | 423.0 | 425.2 | 2.2 | 426.4 | 1.2 |
| 13053 | 5057.12 | 2892.57 | 417.5 | 419.7 | 2.2 | 420.8 | 1.1 |
| 13054 | 5017.04 | 2857.04 | 417.8 | 420.1 | 2.3 | 421.3 | 1.3 |
| 13055 | 5007.05 | 2868.20 | 422.7 | 424.8 | 2.1 | 426.1 | 1.3 |
| 13056 | 4997.15 | 2877.75 | 427.2 | 429.4 | 2.2 | 431.0 | 1.6 |
| 13057 | 4996.21 | 2879.44 | N/A | 430.3 | N/A | 431.5 | 1.1 |
| 13058 | 4957.90 | 2845.02 | N/A | 430.5 | N/A | 431.4 | 1.0 |
| 13059 | 4959.30 | 2842.65 | 427.1 | 429.3 | 2.2 | 430.5 | 1.2 |
| 13060 | 4966.61 | 2831.80 | 422.8 | 424.9 | 2.1 | 426.2 | 1.2 |
| 13061 | 4976.05 | 2821.67 | 418.4 | 420.4 | 2.0 | 421.9 | 1.4 |
| 13062 | 4936.82 | 2786.19 | 418.5 | 420.6 | 2.1 | 422.1 | 1.5 |
| 13063 | 4926.59 | 2797.85 | 423.5 | 425.5 | 2.0 | 426.8 | 1.3 |
| 13064 | 4917.75 | 2806.02 | 427.4 | 429.6 | 2.0 | 431.1 | 1.5 |
| 13065 | 4916.68 | 2807.61 | N/A | 430.5 | N/A | 431.7 | 1.2 |
| 13066 | 4877.13 | 2772.34 | N/A | 430.8 | N/A | 431.9 | 1.0 |
| 13067 | 4878.40 | 2770.40 | 427.6 | 429.8 | 2.2 | 430.9 | 1.1 |
| 13068 | 4885.56 | 2761.00 | 423.5 | 425.6 | 2.1 | 427.0 | 1.5 |
| 13069 | 4896.14 | 2750.49 | 418.8 | 421.0 | 2.2 | 422.7 | 1.7 |
| 13070 | 4853.36 | 2715.90 | 418.9 | 421.1 | 2.2 | 423.8 | 2.6 |
| 13071 | 4844.19 | 2725.82 | 424.2 | 426.4 | 2.2 | 427.6 | 1.3 |
| 13072 | 4837.08 | 2735.05 | 427.9 | 430.1 | 2.2 | 431.6 | 1.6 |
| 13073 | 4836.35 | 2736.19 | N/A | 431.1 | N/A | 432.1 | 1.0 |
| 13074 | 4800.76 | 2697.82 | N/A | 430.8 | N/A | 431.8 | 1.0 |
| 13075 | 4802.14 | 2696.77 | 427.6 | 429.6 | 2.0 | 431.0 | 1.4 |
| 13076 | 4813.12 | 2692.83 | 423.5 | 425.7 | 2.2 | 427.2 | 1.5 |
| 13077 | 4825.16 | 2687.88 | 419.7 | 421.8 | 2.1 | 423.4 | 1.6 |
| 13078 | 4823.40 | 2652.82 | 420.4 | 422.4 | 2.0 | 423.7 | 1.3 |
| 13079 | 4811.75 | 2648.80 | 424.2 | 426.3 | 2.1 | 427.3 | 1.0 |
| 13080 | 4802.51 | 2646.35 | 427.2 | 429.4 | 2.2 | 430.8 | 1.5 |
| 13081 | 4798.79 | 2645.02 | N/A | 431.2 | N/A | 432.3 | 1.1 |
| 13082 | 4834.90 | 2611.00 | N/A | 430.5 | N/A | 431.5 | 1.0 |
| 13083 | 4835.68 | 2613.60 | 427.0 | 429.0 | 2.0 | 430.2 | 1.2 |
| 13084 | 4839.50 | 2625.88 | 422.6 | 424.7 | 2.1 | 426.1 | 1.4 |
| 13085 | 4843.14 | 2637.32 | 419.7 | 421.7 | 2.0 | 423.2 | 1.5 |
| 13086 | 4880.85 | 2635.29 | 419.5 | 421.7 | 2.2 | 423.1 | 1.4 |
| 13087 | 4880.37 | 2623.03 | 423.3 | 425.4 | 2.1 | 426.7 | 1.3 |
| 13088 | 4880.67 | 2610.56 | 427.6 | 429.8 | 2.2 | 430.9 | 1.1 |
| 13089 | 4880.21 | 2607.31 | N/A | 431.3 | N/A | 432.4 | 1.0 |
| 13090 | 4933.24 | 2608.28 | N/A | 431.0 | N/A | 432.1 | 1.0 |
| 13091 | 4933.03 | 2610.71 | 427.6 | 429.8 | 2.2 | 430.9 | 1.1 |
| 13092 | 4934.46 | 2623.14 | 423.7 | 425.7 | 2.0 | 426.8 | 1.1 |
| 13093 | 4935.15 | 2636.33 | 419.3 | 421.5 | 2.2 | 422.8 | 1.3 |
| 13094 | 4988.73 | 2635.89 | 419.4 | 421.5 | 2.1 | 422.7 | 1.2 |
| 13095 | 4988.09 | 2623.28 | 423.5 | 425.7 | 2.2 | 426.8 | 1.0 |

| POINT | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | COVER THICK |
|---|---|---|---|---|---|---|---|
| 13096 | 4988.43 | 2611.19 | 427.4 | 429.5 | 2.1 | 430.6 | 1.0 |
| 13097 | 4988.23 | 2607.41 | N/A | 431.2 | N/A | 432.2 | 1.0 |
| 13098 | 5044.42 | 2605.21 | N/A | 432.0 | N/A | 433.0 | 1.0 |
| 13099 | 5044.63 | 2611.31 | 427.3 | 429.3 | 2.0 | 430.8 | 1.4 |
| 13100 | 5045.26 | 2624.68 | 423.0 | 425.2 | 2.2 | 426.2 | 1.0 |
| 13101 | 5045.91 | 2638.39 | 418.8 | 421.0 | 2.2 | 422.1 | 1.1 |
| 13102 | 5100.54 | 2639.32 | 418.3 | 420.6 | 2.3 | 421.7 | 1.1 |
| 13103 | 5100.82 | 2624.34 | 423.0 | 425.0 | 2.0 | 426.1 | 1.1 |
| 13104 | 5101.38 | 2611.26 | 427.3 | 429.5 | 2.2 | 430.8 | 1.2 |
| 13105 | 5101.25 | 2606.63 | N/A | 431.4 | N/A | 432.4 | 1.0 |
| 13106 | 5162.12 | 2609.85 | 428.8 | 431.0 | 2.2 | 432.1 | 1.1 |
| 13107 | 5161.87 | 2612.30 | 426.9 | 429.1 | 2.2 | 430.4 | 1.3 |
| 13108 | 5163.35 | 2627.32 | 421.9 | 423.9 | 2.0 | 425.1 | 1.3 |
| 13118 | 5347.43 | 2502.58 | 422.6 | 424.8 | 2.2 | 426.2 | 1.4 |
| 13119 | 5348.58 | 2489.08 | 427.6 | 429.7 | 2.1 | 430.8 | 1.1 |
| 13120 | 5348.60 | 2486.78 | N/A | 430.2 | N/A | 431.3 | 1.1 |
| 13121 | 5390.59 | 2516.83 | N/A | 430.8 | N/A | 432.2 | 1.4 |
| 13122 | 5388.53 | 2518.46 | 428.0 | 430.1 | 2.1 | 431.3 | 1.2 |
| 13123 | 5379.27 | 2529.72 | 423.2 | 425.3 | 2.1 | 426.6 | 1.3 |
| 13124 | 5365.84 | 2541.20 | 417.7 | 419.9 | 2.2 | 421.3 | 1.4 |
| 13125 | 5404.94 | 2581.86 | 417.3 | 419.4 | 2.1 | 420.5 | 1.1 |
| 13126 | 5415.38 | 2569.66 | 422.6 | 424.7 | 2.1 | 425.8 | 1.1 |
| 13127 | 5427.07 | 2559.25 | 427.7 | 429.8 | 2.1 | 430.9 | 1.1 |
| 13128 | 5429.65 | 2556.66 | N/A | 431.1 | N/A | 432.1 | 1.0 |
| 13129 | 5469.68 | 2597.22 | N/A | 431.0 | N/A | 432.3 | 1.3 |
| 13130 | 5467.02 | 2599.97 | 427.6 | 429.7 | 2.1 | 431.0 | 1.2 |
| 13131 | 5457.39 | 2611.19 | 422.8 | 425.0 | 2.2 | 426.1 | 1.2 |
| 13132 | 5443.05 | 2624.17 | 416.6 | 418.8 | 2.2 | 419.9 | 1.1 |
| 13133 | 5479.76 | 2664.50 | 416.1 | 418.2 | 2.1 | 419.7 | 1.5 |
| 13134 | 5494.02 | 2653.10 | 421.8 | 423.9 | 2.1 | 425.2 | 1.3 |
| 13135 | 5507.16 | 2641.77 | 427.4 | 429.8 | 2.4 | 431.0 | 1.2 |
| 13136 | 5511.05 | 2638.36 | N/A | 431.2 | N/A | 432.3 | 1.1 |
| 13137 | 5548.52 | 2680.81 | N/A | 430.7 | N/A | 431.8 | 1.1 |
| 13138 | 5547.16 | 2682.84 | 427.3 | 429.6 | 2.3 | 431.0 | 1.4 |
| 13139 | 5547.11 | 2682.87 | 427.3 | 429.5 | 2.2 | 430.5 | 1.0 |
| 13140 | 5534.95 | 2694.88 | 421.9 | 424.0 | 2.1 | 425.2 | 1.3 |
| 13141 | 5519.94 | 2708.72 | 415.6 | 417.8 | 2.2 | 419.2 | 1.4 |
| 13142 | 5558.79 | 2747.85 | 415.4 | 417.4 | 2.0 | 418.7 | 1.3 |
| 13143 | 5572.25 | 2735.09 | 421.3 | 423.4 | 2.1 | 424.7 | 1.3 |
| 13144 | 5586.44 | 2722.79 | 427.5 | 429.6 | 2.1 | 430.9 | 1.3 |
| 13145 | 5588.58 | 2721.17 | N/A | 430.7 | N/A | 431.9 | 1.2 |
| 13146 | 5631.45 | 2763.20 | N/A | 430.9 | N/A | 432.2 | 1.4 |
| 13147 | 5629.27 | 2765.82 | 427.7 | 429.8 | 2.1 | 431.2 | 1.4 |
| 13148 | 5615.51 | 2780.42 | 420.9 | 423.1 | 2.2 | 424.5 | 1.4 |
| 13149 | 5601.22 | 2792.82 | 415.1 | 417.2 | 2.1 | 418.4 | 1.3 |
| 13150 | 5639.31 | 2834.64 | 414.5 | 416.5 | 2.0 | 417.9 | 1.4 |
| 13151 | 5654.98 | 2818.73 | 421.5 | 423.5 | 2.0 | 425.1 | 1.6 |
| 13152 | 5667.55 | 2806.33 | 427.3 | 429.3 | 2.0 | 430.9 | 1.6 |
| 13153 | 5672.32 | 2802.02 | N/A | 431.5 | N/A | 432.5 | 1.0 |
| 13154 | 5711.74 | 2843.81 | N/A | 431.5 | N/A | 432.5 | 1.0 |
| 13155 | 5707.37 | 2846.62 | 427.6 | 429.8 | 2.2 | 430.9 | 1.1 |
| 13156 | 5693.63 | 2861.24 | 421.0 | 423.1 | 2.1 | 424.2 | 1.1 |
| 13157 | 5678.04 | 2876.30 | 413.9 | 416.0 | 2.1 | 417.6 | 1.5 |
| 13158 | 5710.24 | 2910.70 | 413.6 | 415.8 | 2.2 | 417.1 | 1.3 |
| 13159 | 5725.27 | 2898.42 | 419.9 | 422.1 | 2.2 | 423.1 | 1.0 |
| 13160 | 5741.64 | 2883.69 | 427.1 | 429.2 | 2.1 | 430.4 | 1.3 |
| 13161 | 5746.66 | 2879.91 | N/A | 431.3 | N/A | 432.3 | 1.0 |
| 13162 | 5777.91 | 2915.60 | N/A | 430.6 | N/A | 431.8 | 1.3 |
| 13163 | 5778.03 | 2919.63 | 427.6 | 429.7 | 2.1 | 430.9 | 1.2 |
| 13164 | 5763.30 | 2934.55 | 420.7 | 422.7 | 2.0 | 423.8 | 1.1 |
| 13165 | 5748.21 | 2949.21 | 413.6 | 415.7 | 2.1 | 416.9 | 1.1 |
| 13166 | 5773.93 | 2987.40 | 412.8 | 414.9 | 2.1 | 416.6 | 1.6 |
| 13167 | 5796.64 | 2979.39 | 420.9 | 423.1 | 2.2 | 424.2 | 1.1 |
| 13168 | 5813.05 | 2972.08 | 427.2 | 429.4 | 2.2 | 430.3 | 1.0 |
| 13169 | 5817.66 | 2971.18 | N/A | 430.9 | N/A | 431.9 | 1.1 |
| 13170 | 5822.28 | 3021.53 | N/A | 429.7 | N/A | 431.3 | 1.6 |
| 13171 | 5820.84 | 3021.23 | 427.3 | 429.3 | 2.0 | 430.7 | 1.4 |
| 13172 | 5804.69 | 3016.51 | 421.6 | 423.6 | 2.0 | 425.2 | 1.6 |
| 13173 | 5775.44 | 3008.75 | 412.7 | 414.8 | 2.1 | 416.0 | 1.2 |
| 13174 | 5752.32 | 3051.07 | 412.7 | 414.9 | 2.2 | 416.2 | 1.3 |
| 13175 | 5772.74 | 3063.42 | 420.1 | 422.3 | 2.2 | 423.5 | 1.2 |
| 13176 | 5792.83 | 3068.98 | 427.0 | 429.2 | 2.2 | 430.4 | 1.2 |
| 13177 | 5796.14 | 3069.75 | N/A | 430.3 | N/A | 431.7 | 1.4 |
| 13178 | 5806.63 | 3124.66 | N/A | 430.0 | N/A | 431.2 | 1.2 |
| 13179 | 5804.34 | 3125.62 | 426.5 | 428.7 | 2.2 | 430.3 | 1.6 |
| 13180 | 5784.37 | 3131.51 | 420.2 | 422.2 | 2.0 | 423.4 | 1.2 |
| 13181 | 5761.42 | 3137.74 | 412.7 | 414.8 | 2.1 | 416.0 | 1.3 |
| 13182 | 5764.51 | 3159.55 | 412.9 | 415.1 | 2.2 | 416.1 | 1.0 |
| 13183 | 5786.13 | 3167.58 | 420.4 | 422.5 | 2.1 | 423.5 | 1.1 |
| 13184 | 5805.70 | 3176.50 | 427.3 | 429.4 | 2.1 | 430.8 | 1.4 |
| 13185 | 5807.57 | 3176.92 | N/A | 430.3 | N/A | 431.4 | 1.1 |
| 13186 | 5781.48 | 3223.31 | N/A | 430.1 | N/A | 431.4 | 1.3 |
| 13187 | 5779.47 | 3221.89 | 427.2 | 429.4 | 2.2 | 430.4 | 1.0 |
| 13188 | 5762.80 | 3212.20 | 421.0 | 423.0 | 2.0 | 424.1 | 1.1 |
| 13189 | 5741.18 | 3199.21 | 413.0 | 415.0 | 2.0 | 416.2 | 1.2 |
| 13190 | 5713.21 | 3240.19 | 412.9 | 415.0 | 2.1 | 416.7 | 1.7 |
| 13191 | 5730.81 | 3252.25 | 420.1 | 422.2 | 2.1 | 423.3 | 1.1 |
| 13192 | 5746.68 | 3267.31 | 426.8 | 428.9 | 2.1 | 430.7 | 1.7 |
| 13193 | 5748.35 | 3268.57 | N/A | 430.2 | N/A | 431.3 | 1.2 |
| 13194 | 5711.71 | 3309.87 | N/A | 430.3 | N/A | 431.5 | 1.2 |
| 13195 | 5710.27 | 3308.52 | 427.3 | 429.3 | 2.0 | 430.7 | 1.4 |
| 13196 | 5696.79 | 3295.75 | 421.4 | 423.6 | 2.2 | 424.6 | 1.0 |
| 13197 | 5677.41 | 3278.50 | 413.0 | 415.1 | 2.1 | 416.2 | 1.1 |
| 13198 | 5640.71 | 3311.27 | 412.8 | 415.0 | 2.2 | 416.1 | 1.2 |
| 13199 | 5656.58 | 3331.57 | 421.4 | 423.4 | 2.0 | 424.5 | 1.0 |
| 13200 | 5669.13 | 3345.56 | 427.2 | 429.2 | 2.0 | 430.9 | 1.7 |
| 13201 | 5671.09 | 3348.08 | N/A | 430.8 | N/A | 432.1 | 1.3 |
| 13202 | 5624.46 | 3379.57 | N/A | 430.6 | N/A | 431.6 | 1.0 |
| 13203 | 5622.49 | 3376.88 | 427.0 | 429.0 | 2.0 | 430.6 | 1.6 |
| 13204 | 5613.58 | 3362.23 | 421.5 | 423.5 | 2.0 | 424.7 | 1.1 |
| 13205 | 5600.72 | 3338.61 | 413.0 | 415.1 | 2.1 | 416.6 | 1.5 |
| 13206 | 5571.55 | 3352.81 | 412.9 | 415.0 | 2.1 | 416.7 | 1.7 |
| 13207 | 5572.02 | 3373.54 | 419.4 | 421.5 | 2.1 | 423.0 | 1.5 |
| 13208 | 5576.14 | 3397.52 | 427.4 | 429.5 | 2.1 | 431.0 | 1.5 |
| 13209 | 5576.49 | 3399.84 | N/A | 430.7 | N/A | 432.0 | 1.2 |
| 13210 | 5525.78 | 3386.03 | N/A | 430.5 | N/A | 431.5 | 1.0 |
| 13211 | 5526.93 | 3384.18 | 427.0 | 429.1 | 2.1 | 430.8 | 1.7 |
| 13212 | 5537.22 | 3364.36 | 419.6 | 421.8 | 2.2 | 423.1 | 1.3 |
| 13213 | 5548.26 | 3347.30 | 413.0 | 415.2 | 2.2 | 416.7 | 1.5 |
| 13226 | 5163.15 | 2640.63 | 419.7 | 421.8 | 2.1 | 422.8 | 1.0 |
| 13227 | 5161.70 | 2616.41 | 425.7 | 428.0 | 2.3 | 428.9 | 1.0 |
| 13228 | 5148.26 | 2601.86 | 430.1 | 432.1 | 2.0 | 433.1 | 1.0 |
| 13229 | 5197.99 | 2597.84 | 430.2 | 432.2 | 2.0 | 434.0 | 1.9 |
| 13230 | 5204.41 | 2613.15 | 424.9 | 427.1 | 2.2 | 428.1 | 1.0 |
| 13231 | 5210.27 | 2631.75 | 418.4 | 420.5 | 2.1 | 421.6 | 1.1 |
| 13232 | 5256.92 | 2601.58 | 418.3 | 420.4 | 2.1 | 422.0 | 1.6 |
| 13233 | 5246.25 | 2587.35 | 424.1 | 426.1 | 2.0 | 427.5 | 1.4 |
| 13234 | 5234.91 | 2573.04 | 430.2 | 432.3 | 2.1 | 433.3 | 1.0 |
| 13235 | 5276.18 | 2533.37 | 429.8 | 431.9 | 2.1 | 432.8 | 1.0 |
| 13236 | 5289.13 | 2545.58 | 424.0 | 426.0 | 2.0 | 427.4 | 1.4 |
| 13237 | 5302.35 | 2557.77 | 418.8 | 420.8 | 2.0 | 421.8 | 1.0 |
| 13238 | 5344.11 | 2520.06 | 419.8 | 422.1 | 2.3 | 423.2 | 1.1 |
| 13239 | 5332.64 | 2507.73 | 425.2 | 427.2 | 2.0 | 428.2 | 1.0 |
| 13240 | 5324.14 | 2493.17 | N/A | 430.7 | N/A | 432.0 | 1.3 |

STATE OF TEXAS REGISTERED S. KEVIN WENDELL 5500 PROFESSIONAL LAND SURVEYOR

Figure 12

| NO. | REVISIONS | BY | DATE |
|---|---|---|---|

PROJECT: GOLDER ASSOCIATES OAK GROVE FGD POND
JOB NUMBER: 31100-09
DATE: JANUARY 13, 2012
SCALE: 1" = 50'
SURVEYOR: G.VEDRO
TECHNICIAN: G.HANSON
DRAWING: FGD POND.DWG
FIELDNOTES: N/A
PARTYCHIEF: A.MANCERA
FIELDBOOKS: 811

SAM INC.
SURVEYING•AERIAL MAPPING•ENGINEERING
4801 SOUTHWEST PARKWAY
PARKWAY TWO, SUITE 100
AUSTIN TEXAS, 78735
(512) 447-0575
FAX: (512) 326-3029
EMAIL: SAM@SAMINC.BIZ

# SUBGRADE, CLAY LINER, AND PROTECTIVE COVER ELEVATIONS AS OF DECEMBER 7, 2011
## OAK GROVE POWER PLANT
## FGD POND
## ROBERTSON COUNTY, TEXAS

SHEET 1 OF 1

DWG. NO.: G034-31100-09

JANUARY 13, 2012

# APPENDIX A
# RESUMES OF GOLDER PROJECT PERSONNEL

# CONSTRUCTION QUALITY ASSURANCE PERSONNEL
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Construction Quality Assurance Personnel<br>Golder Associates Inc. | |
|---|---|
| **Name** | **Initials** |
| Charles F. Rickert, P.E.<br>*Certifying Engineer* | CFR |
| Stephen A. Burks | SAB |
| Mark Day<br>*Technician* | MD |

## Education

*Bachelor of Science Civil Engineering, Texas A&M University, Texas, 1980*

*Continuing Engineering Studies Landfill Leachate and Gas Management Design, University of Florida, 1992*

*Continuing Education Technical and Business Writing, Murray Associates. 1989*

*Continuing Engineering Studies Clay Liners and Covers for Waste Disposal Facilities, University of Texas, Texas, 1989*

## Certifications

*Professional Engineer, Arkansas #9447*

*Professional Engineer, Mississippi #14154*

*Professional Engineer, Louisiana #27506*

*Professional Engineer, Oklahoma #18401*

*Professional Engineer, Texas #62392*

## Languages

*English – Fluent*

# Employment History

***Golder Associates Inc. – Houston, Texas***
*Associate (1995 to Present)*

Responsibilities include engineering and managing environmental, geotechnical, and construction quality assurance (CQA) projects. Projects have involved design and CQA for coal power plant ash landfills and surface impoundments, and municipal solid and hazardous waste landfill construction including the design and CQA services for containment cells and landfill gas systems.

***Harding Lawson Associates – Houston, Texas***
*Senior Engineer (1986 to 1995)*

Responsibilities included engineering and managing various environmental, geotechnical, and construction quality assurance projects. Projects included:

Municipal solid waste landfill construction quality assurance
Hazardous waste landfill construction quality assurance
Hazardous landfill site feasibility study
Hydrogeologic investigations
Geotechnical investigation and shallow foundation design
Hazardous facility/unit closures
Environmental site assessment and compliance audits
Environmental site investigation and remediation
Underground storage tank investigations and closures

***Fugro Inter, Inc. – Houston, Texas***
*Project Engineer (1980 to 1986)*

Responsibilities included engineering and managing offshore geotechnical projects. Projects included:

Geotechnical investigation and foundation design for offshore platforms
Jack-up rig foundation investigations

## PROJECT EXPERIENCE – POWER

Project Manager for a viewshed analysis for the potential vertical expansion of the Luminant Oak Grove SES Ash Landfill including providing the client with a viewshed map showing the Zone of Theoretical Visibility (ZTV). Photomontages were created showing the project expansion from selected viewpoints. The photomontages rendered views of the proposed expansion and were modeled based on the proposed design and project components. The landfill was superimposed over the photos collected in the field and faded back to show the features blocking the view towards the project (e.g. trees).

Project Manager providing engineering services related to the continuing development of the Luminant Oak Grove SES Ash Landfill. The scope of work included preparation of construction drawings and related documents to support construction of a 30 acre ash landfill cell.

Project manager and engineer of record providing construction quality assurance (CQA) during the construction of a 50 acre ash landfill cell, FGD Pond and Lignite Run-off Pond at the Luminant Oak Grove SES.

Project manager during a screening-level siting evaluation of three potential new flue gas desulfurization (FGD) effluent pond locations at the Luminant Oak Grove SES, including evaluation of constructed liner options and order-of-magnitude costs. The objective was to provide a subjective ranking of each site's suitability, focusing on location restrictions, along with providing budgetary estimates for differing liner designs and overall construction costs.

## PROJECT EXPERIENCE – MUNICIPAL AND HAZARDOUS WASTE LANDFILLS

**Landfill Gas Systems**

Prepared construction drawings and contractor bid documents for landfill gas systems. Directed construction quality assurance of construction services during landfill gas system installation.

**Design and Construction Quality Assurance of Municipal Waste Landfills**

Prepared construction drawings and contractor bid documents for containment cell constructions. Directed construction quality assurance during construction of compacted clay liners. Work has included sampling and testing preconstruction soil, reviewing construction specifications, directing field monitoring staff, providing technical guidance to construction contractors, and preparing certification documents for the owners and state agencies. Work has also included direct monitoring during the installation of geosynthetic liners.

**Hazardous Waste Landfill Site Feasibility Study**

Conducted a study in conjunction with a Material and Area Feasibility Study to evaluate site-specific requirements for the construction of a hazardous waste landfill to meet applicable federal, state, and local regulatory requirements. The study included:

evaluating waste types, volumes, and generation rates
evaluating regulatory criteria
determining specific site considerations and limitations
providing conceptual design alternatives
evaluating and screening of alternatives
designing facility layout
evaluating material quantities and availability
determining construction cost estimates and schedules
evaluating operation and maintenance requirements

**Construction Quality Assurance of Hazardous Waste Landfills**

Directed construction quality control during the construction of a hazardous waste landfill cell. Work included reviewing construction specifications, fulfilling daily project management duties, directing field technicians, reviewing field documentation, and communicating with landfill personnel.

**Construction and Testing of Soil Test Pads**

Directed the construction and subsequent testing of clay and betonite amended soil test pads. The purpose of the test pads was to establish construction procedures for landfill liner systems and to demonstrate that the pad, constructed under specific controlled repeatable conditions, could achieve a specified hydraulic conductivity. Testing procedures for determining hydraulic conductivity included sealed double-ring infiltrometers, Boutwell permeameters, and laboratory permeability tests on selected samples.

## PROJECT EXPERIENCE – REPRESENTATIVE PROJECTS

**Site Assessments**

Project Manager on over 20 environmental site investigations for underground storage tanks. Project included drilling and sampling soil borings, installing groundwater monitor wells, conducting site hydrogeologic characterizations, analyzing soil and groundwater, and providing recommendations for site remediation.

Project Engineer on a project for site characterization of an abandoned hazardous waste disposal site located in Niagara Falls, New York. Under strict health and safety protocol, conducted site exploration, which included completing a buried metals survey, drilling and sampling, and installing groundwater monitoring wells.

Project Engineer for environmental site investigation. Duties included drilling and sampling soil borings, installing groundwater monitoring wells, assessing soil and groundwater contamination, developing closure plan, and implementing clean-up of an abandoned pit containing paint manufacturing waste and solvents. Clean closure involved excavating and disposing of approximately 3,500 cubic yards of Class I and Class II waste.

Senior Engineer responsible for collecting and classifying soil samples on inactive artillery/firing ranges at Fort Ord Army Base. Analyzed soils for explosives and metals. The work was performed under strict health and safety protocol due to live ornaments and biohazards.

Project Manager responsible for assessing and cleaning of a chemical spill beneath a hospital building. The spill material was an x-ray film development solution.

Senior Engineer providing oversight and recommendations for the cleanup of a marsh adjacent to a Superfund site.

**Facility/Unit Closures**

Project Manager responsible for constructing of a clay test pad to establish the construction procedure for a clay cover and liner system. The test pad demonstrated that a cover and liner constructed under specific controllable and repeatable conditions could attain a hydraulic conductivity of 1 x 10-7 cm/sec or less, as determined by in-situ sealed double-ring infiltrometer (SDRI) testing performed as a part of this project. Four SDRI's were installed on the test pad. Prepared a report for the client to present to the Texas Water Commission.

Project Manager responsible for providing Construction Quality Control (CDC) during construction of a clay cover for a RCRA closure of two hazardous waste surface impoundments. Project duties included monitoring the construction operations, providing quality control to comply with project specifications, and communicating with the facility personnel and contractors.

Project Manager responsible for providing CQC during construction of a clay liner for a storm water pond facility. Project duties included monitoring the construction operations, providing quality control to comply with project specifications, and communicating with the facility personnel and contractors.

Senior Engineer responsible for the RCRA closure of a hazardous waste incinerator and feed tank. Project duties included supervising the field crew, monitoring the decontamination operations, collecting verification samples, and preparing and submitting the certification report to the Texas Water Commission.

Developed a closure and contingency plan for 16 hazardous waste treatment/storage units at an industrial wastewater treatment facility.

**Underground Storage Tanks**

Project Engineer for closure of a leaking underground storage tank (UST) discovered during construction of Metro's Northwest Transit Center project in Houston, Texas. Project included performing electromagnetometer and ground penetrating radar surveys to clear work areas of other USTs.

**Preliminary Site Assessments**

Performed an Environmental Hazardous Materials Site Assessment to identify potential environmental concerns at three truck stop sites. The assessment included reviewing the site history and available data, conducting a regulatory agency review, completing a site visit, and performing off-site reconnaissance.

Performed an environmental site assessment (ESA) to identify potential environmental concerns for properties prior to real estate transactions. The ESA included reviewing the site history and available data, conducting regulatory agency review, completing a site visit, and performing off-site reconnaissance.

**Landfill Construction**

Project Engineer responsible for providing CQC during the construction of two soil/bentonite test liners to establish the construction procedures for a landfill liner system. Provided significant guidance to the contractor who was inexperienced in constructing liners with soils available at the site. The purpose of the test liners was to demonstrate that the designed soil/bentonite liner, constructed under specific controlled repeatable conditions, could attain a hydraulic conductivity of 1 x 10-6 cm/sec or less. Intalled and monitored two in-situ sealed double-ring infiltrometer (SDRI) units on each test liner to determine the hydraulic conductivity.

Project Manager providing Construction Quality Assurance (CQA) services during construction of a cell at a hazardous waste landfill in Oklahoma. Duties included reviewing construction specifications, fulfilling daily project management duties, providing guidance for the field technicians, reviewing field reports and test results, and communicating with landfill personnel.

Project Manager responsible for overseeing construction of a clay liner for cell expansions at Type I and Type IV landfills. Project duties included monitoring the construction operations, providing quality control to comply with regulatory specifications, and submitting a soil liner evaluation report (SLER) to the state.

Project Manager responsible for providing CQC services during the initial construction of a landfill facility. The project included overseeing and monitoring site grading, constructing detention basins and drainage ditches, and observing and testing concrete poured for spillways, flow channels, and junction boxes.

Senior Engineer responsible for overseeing drilling and sampling pilot soil borings and designing and installing monitor wells for a new landfill facility.

**Construction Monitoring**

Project Engineering responsible for construction surveillance of new fluid milk plant in Austin, Texas. Project involved testing soil and concrete, preparing subgrade, and placing concrete for pavements and foundations. Duties included supervising field test fill, fulfilling daily project management duties, reviewing field reports and test results, and preparing periodic summary reports.

Performed construction surveillance for a jet engine test facility at Ellington Air Force Base, Texas. Project included conducting an on-site inspection of foundation construction and preparing subgrade.

Managed soil and concrete testing for a new church in Houston, Texas. Responsibilities included reviewing field technician's daily reports and test results.

**Geotechnical**

Project Manager responsible for conducting a geotechnical investigation to assess the stability of a containment dike surrounding an above-ground surface impoundment. Duties included supervising the drilling and sampling operations, assigning a laboratory testing program to determine the engineering characteristics of the soils, and preparing a report summarizing the field activities and laboratory testing.

Senior Engineer responsible for preparing a geotechnical and geological assessment for a proposed asbestos pit. Duties included supervising the soils investigation, assigning laboratory testing to evaluate the engineering characteristics of the subsurface soils, and preparing a report providing slope stability analyses and construction recommendations.

Managed field exploration to determine subsurface characteristics and to provide engineering design and construction recommendations for an extraneous water treatment plant for an expansion of a bromine facility in Magnolia, Arkansas.

Managed field exploration for geotechnical investigations at several gasoline service stations. Provided recommendations for foundation support of the service station facilities.

Performed geotechnical investigations for onshore exploratory drilling rigs. Used cone penetration testing (CPT), interpreted CPT data, and calculated axial capacities for pile foundations.

Participated in dynamic compaction investigation for levee design using cone penetration testing (CPT). Responsible for aquiring soils data and reporting.

Supervised more than 65 onshore and offshore projects including mobilization of equipment, site investigation and demobilization. Duties included classifying soil samples, performing field tests, and preparing field reports.

Performed engineering analyses and developed recommendations for foundation design on over 40 offshore projects. Analyses included axial pile capacity, lateral soil resistance, load transfer, mudline bearing capacity, and pile driveability.

Performed over 40 jack-up rig foundation investigations. Supervised drilling and soil sampling operations. Analyses included estimating leg penetrations after preloading, and assessing rig stability with respect to punch-through failure.

**Permitting**

Senior Engineer responsible for preparing the Engineering Report, Section III of the Texas Water Commission Permit Application for Hazardous Waste Storage/Processing/Disposal Facility (Part B instructions) for two hazardous waste impoundments.

## TRAINING

***SWANA Landfill Gas Systems Operation & Maintenance Training***

## PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers, Member

## Education

*University of Alabama*
*(1997 – 2000)*

## Certifications

*Radiation Safety and Use of Nuclear Gauges*

*N.I.C.E.T. Level 2 Geosynthetics Installation and Inspection*

*N.I.C.E.T Level 1 Geotechnical Construction*

*HAZWOPER 24 Hr.*

*Confined Space Entry Certification*

*SWANA Landfill Gas Systems Operations & Maintenance Training*

*GSI Certification*

*DOT Radiation Certification*

## Education

*University of Alabama*
*(1997 – 2000)*

# Employment History

***Golder Associates Inc. – Houston, Texas***
*Engineering Technician (2000 to Present)*

Resident CQA Manager and CQA Technician during construction of composite lining systems at solid and hazardous waste landfill facilities in Arkansas, Alabama, California, West Virginia, Virginia, Louisiana Texas, South America, and Mexico. Responsibilities on these projects include management of field data, monitoring construction/installation of the soil and synthetic lining systems, communication with client and contractor, and assistance with report preparation. Experience totalling over fifty million square feet of geomembrane installation and over one million cubic yards of soil placement. Conducted a variety of soil tests at the Golder Associates laboratory in Houston, Texas. Also has experience with total station survey.

Specific Project Responsibilities include:

- Lead Soils Technician, Solid Waste Landfill, King George County, Virginia
- Geosynthetics Technician, Solid Waste Landfill, King George County, Virginia
- Resident CQA Manager, Chemical Waste Management, Lake Charles, Louisiana
- Geosynthetics Technician, Solid Waste Landfill, Security, Texas
- MQA Monitor, Poly-Flex, Grand Prairie, Texas
- Geosynthetics Technician, Atascocita Landfill, Houston, Texas
- Resident CQA Manager, Mt. Storm Power Plant, Mt. Storm, West Virginia
- Resident CQA Manager, U.S. Liquids, Zapata County, Texas
- Resident CQA Manager, De Kalb County Landfill, Collinsville, Alabama
- Geosynthetics Technician, Newton County Landfill, Newton County, Texas
- Resident CQA Manager, LaSalle- Grant Parrish Landfill, Jena, Louisiana
- Geosynthetics Technician, Lacy Lakeview Landfill, Waco, Texas
- Resident CQA Manager, El Sobrante Landfill, Corona, California
- Resident CQA Manger, Union County Landfill, El Dorado, Arkansas
- Resident CQA Manager, Greenshadow Landfill, Pasadena, Texas
- Geosynthetics Technician, US Liquids Rincon, Starr County, Texas
- Resident CQA Manager, Dow Chemical, Freeport, Texas
- Resident CQA Manager, Coastal Plains Recycling and Disposal Facility, Alvin, Texas
- Resident CQA Manager, Austin Community Landfill, Austin, Texas
- Geosynthetic Technician, Alto Chicama Lima, Peru
- Resident CQA Manager, Temple LF, Temple, Texas
- Resident CQA Manager, CHESI, Pasadena, Texas
- Resident CQA Manager, City of Victoria Landfill, Victoria, Texas
- Resident CQA Manager, Simi Valley Landfill, Simi Valley, California

## Education

*BS Human Resources, Miami University, Oxford, Ohio, 1992*

## Certifications

*Storm water and Erosion Inspector FDEP, 6/2009*

*CPR/AED/Heartsaver first aid, 11/2008*

*HAZMAT Security Awareness, 7/2009*

*OSHA 30 hour Safety (510), 4/2009*

*United States Corp Of Engineer Construction Quality Management , 9/2008*

*OSHA 40 hour HAZWOPR, 4/2000 (updated 2/2010)*

*OSHA 10 hour Construction Safety, 10/2006*

*GRI Certification Soils, 4/2006*

*GRI Certification Geosynthetics, 4/2006*

*Troxler Certification, 5/2000*

# Golder Associates Inc. – Tampa

***Senior Technician***

Mark Day is a senior technician with Golder Associates and has over 10 years experience performing Construction Quality Assurance (CQA) services for solid waste projects. His responsibilities include performing CQA for soil and geosynthetic components in landfill cell and closure cover system construction, mining leach pads, and landfill gas (LFG) extraction systems. Construction management functions were performed during construction of landfill cell and closure projects and installation LFG systems. Duties also included installation, operation, and maintenance of passive and active LFG systems, including well drilling and pipe installation.

# Employment History

***Golder Associates Inc. – Tampa, Florida***

*Senior Technician (2000 to Present)*

As technician in Solid Waste division, duties varied as the projects changed. Primary responsibilities have been construction quality assurance and construction manager. Projects have ranged from landfill disposal cell and closure caps, tailing facilities, DOE facility, and power plants. Duties have also included installation of passive and active landfill gas extraction systems and well field operation and maintenance. Daily functions include scheduling subcontractors, reviewing pay requests, budgets, submittal review, scheduling, staffing, training, certification report compilation, interaction with state and local government agencies, and client liaison. Position has required the ability to work from construction drawing, CAD file, or engineer's sketches to ensure that projects are constructed to site specifications and working with earth works contractors and maintaining accurate records of deviations from design and contractors' construction activities. Specific duties varied depending on project scope and client needs and have held to position of field technician, construction manager, safety manager and/or resident manager on numerous projects throughout the United States, including Delaware, New York, New Jersey, Pennsylvania, Ohio, Kentucky, Tennessee, North Carolina, Virginia, Florida, Maryland, Texas, and California, as well as Australia.

***Airborne Express – Wilmington, Ohio***

*Recruiter (1999 to 2000)*

Position included recruitment of potential candidates for flight staff, sort staff, fire brigade, cafeteria, custodial services, clerical, and communication. As a recruiter, duties consisted of determining department needs with the department head and filling required opening. Associated activities included conducting off-site recruiting events (school, job fairs); maintaining/establishing contacts with employment offices; and advertising events and openings, interviewing, screening, and referencing potential candidates. Post-selection tasks included employee orientation and employee benefits program, conducting hazard awareness analysis, performance review, documentation in HRIS, and ongoing

human resources issues as additional job responsibilities.

***Macke Brothers – Springdale, Ohio***
*Human Resource Director (1998 to 1999)*

Duties focused on staffing for all three shifts the positions of entry level line assemblers, specialized equipment operators, and clerical staff. Facility is a bindery specializing in magazine and apartment guide production. Responsible for MSDS maintenance, completed safety policy and implemented same. Also did accident investigation, payroll, employee wage review, OSHA 200, hazard analysis, and benefits evaluation.

## PROJECT EXPERIENCE – LANDFILL GAS EXTRACTION INSTALLATION, OPERATION, AND MAINTENANCE

**Millersville Landfill**
Anne Arundel County, Maryland

As technician, installed upgrades to the existing LFG and condensate collection system. Duties also included air quality monitoring, gas detection, well field monitoring, and repair.

## PROJECT EXPERIENCE – CONSTRUCTION QUALITY ASSURANCE

**Crystal River**
Crystal River, Florida

Served as construction quality assurance manager for multi-phase Clean Air Recovery Act construction improvements to Units 4 and 5 at the Crystal River complex of Progress Energy Florida. Project included the monitoring of removal of existing coal stockpiles to install geosynthetic clay liner, construction of runoff and treatment ponds lined with GCL and concrete, geosynthetic clay liner cap to existing fly ash stockpile, and the construction oversight for flue gas blow-down dual-pond construction. Duties included the coordination of CQC and performance of CQA testing, review of submittals, daily and weekly report to client, subcontractor scheduling, and design changes with design engineer. Position encompassed the role of site safety manager for Golder during the 15-month construction project.

**Olympic Dam**
Roxby Downs, South Australia, Australia

As a member of CQA team, responsible for the construction quality assurance oversight of two 140,000-square-meter evaporation ponds. Project consisted of quality assurance for both soils and a 60 mil HDPE. Trained Adelaide technicians in use of Golder USA quality assurance documents to monitor, track, and document installation process. Preformed soils testing and hills compaction verification as needed.

**Department of Energy Oak Ridge Facility**
Oak Ridge, Tennessee

As member of construction quality control team, tasked with CQC of a two-cell, 6-acre low-level radiation landfill. Aspects of project consisted of extensive soils sampling, cut/fill activities, concrete pour sampling, HDPE lift station/manhole and associated leachate collection, and leachate transfer piping. Position required close interaction with CQA, design team, and federal services contractor regarding site specifications issues, problem resolution, geological buffer placement, clay liner placement, HDPE liner installation, scheduling, staffing, lab results, and concrete testing.

**Catawba County MSW**
Catawba County, North Carolina

Quality assurance officer for phases I and II cell expansion. Construction oversight responsibilities included permeability test of clay liner through Shelby tubes, Troxler moisture density tests, soil/product sample collection of structural fill, clay liner material, and drainage layer for 15-acre cell expansion. Position provided liaison between on-site client, soils contractor, geosynthetic contractor, engineer design firm, and Golder Richmond office to ensure project timely completion. Upon completion of earthwork, focus changed to lead for HDPE liner installation and responsibilities consisted of the documentation and observation of HDPE liner-related activities. Position encompassed the role of site safety manager for Golder during the five-month construction project.

**G.R.O.W.S Landfill**
Falls Township, Pennsylvania

As resident manager, provided construction quality assurance oversight of a 10-acre new cell for WMI. Slope of new cell was clay cap of existing hazardous closed cell that was lined with primary and secondary geosynthetic liner. A portion of cell received a tertiary geosynthetic liner as well. Other duties include the documentation of all contractor construction activities, coordination of field staff, weekly progress meeting, and coordinating scheduling efforts between HDPE contractor and earth works contractor. Position encompassed the role of site safety manager for Golder during the seven-month construction project.

**New Morgan Landfill Company**
New Morgan Borough, Pennsylvania

As the CQA manager and construction manager, responsibilities included monitoring and documenting construction efforts of an 11.7-acre municipal solid waste disposal cell with contained 3 feet low perm soil and two layers of 60-mil textured HDPE. Duties included client-designated liaison between state and county environmental oversight agencies, third-party design firm, earthworks contractor, and geosynthetic contractor, as well as documentation and oversight of required tests associated with soils and HDPE aspects. In 2006, returned to construction quality assurance oversight for 17-acre cap work in two phases and related LFG systems improvements. Position encompassed the role of site safety manager for Golder during both construction projects.

**Casella Waste/ Hyland Associates Facility**
Angelica, New York

Responsible for the construction quality assurance oversight of an 11-acre soil and geosynthetic cell. Associated tasks included observation and documentation of HDEP-related activities, soils testing with Troxler nuclear moisture density, conformance sampling of clay liner though the use of Shelby tubes, as well as visual monitoring of construction activities to ensure compliance with site technical specifications . Position required daily interaction with client and state oversight.

**Kettleman Hills Facility**
Kettleman Hills, California

As the CQA manager and construction manager, responsibilities involved coordinating efforts, as well as monitoring and documenting activities between earthworks contractor and two HDPE contractors for two overlapping projects of evaporation pond repair and new cell construction. Project included oversight of upgrades to LFG system. Pond work consisted of capping exposed seams that had been degraded due to weather while the new cell construction was a 12-acre liner over refuse extension. Position encompassed the role of site safety manager for Golder during the five-month construction project.

**Mountain View Reclamation**
Greencastle, Pennsylvania

Responsible for the construction quality assurance oversight to monitor and document construction efforts associated with the installation of a 5.7-acre municipal solid waste disposal cell. Second phase of project consisted of construction quality assurance oversight and construction management of mechanically stabilized earthen wall (MSE), using Tensar uniaxil and biaxil grids.Position encompassed the role of site safety manager for Golder during the 13 month construction project.

**Pinelands Landfill**
Egg Harbor Township, New Jersey

Responsible for construction quality assurance oversight for the removal of existing concrete condensate pump stations and the installation of HDPE CPS. Other functions included flare system upgrades, leachate system maintenance, and oversight during conversion to municipal golf course.

**Countywide Resource Recovery Facility**
Stark County, Ohio

Responsible for the cover system upgrade and for soils quality assurance to the new cell construction. Duties also included quality assurance to leachate collection system and flare system upgrades.

**Victoria County Landfill**
Victoria, Texas

Responsible for the construction quality assurance oversight for the installation of a 6-acre C and D landfill cell. Trained field technicians, coordinated laboratory testing, surveyed, and certified report generation. Position encompassed the role of site safety manager for Golder during the one-month construction project.

# CONSTRUCTION QUALITY ASSURANCE PERSONNEL
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Installation Personnel<br>Texas Environmental Plastics, Ltd. | |
|---|---|
| **Name** | **Initials** |
| Rone Intyrath<br>*Supervisor* | RI |
| Sommay Intyrath | SI |
| Samane Phommachanh | SP |
| Mouane Sanithsone | MS |
| Antonio Ramirez | AR |
| Sene Chanthasouxat | SC |
| Victor Martinez | VM |
| Lane Vongpathoum | LV |
| Roberto Hernandez | RH |
| Antolin Yata | AY |
| Abelino Garcia | AG |
| Daniel Phachomphon<br>*Technician* | DP |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

## RESUME

NAME: Rone Intyrath



POSITION: Supervisor

EXPERIENCE: Has worked on the following projects since 08/12/85

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| CHESAPEAKE CORP SUMP LINERS | FREDERICKSBURG | VA | 538 |
| TEXAS GULF GYPSUM STACK 3-4 | AURORA | NC | 8,400 |
| ROLLINS ENVIRO ASH/SLUDG | DEER PARK | TX | 1,582 |
| SAN LUIS CANAL | LOS BANOS | CA | 133,450 |
| RODMAN LANDFILL | RODMAN | NY | 35,768 |
| 110 SAND PHASE VI | MELVILLE | NY | 42,500 |
| LIVINGSTON LANDFILL | PONTIAC | IL | 25,376 |
| CAROLINA FOOD PROCESSORS POND | TAR HEEL | NC | 141,178 |
| CIBA GEIGY CELL 11-13 | McINTOSH | AL | 9,663 |
| PALM BEACH COUNTY LF PH 2 | W. PALM BEACH | FL | 228,369 |
| ST LUCIE COUNTY | FT. PEARCE | FL | 555,520 |
| FORT MEADE | FORT MEADE | FL | 336,320 |
| COAL CREEK PONDS 92 & 94 | UNDERWOOD | ND | 1,490,148 |
| CWM LAKE CHARLES | SULPHUR | LA | 104,029 |
| CITY OF LUBBOCK | LUBBOCK | TX | 503,535 |
| CSG REPUBLIC WASTE | AVALON | TX | 16,665 |
| SOUTHERN PACIFIC TRANSPORTATION | HOUSTON | TX | 4,640 |
| WESTERN WASTE | CONROE | TX | 105,880 |
| AGRICO CHEMICAL | ST JAMES | LA | 3,640,461 |
| BFI FM 521 | FRESNO | TX | 129,259 |
| ST. JOHNS LF SUBAREA 1 | PORTLAND | OR | 1,233,961 |
| FORMOSA EXPLORATION | RIDDLE | OR | 311,029 |
| SNOHOMISH COUNTY LANDFILL | SNOHOMISH | WA | 501,119 |
| CEDARILLE LANDFILL | CEDARVILLE | WA | 761,685 |
| COWLITZ COUNTY LANDFILL | LONGVIEW | WA | 1,777,866 |
| ATOCHEM WASTE CONTAINMENT | TACOMA | WA | 339,854 |
| ENVIROSAFE MANAGEMENT | GRANDVIEW | ID | 34,438 |
| USPCI CELL Y | KNOLLS | UT | 1,930 |
| USPCI CELL 2 | KNOLLS | UT | 90,883 |

| | | | |
|---|---|---|---|
| NA COLITE PROJECT | RIFLE | CO | 35,488 |
| KENNECOTT LARGE SLIME RESV. | BINGHAM CANYON | UT | 835,020 |
| UNION OIL CO POND | PARACHUTE | CO | 173,013 |
| DENVER LAIDLAW LANDFILL | DENVER | CO | 44,527 |
| NEWMONT MINING NORTH AREA P 3 | CARLIN | NV | 343,410 |
| GOLD STRIKE MINE LINING | CARLIN | NV | 109,118 |
| OPERATING INDUSTRIES LF | MONTEREY | CA | 20,000 |
| LA HONDA LOWER RESERVOIR | LA HONDA | CA | 6,513 |
| NEWMONT NORTH AREA POND | CARLIN | NV | 2,702 |
| NEWMONT GOLD SOUT LEACH PAD | CARLIN | NV | 138,408 |
| BARRICK GOLDSTRIKE AA POND | ELKO | NV | 352 |
| NEWMONT GOLD NON-PROPERTY | CARLIN | NV | 539,333 |
| BARRICK NORTH BLOCK PHASE I | CARLIN | NV | 2,581,185 |
| BARRICK GOLDSTRIKE NORTH PONDS | CARLIN | NV | 6,470 |
| COEUR-ROCHESTER PH II | LOVELOCK | NV | 45,380 |
| GOLD STRIKE MINE/BARRICK PH 1A | CARLIN | NV | 9,152 |
| BARNEYS CANYON PROJECT | BINGHAM CANYON | UT | 22,650 |
| CALABASAS LANDFILL | AGOURA HILLS | CA | 550,000 |
| PALM BEACH COUNTY AUTH. | W. PALM BEACH | FL | 132,594 |
| STANDARD INDUSTRIES | SAN ANTONIO | TX | 12,347 |
| TOWN OF WORTHINGTION | WORTHINGTON | MN | 68,554 |
| CHEM WASTE ARAPAHOE | AURORA | CO | 57,197 |
| SEVENSON CONSTRUCTION | MODEL CITY | NY | 126,192 |
| TURNKEY LANDFILL | DANBURY | NY | 102,126 |
| METRO DADE | MIAMI | FL | 110,000 |
| GNB RESOURCES | FRISCO | TX | 15,000 |
| CITY OF WILLISTON | WILLISTON | SC | 327,000 |
| ORLEANS LANDFILL | ROCHESTER | PA | 87,048 |
| LANZO CONSTRUCTION | ORLANDO | FL | 270,800 |
| HOLLY FARMS | CENTER | TX | 17,500 |
| WASTE MANAGEMENT | ERIE | PA | 120,080 |
| CECOS | LIVINGSTON | LA | 130,000 |
| H.E. SARGENT | DEXTER | ME | 150,000 |
| MUSKEGON | WHITEHALL | MI | 325,000 |
| SHELLY AND SANDS | SISTERVILLE | WV | 34,000 |
| FMC CORPORATION | MINNEAPOLIS | MN | 17,500 |
| AMOCO | WOOD RIVER | IL | 122,154 |
| CHEMICAL WASTE MANAGEMENT | LAKE CHARLES | LA | 55,000 |
| MURNANE ASSOCIATES | CORTLAND | NY | 57,258 |
| CHEMICAL WASTE MANAGEMENT | DENVER | CO | 75,000 |
| CIBA GEIGY | McINTOSH | AL | 62,000 |

| | | | |
|---|---|---|---|
| KAB CONSTRUCTION | LAKE CHARLES | LA | 90,964 |
| CHEMICAL WASTE MANAGEMENT | EMELLE | AL | 193,286 |
| CHEVRON | ROCK SPRINGS | WY | 417,885 |
| ALLIED MATERIALS | STROUD | OK | 350,000 |
| WOODBURN LANDFILL | SALEM | OR | 67,000 |
| FT. LEWIS | FT. LEWIS | WA | 105,000 |
| ST. JOHNS LANDFILL | ST. JOHN'S | OR | 1,200,000 |
| COFFIN BUTTE LANDFILL | CORVALIS | OR | 40,000 |
| MARION COUNTY LANDFILL | WOODBURN | OR | 600,000 |
| HILLSBORO LANDFILL | HILLSBORO | OR | 600,000 |
| WOMACK INC. | FREEPORT | TX | 13,800 |
| GREAT LAKES CONTAINMENT | ST. LOUIS | MO | 47,250 |
| ZINC CORP | BARTLESVILLE | OK | 65,000 |
| BAILEY SUPERFUND | BRIDGE CITY | TX | 495,000 |
| COFFIN BUTTE LANDFILL | CORVALIS | OR | 470,553 |
| BEAVER RESERVOIR | GUNNISON | CO | 128,010 |
| SHERRCO ASH | BECKER | MN | 220,000 |
| BRUNNER LANDFILL | PITTSBURGH | PA | 398,732 |
| GASTON COUNTY | GASTON | NC | 595,469 |
| ISP | LINDEN | NJ | 101,327 |
| HARDIN COUNTY | KOUNTZ | TX | 144,655 |
| J.C. ELLIOTT LANDFILL | CORPUS CHRISTI | TX | 483,921 |
| SOUTHWEST TANK | DEER PARK | TX | 42,000 |
| PHELPS DODGE REFINERY | EL PASO | TX | 150,000 |
| COFFIN BUTTE LANDFILL | CORVALLIS | OR | 130,000 |
| DRY CREEK PHASE I | MEDFORD | OR | 831,012 |
| DRY CREEK PHASE II | MEDFORD | OR | 831,000 |
| PREMIUM FARMS IOWA SITE | DES MOINES | IO | 427,438 |
| PREMIUM FARMS AHLSTEDT SITE | PLAINVIEW | NE | 451,580 |
| PREMIUM FARMS ANSON SITE | NELIGH | NE | 491,593 |
| PREMIUM FARMS VANDERSNICK WEST | NELIGH | NE | 425,000 |
| BELMONT ASH | INDIANAPOLIS | IN | 248,922 |
| MURET GRAIN | BRUNSWICK | NE | 418,950 |
| ALTURI LANDFILL | GOSHEN | NY | 285,000 |
| NEW HANOVER COUNTY LANDFILL | WILMINGTON | NC | 1,570,000 |
| GOULD SUPERFUND SITE | PORTLAND | OR | 158,468 |
| COFFIN BUTTE LANDFILL | CORVALLIS | OR | 1,059,300 |
| OCEAN COUNTY | LAKEHURST | NJ | 12,000 |
| HARDIN COUNTY | KOUNTZ | TX | 220,000 |
| ALTURI LANDFILL | GOSHEN | NY | 287,000 |

| | | | |
|---|---|---|---|
| ROCK PRARIE | COLLEGE STATION | TX | 210,000 |
| TRANS JORDAN | SOUTH JORDAN | UT | 450,000 |
| PLAINVIEW | PLAINVIEW | TX | 530,000 |
| WEST LANDFILL | ANDREWS | TX | 145,000 |
| WASCO COUNTY | THE DALLES | OR | 450,175 |
| KERR MCGEE | SODA SPRINGS | ID | 1,117,703 |
| McGILL ROAD LANDFILL | JACKSON | MI | 220,000 |
| LAKEVIEW | AUSTIN | TX | 287,000 |
| EXEL BEEF | PLAINVIEW | TX | 110,000 |
| EL CENTRO | ROBSTOWN | TX | 469,000 |
| WEYERHAUSER | CASTLE ROCK | WA | 450,000 |
| JOHNSTON COUNTY LANDFILL | SMITHVILLE | NC | 1,506,844 |
| TRANS JORDAN | SOUTH JORDAN | UT | 556,672 |
| PAGEL LANDFILL | ROCKFORD | IL | 385,000 |
| CARROLL COUNTY LANDFILL | CARROLL | IA | 283,000 |
| LYCOMING CO. LANDFILL | WILLIAMSPORT | PA | 972,000 |
| TRANS-ASH | SEMORA | NC | 744,000 |
| SOUTHERN PLAINS LANDFILL | ALEX | OK | 197,000 |
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 97,000 |
| PORTSMOUTH NAVAL SHIPYARD | KITTERY | ME | 470,000 |
| MILL CREEK LANDFILL | FORT POLK | LA | 280,000 |
| KING & QUEEN LANDFILL | LITTLE PLYMOUTH | VA | 1,000,000 |
| CITY OF MIDLAND LANDFILL | MIDLAND | TX | 460,000 |
| COEUR ROCHESTER | LOVELOCK | NV | 120,000 |
| HART CREOSOTE PLANT | JASPER | TX | 1,271,000 |
| APEX | SPRINGFIELD | OH | 3,200,000 |
| CMS LANDFILL | CONCORD | NC | 1,030,000 |
| BRUNSWICK WASTE | LAWRENCEVILLE | VA | 230,000 |
| ANDERSON LANDFILL | BELTON | SC | 460,000 |
| WASATCH INTEGRATED | SALT LAKE CITY | UT | 440,000 |
| PROGRESS ENERGY | ROXBORO | NC | 500,000 |
| WASATCH INTEGRATED | LAYTON | UT | 4,000,000 |
| SORD LANDFILL | ARDMORE | OK | 270,000 |
| WASATCH INTEGRATED | LAYTON | UT | 1,000,000 |
| APEX LANDFILL | STUBENVILLE | OH | 250,000 |
| WASTE MANAGEMENT | TEMPLE | TX | 610,000 |
| VEOLIA LANDFILL | HORICON | WI | 650,000 |
| TWO PINE LANDFILL | N. LITTLE ROCK | AR | 2,660,000 |
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 330,000 |
| DFW LANDFILL | LEWISVILLE | TX | 871,000 |

| | | | |
|---|---|---|---|
| LUMINANT MARTIN LAKE | TATEM | TX | 900,000 |
| KING AND QUEEN | LITTLE PLYMOUTH | VA | 334,000 |
| ECHO VISTA | TONTITOWN | AR | 16,500,000 |
| SECURITY LANDFILL | CLEVELAND | TX | 427,000 |
| MESQUITE CREEK LANDFILL | NEW BRAUNFELS | TX | 650,000 |
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| | **Total Sq. Ft.** | | **86,651,696** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

**RESUME**

NAME: Sommay Intyrath



POSITION: Weld Technician / QC Personnel

EXPERIENCE: Has worked on the following projects since 7/23/92

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| CHESAPEAKE CORP SUMP LINERS | FREDERICKSBURG | VA | 538 |
| TEXAS GULF GYPSUM STACK 3-4 | AURORA | NC | 8,400 |
| ROLLINS ENVIRO ASH/SLUDG | DEER PARK | TX | 1,582 |
| SAN LUIS CANAL | LOS BANOS | CA | 133,450 |
| RODMAN LANDFILL | RODMAN | NY | 35,768 |
| 110 SAND PHASE VI | MELVILLE | NY | 42,500 |
| CAROLINA FOOD PROCESSORS POND | TAR HEEL | NC | 141,178 |
| CIBA GEIGY CELL 11-13 | McINTOSH | AL | 9,663 |
| PALM BEACH COUNTY LF PH 2 | W. PALM BEACH | FL | 228,369 |
| COAL CREEK PONDS 92 & 94 | UNDERWOOD | ND | 1,490,148 |
| CWM LAKE CHARLES | SULPHUR | LA | 104,029 |
| CITY OF LUBBOCK | LUBBOCK | TX | 503,535 |
| CSG REPUBLIC WASTE | AVALON | TX | 16,665 |
| SOUTHERN PACIFIC TRANSPORTATION | HOUSTON | TX | 4,640 |
| WESTERN WASTE | CONROE | TX | 105,880 |
| ENVIROSAFE MANAGEMENT | GRANDVIEW | ID | 34,438 |
| USPCI CELL Y | KNOLLS | UT | 1,930 |
| USPCI CELL 2 | KNOLLS | UT | 90,883 |
| NA COLITE PROJECT | RIFLE | CO | 35,488 |
| UNION OIL CO POND | PARACHUTE | CO | 173,013 |
| DENVER LAIDLAW LANDFILL | DENVER | CO | 44,527 |
| GOLD STRIKE MINE LINING | CARLIN | NV | 109,118 |
| OPERATING INDUSTRIES LF | MONTEREY | CA | 20,000 |
| LA HONDA LOWER RESERVOIR | LA HONDA | CA | 6,513 |
| NEWMONT NORTH AREA POND | CARLIN | NV | 2,702 |
| NEWMONT GOLD SOUT LEACH PAD | CARLIN | NV | 138,408 |
| BARRICK GOLDSTRIKE AA POND | ELKO | NV | 352 |
| BARRICK GOLDSTRIKE NORTH PONDS | CARLIN | NV | 6,470 |

| | | | |
|---|---|---|---|
| COEUR-ROCHESTER PH II | LOVELOCK | NV | 45,380 |
| GOLD STRIKE MINE/BARRICK PH 1A | CARLIN | NV | 9,152 |
| BARNEYS CANYON PROJECT | BINGHAM CANYON | UT | 22,650 |
| CALABASAS LANDFILL | AGOURA HILLS | CA | 163,530 |
| PALM BEACH COUNTY AUTH. | W. PALM BEACH | FL | 132,594 |
| STANDARD INDUSTRIES | SAN ANTONIO | TX | 12,347 |
| ST. JOHN'S LANDFILL | ST. JOHN'S | OR | 1,200,000 |
| HILLSBORO LANDFILL | HILLSBORO | OR | 600,000 |
| COFFIN BUTTE LANDFILL | CORVALIS | OR | 40,000 |
| MARION COUNTY LANDFILL | WOODBURN | OR | 600,000 |
| WOMACK INC. | FREEPORT | TX | 13,800 |
| GREAT LAKES CONTAIMENT | ST. LOUIS | MO | 47,250 |
| ZINC CORP | BARTLESVILLE | OK | 65,000 |
| BAILEY SUPERFUND | BRIDGE CITY | TX | 425,265 |
| COFFIN BUTTE | CORVALLIS | OR | 470,553 |
| BEAVER RESERVOIR | GUNNISON | CO | 128,010 |
| SHERRCO ASH | BECKER | MN | 220,000 |
| BRUNNER LANDFILL | PITTSBURGH | PA | 398,732 |
| GASTON COUNTY | GASTON | NC | 595,469 |
| HARDIN COUNTY | KOUNTZ | TX | 144,655 |
| J.C. ELLIOTT LANDFILL | CORPUS CHRISTI | TX | 483,921 |
| SOUTHWEST TANK | DEER PARK | TX | 42,000 |
| PHELPS DODGE REFINERY | EL PASO | TX | 150,000 |
| COFFIN BUTTE LANDFILL | CORVALLIS | OR | 130,000 |
| PHELPS DODGE REFINERY | EL PASO | TX | 150,000 |
| DRY CREEK PHASE II | MEDFORD | OR | 831,000 |
| PREMIUM FARMS IOWA SITE | DES MOINES | IO | 427,438 |
| PREMIUM FARMS AHLSTEDT SITE | PLAINVIEW | NE | 451,580 |
| PREMIUM FARMS ANSON SITE | NELIGH | NE | 491,593 |
| PREMIUM FARMS VANDERSNICK WEST | NELIGH | NE | 425,000 |
| BELMONT ASH | INDIANAPOLIS | IN | 248,922 |
| MURET GRAIN | BRUNSWICK | NE | 418,950 |
| ALTURI LANDFILL | GOSHEN | NY | 285,000 |
| GOULD SUPERFUND SITE | PORTLAND | OR | 158,468 |
| COFFIN BUTTE LANDFILL | CORVALLIS | OR | 529,650 |
| EXIDE | FRISCO | TX | 140,000 |
| TRANS-ASH | SEMORA | NC | 744,000 |
| SOUTHERN PLAINS LANDFILL | ALEX | OK | 197,000 |



| | | | |
|---|---|---|---|
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 97,000 |
| PORTSMOUTH NAVAL SHIPYARD | KITTERY | ME | 470,000 |
| MILL CREEK LANDFILL | FORT POLK | LA | 280,000 |
| KING & QUEEN LANDFILL | LITTLE PLYMOUTH | VA | 1,000,000 |
| CITY OF MIDLAND LANDFILL | MIDLAND | TX | 460,000 |
| COEUR ROCHESTER | LOVELOCK | NV | 120,000 |
| HART CREOSOTE PLANT | JASPER | TX | 1,271,000 |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

| | | | |
|---|---|---|---|
| APEX | SPRINGFIELD | OH | 3,200,000 |
| BRUNSWICK WASTE | LAWRENCEVILLE | VA | 230,000 |
| WASATCH INTEGRATED | LAYTON | UT | 4,000,000 |
| SORD LANDFILL | ARDMORE | OK | 270,000 |
| WASATCH INTEGRATED | LAYTON | UT | 1,000,000 |
| APEX LANDFILL | STUBENVILLE | OH | 250,000 |
| WASTE MANAGEMENT | TEMPLE | TX | 610,000 |
| VEOLIA LANDFILL | HORICON | WI | 650,000 |
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 330,000 |
| DFW LANDFILL | LEWISVILLE | TX | 871,000 |
| LUMINANT MARTIN LAKE | TATEM | TX | 900,000 |
| KING AND QUEEN | LITTLE PLYMOUTH | VA | 334,000 |
| ECHO VISTA | TONTITOWN | AR | 16,500,000 |
| SECURITY LANDFILL | CLEVELAND | TX | 427,000 |
| MESQUITE CREEK LANDFILL | NEW BRAUNFELS | TX | 650,000 |
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| | **Total Sq. Ft.** | | **53,198,178** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

**RESUME**

NAME: Samane Phommachanh



POSITION: Weld Technician

EXPERIENCE: Has worked on the following projects since 9/15/87

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| CIBA GEIGY SEC. CONTAINMENT | NEWPORT | DE | 14,333 |
| HOLLY POINT ECREATION WWTP | WAKE FOREST | NC | 2,997 |
| KNOUSE FOODS INWOOD PROJECT | INWOOD | WV | 37,857 |
| JOCKY INTERNATIONAL | CARLISLE | KY | 16,063 |
| HF CONCRETE REHAB | CALVERT CITY | KY | 115 |
| CITY OF JEFFERSON WWTP | JEFFERSON | GA | 36,228 |
| EGLIN AIR FORCE BASE 870 | EGLIN AFB | FL | 64,145 |
| ESCAMBIA WOOD PRESERVING | BRUNSWICK | GA | 35,322 |
| FLORENCE COUNTY DISTRICT 6 | EFFINGHAM | SC | 2,813 |
| CITGO ASPHALT REFINING | SAVANNAH | GA | 418 |
| MALLIMCKRODT MEDICAL | ST. LOUIS | MO | 468 |
| EMPIRE DISTRICT ELECTRIC CO. | JOPLIN | MO | 34,204 |
| GE RAILCAR PROJECT | RANGER | TX | 23,000 |
| BFI COLONIAL LANDFILL | SORRENTO | LA | 23,545 |
| TUCSON AQUEDUCT REACH 3 | TUCSON | AZ | 387,033 |
| ESSEX COUNTY LANDFILL | LEWIS | NY | 77,772 |
| NIAGARA RECYCLING / CECOS | NIAGARA FALLS | NY | 160,498 |
| AL-TURI LANDFILL CELL 13 | GOSHEN | NY | 3,822 |
| BROOKHAVEN LANDFILL & CAP | BROOKHAVEN | NY | 20,376 |
| NANTICOKE CLOSURE | BINGHAMPTON | NY | 14,712 |
| MASS MILITARY CLOSURE | CAPE COD | MA | 113,115 |
| OCEAN COUNTY CAP | LAKEHURST | NJ | 351,403 |
| PINE GROVE LANDFILL | PINE GROVE | PA | 16,053 |
| POTTSTOWN CELL 6 | POTTSTOWN | PA | 11,471 |
| CHARLES GEORGE POND | TYNGSBORO | MA | 6,266 |
| BFI GREENTREE B1, B2 | BROCKWAY | PA | 224,593 |
| PENNSAUKEN LANDFILL PHASE 1 | PENNSAUKEN | NJ | 101,701 |
| AMERICAN CYANMID | BOUND BROOK | NJ | 6,662 |
| OCEAN COUNTY CELL 4 | LAKEHURST | NJ | 84,334 |



| | | | |
|---|---|---|---|
| HARRISBURG FACILITY | HARRISBURG | PA | 15,025 |
| OAKS LANDFILL | LAYTONSVILLE | MD | 29,295 |
| UNION CARBIDE | BOUND BROOK | NJ | 106,189 |
| WESTMORELAND COUNTY | MONESSEN | PA | 8,568 |
| OCEAN COUNTY CELL 6 | LAKEHURST | NJ | 58,034 |
| KELLY RUN FINAL CLOSURE | ELIZABETH | PA | 17,296 |
| EDGEBORO / MIDDLESEX PHASE 2 | EAST BRUNSWICK | NJ | 65,194 |
| GIBRALTER WWT PLANT LINER | BIRDSBORO | PA | 4,200 |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

| | | | |
|---|---|---|---|
| FORT A.P. HILL / PHASE 1 | BOLWING GREEN | VA | 20,791 |
| L-TECH LANDFILL CLOSURE | ASHTABULA | OH | 6,600 |
| BFI LAUBSCHER MEADOWS L.F. | EVANSVILLE | IN | 499,076 |
| US STEEL MINEWATER POND LINER | PINEVILLE | WV | 4,245 |
| BEAR ISLAND PAPER LANDFILL | ASHLAND | VA | 39,177 |
| OLD DOMINION ELECTRIC COOP | CLOVER | VA | 285,989 |
| HOECHST CELANESE CORP | NARROWS | VA | 8,701 |
| LOUDON CO LF EXPANSION | LEESBURG | VA | 62,191 |
| HALIFAX COUNTY LANDFILL | HALIFAX | VA | 82,724 |
| ABEX CORP LANDFILL | WINCHESTER | VA | 4,504 |
| LOUDON CO LF EXPANSION | LEESBURG | VA | 34,414 |
| CARROLL CO LF EXPANSION | HILLSVILLE | VA | 20,812 |
| GREEN VALLEY LANDFILL | ASHLAND | KY | 15,816 |
| FORD BRANCH LF / PIKE COUNTY | META | KY | 41,959 |
| SEVIER COUNTY LF | SEVIERVILLE | TN | 16,617 |
| SMITHS FARM OPERABLE UNIT ONE | SHEPERDSVILLE | KY | 38,590 |
| GHENT GENERATING STATION | GHENT | KY | 81 |
| ALCOA SOUTH PLANT RECLOSURE | ALCOA | TN | 32,132 |
| ROCKY RIVER WWTP | ANDERSON | SC | 4,263 |
| PASCO COUNTY LF CLASS 111 & 1 | SPRINGHILL | FL | 11,202 |
| N DADE COUNTY LANDFILL | MIAMI | FL | 159,155 |
| HOLLEY LANDFILL CAP | MILTON | FL | 49,102 |
| CENTRAL LANDFILL | MILTON | FL | 43,151 |
| MARION COUNTY PHASE 3 | OCALA | FL | 54,291 |
| WATERFORD SANITARY LANDFILL | PONTIAC | MI | 20,988 |
| MONOFILL ASH CELL | WAYNE COUNTY | MI | 243,000 |
| HASTINGS SANITARY LANDFILL | HASTINGS | MI | 142,030 |
| TROY LANDFILL CAP | EAST TROY | WI | 54,501 |
| CITIZENS DISPOSAL PHASE II | GRAND BLANC | MI | 48,922 |
| CENTRAL SANITARY LANDFILL | PIERSON | MI | 32,971 |
| ALLIED WASTE | HOOPESTON | IL | 16,468 |
| BRENT RUN | MONTROSE | MI | 885,426 |



| | | | |
|---|---|---|---|
| STEUTERMANN QUARRY LANDFILL | WASHINGTON | MO | 31,347 |
| COAL CREEK PONDS 92 & 94 | UNDERWOOD | ND | 223,894 |
| LAREDO LF CELL 2 & 4 | LAREDO | TX | 86,220 |
| BFI KERRVILLE | KERRVILLE | TX | 123,461 |
| BFI BLUERIDGE | HOUSTON | TX | 470,610 |
| ALCOA POND 3 | ROCKDALE | TX | 27,989 |
| SOUTHERN PACIFIC TRANSPORTATION | HOUSTON | TX | 4,642 |
| CITY OF KINGSVILLE | KINGSVILLE | TX | 37,892 |
| POLY CYCLE INDUSTRIES | JACKSONVILLE | FL | 30,847 |
| TEXAS EASTERN POND | MONT BELVIEW | TX | 2,007,916 |
| MT SOLO LANDFILL | LONGVIEW | WA | 1,500 |
| SMC SANITARY UPGRADE | SCOVILLE | ID | 493,268 |
| HELENA MUNICIPAL LANDFILL | HELENA | MT | 36,092 |
| MAGMA COPPER N.E. PAD EXP. | SAN MANOEL | AZ | 66,238 |
| CITY OF ALBUQUERQUE LANDFILL | ALBUQUERQUE | NM | 122,771 |
| ARTHUR RESPOSITORY LINING PRJ. | SALT LAKE CITY | UT | 80,243 |
| EAST CARBON LANDFILL PHASE II | EAST CARBON | UT | 23,767 |
| ROCKWOOL IND. SHOT PILE | PUEBLO | CO | 331,929 |
| NEWMOUNT MINING # 2 # 5 PHASE I | CARLIN | NV | 21,514 |
| CHEMICAL WASTE MGMT. KETTLEMAN | KETTLEMAN CITY | CA | 63,823 |

| | | | |
|---|---|---|---|
| BARRICK GOLDSTRIKE PHASE III | CARLIN | NV | 69,947 |
| BARRICK GOLDSTRIKE AA POND | ELKO | NV | 14,339 |
| BFI LITTLE DIXIE LF EXPANSION | JACKSON | MS | 30,437 |
| BFI BENSON VALLEY | FRANKFORT | KY | 30,314 |
| MURUNTAU PROJECT | UZBEKISTAN | NA | 101,329 |
| SPROUTBROOK ASHFILL | PEEKSKILL | NY | 25,759 |
| CHARLES GEORGE LANDFILL | TYNGSBORO | MA | 3,649 |
| CIBA GEIGY 44 | MCINTOSH | AL | 1,788 |
| GENEVA IND. 1 & 2 | HOUSTON | TX | 16,817 |
| OCEAN COUNTY LANDFILL | LAKEHURST | NJ | 88,500 |
| CHEMICAL WASTE MGMT. | LAKE CHARLES | LA | 37,000 |
| METRO DADE | MIAMI | FL | 170,000 |
| BFI IMPERIAL | PITTSBURG | PA | 85,000 |
| CHWM VICKERY | VICKERY | OH | 89,500 |
| BELMONT ASH | INDIANAPOLIS | IN | 29,500 |
| FOUR COUNTIES LANDFILL | ROCHESTER | IN | 31,000 |
| HURON COUNTY LANDFILL | NORWALK | OH | 72,500 |
| CITY OF SPRINGFIELD | SPRINGFIELD | GA | 32,039 |
| SCHUYLKILL LANDFILL CLOSURE | FT. LEE | VA | 101,070 |
| ZINC CORP | BARTLESVILLE | OK | 55,000 |

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|---|---|---|---|
| BAILEY SUPERFUND | BRIDGE CITY | TX | 289,000 |
| WINNESHIEK LANDFILL | DECORAH | IO | 350,000 |
| RED WING ASH DISP | RED WING | MN | 162,133 |
| A.S.KING ASH DISP | OAK PARK HTS | MN | 187,077 |
| WILMARTH ASH DISP | MANKATO | MN | 83,549 |
| ALTURI LANDFILL | GOSHEN | NY | 375,000 |
| BRUNNER LANDFILL | PITTSBURG | PA | 398,732 |
| ISP | LINDEN | NJ | 101,327 |
| J.C. ELLIOTT LANDFILL | CORPUS CHRISTI | TX | 483,921 |
| SOUTHWEST TANK | DEER PARK | TX | 42,000 |
| PHELPS DODGE REFINERY | EL PASO | TX | 150,000 |
| COFFIN BUTTE LANDFILL | CORVALLIS | OH | 130,000 |
| DRY CREEK PHASE I | MEDFORD | OR | 831,012 |
| PREMIUM FARMS IOWA SITE | DES MOINES | IO | 427,438 |
| PREMIUM FARMS AHLSTEDT SITE | PLAINVIEW | NE | 451,580 |
| PREMIUM FARMS ANSON SITE | NELIGH | NE | 491,593 |
| PREMIUM FARMS VANDERSNICK WEST | NELIGH | NE | 425,000 |
| BELMONT ASH | INDIANAPOLIS | IN | 248,922 |
| MURET GRAIN | BRUNSWICK | NE | 418,950 |
| ALTURI LANDFILL | GOSHEN | NY | 285,000 |
| OCEAN COUNTY LANDFILL | LAKEHURST | NJ | 217,868 |
| ALTURI LANDFILL | GOSHEN | NY | 250,275 |
| NEW HANOVER COUNTY LANDFILL | WILMINGTON | NC | 1,570,000 |
| GOULD SUPERFUND SITE | PORTLAND | OR | 158,468 |
| INTERNATIONAL PAPER MILL | MANSFIELD | LA | 193,000 |
| ALTURI LANDFILL | GOSHEN | NY | 287,000 |
| ROCK PRAIRIE | COLLEGE STATION | TX | 210,000 |
| MONTAUK LANDFILL | MONTAUK | NY | 770,000 |
| WELIND FORD REPAIR | WELING FORD | CT | 61,200 |
| CHRIN BROTHERS | EASTON | PA | 180,000 |
| ROCKWELL INT. LANDFILL | UNIONTOWN | PA | 90,000 |

| | | | |
|---|---|---|---|
| AL-TURI LANDFILL | GOSHEN | NY | 38,000 |
| PLAINVIEW | PLAINVIEW | TX | 530,000 |
| WEST LANDFILL | ANDREWS | TX | 145,000 |
| WASCO COUNTY | THE DALLES | OR | 450,175 |
| QUALITY EGG | AUBURN | ME | 407,000 |
| KERR MCGEE | SODA SPRINGS | ID | 1,117,703 |
| McGILL ROAD LANDFILL | JACKSON | MI | 220,000 |
| OCEAN COUNTY LANDFILL | LAKEHURST | NJ | 440,000 |
| EL CENTRO | ROBSTOWN | TX | 469,000 |
| JOHNSTON CO. LANDFILL | SMITHVILLE | NC | 600,000 |



| | | | |
|---|---|---|---|
| OCEAN COUNTY | LAKEHURST | NJ | 410,000 |
| WEYERHAUSER | CASTLE ROCK | WA | 450,000 |
| MUNDY LANDFILL | MANSFIELD | LA | 212,000 |
| JOHNSTON CO. LANDFILL | SMITHVILLE | NC | 1,506,844 |
| TRANS JORDAN | SOUTH JORDAN | UT | 556,672 |
| PAGEL LANDFILL | ROCKFORD | IL | 385,000 |
| CARROLL CO. LANDFILL | CARROLL | IA | 283,000 |
| LYCOMING CO. LANDFILL | WILLIAMSPORT | PA | 972,000 |
| TRANS-ASH | SEMORA | NC | 744,000 |
| SOUTHERN PLAINS LANDFILL | ALEX | OK | 197,000 |
| FMC | FRONT ROYAL | VA | 330,000 |
| WEYERHAUSER | CASTLE ROCK | WA | 600,000 |
| PORTSMOUTH NAVAL SHIPYARD | KITTERY | ME | 470,000 |
| LONGPOINT LANDFILL | NEEDVILLE | TX | 370,000 |
| MILL CREEK LANDFILL | FORT POLK | LA | 280,000 |
| CITY OF MIDLAND LANDFILL | MIDLAND | TX | 460,000 |
| COUER ROCHESTER | LOVE LOCK | NV | 120,000 |
| LEE COUNTY LANDFILL | BISHOPVILLE | SC | 412,907 |
| THREE RIVERS LANDFILL | AIKEN | SC | 2,700,000 |
| LEE COUNTY LANDFILL | BISHOPVILLE | SC | 412,907 |
| THREE RIVERS LANDFILL | AIKEN | SC | 300,000 |
| CLOVER POWER STATION | SOUTH BOSTON | VA | 1,200,000 |
| JEFFERSON COUNTY LANDFILL | N. LITTLE ROCK | AR | 487,544 |
| COVEL GARDENS LANDFILL | SAN ANTONIO | TX | 595,000 |
| AUSTIN COMMUNITY LANDFILL | AUSTIN | TX | 377,000 |
| APEX LANDFILL | STUBENVILLE | OH | 250,000 |
| WASTE MANAGEMENT | TEMPLE | TX | 610,000 |
| VEOLIA LANDFILL | HORICON | WI | 650,000 |
| ECO-VISTA | TONITOWN | AR | 1,655,000 |
| DEER PARK | LA PORTE | TX | 260,000 |
| TWO PINE LANDFILL | N. LITTLE ROCK | AR | 320,000 |
| KENT COUNTY | GRAND RAPIDS | MI | 300,000 |
| OUTER LOOP LANDFILL | LOUISVILLE | KY | 125,000 |
| TWO PINE LANDFILL | N. LITTLE ROCK | AR | 1,525,000 |
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 330,000 |
| DFW LANDFILL | LEWISVILLE | TX | 871,000 |
| LUMINANT MARTIN LAKE | TATEM | TX | 900,000 |
| KING AND QUEEN | LITTLE PLYMOUTH | VA | 334,000 |
| ECHO VISTA | TONTITOWN | AR | 16,500,000 |
| SECURITY LANDFILL | CLEVELAND | TX | 427,000 |
| MESQUITE CREEK LANDFILL | NEW BRAUNFELS | TX | 650,000 |
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

| | | | |
|---|---|---|---|
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| | **Total Sq. Ft.** | | **68,990,327** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

**RESUME**

NAME: Mouane Sanithsone



POSITION: Plastic Weld Technician

EXPERIENCE: Has worked on the following projects since 6/4/93

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| MOBIL OIL CORP BASIN LINER | WOODHAVEN | MI | 7,806 |
| VFL SEC. CONT. LINER | PHILADELPHIA | PA | 4,830 |
| BECHTEL WATER MANAGEMENT PROJ. | PASADENA | TX | 10,565 |
| IKS CULVERT AND PAVING LINER | HOUSTON | TX | 6,476 |
| FORMOSA PLASTICS MAINTENENCE | POINT COMFORT | TX | 2,700 |
| NORTH START STEEL EVAP. POND | KINGMAN | AZ | 164,539 |
| SAN FRANCISCO AIRPORT POND | SAN FRANCISCO | CA | 2,570 |
| IT CORP: BEAZER DISPOSAL CELL | OROVILLE | CA | 48,120 |
| SHELL OIL ETP TANK PROJECT | MARTINEZ | CA | 298,193 |
| NEW BEDFORD LANDFILL | DARTMOUTH | MA | 76,150 |
| CROTON LANDFILL CAP | CROTON ON HUDSON | NY | 7,641 |
| CHENANGO COUNTY LF EXPANSION | EAST PHARASALIA | NY | 3,914 |
| RANDOLPH CLOSURE PHASE I | RANDOLPH | MA | 3,990 |
| OLD SPRINGFIELD LANDFILL | SPRINGFIELD | VT | 4,061 |
| STARR ENTERPRISES LANDFILL | DELAWARE CITY | DE | 11,071 |
| NORTHERN TIER FIELD 5 | TROY | PA | 6,686 |
| FORESTLAWN SEDIMENT POND | CLEARFIELD | PA | 34,166 |
| BFI GREENTREE CELL E2-B | KERSEY | PA | 29,573 |
| BRANDYWINE SEDIMENT POND | BRANDYWINE | MD | 55,150 |
| UPPER OCCOQUAN LANDFILL | CENTERVILLE | VA | 142,201 |
| HOECHST CELANESE CORP | NARROWS | VA | 279,646 |
| LTV STEEL LANDFILL CAP | CLEVELAND | OH | 36,401 |
| FOX POINT STATE PARK CAP | WILMINGTON | DE | 204,688 |
| MIDDLEPOINT BFI | MURFEESBORO | TN | 47,386 |
| VALLEY VIEW LANDFILL | SULPHUR | KY | 765,875 |
| GHENT GENERATING STATION | GHENT | KY | 1,139,158 |
| SARASOTA COUNTY LANDFILL CAP | SARASOTA | FL | 1,403,073 |
| K&W LANDFILL | ONTONGAN | MI | 264,525 |
| DELTA SOLID WASTE AUTHORITY | ESCANABA | MI | 55,017 |
| RICHMOND SANITARY LANDFILL IV | REED CITY | MI | 91,903 |

| | | | |
|---|---|---|---|
| SHELL DEER PARK CELL #2 | DEER PARK | TX | 476,739 |
| BFI SINTON | SINTON | TX | 121,213 |
| ST. JOHNS LANDFILL | PORTLAND | OR | 1,425,038 |
| MEDICAL LAKE GRAHAM ROAD | MEDICAL LAKE | WA | 132,453 |
| MT SOLO LF WEYERHAEUSER PAPER | LONGVIEW | WA | 1,320 |
| USS POSCO INDUSTRIES LF | PITTSBURG | CA | 17,728 |
| COFFIN BUTTE LANDFILL | CORVALIS | OR | 1,200,000 |
| MARION COUNTY LANDFILL | WOODBURN | OR | 600,000 |
| HILLSBORO LANDFILL | HILLSBORO | OR | 600,000 |
| WOMACK INC. | FREEPORT | TX | 13,800 |
| ZINC CORP | BARTLESVILLE | OK | 65,000 |
| BAILEY SUPERFUND | BRIDGE CITY | TX | 628,000 |
| COFFIN BUTTE | CORVALLIS | OR | 470,553 |
| BEAVER RESERVOIR | GUNNISON | CO | 128,010 |
| WILMARTH ASH DISP | MANKATO | MN | 83,549 |
| SHERRCO ASH | BECKER | MN | 220,000 |
| BRUNNER LANDFILL | PITTSBURGH | PA | 398,732 |
| GASTON COUNTY | GASTON | NC | 595,469 |
| ISP | LINDEN | NJ | 101,327 |
| HARDIN COUNTY | KOUNTZ | TX | 144,655 |
| NEW HANOVER COUNTY LANDFILL | WILMINGTON | NC | 1,570,000 |
| GOULD SUPERFUND SITE | PORTLAND | OR | 158,468 |
| GOULD SUPERFUND SITE | PORTLAND | OR | 182,842 |
| COFFIN BUTTE LANDFILL | CORVALLIS | OR | 1,059,300 |
| OCEAN COUNTY LANDFILL | LAKEHURST | NJ | 12,000 |
| GOULD SUPERFUND SITE | PORTLAND | OR | 275,000 |
| HARDIN COUNTY | KOUNTZ | TX | 220,000 |
| ALTURI LANDFILL | GOSHEN | NY | 287,000 |
| ROCK PRARIE | COLLEGE STATION | TX | 210,000 |
| AMARILLO LANDFILL | AMARILLO | TX | 330,000 |
| TRANS JORDAN | SOUTH JORDAN | UT | 450,000 |
| UNION PARISH | FARMERSVILLE | LA | 252,000 |
| WASCO COUNTY | THE DALLES | OR | 450,175 |
| QUALITY EGG | AUBURN | ME | 407,000 |
| KERR MCGEE | SODA SPRINGS | ID | 1,117,703 |
| McGILL ROAD LANDFILL | JACKSON | MI | 220,000 |
| LAKEVIEW | AUSTIN | TX | 287,000 |
| EXEL BEEF | PLAINVIEW | TX | 110,000 |
| EL CENTRO | ROBSTOWN | TX | 469,000 |
| WEYERHAUSER | CASTLE ROCK | WA | 450,000 |
| JOHNSTON COUNTY LANDFILL | SMITHVILLE | NC | 1,506,844 |



| | | | |
|---|---|---|---|
| LYCOMING CO. LANDFILL | WILLIAMSPORT | PA | 972,000 |
| FMC | LYNCHBURG | VA | 422,000 |
| TRANS-ASH | SEMORA | NC | 744,000 |
| SOUTHERN PLAINS LANDFILL | ALEX | OK | 197,000 |
| FMC | FRONT ROYAL | VA | 330,000 |
| WEYERHAUSER | CASTLE ROCK | WA | 600,000 |
| PORTSMOUTH NAVAL SHIPYARD | KITTERY | ME | 470,000 |
| MILL CREEK LANDFILL | FORT POLK | LA | 280,000 |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

| | | | |
|---|---|---|---|
| LOUDOUN COUNTY LANDFILL | LEESBURG | VA | 1,650,000 |
| J BAR J | MILFORD | NE | 264,000 |
| LEE COUNTY LANDFILL | BISHOPVILLE | SC | 412,907 |
| THREE RIVERS LANDFILL | AIKEN | SC | 2,700,000 |
| OKLAHOMA CITY LANDFILL | OKLAHOMA CITY | OK | 24,462 |
| LEE COUNTY LANDFILL | BISHOPVILLE | SC | 412,907 |
| CLOVER POWER STATION | SOUTH BOSTON | VA | 1,200,000 |
| THREE RIVERS LANDFILL | BISHOPVILLE | SC | 300,000 |
| THREE RIVERS LANDFILL | AIKEN | SC | 300,000 |
| CLOVER POWER STATION | SOUTH BOSTON | VA | 1,200,000 |
| JEFFERSON COUNTY LANDFILL | N. LITTLE ROCK | AR | 487,544 |
| COVEL GARDENS LANDFILL | SAN ANTONIO | TX | 595,000 |
| AUSTIN COMMUNITY LANDFILL | AUSTIN | TX | 377,000 |
| FREDERICKSBURG LANDFILL | FREDERICKSBURG | TX | 654,000 |
| JEFFERSON COUNTY LANDFILL | WHITEHALL | AR | 230,000 |
| COVEL GARDENS LANDFILL | SAN ANTONIO | TX | 1,200,000 |
| WASTE MANAGEMENT - ECO VISTA LF | SPRINGDALE | AR | 600,000 |
| ECO-VISTA | TONITOWN | AR | 1,655,000 |
| DEER PARK | LA PORTE | TX | 260,000 |
| TWO PINE LANDFILL | N. LITTLE ROCK | AR | 320,000 |
| KENT COUNTY | GRAND RAPIDS | MI | 300,000 |
| OUTER LOOP LANDFILL | LOUISVILLE | KY | 125,000 |
| TWO PINE LANDFILL | N. LITTLE ROCK | AR | 1,525,000 |
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 330,000 |
| DFW LANDFILL | LEWISVILLE | TX | 871,000 |
| LUMINANT MARTIN LAKE | TATEM | TX | 900,000 |
| KING AND QUEEN | LITTLE PLYMOUTH | VA | 334,000 |
| ECHO VISTA | TONTITOWN | AR | 16,500,000 |
| SECURITY LANDFILL | CLEVELAND | TX | 427,000 |
| MESQUITE CREEK LANDFILL | NEW BRAUNFELS | TX | 650,000 |
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| | **Total Sq. Ft.** | | **66,663,882** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

## RESUME

NAME: Antonio Ramirez



POSITION: Technician

EXPERIENCE: Has worked on the following projects since 07/01/02

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| LYCOMING CO. LANDFILL | WILLIAMS PORT | PA | 972,000 |
| OCEAN CO. LANDFILL | LAKEHURST | NJ | 542,000 |
| TRANS JORDAN | SOUTH JORDAN | UT | 556,672 |
| PAGEL LANDFILL | ROCKFORD | IL | 385,000 |
| CARROLL CO. LANDFILL | CARROLL | IA | 283,000 |
| FMC | LYNCHBURGH | VA | 422,000 |
| TRANS-ASH | SEMORA | NC | 744,000 |
| SOUTHERN PLAINS LANDFILL | ALEX | OK | 197,000 |
| FMC | FRONT ROYAL | VA | 330,000 |
| MANN LANDFILL | WEST POINT | VA | 320,000 |
| INTERNATIONAL PAPER | FRANKLIN | VA | 370,000 |
| HART CREOSOTE PLANT | JASPER | TX | 1,271,000 |
| APEX | SPRINGFIELD | OH | 3,200,000 |
| BRUNSWICK WASTE | LAWRENCEVILLE | VA | 230,000 |
| ANDERSON LANDFILL | BELTON | SC | 183,724 |
| WASATCH INTEGRATED | LAYTON | UT | 4,000,000 |
| SORD LANDFILL | ARDMORE | OK | 270,000 |
| WASATCH INTEGRATED | LAYTON | UT | 1,000,000 |
| APEX LANDFILL | STUBENVILLE | OH | 250,000 |
| WASTE MANAGEMENT | TEMPLE | TX | 610,000 |
| VEOLIA LANDFILL | HORICON | WI | 650,000 |
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 330,000 |
| DFW LANDFILL | LEWISVILLE | TX | 871,000 |
| LUMINANT MARTIN LAKE | TATEM | TX | 900,000 |
| KING AND QUEEN | LITTLE PLYMOUTH | VA | 334,000 |
| ECHO VISTA | TONTITOWN | AR | 16,500,000 |
| SECURITY LANDFILL | CLEVELAND | TX | 427,000 |
| MESQUITE CREEK LANDFILL | NEW BRAUNFELS | TX | 650,000 |
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| | **Total Sq. Ft.** | | **39,986,466** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

## RESUME

NAME: Sene Chanthasouxat



POSITION: Field Technician

EXPERIENCE: Has worked on the following projects since 09-20-10

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| | **Total Sq. Ft.** | | **3,188,070** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

## RESUME

NAME: Victor Martinez



POSITION: Field Technician

EXPERIENCE: Has worked on the following projects since 02/14/07

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| WASATCH INTEGRATED | SALT LAKE CITY | UT | 440,000 |
| PROGRESS ENERGY | ROXBORO | NC | 500,000 |
| WASATCH INTEGRATED | LAYTON | UT | 4,000,000 |
| SORD LANDFILL | ARDMORE | OK | 270,000 |
| WASATCH INTEGRATED | LAYTON | UT | 1,000,000 |
| APEX LANDFILL | STUBENVILLE | OH | 250,000 |
| WASTE MANAGEMENT | TEMPLE | TX | 610,000 |
| VEOLIA LANDFILL | HORICON | WI | 650,000 |
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 330,000 |
| DFW LANDFILL | LEWISVILLE | TX | 871,000 |
| LUMINANT MARTIN LAKE | TATEM | TX | 900,000 |
| KING AND QUEEN | LITTLE PLYMOUTH | VA | 334,000 |
| ECHO VISTA | TONTITOWN | AR | 16,500,000 |
| SECURITY LANDFILL | CLEVELAND | TX | 427,000 |
| MESQUITE CREEK LANDFILL | NEW BRAUNFELS | TX | 650,000 |
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| | **Total Sq. Ft.** | | **30,920,070** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

## RESUME

NAME: LaneVongpathoum



POSITION: Field Technician

EXPERIENCE: Has worked on the following projects since 12/05/06

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| LEE COUNTY LANDFILL | BISHOPVILLE | SC | 412,907 |
| ANDERSON LANDFILL | BELTON | SC | 183,724 |
| OUTER LOOP LANDFILL | LOUISVILLE | KY | 813,098 |
| COVEL GARDENS LANDFILL | SAN ANTONIO | TX | 595,000 |
| AUSTIN COMMUNITY LANDFILL | AUSTIN | TX | 377,000 |
| APEX LANDFILL | STUBENVILLE | OH | 250,000 |
| WASTE MANAGEMENT | TEMPLE | TX | 610,000 |
| VEOLIA LANDFILL | HORICON | WI | 650,000 |
| WASTE MANAGEMENT MOTIVA | BAYTOWN | TX | 250,000 |
| EDINBURG LANDFILL | EDINBURG | TX | 392,000 |
| GB BIOSCINCES | HOUSTON | TX | 2,000,000 |
| WASTE MANAGEMENT | NEW BOSTON | TX | 300,000 |
| COASTAL PLAINS LANDFILL | ALVIN | TX | 567,000 |
| ANDERSON LANDFILL | BELTON | SC | 183,724 |
| THREE RIVERS LANDFILL | AIKEN | SC | 300,000 |
| CLOVER POWER STATION | SOUTH BOSTON | VA | 1,200,000 |
| JEFFERSON COUNTY LANDFILL | N. LITTLE ROCK | AR | 487,544 |
| OUTER LOOP LANDFILL | LOUISVILLE | KY | 813,098 |
| COVEL GARDENS LANDFILL | SAN ANTONIO | TX | 1,200,000 |
| ECO-VISTA | TONITOWN | AR | 1,655,000 |
| DEER PARK | LA PORTE | TX | 260,000 |
| TWO PINE LANDFILL | N. LITTLE ROCK | AR | 320,000 |
| KENT COUNTY | GRAND RAPIDS | MI | 300,000 |
| OUTER LOOP LANDFILL | LOUISVILLE | KY | 125,000 |
| TWO PINE LANDFILL | N. LITTLE ROCK | AR | 1,525,000 |
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 330,000 |
| DFW LANDFILL | LEWISVILLE | TX | 871,000 |
| LUMINANT MARTIN LAKE | TATEM | TX | 900,000 |



| | | | |
|---|---|---|---|
| KING AND QUEEN | LITTLE PLYMOUTH | VA | 334,000 |
| ECHO VISTA | TONTITOWN | AR | 16,500,000 |
| SECURITY LANDFILL | CLEVELAND | TX | 427,000 |
| MESQUITE CREEK LANDFILL | NEW BRAUNFELS | TX | 650,000 |
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |

| | | | |
|---|---|---|---|
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |

| | |
|---|---|
| **Total Sq. Ft.** | **38,970,165** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

**RESUME**

NAME: Roberto Hernandez



POSITION: Field Technician

EXPERIENCE: Has worked on the following projects since 5/16/05

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| COASTAL PLAINS LANDFILL | ALVIN | TX | 280,000 |
| LEE COUNTY LANDFILL | BISHOPVILLE | SC | 412,907 |
| THREE RIVERS LANDFILL | AIKEN | SC | 2,700,000 |
| OKLAHOMA CITY LANDFILL | OKLAHOMA CITY | OK | 24,462 |
| LEE COUNTY LANDFILL | BISHOPVILLE | SC | 412,907 |
| APEX LANDFILL | STUBENVILLE | OH | 250,000 |
| WASTE MANAGEMENT | TEMPLE | TX | 610,000 |
| VEOLIA LANDFILL | HORICON | WI | 650,000 |
| WASTE MANAGEMENT MOTIVA | BAYTOWN | TX | 250,000 |
| EDINBURG LANDFILL | EDINBURG | TX | 392,000 |
| GB BIOSCINCES | HOUSTON | TX | 2,000,000 |
| WASTE MANAGEMENT | NEW BOSTON | TX | 300,000 |
| COASTAL PLAINS LANDFILL | ALVIN | TX | 567,000 |
| ANDERSON LANDFILL | BELTON | SC | 183,724 |
| THREE RIVERS LANDFILL | AIKEN | SC | 300,000 |
| CLOVER POWER STATION | SOUTH BOSTON | VA | 1,200,000 |
| JEFFERSON COUNTY LANDFILL | N. LITTLE ROCK | AR | 487,544 |
| OUTER LOOP LANDFILL | LOUISVILLE | KY | 813,098 |
| COVEL GARDENS LANDFILL | SAN ANTONIO | TX | 1,200,000 |
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 330,000 |
| DFW LANDFILL | LEWISVILLE | TX | 871,000 |
| LUMINANT MARTIN LAKE | TATEM | TX | 900,000 |
| KING AND QUEEN | LITTLE PLYMOUTH | VA | 334,000 |
| ECHO VISTA | TONTITOWN | AR | 16,500,000 |
| SECURITY LANDFILL | CLEVELAND | TX | 427,000 |
| MESQUITE CREEK LANDFILL | NEW BRAUNFELS | TX | 650,000 |
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| **Total Sq. Ft.** | | | **36,233,712** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

## RESUME

NAME: Antolin Yata



POSITION: Technician

EXPERIENCE: Has worked on the following projects since 8/24/07

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| COVEL GARDENS LANDFILL | SAN ANTONIO | TX | 595,000 |
| AUSTIN COMMUNITY LANDFILL | AUSTIN | TX | 377,000 |
| WASTE MANAGEMENT | TEMPLE | TX | 610,000 |
| VEOLIA LANDFILL | HORICON | WI | 650,000 |
| BAYTOWN LANDFILL | BAYTOWN | TX | 285,448 |
| FREDERICKSBURG LANDFILL | FREDERICKSBURG | TX | 654,000 |
| JEFFERSON COUNTY LANDFILL | WHITEHALL | AR | 230,000 |
| KING & QUEEN LANDFILL | LITTLE PLYMOUTH | VA | 1,000,000 |
| CITY OF MIDLAND LANDFILL | MIDLAND | TX | 460,000 |
| COEUR ROCHESTER | LOVELOCK | NV | 120,000 |
| HART CREOSOTE PLANT | JASPER | TX | 1,271,000 |
| APEX | SPRINGFIELD | OH | 3,200,000 |
| BAYTOWN LANDFILL | BAYTOWN | TX | 162,000 |
| WILLIAMSON COUNTY LANDFILL | HUTTO | TX | 518,000 |
| DFW LANDFILL | LEWISVILLE | TX | 871,000 |
| WASATCH INTEGRATED | LAYTON | UT | 4,000,000 |
| SORD LANDFILL | ARDMORE | OK | 270,000 |
| WASATCH INTEGRATED | LAYTON | UT | 1,000,000 |
| TWO PINE LANDFILL | NORTH LITTLE ROCK | AR | 2,660,000 |
| ECHO VISTA | TONTITOWN | AR | 16,500,000 |
| SECURITY LANDFILL | CLEVELAND | TX | 427,000 |
| MESQUITE CREEK LANDFILL | NEW BRAUNFELS | TX | 650,000 |
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| | **Total Sq. Ft.** | | **39,698,518** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

**RESUME**

NAME: Abelino Garcia



POSITION: Weld Technician

EXPERIENCE: Has worked on the following projects since 04/8/05

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| LOUDOUN COUNTY LANDFILL | LEESBURG | VA | 1,650,000 |
| CITY OF MIDLAND LANDFILL | MIDLAND | TX | 460,000 |
| COASTAL PLAINS LANDFILL | ALVIN | TX | 280,000 |
| G&P LANDFILL | MILFORD | NE | 490,000 |
| HART CREOSOTE PLANT | JASPER | TX | 1,271,000 |
| APEX | SPRINGFIELD | OH | 3,200,000 |
| CMS LANDFILL | CONCORD | SC | 1,030,000 |
| BRUNSWICK WASTE | LAWRENCEVILLE | VA | 230,000 |
| ANDERSON LANDFILL | BELTON | SC | 183,724 |
| WASATCH INTEGRATED | LAYTON | UT | 4,000,000 |
| SORD LANDFILL | ARDMORE | OK | 270,000 |
| WASATCH INTEGRATED | LAYTON | UT | 1,000,000 |
| APEX LANDFILL | STUBENVILLE | OH | 250,000 |
| WASTE MANAGEMENT | TEMPLE | TX | 610,000 |
| VEOLIA LANDFILL | HORICON | WI | 650,000 |
| WASTE MANAGEMENT MOTIVA | BAYTOWN | TX | 250,000 |
| EDINBURG LANDFILL | EDINBURG | TX | 392,000 |
| GB BIOSCINCES | HOUSTON | TX | 2,000,000 |
| WASTE MANAGEMENT | NEW BOSTON | TX | 300,000 |
| COASTAL PLAINS LANDFILL | ALVIN | TX | 567,000 |
| ANDERSON LANDFILL | BELTON | SC | 183,724 |
| THREE RIVERS LANDFILL | AIKEN | SC | 300,000 |
| CLOVER POWER STATION | SOUTH BOSTON | VA | 1,200,000 |
| JEFFERSON COUNTY LANDFILL | N. LITTLE ROCK | AR | 487,544 |
| OUTER LOOP LANDFILL | LOUISVILLE | KY | 813,098 |
| COVEL GARDENS LANDFILL | SAN ANTONIO | TX | 1,200,000 |
| KENT COUNTY LANDFILL | GRAND RAPIDS | MI | 330,000 |
| DFW LANDFILL | LEWISVILLE | TX | 871,000 |

Abelino Garcia



| | | | |
|---|---|---|---|
| LUMINANT MARTIN LAKE | TATEM | TX | 900,000 |
| KING AND QUEEN | LITTLE PLYMOUTH | VA | 334,000 |
| ECHO VISTA | TONTITOWN | AR | 16,500,000 |
| SECURITY LANDFILL | CLEVELAND | TX | 427,000 |
| MESQUITE CREEK LANDFILL | NEW BRAUNFELS | TX | 650,000 |
| BUTLER COUNTY LANDFILL | DAVID CITY | NE | 263,970 |
| NOBLES COUNTY LANDFILL | RUSHMORE | MN | 36,000 |
| KIMBALL LANDFILL | KIMBALL | NE | 1,170,000 |

| | | | |
|---|---|---|---|
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| | **Total Sq. Ft.** | | **46,468,160** |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

## RESUME

NAME: Daniel Phachomphon



POSITION: Field Technician

EXPERIENCE: Has worked on the following projects since 5/16/06

| PROJECT | LOCATION | | SQ FT |
|---|---|---|---|
| THREE RIVERS LANDFILL | AIKEN | SC | 300,000 |
| CLOVER POWER STATION | SOUTH BOSTON | VA | 1,200,000 |
| JEFFERSON COUNTY LANDFILL | N. LITTLE ROCK | AR | 487,544 |
| OUTER LOOP LANDFILL | LOUISVILLE | KY | 813,098 |
| COVEL GARDENS LANDFILL | SAN ANTONIO | TX | 595,000 |
| AUSTIN COMMUNITY LANDFILL | AUSTIN | TX | 377,000 |
| ECHO VISTA | SPRINGDALE | AR | 90,100 |
| OLD DOMINION | RICHMOND | VA | 959,000 |
| ANSON COUNTY LANDFILL | POLKTON | NC | 669,000 |
| | **Total Sq. Ft.** | | **5,490,742** |

# APPENDIX B
# LABORATORY PRECONSTRUCTION AND CONSTRUCTION TEST RESULTS

# APPENDIX B-1
# PRECONSTRUCTION TEST DATA

Golder Associates

# SUMMARY OF PRECONSTRUCTION LABORATORY RESULTS



**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas

| Sample ID | Compaction | | Natural Moisture (%) | Atterberg Limits | | | %<#200 Sieve | Class-ification | Unit Weight | | Permeability (cm/sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum Dry Density (lb/cuft) | Optimum Moisture (%) | | Liquid Limit | Plastic Limit | Plasticity Index | | | Moisture Content (%) | Dry Density (psf) | |
| QCL-001 | 99.9 | 19.2 | 24.4 | 58 | 21 | 37 | 96 | CH | 19.5 | 94.9 | 4.6E-09 |
| QCL-2-3 | 101.7 | 20.2 | | 49 | 13 | 36 | 78 | CL | 20.1 | 96.2 | 1.07E-08 |
| QCL-2-4 | 96.7 | 22.0 | 16.4 | 52 | 13 | 39 | 88 | CH | 21.9 | 92.0 | 8.38E-09 |
| QCL-2-7 | 104.4 | 17.8 | 10.8 | 59 | 18 | 41 | 80 | CH | 17.6 | 99.1 | 1.22E-08 |
| QCL-008 | 102.1 | 17.9 | 17.2 | 42 | 19 | 23 | 79 | CL | 17.8 | 96.6 | 9.4E-08 |
| QCL-A-2 | 97.4 | 23.2 | 21.8 | 72 | 24 | 48 | 97 | CH | 24.6 | 92.9 | 1.5E-08 |
| QCL-FGDB-04A | 110.0 | 15.9 | 11.1 | 55 | 15 | 40 | 42 | SC | 20.7 | 98.7 | 9.69E-08 |

LAB SUMMARY - CQA - PRECONSTRUCTION - GINT STD US LAB.GDT - 1/17/12 13:50 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

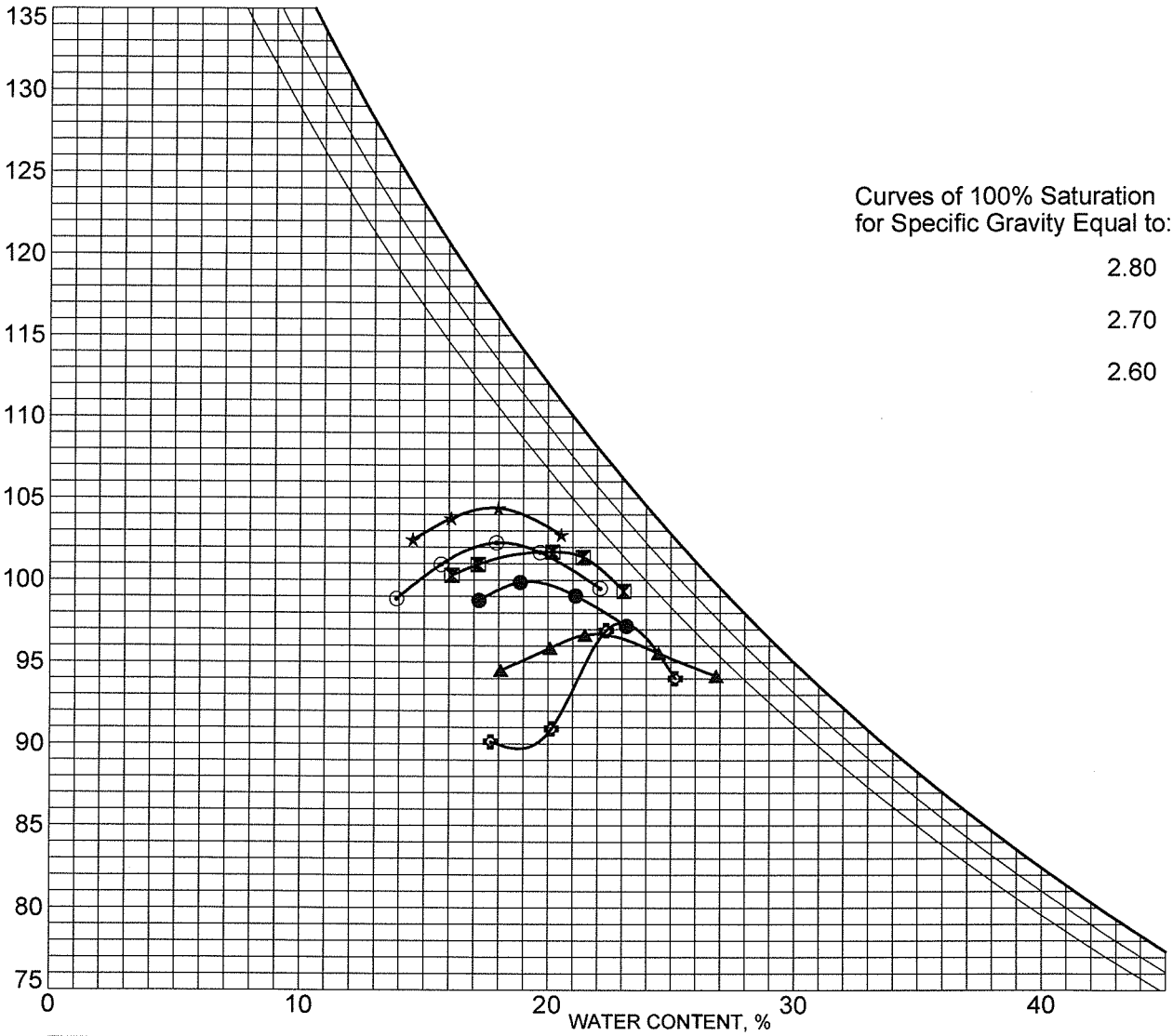
# MOISTURE/DENSITY RELATIONSHIP

# MOISTURE-DENSITY RELATIONSHIP

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| | BOREHOLE | DEPTH | Description of Materials |
|---|---|---|---|
| ● | QCL-001 | --- | FAT CLAY(CH) |
| ⊠ | QCL-2-3 | --- | LEAN CLAY with SAND(CL) |
| ▲ | QCL-2-4 | --- | FAT CLAY(CH) |
| ★ | QCL-2-7 | | FAT CLAY with SAND(CH) |
| ⊙ | QCL-008 | | LEAN CLAY with SAND(CL) |
| ✿ | QCL-A-2 | | FAT CLAY(CH) |

| | BOREHOLE | DEPTH | Test Method | LL | PL | PI | Max DD | Optimum WC |
|---|---|---|---|---|---|---|---|---|
| ● | QCL-001 | --- | ASTM D698 Method A | 58 | 21 | 37 | 99.9 PCF | 19.2 % |
| ⊠ | QCL-2-3 | --- | ASTM D698 Method A | 49 | 13 | 36 | 101.7 PCF | 20.2 % |
| ▲ | QCL-2-4 | --- | ASTM D698 Method A | 52 | 13 | 39 | 96.7 PCF | 22.0 % |
| ★ | QCL-2-7 | | ASTM D698 Method A | 59 | 18 | 41 | 104.4 PCF | 17.8 % |
| ⊙ | QCL-008 | | ASTM D698 Method A | 42 | 19 | 23 | 102.1 PCF | 17.9 % |
| ✿ | QCL-A-2 | | ASTM D698 Method A | 72 | 24 | 48 | 97.4 PCF | 23.2 % |

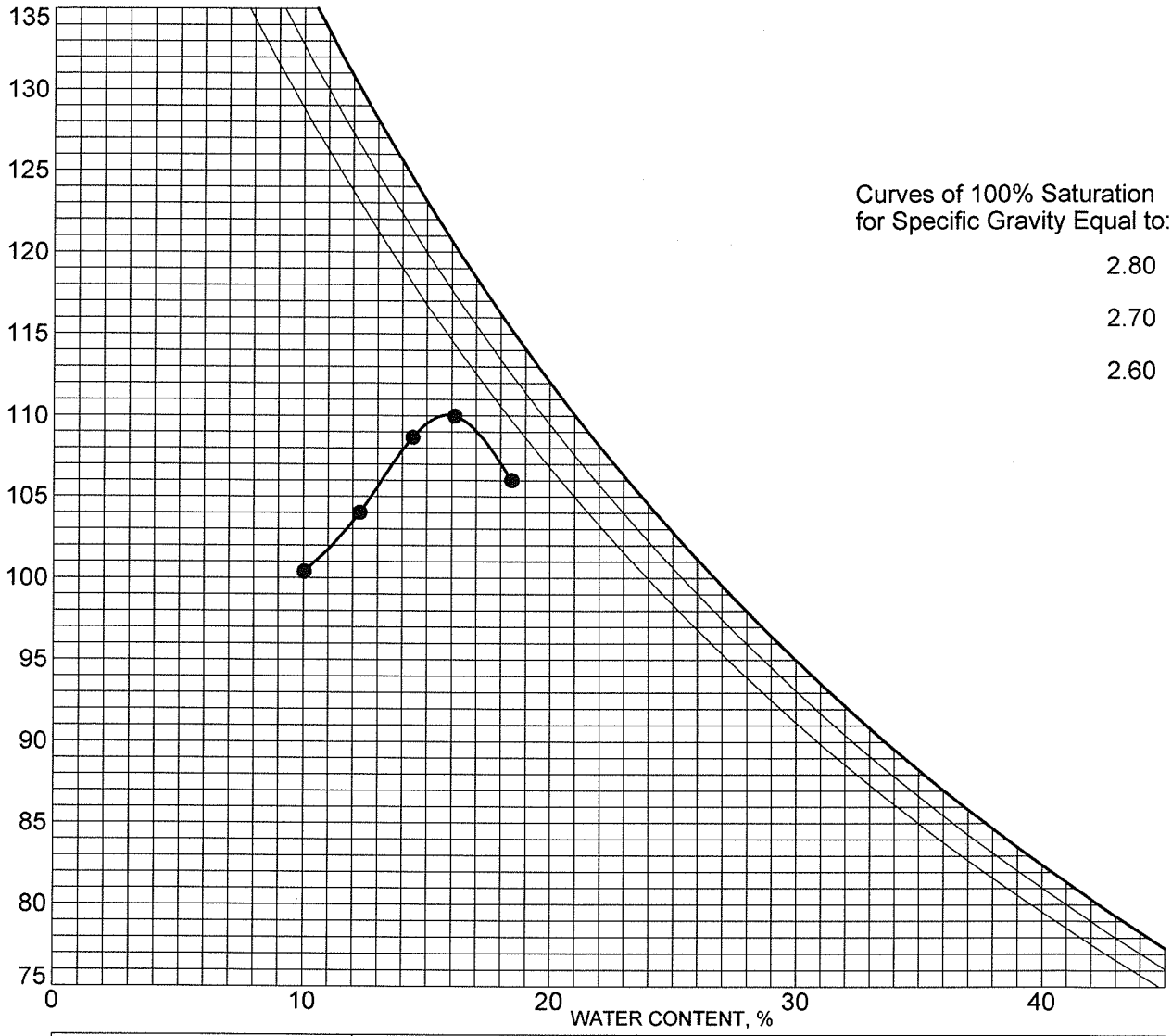
COMPACTION (MULTIPLE CURVES) - GINT STD US LAB.GDT - 1/17/12 13:51 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# MOISTURE-DENSITY RELATIONSHIP

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| | BOREHOLE | DEPTH | Description of Materials |
|---|---|---|---|
| ● | QCL-FGDB-04A | --- | CLAYEY SAND(SC) |
| | | --- | |
| | | --- | |
| | | | |
| | | | |
| | | | |

| | BOREHOLE | DEPTH | Test Method | LL | PL | PI | Max DD | Optimum WC |
|---|---|---|---|---|---|---|---|---|
| ● | QCL-FGDB-04A | --- | ASTM D698 Method A | 55 | 15 | 40 | 110.0 PCF | 15.9 % |
| | | --- | | | | | | |
| | | --- | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

COMPACTION (MULTIPLE CURVES) - GINT STD US LAB.GDT - 1/17/12 13:51 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

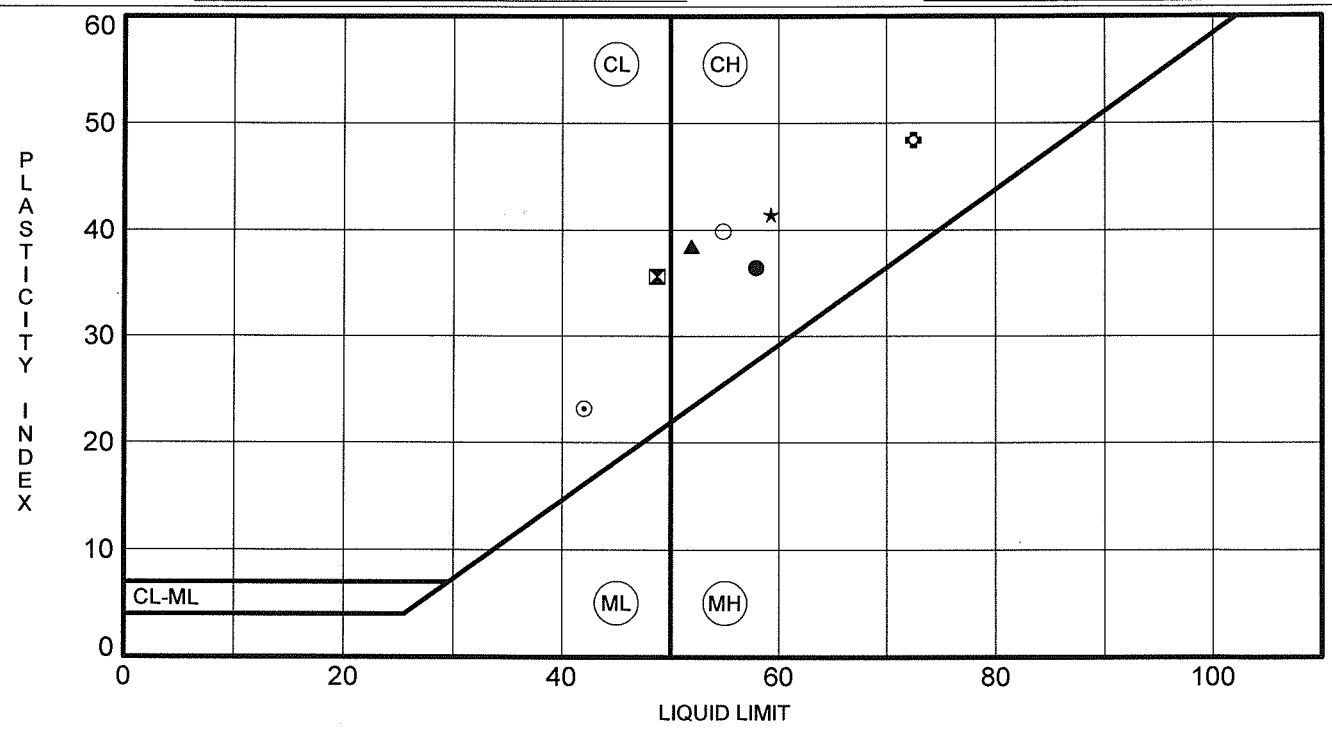
# ATTERBERG LIMITS

# ATTERBERG LIMITS' RESULTS

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| | BOREHOLE | DEPTH | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|---|
| ● | QCL-001 | --- | 58 | 21 | 37 | 96 | FAT CLAY(CH) |
| ⊠ | QCL-2-3 | --- | 49 | 13 | 36 | 78 | LEAN CLAY with SAND(CL) |
| ▲ | QCL-2-4 | --- | 52 | 13 | 39 | 88 | FAT CLAY(CH) |
| ★ | QCL-2-7 | | 59 | 18 | 41 | 80 | FAT CLAY with SAND(CH) |
| ⊙ | QCL-008 | | 42 | 19 | 23 | 79 | LEAN CLAY with SAND(CL) |
| ✿ | QCL-A-2 | | 72 | 24 | 48 | 97 | FAT CLAY(CH) |
| ○ | QCL-FGDB-04A | | 55 | 15 | 40 | 42 | CLAYEY SAND(SC) |

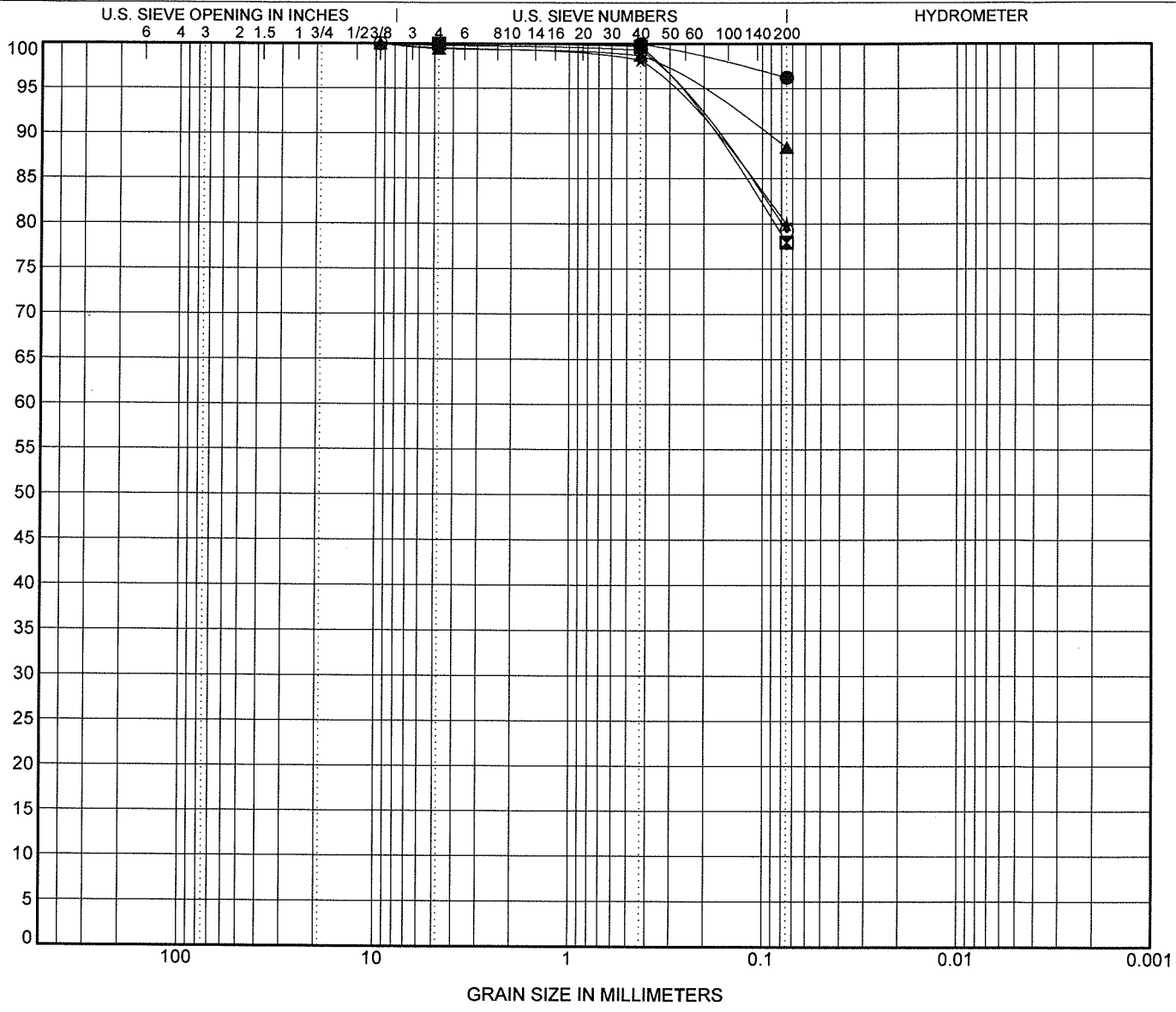
ATTERBERG LIMITS - CQA - PRECONSTRUCTION - GINT STD US LAB.GDT - 1/17/12 13:51 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE ANALYSIS

# GRAIN SIZE DISTRIBUTION

Golder Associates

**CLIENT** Luminant
**PROJECT NAME** Oak Grove FGD-B Pond CQA
**PROJECT NUMBER** 113-9478801
**PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|
| ● QCL-001 | --- | FAT CLAY(CH) | 58 | 21 | 37 | | |
| ⊠ QCL-2-3 | --- | LEAN CLAY with SAND(CL) | 49 | 13 | 36 | | |
| ▲ QCL-2-4 | --- | FAT CLAY(CH) | 52 | 13 | 39 | | |
| ★ QCL-2-7 | --- | FAT CLAY with SAND(CH) | 59 | 18 | 41 | | |
| ⊙ QCL-008 | | LEAN CLAY with SAND(CL) | 42 | 19 | 23 | | |

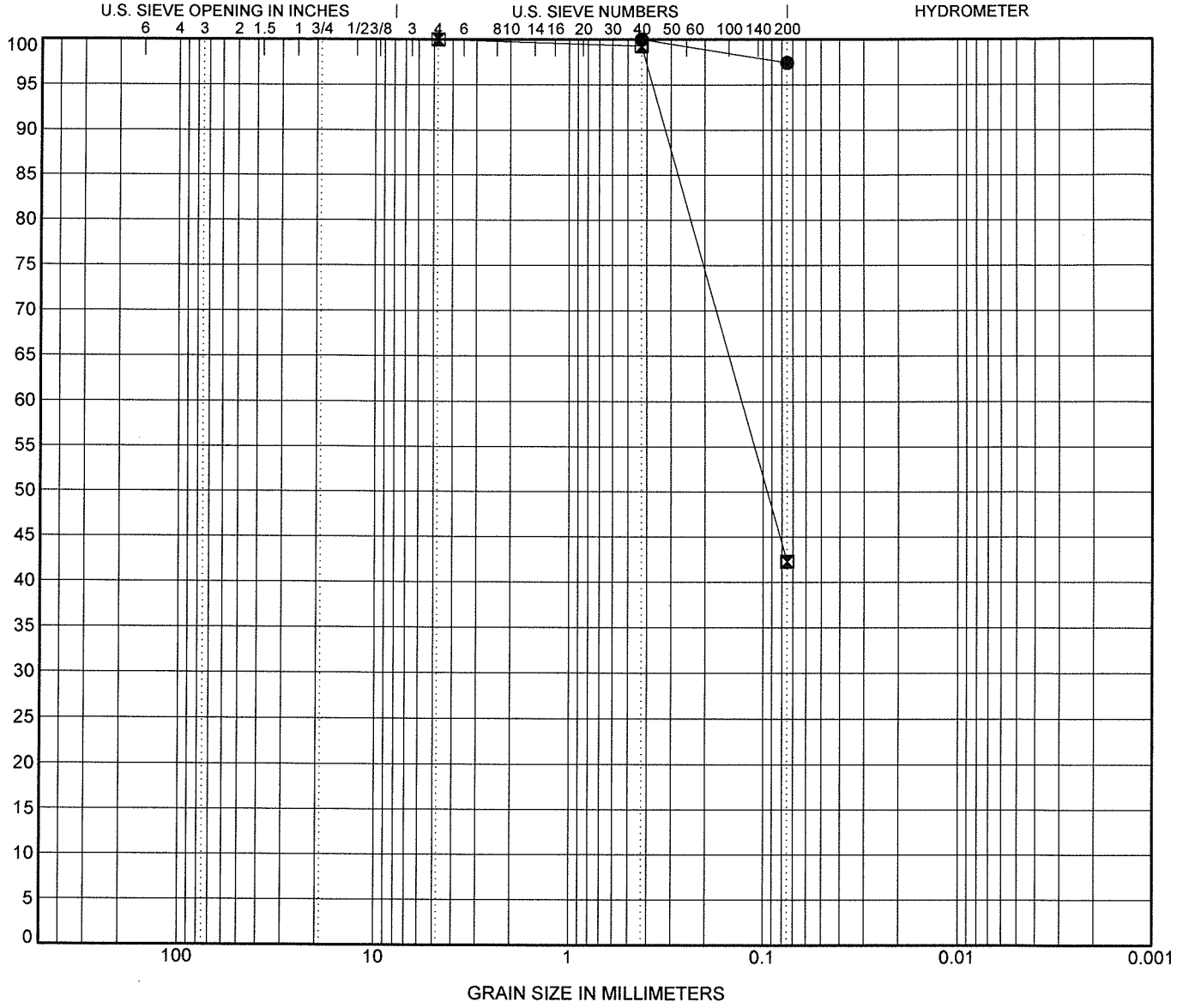
| BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|
| ● QCL-001 | --- | 4.75 | | | | 0.0 | 3.8 | 96.2 | |
| ⊠ QCL-2-3 | --- | 4.75 | | | | 0.0 | 22.1 | 77.9 | |
| ▲ QCL-2-4 | --- | 9.5 | | | | 0.5 | 11.0 | 88.4 | |
| ★ QCL-2-7 | | 9.5 | | | | 0.4 | 19.6 | 79.9 | |
| ⊙ QCL-008 | | 9.5 | | | | 0.2 | 20.6 | 79.3 | |

GRAIN SIZE - CQA - PRECONSTRUCTION - GINT STD US LAB.GDT - 1/17/12 13:51 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|
| ● QCL-A-2 | --- | **FAT CLAY(CH)** | **72** | **24** | **48** | | |
| ⊠ QCL-FGDB-04A | --- | **CLAYEY SAND(SC)** | **55** | **15** | **40** | | |
| | --- | | | | | | |
| | --- | | | | | | |
| | | | | | | | |

| BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|
| ● QCL-A-2 | --- | **0.425** | | | | **0.0** | **2.6** | **97.4** | |
| ⊠ QCL-FGDB-04A | --- | **4.75** | **0.129** | | | **0.0** | **57.7** | **42.3** | |
| | --- | | | | | | | | |
| | | | | | | | | | |



GRAIN SIZE - CQA - *RECONSTRUCTION - GINT STD US LAB.GDT - 1/17/12 13:51 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# HYDRAULIC CONDUCTIVITY

# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | | | |
|---|---|---|---|
| PROJECT TITLE: | JAMES CONST / TXU OAK GROVE / TX | Cell Pressure = | 80 psi |
| PROJECT NUMBER | 083-94281 | Backwater Pressure = | 70 psi |
| SAMPLE ID: | QCL-001 | Run Number = | 1 |
| LIFT NUMBER: | | | |

| **Sample Data, Initial** | | inches |
|---|---|---|
| Height, cm | 7.89 | 3.105 |
| Diameter, cm | 7.31 | 2.879 |
| Area, $cm^2$ | 42.00 | |
| Volume, $cm^3$ | 331.23 | |
| Wet Mass, g | 602.1 | |
| Wt. wet soil + tare, gm | 296.00 | |
| Wt. dry soil + tare, gm | 249.40 | |
| Wt. tare, gm | 10.2 | |
| Moisture Content, % | 19.5% | |
| Dry Density, pcf | 94.9 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.77 | |
| Saturation, % | 67.9% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.7

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.19 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

| **Sample Data, Final** | | inches |
|---|---|---|
| Height, cm | 7.98 | 3.143 |
| Diameter, cm | 7.28 | 2.867 |
| Area, $cm^2$ | 41.65 | |
| Volume, $cm^3$ | 332.50 | |
| Wet Mass, g | 677.8 | |
| Wt. wet soil + tare, gm | 685.60 | |
| Wt. dry soil + tare, gm | 539.90 | |
| Wt. tare, gm | 8.1 | |
| Moisture Content, % | 27.4% | |
| Dry Density, pcf | 99.8 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.69 | |
| Saturation, % | 107.6% | |

| Minutes | Seconds | $\Delta t$ (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.7 | 0.85 | 0 | | 0.037 | 1.000 | 0.00E+00 | 23 | 0.931 | 0.0E+00 |
| 5 | 0 | 300 | 28.0 | 0.88 | 0.7 | 1.5E-06 | 0.038 | 0.973 | 4.10E-08 | 23 | 0.931 | 3.8E-08 |
| 18 | 40 | 820 | 27.1 | 0.92 | 0.9 | 5.5E-07 | 0.040 | 0.964 | 2.00E-08 | 23 | 0.931 | 1.9E-08 |
| 32 | 31 | 831 | 26.5 | 0.94 | 0.6 | 5.4E-07 | 0.041 | 0.976 | 1.34E-08 | 23 | 0.931 | 1.3E-08 |
| 44 | 46 | 735 | 26.1 | 0.96 | 0.4 | 6.1E-07 | 0.041 | 0.983 | 1.03E-08 | 23 | 0.931 | 9.5E-09 |
| 56 | 34 | 708 | 25.7 | 0.97 | 0.4 | 6.4E-07 | 0.042 | 0.983 | 1.08E-08 | 23 | 0.931 | 1.0E-08 |
| 67 | 21 | 647 | 25.4 | 0.99 | 0.3 | 7.0E-07 | 0.043 | 0.987 | 8.98E-09 | 23 | 0.931 | 8.4E-09 |
| 77 | 53 | 632 | 25.1 | 1.00 | 0.3 | 7.1E-07 | 0.043 | 0.987 | 9.31E-09 | 23 | 0.931 | 8.7E-09 |
| 95 | 7 | 1034 | 24.7 | 1.01 | 0.4 | 4.4E-07 | 0.044 | 0.982 | 7.74E-09 | 23 | 0.931 | 7.2E-09 |
| 120 | 59 | 1552 | 24.1 | 1.04 | 0.6 | 2.9E-07 | 0.045 | 0.973 | 7.98E-09 | 23 | 0.931 | 7.4E-09 |
| 136 | 29 | 930 | 23.8 | 1.05 | 0.3 | 4.9E-07 | 0.046 | 0.986 | 6.71E-09 | 23 | 0.931 | 6.2E-09 |
| 156 | 26 | 1197 | 23.4 | 1.07 | 0.4 | 3.8E-07 | 0.047 | 0.981 | 7.09E-09 | 23 | 0.931 | 6.6E-09 |
| 171 | 22 | 896 | 23.1 | 1.08 | 0.3 | 5.0E-07 | 0.047 | 0.986 | 7.19E-09 | 23 | 0.931 | 6.7E-09 |
| 211 | 35 | 2413 | 22.4 | 1.11 | 0.7 | 1.9E-07 | 0.049 | 0.966 | 6.51E-09 | 23 | 0.931 | 6.1E-09 |
| 241 | 36 | 1801 | 21.9 | 1.13 | 0.5 | 2.5E-07 | 0.050 | 0.975 | 6.36E-09 | 23 | 0.931 | 5.9E-09 |
| 278 | 35 | 2219 | 21.3 | 1.15 | 0.6 | 2.0E-07 | 0.052 | 0.969 | 6.40E-09 | 23 | 0.931 | 6.0E-09 |
| 300 | 10 | 1295 | 21.0 | 1.17 | 0.3 | 3.5E-07 | 0.052 | 0.984 | 5.53E-09 | 23 | 0.931 | 5.1E-09 |
| 332 | 16 | 1926 | 20.5 | 1.19 | 0.5 | 2.3E-07 | 0.054 | 0.973 | 6.40E-09 | 23 | 0.931 | 6.0E-09 |
| 379 | 51 | 2855 | 19.9 | 1.21 | 0.6 | 1.6E-07 | 0.056 | 0.967 | 5.37E-09 | 23 | 0.931 | 5.0E-09 |
| 410 | 5 | 1814 | 19.6 | 1.22 | 0.3 | 2.5E-07 | 0.057 | 0.983 | 4.26E-09 | 23 | 0.931 | 4.0E-09 |
| 455 | 50 | 2745 | 19.1 | 1.24 | 0.5 | 1.6E-07 | 0.058 | 0.971 | 4.86E-09 | 23 | 0.931 | 4.5E-09 |
| 500 | 25 | 2675 | 18.6 | 1.26 | 0.5 | 1.7E-07 | 0.060 | 0.970 | 5.14E-09 | 23 | 0.931 | 4.8E-09 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **4.6E-09** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | |
| DATE: | 7/29/2008 | DATE: | |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | | | |
|---|---|---|---|
| PROJECT TITLE: | LUMINANT/OAK GROVE LF 1 CELL 2/TX | Cell Pressure = | 80 psi |
| PROJECT NUMBER | 113-94788 | Backwater Pressure = | 70 psi |
| SAMPLE ID: | QCL-2-3 | Run Number = | 1 |
| LIFT NUMBER: | | | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.69 | 3.423 |
| Diameter, cm | 7.28 | 2.868 |
| Area, $cm^2$ | 41.68 | |
| Volume, $cm^3$ | 362.37 | |
| Wet Mass, g | 670.9 | |
| Wt. wet soil + tare, gm | 117.40 | |
| Wt. dry soil + tare, gm | 98.87 | |
| Wt. tare, gm | 6.7 | |
| Moisture Content, % | 20.1% | |
| Dry Density, pcf | 96.2 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.75 | |
| Saturation, % | 72.2% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.4

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.21 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.85 | 3.483 |
| Diameter, cm | 7.35 | 2.893 |
| Area, $cm^2$ | 42.41 | |
| Volume, $cm^3$ | 375.18 | |
| Wet Mass, g | 724.0 | |
| Wt. wet soil + tare, gm | 733.70 | |
| Wt. dry soil + tare, gm | 581.01 | |
| Wt. tare, gm | 9.8 | |
| Moisture Content, % | 26.7% | |
| Dry Density, pcf | 95.0 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.77 | |
| Saturation, % | 93.3% | |

| Minutes | Seconds | $\Delta t$ (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.4 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 2 | 7 | 127 | 26.9 | 0.37 | 0.5 | 3.9E-06 | 0.039 | 0.980 | 7.82E-08 | 22 | 0.956 | 7.47E-08 |
| 10 | 3 | 476 | 26.0 | 0.41 | 0.9 | 1.1E-06 | 0.041 | 0.963 | 3.93E-08 | 22 | 0.956 | 3.75E-08 |
| 15 | 1 | 298 | 25.6 | 0.42 | 0.4 | 1.7E-06 | 0.041 | 0.983 | 2.81E-08 | 22 | 0.956 | 2.68E-08 |
| 24 | 16 | 555 | 25.0 | 0.45 | 0.6 | 9.0E-07 | 0.042 | 0.975 | 2.33E-08 | 22 | 0.956 | 2.22E-08 |
| 32 | 18 | 482 | 24.6 | 0.46 | 0.4 | 1.0E-06 | 0.043 | 0.983 | 1.81E-08 | 22 | 0.956 | 1.73E-08 |
| 38 | 9 | 351 | 24.4 | 0.47 | 0.2 | 1.4E-06 | 0.044 | 0.991 | 1.25E-08 | 22 | 0.956 | 1.19E-08 |
| 45 | 50 | 461 | 24.0 | 0.49 | 0.4 | 1.1E-06 | 0.044 | 0.982 | 1.94E-08 | 22 | 0.956 | 1.86E-08 |
| 52 | 35 | 405 | 23.8 | 0.50 | 0.2 | 1.2E-06 | 0.045 | 0.991 | 1.11E-08 | 22 | 0.956 | 1.06E-08 |
| 62 | 55 | 620 | 23.5 | 0.51 | 0.3 | 8.1E-07 | 0.045 | 0.986 | 1.11E-08 | 22 | 0.956 | 1.06E-08 |
| 73 | 20 | 625 | 23.2 | 0.52 | 0.3 | 8.0E-07 | 0.046 | 0.986 | 1.11E-08 | 22 | 0.956 | 1.06E-08 |
| 80 | 2 | 402 | 23.0 | 0.53 | 0.2 | 1.2E-06 | 0.046 | 0.991 | 1.16E-08 | 22 | 0.956 | 1.11E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.07E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | DM |
| DATE: | 6/17/2011 | DATE: | 6/20/2011 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | | | | |
|---|---|---|---|---|
| PROJECT TITLE: | LUMINANT/OAK GROVE LF 1 CELL 2/TX | Cell Pressure = | 80 | psi |
| PROJECT NUMBER: | 113-94788 | Backwater Pressure = | 70 | psi |
| SAMPLE ID: | QCL-2-4 | Run Number = | 1 | |
| LIFT NUMBER: | | | | |

| **Sample Data, Initial** | | inches |
|---|---|---|
| Height, cm | 8.38 | 3.298 |
| Diameter, cm | 7.25 | 2.853 |
| Area, $cm^2$ | 41.24 | |
| Volume, $cm^3$ | 345.50 | |
| Wet Mass, g | 620.9 | |
| Wt. wet soil + tare, gm | 154.80 | |
| Wt. dry soil + tare, gm | 128.50 | |
| Wt. tare, gm | 8.3 | |
| Moisture Content, % | 21.9% | |
| Dry Density, pcf | 92.0 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.83 | |
| Saturation, % | 71.1% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.8

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.20 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

| **Sample Data, Final** | | inches |
|---|---|---|
| Height, cm | 8.42 | 3.313 |
| Diameter, cm | 7.33 | 2.884 |
| Area, $cm^2$ | 42.15 | |
| Volume, $cm^3$ | 354.65 | |
| Wet Mass, g | 656.2 | |
| Wt. wet soil + tare, gm | 664.10 | |
| Wt. dry soil + tare, gm | 521.08 | |
| Wt. tare, gm | 8.1 | |
| Moisture Content, % | 27.9% | |
| Dry Density, pcf | 90.3 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.87 | |
| Saturation, % | 86.9% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.8 | 0.85 | 0 | | 0.039 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 1 | 36 | 96 | 27.5 | 0.86 | 0.3 | 5.1E-06 | 0.039 | 0.988 | 6.00E-08 | 22 | 0.956 | 5.73E-08 |
| 3 | 24 | 108 | 27.3 | 0.87 | 0.2 | 4.5E-06 | 0.039 | 0.992 | 3.57E-08 | 22 | 0.956 | 3.41E-08 |
| 8 | 43 | 319 | 26.9 | 0.89 | 0.4 | 1.5E-06 | 0.040 | 0.984 | 2.47E-08 | 22 | 0.956 | 2.36E-08 |
| 13 | 45 | 302 | 26.6 | 0.90 | 0.3 | 1.6E-06 | 0.041 | 0.988 | 1.98E-08 | 22 | 0.956 | 1.89E-08 |
| 23 | 33 | 588 | 26.2 | 0.92 | 0.4 | 8.3E-07 | 0.041 | 0.984 | 1.38E-08 | 22 | 0.956 | 1.32E-08 |
| 31 | 36 | 483 | 26.0 | 0.92 | 0.2 | 1.0E-06 | 0.042 | 0.992 | 8.42E-09 | 22 | 0.956 | 8.05E-09 |
| 54 | 45 | 1389 | 25.4 | 0.95 | 0.6 | 3.5E-07 | 0.043 | 0.974 | 9.09E-09 | 22 | 0.956 | 8.69E-09 |
| 66 | 34 | 709 | 25.1 | 0.96 | 0.3 | 6.9E-07 | 0.043 | 0.987 | 8.96E-09 | 22 | 0.956 | 8.56E-09 |
| 79 | 3 | 749 | 24.8 | 0.97 | 0.3 | 6.5E-07 | 0.044 | 0.987 | 8.60E-09 | 22 | 0.956 | 8.21E-09 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **8.38E-09** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | DM |
| DATE: | 6/24/2011 | DATE: | 6/27/2011 |

**GEOTECHNICAL TESTING LABORATORY**
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**HOUSTON, TEXAS**

# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | LUMINANT/OAK GROVE LF 1 CELL 2/TX |
| PROJECT NUMBER: | 113-94788 |
| SAMPLE ID: | QCL-2-7 |
| LIFT NUMBER: | |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.78 | 3.458 |
| Diameter, cm | 7.28 | 2.865 |
| Area, $cm^2$ | 41.59 | |
| Volume, $cm^3$ | 365.31 | |
| Wet Mass, g | 682.70 | |
| Wt. wet soil + tare, gm | 131.70 | |
| Wt. dry soil + tare, gm | 113.19 | |
| Wt. tare, gm | 8.3 | |
| Moisture Content, % | 17.6% | |
| Dry Density, pcf | 99.1 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.70 | |
| Saturation, % | 68.1% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.8

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.21 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.88 | 3.498 |
| Diameter, cm | 7.31 | 2.878 |
| Area, $cm^2$ | 41.97 | |
| Volume, $cm^3$ | 372.90 | |
| Wet Mass, g | 730.30 | |
| Wt. wet soil + tare, gm | 738.50 | |
| Wt. dry soil + tare, gm | 595.52 | |
| Wt. tare, gm | 8.2 | |
| Moisture Content, % | 24.3% | |
| Dry Density, pcf | 98.3 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.71 | |
| Saturation, % | 92.0% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.8 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 1 | 46 | 106 | 27.3 | 0.37 | 0.5 | 4.8E-06 | 0.039 | 0.981 | 9.34E-08 | 22 | 0.956 | 8.93E-08 |
| 5 | 22 | 216 | 26.8 | 0.39 | 0.5 | 2.3E-06 | 0.039 | 0.980 | 4.68E-08 | 22 | 0.956 | 4.47E-08 |
| 8 | 23 | 181 | 26.5 | 0.40 | 0.3 | 2.8E-06 | 0.040 | 0.988 | 3.38E-08 | 22 | 0.956 | 3.23E-08 |
| 12 | 18 | 235 | 26.2 | 0.42 | 0.3 | 2.2E-06 | 0.040 | 0.988 | 2.63E-08 | 22 | 0.956 | 2.51E-08 |
| 20 | 7 | 469 | 25.7 | 0.44 | 0.5 | 1.1E-06 | 0.041 | 0.979 | 2.25E-08 | 22 | 0.956 | 2.15E-08 |
| 25 | 58 | 351 | 25.4 | 0.45 | 0.3 | 1.4E-06 | 0.042 | 0.987 | 1.82E-08 | 22 | 0.956 | 1.74E-08 |
| 32 | 19 | 381 | 25.1 | 0.46 | 0.3 | 1.3E-06 | 0.042 | 0.987 | 1.70E-08 | 22 | 0.956 | 1.62E-08 |
| 37 | 35 | 316 | 24.9 | 0.47 | 0.2 | 1.6E-06 | 0.043 | 0.991 | 1.37E-08 | 22 | 0.956 | 1.31E-08 |
| 43 | 23 | 348 | 24.7 | 0.48 | 0.2 | 1.5E-06 | 0.043 | 0.991 | 1.26E-08 | 22 | 0.956 | 1.20E-08 |
| 52 | 5 | 522 | 24.4 | 0.49 | 0.3 | 9.7E-07 | 0.044 | 0.987 | 1.28E-08 | 22 | 0.956 | 1.22E-08 |
| 61 | 21 | 556 | 24.1 | 0.50 | 0.3 | 9.1E-07 | 0.044 | 0.987 | 1.22E-08 | 22 | 0.956 | 1.16E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.22E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | DM |
| DATE: | 8/14/2011 | DATE: | 8/26/2011 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | | | |
|---|---|---|---|
| PROJECT TITLE: | JAMES CONST / TXU OAK GROVE / TX | Cell Pressure = | 80 psi |
| PROJECT NUMBER: | 083-94380 | Backwater Pressure = | 70 psi |
| SAMPLE ID: | QCL-008 | Run Number = | 1 |
| LIFT NUMBER: | | | |

| **Sample Data, Initial** | | inches |
|---|---|---|
| Height, cm | 8.11 | 3.194 |
| Diameter, cm | 7.21 | 2.838 |
| Area, $cm^2$ | 40.81 | |
| Volume, $cm^3$ | 331.09 | |
| Wet Mass, g | 603.6 | |
| Wt. wet soil + tare, gm | 223.80 | |
| Wt. dry soil + tare, gm | 191.28 | |
| Wt. tare, gm | 8.4 | |
| Moisture Content, % | 17.8% | |
| Dry Density, pcf | 96.6 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.74 | |
| Saturation, % | 64.5% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.0

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.20 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

| **Sample Data, Final** | | inches |
|---|---|---|
| Height, cm | 8.15 | 3.207 |
| Diameter, cm | 7.29 | 2.871 |
| Area, $cm^2$ | 41.77 | |
| Volume, $cm^3$ | 340.22 | |
| Wet Mass, g | 647.4 | |
| Wt. wet soil + tare, gm | 657.10 | |
| Wt. dry soil + tare, gm | 530.20 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 24.4% | |
| Dry Density, pcf | 95.5 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.76 | |
| Saturation, % | 86.1% | |

| Minutes | Seconds | $\Delta t$ (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.0 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 23 | 0.931 | 0.0E+00 |
| 0 | 52 | 52 | 27.0 | 0.39 | 1 | 9.2E-06 | 0.039 | 0.961 | 3.67E-07 | 23 | 0.931 | 3.4E-07 |
| 2 | 4 | 72 | 26.0 | 0.43 | 1 | 6.6E-06 | 0.041 | 0.959 | 2.76E-07 | 23 | 0.931 | 2.6E-07 |
| 2 | 19 | 15 | 25.5 | 0.45 | 0.5 | 3.2E-05 | 0.042 | 0.979 | 6.69E-07 | 23 | 0.931 | 6.2E-07 |
| 3 | 37 | 78 | 25.0 | 0.47 | 0.5 | 6.1E-06 | 0.042 | 0.979 | 1.31E-07 | 23 | 0.931 | 1.2E-07 |
| 5 | 26 | 109 | 24.0 | 0.51 | 1 | 4.4E-06 | 0.044 | 0.956 | 1.99E-07 | 23 | 0.931 | 1.8E-07 |
| 7 | 33 | 127 | 23.0 | 0.55 | 1 | 3.8E-06 | 0.046 | 0.954 | 1.79E-07 | 23 | 0.931 | 1.7E-07 |
| 9 | 50 | 137 | 22.0 | 0.60 | 1 | 3.5E-06 | 0.049 | 0.951 | 1.74E-07 | 23 | 0.931 | 1.6E-07 |
| 12 | 37 | 167 | 21.0 | 0.64 | 1 | 2.9E-06 | 0.051 | 0.949 | 1.50E-07 | 23 | 0.931 | 1.4E-07 |
| 15 | 51 | 194 | 20.0 | 0.68 | 1 | 2.5E-06 | 0.054 | 0.946 | 1.36E-07 | 23 | 0.931 | 1.3E-07 |
| 19 | 50 | 239 | 19.0 | 0.72 | 1 | 2.0E-06 | 0.057 | 0.943 | 1.17E-07 | 23 | 0.931 | 1.1E-07 |
| 24 | 21 | 271 | 18.0 | 0.76 | 1 | 1.8E-06 | 0.060 | 0.940 | 1.10E-07 | 23 | 0.931 | 1.0E-07 |
| 29 | 18 | 297 | 17.0 | 0.80 | 1 | 1.6E-06 | 0.064 | 0.936 | 1.07E-07 | 23 | 0.931 | 9.9E-08 |
| 34 | 43 | 325 | 16.0 | 0.84 | 1 | 1.5E-06 | 0.069 | 0.931 | 1.05E-07 | 23 | 0.931 | 9.7E-08 |
| 40 | 43 | 360 | 15.0 | 0.88 | 1 | 1.3E-06 | 0.074 | 0.926 | 1.02E-07 | 23 | 0.931 | 9.5E-08 |
| 47 | 14 | 391 | 14.0 | 0.92 | 1 | 1.2E-06 | 0.080 | 0.920 | 1.01E-07 | 23 | 0.931 | 9.4E-08 |
| 54 | 24 | 430 | 13.0 | 0.96 | 1 | 1.1E-06 | 0.086 | 0.914 | 1.00E-07 | 23 | 0.931 | 9.4E-08 |
| 62 | 16 | 472 | 12.0 | 1.01 | 1 | 1.0E-06 | 0.095 | 0.905 | 1.01E-07 | 23 | 0.931 | 9.4E-08 |
| 70 | 54 | 518 | 11.0 | 1.05 | 1 | 9.2E-07 | 0.105 | 0.895 | 1.02E-07 | 23 | 0.931 | 9.5E-08 |
| 80 | 33 | 579 | 10.0 | 1.09 | 1 | 8.2E-07 | 0.117 | 0.883 | 1.02E-07 | 23 | 0.931 | 9.5E-08 |
| 91 | 47 | 674 | 9.0 | 1.13 | 1 | 7.1E-07 | 0.132 | 0.868 | 1.01E-07 | 23 | 0.931 | 9.4E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | 9.4E-08 cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | |
| DATE: | 1/15/2009 | DATE: | |

**GEOTECHNICAL TESTING LABORATORY**
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## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | JCG/OAKGROVE ASH LANDFILL/TX | Board # | 7 |
| PROJECT NUMBER | 083-94380 | Flow Pump | 2 |
| SAMPLE ID | QCL-A-2 - | Flow Pump Speed | 11 |
| SAMPLE TYPE | Bulk | Technician | DA |

COMMENTS: The sample was remolded to 95.4% of the Maximum Dry Density and OPTM +1.4% (using ASTM D698)

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.002 | B-Value, f | 1.00 | Height, inches | 3.113 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 | Diameter, inches | 2.850 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 | Area, cm² | 41.16 |
| Volume, cm³ | 300.75 | Top Pres. | 80.0 | Volume, cm³ | 325.43 |
| Mass, g | 557.87 | Tot. B.P. | 80.0 | Mass, g | 596.95 |
| Moisture Content, % | 24.59 | Head, max. | 151.23 | Moisture Content, % | 33.32 |
| Dry Density, pcf | 92.90 | Head, min. | 151.23 | Dry Density, pcf | 85.85 |
| Spec. Gravity | 2.733 | Max. Grad. | 19.13 | Volume Solids, cm³ | 163.83 |
| Volume Solids, cm³ | 163.83 | Min. Grad. | 19.13 | Volume Voids, cm³ | 161.60 |
| Volume Voids, cm³ | 136.92 | | | Void Ratio | 0.99 |
| Void Ratio | 0.84 | | | Saturation, % | 92.3% |
| Saturation, % | 80.4% | | | | |

Flow Pump Rate: 1.18E-05 cm³/sec

USCS: CH

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 557.87 | 604.94 |
| Wt Soil & Tare, f | g | 447.76 | 455.84 |
| Wt Tare | g | 0.00 | 8.37 |
| Wt Moisture Lost | g | 110.11 | 149.10 |
| Wt Dry Soil | g | 447.76 | 447.47 |
| Water Content | % | 24.59% | 33.32% |

DESCRIPTION: Light Olive Brown CLAY

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 01/31/09 | 39844 | 17 | 0 | 20.1 | 0 | 0 | 0 | 0 | 2.15 | 151.23 | 19.13 | 1.5E-08 |
| 01/31/09 | 39844 | 17 | 5 | 20.1 | 5 | 5 | 300 | 300 | 2.15 | 151.23 | 19.13 | 1.5E-08 |
| 01/31/09 | 39844 | 17 | 10 | 20.1 | 5 | 10 | 300 | 600 | 2.15 | 151.23 | 19.13 | 1.5E-08 |
| 01/31/09 | 39844 | 17 | 15 | 20.1 | 5 | 15 | 300 | 900 | 2.15 | 151.23 | 19.13 | 1.5E-08 * |
| 01/31/09 | 39844 | 17 | 20 | 20.1 | 5 | 20 | 300 | 1200 | 2.15 | 151.23 | 19.13 | 1.5E-08 * |
| 01/31/09 | 39844 | 17 | 25 | 20.1 | 5 | 25 | 300 | 1500 | 2.15 | 151.23 | 19.13 | 1.5E-08 * |
| 01/31/09 | 39844 | 17 | 30 | 20.1 | 5 | 30 | 300 | 1800 | 2.15 | 151.23 | 19.13 | 1.5E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.5E-08 cm/sec **

| | |
|---|---|
| DATE | 01/31/09 |
| CHECK | SBK |
| REVIEW | CFR |

# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | QCL-FGDB-04A |
| LIFT NUMBER: | |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.62 | 3.392 |
| Diameter, cm | 7.29 | 2.871 |
| Area, $cm^2$ | 41.77 | |
| Volume, $cm^3$ | 359.84 | |
| Wet Mass, g | 686.9 | |
| Wt. wet soil + tare, gm | 133.00 | |
| Wt. dry soil + tare, gm | 111.90 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 20.7% | |
| Dry Density, pcf | 98.7 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.71 | |
| Saturation, % | 79.0% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.0

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.21 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.87 | 3.492 |
| Diameter, cm | 7.34 | 2.891 |
| Area, $cm^2$ | 42.35 | |
| Volume, $cm^3$ | 375.63 | |
| Wet Mass, g | 734.7 | |
| Wt. wet soil + tare, gm | 742.88 | |
| Wt. dry soil + tare, gm | 596.85 | |
| Wt. tare, gm | 8.23 | |
| Moisture Content, % | 24.8% | |
| Dry Density, pcf | 97.8 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.72 | |
| Saturation, % | 92.7% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.0 | 0.35 | 0 | | 0.039 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 1 | 13 | 73 | 26.0 | 0.39 | 1 | 6.8E-06 | 0.041 | 0.959 | 2.82E-07 | 22 | 0.956 | 2.69E-07 |
| 3 | 14 | 121 | 25.0 | 0.43 | 1 | 4.1E-06 | 0.042 | 0.958 | 1.77E-07 | 22 | 0.956 | 1.69E-07 |
| 6 | 23 | 189 | 23.7 | 0.49 | 1.3 | 2.6E-06 | 0.045 | 0.942 | 1.58E-07 | 22 | 0.956 | 1.51E-07 |
| 8 | 46 | 143 | 22.9 | 0.52 | 0.8 | 3.5E-06 | 0.047 | 0.963 | 1.31E-07 | 22 | 0.956 | 1.26E-07 |
| 11 | 44 | 178 | 22.0 | 0.55 | 0.9 | 2.8E-06 | 0.049 | 0.956 | 1.24E-07 | 22 | 0.956 | 1.19E-07 |
| 15 | 36 | 232 | 21.0 | 0.60 | 1 | 2.1E-06 | 0.051 | 0.949 | 1.12E-07 | 22 | 0.956 | 1.07E-07 |
| 19 | 44 | 248 | 20.0 | 0.64 | 1 | 2.0E-06 | 0.054 | 0.946 | 1.10E-07 | 22 | 0.956 | 1.06E-07 |
| 24 | 11 | 267 | 19.0 | 0.68 | 1 | 1.9E-06 | 0.057 | 0.943 | 1.09E-07 | 22 | 0.956 | 1.04E-07 |
| 29 | 7 | 296 | 18.0 | 0.72 | 1 | 1.7E-06 | 0.060 | 0.940 | 1.04E-07 | 22 | 0.956 | 9.94E-08 |
| 34 | 24 | 317 | 17.0 | 0.76 | 1 | 1.6E-06 | 0.064 | 0.936 | 1.04E-07 | 22 | 0.956 | 9.90E-08 |
| 40 | 3 | 339 | 16.0 | 0.80 | 1 | 1.5E-06 | 0.068 | 0.932 | 1.04E-07 | 22 | 0.956 | 9.91E-08 |
| 46 | 51 | 408 | 14.9 | 0.85 | 1.1 | 1.2E-06 | 0.074 | 0.919 | 1.03E-07 | 22 | 0.956 | 9.87E-08 |
| 54 | 41 | 470 | 13.8 | 0.89 | 1.1 | 1.1E-06 | 0.081 | 0.911 | 9.80E-08 | 22 | 0.956 | 9.36E-08 |
| 60 | 33 | 352 | 13.0 | 0.92 | 0.8 | 1.4E-06 | 0.086 | 0.931 | 1.01E-07 | 22 | 0.956 | 9.61E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **9.69E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | DM |
| DATE: | 8/10/2011 | DATE: | 8/19/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

# APPENDIX B-2
# CONSTRUCTION TEST RESULTS

# SUMMARY OF LABORATORY RESULTS

**CLIENT** Luminant **PROJECT NAME** Oak Grove Landfill 1 Cell 2

**PROJECT NUMBER** 113-94788 **PROJECT LOCATION** Robertson County, Texas

| Sample ID | Depth | Natural Moisture (%) | Atterberg Limits | | | %<#200 Sieve | Class-ification | Unit Weight | | Permeability (cm/sec) | Additional Lab Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Liquid Limit | Plastic Limit | Plasticity Index | | | Moisture Content (%) | Dry Density (psf) | | |
| CL-017 | 1 | 23.1 | 54 | 18 | 36 | 54 | CH | | | | |
| CL-018 | 1 | 18.4 | 54 | 18 | 36 | 55 | CH | | | | |
| CL-024 | 1 | 21.7 | 55 | 17 | 38 | 65 | CH | | | | |
| CL-027 | 1 | 23.6 | 48 | 16 | 32 | 70 | CL | | | | |
| CL-032 | 1 | 21.0 | 46 | 16 | 30 | 76 | CL | | | | |
| CL-037 | 1 | 23.7 | 45 | 16 | 29 | 69 | CL | | | | |
| CL-040 | 1 | 23.0 | 45 | 16 | 29 | 55 | CL | | | | |
| CL-043 | 1 | 24.2 | 48 | 16 | 32 | 76 | CL | | | | |
| CL-046 | 1 | 21.6 | 56 | 18 | 38 | 83 | CH | | | | |
| CL-050 | 2 | 20.7 | 65 | 17 | 48 | 85 | CH | | | | |
| CL-057 | 2 | 18.0 | 54 | 15 | 39 | 64 | CH | | | | |
| CL-061 | 2 | 19.4 | 72 | 17 | 55 | 83 | CH | | | | |
| CL-071 | 2 | 20.9 | 62 | 15 | 47 | 78 | CH | | | | |
| CL-079 | 2 | 20.3 | 55 | 19 | 36 | 68 | CH | | | | |
| CL-085 | 2 | 17.1 | 47 | 17 | 30 | 67 | CL | | | | |
| CL-089 | 2 | 19.4 | 59 | 22 | 37 | 88 | CH | | | | |
| CL-093 | 2 | 20.3 | 57 | 21 | 36 | 89 | CH | | | | |
| CL-098 | 3 | 21.9 | 44 | 16 | 28 | 76 | CL | | | | |
| CL-104 | 3 | 19.4 | 46 | 16 | 30 | 74 | CL | | | | |
| CL-106 | 3 | 23.5 | 56 | 14 | 42 | 71 | CH | | | | |
| CL-109 | 3 | 16.2 | 51 | 13 | 38 | 75 | CH | | | | |
| CL-118 | 3 | 21.1 | 49 | 16 | 33 | 77 | CL | | | | |
| CL-120 | 3 | 23.7 | 55 | 18 | 37 | 83 | CH | | | | |
| CL-127 | 3 | 21.6 | 49 | 17 | 32 | 78 | CL | | | | |
| CL-190 | 1 | 20.2 | 53 | 19 | 34 | 83 | CH | | | | |
| CL-196 | 1 | 17.7 | 55 | 19 | 36 | 84 | CH | | | | |
| CL-201 | 1 | 23.8 | 57 | 19 | 38 | 84 | CH | | | | |
| CL-206 | 1 | 23.8 | 56 | 18 | 38 | 83 | CH | | | | |
| CL-213 | 2 | 23.5 | 56 | 18 | 38 | 84 | CH | | | | |
| CL-216 | 2 | 22.3 | 58 | 19 | 39 | 84 | CH | | | | |
| CL-219 | 2 | 22.9 | 56 | 18 | 38 | 83 | CH | | | | |
| CL-224 | 2 | 21.2 | 58 | 17 | 41 | 84 | CH | | | | |
| CL-229 | 2 | 22.3 | 56 | 18 | 38 | 85 | CH | | | | |
| CL-232 | 3 | 16.1 | 58 | 19 | 39 | 88 | CH | | | | |
| CL-235 | 3 | 20.8 | 53 | 18 | 35 | 84 | CH | | | | |
| CL-238 | 3 | 19.6 | 55 | 18 | 37 | 85 | CH | | | | |
| CL-240 | 3 | 20.9 | 54 | 18 | 36 | 82 | CH | | | | |
| CL-243 | 3 | 17.2 | 53 | 17 | 36 | 81 | CH | | | | |
| CL-250 | 3 | 19.9 | 52 | 17 | 35 | 82 | CH | | | | |
| CL-289 | 4 | 22.7 | 53 | 19 | 34 | 74 | CH | | | | |
| CL-291 | 4 | 19.2 | 54 | 18 | 36 | 79 | CH | | | | |

LAB SUMMARY - CQA - GINT STD US LAB.GDT - 1/26/12 14:16 - \\HOU1-S-FS2-VM\DATA\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\94788.1GINT.GPJ

**CLIENT** Luminant **PROJECT NAME** Oak Grove Landfill 1 Cell 2

**PROJECT NUMBER** 113-94788 **PROJECT LOCATION** Robertson County, Texas

| Sample ID | Depth | Natural Moisture (%) | Atterberg Limits | | | %<#200 Sieve | Class-ification | Unit Weight | | Permeability (cm/sec) | Additional Lab Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Liquid Limit | Plastic Limit | Plasticity Index | | | Moisture Content (%) | Dry Density (psf) | | |
| CL-294 | 4 | 26.0 | 59 | 20 | 39 | 79 | CH | | | | |
| CL-296 | 4 | 19.7 | 52 | 18 | 34 | 76 | CH | | | | |
| CL-300 | 4 | 21.3 | 53 | 18 | 35 | 78 | CH | | | | |
| CL-305 | 4 | 21.8 | 54 | 18 | 36 | 75 | CH | | | | |
| CL-308 | 4 | 19.9 | 55 | 18 | 37 | 88 | CH | | | | |
| CL-312 | 4 | 20.4 | 53 | 17 | 36 | 73 | CH | | | | |
| CL-316 | 4 | 21.2 | 51 | 17 | 34 | 73 | CH | | | | |
| CL-337 | 4 | 22.7 | 53 | 17 | 36 | | | | | | |
| CL-339 | 4 | 21.5 | 53 | 18 | 35 | 79 | CH | | | | |
| CL-344 | 4 | 18.7 | 54 | 18 | 36 | 81 | CH | | | | |
| CL-347 | 4 | 22.4 | 54 | 18 | 36 | 85 | CH | | | | |

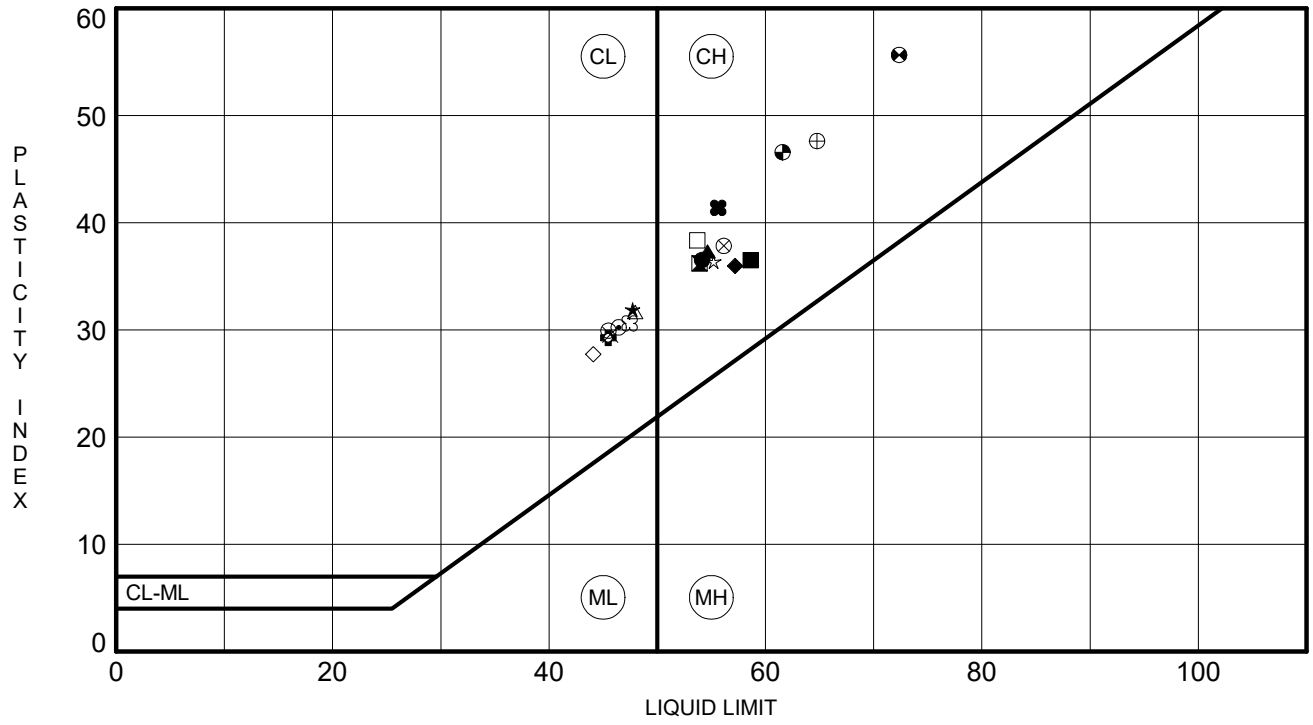
LAB SUMMARY - CQA - GINT STD US LAB.GDT - 1/26/12 14:16 - \\HOU1-S-FS2-VM\DATA\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\94788.1GINT.GPJ

# ATTERBERG LIMITS

# ATTERBERG LIMITS' RESULTS

**CLIENT** Luminant **PROJECT NAME** Oak Grove Landfill 1 Cell 2

**PROJECT NUMBER** 113-94788 **PROJECT LOCATION** Robertson County, Texas

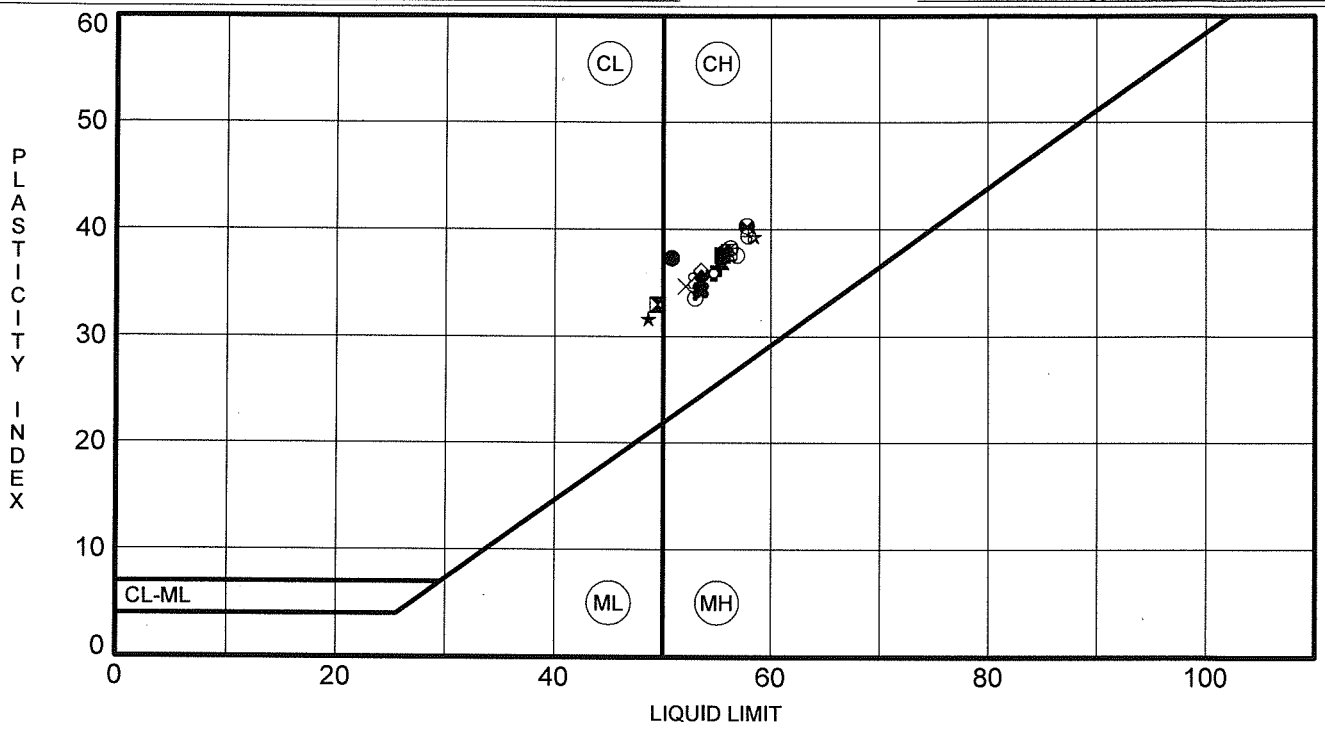



| | BOREHOLE | DEPTH | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|---|
| ● | CL-017 | Lift 1 | 54 | 18 | 36 | 54 | SANDY FAT CLAY(CH) |
| ⊠ | CL-018 | Lift 1 | 54 | 18 | 36 | 55 | SANDY FAT CLAY(CH) |
| ▲ | CL-024 | Lift 1 | 55 | 17 | 38 | 65 | SANDY FAT CLAY(CH) |
| ★ | CL-027 | Lift 1 | 48 | 16 | 32 | 70 | LEAN CLAY with SAND(CL) |
| ⊙ | CL-032 | Lift 1 | 46 | 16 | 30 | 76 | LEAN CLAY with SAND(CL) |
| ✿ | CL-037 | Lift 1 | 45 | 16 | 29 | 69 | SANDY LEAN CLAY(CL) |
| ○ | CL-040 | Lift 1 | 45 | 16 | 29 | 55 | SANDY LEAN CLAY(CL) |
| △ | CL-043 | Lift 1 | 48 | 16 | 32 | 76 | LEAN CLAY with SAND(CL) |
| ⊗ | CL-046 | Lift 1 | 56 | 18 | 38 | 83 | FAT CLAY with SAND(CH) |
| ⊕ | CL-050 | Lift 2 | 65 | 17 | 48 | 85 | FAT CLAY(CH) |
| □ | CL-057 | Lift 2 | 54 | 15 | 39 | 64 | SANDY FAT CLAY(CH) |
| ⊛ | CL-061 | Lift 2 | 72 | 17 | 55 | 83 | FAT CLAY with SAND(CH) |
| ◕ | CL-071 | Lift 2 | 62 | 15 | 47 | 78 | FAT CLAY with SAND(CH) |
| ☆ | CL-079 | Lift 2 | 55 | 19 | 36 | 68 | SANDY FAT CLAY(CH) |
| ⊠ | CL-085 | Lift 2 | 47 | 17 | 30 | 67 | SANDY LEAN CLAY(CL) |
| ■ | CL-089 | Lift 2 | 59 | 22 | 37 | 88 | FAT CLAY(CH) |
| ◆ | CL-093 | Lift 2 | 57 | 21 | 36 | 89 | FAT CLAY(CH) |
| ◇ | CL-098 | Lift 3 | 44 | 16 | 28 | 76 | LEAN CLAY with SAND(CL) |
| × | CL-104 | Lift 3 | 46 | 16 | 30 | 74 | LEAN CLAY with SAND(CL) |
| ✖ | CL-106 | Lift 3 | 56 | 14 | 42 | 71 | FAT CLAY with SAND(CH) |

ATTERBERG LIMITS - CQA - GINT STD US LAB.GDT - 1/26/12 14:14 - \\HOU1-S-FS2-VMDATA\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\94788.1GINT.GPJ

# ATTERBERG LIMITS' RESULTS

**CLIENT** Luminant
**PROJECT NAME** Oak Grove FGD-B Pond CQA
**PROJECT NUMBER** 113-9478801
**PROJECT LOCATION** Robertson County, Texas




| | BOREHOLE | DEPTH | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|---|
| ● | CL-109 | Lift 3 | 51 | 13 | 38 | 75 | FAT CLAY with SAND(CH) |
| ⊠ | CL-118 | Lift 3 | 49 | 16 | 33 | 77 | LEAN CLAY with SAND(CL) |
| ▲ | CL-120 | Lift 3 | 55 | 18 | 37 | 83 | FAT CLAY with SAND(CH) |
| ★ | CL-127 | Lift 3 | 49 | 17 | 32 | 78 | LEAN CLAY with SAND(CL) |
| ⊙ | CL-190 | Lift 1 | 53 | 19 | 34 | 83 | FAT CLAY with SAND(CH) |
| ✿ | CL-196 | Lift 1 | 55 | 19 | 36 | 84 | FAT CLAY with SAND(CH) |
| ○ | CL-201 | Lift 1 | 57 | 19 | 38 | 84 | FAT CLAY with SAND(CH) |
| △ | CL-206 | Lift 1 | 56 | 18 | 38 | 83 | FAT CLAY with SAND(CH) |
| ⊗ | CL-213 | Lift 2 | 56 | 18 | 38 | 84 | FAT CLAY with SAND(CH) |
| ⊕ | CL-216 | Lift 2 | 58 | 19 | 39 | 84 | FAT CLAY with SAND(CH) |
| □ | CL-219 | Lift 2 | 56 | 18 | 38 | 83 | FAT CLAY with SAND(CH) |
| ⊜ | CL-224 | Lift 2 | 58 | 17 | 41 | 84 | FAT CLAY with SAND(CH) |
| ◔ | CL-229 | Lift 2 | 56 | 18 | 38 | 85 | FAT CLAY with SAND(CH) |
| ☆ | CL-232 | Lift 3 | 58 | 19 | 39 | 88 | FAT CLAY(CH) |
| ⊠ | CL-235 | Lift 3 | 53 | 18 | 35 | 84 | FAT CLAY with SAND(CH) |
| ■ | CL-238 | Lift 3 | 55 | 18 | 37 | 85 | FAT CLAY with SAND(CH) |
| ◆ | CL-240 | Lift 3 | 54 | 18 | 36 | 82 | FAT CLAY with SAND(CH) |
| ◇ | CL-243 | Lift 3 | 53 | 17 | 36 | 81 | FAT CLAY with SAND(CH) |
| × | CL-250 | Lift 3 | 52 | 17 | 35 | 82 | FAT CLAY with SAND(CH) |
| ⊗ | CL-289 | Lift 4 | 53 | 19 | 34 | 74 | FAT CLAY with SAND(CH) |

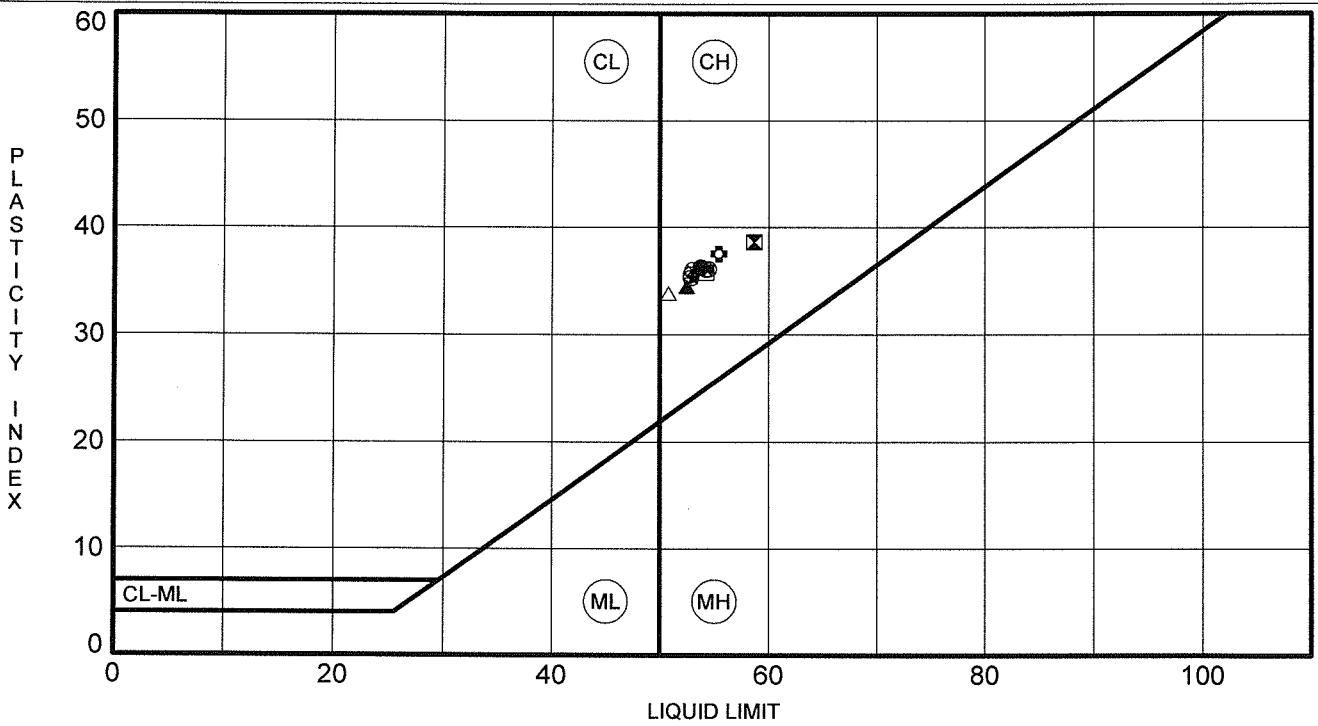
ATTERBERG LIMITS - CQA - GINT STD US LAB.GDT - 1/17/12 14:12 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# ATTERBERG LIMITS' RESULTS

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| | BOREHOLE | DEPTH | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|---|
| ● | CL-291 | Lift 4 | 54 | 18 | 36 | 79 | FAT CLAY with SAND(CH) |
| ⊠ | CL-294 | Lift 4 | 59 | 20 | 39 | 79 | FAT CLAY with SAND(CH) |
| ▲ | CL-296 | Lift 4 | 52 | 18 | 34 | 76 | FAT CLAY with SAND(CH) |
| ★ | CL-300 | Lift 4 | 53 | 18 | 35 | 78 | FAT CLAY with SAND(CH) |
| ⊙ | CL-305 | Lift 4 | 54 | 18 | 36 | 75 | FAT CLAY with SAND(CH) |
| ✿ | CL-308 | Lift 4 | 55 | 18 | 37 | 88 | FAT CLAY(CH) |
| ○ | CL-312 | Lift 4 | 53 | 17 | 36 | 73 | FAT CLAY with SAND(CH) |
| △ | CL-316 | Lift 4 | 51 | 17 | 34 | 73 | FAT CLAY with SAND(CH) |
| ⊗ | CL-337 | Lift 4 | 53 | 17 | 36 | | |
| ⊕ | CL-339 | Lift 4 | 53 | 18 | 35 | 79 | FAT CLAY with SAND(CH) |
| □ | CL-344 | Lift 4 | 54 | 18 | 36 | 81 | FAT CLAY with SAND(CH) |
| ⊛ | CL-347 | Lift 4 | 54 | 18 | 36 | 85 | FAT CLAY with SAND(CH) |



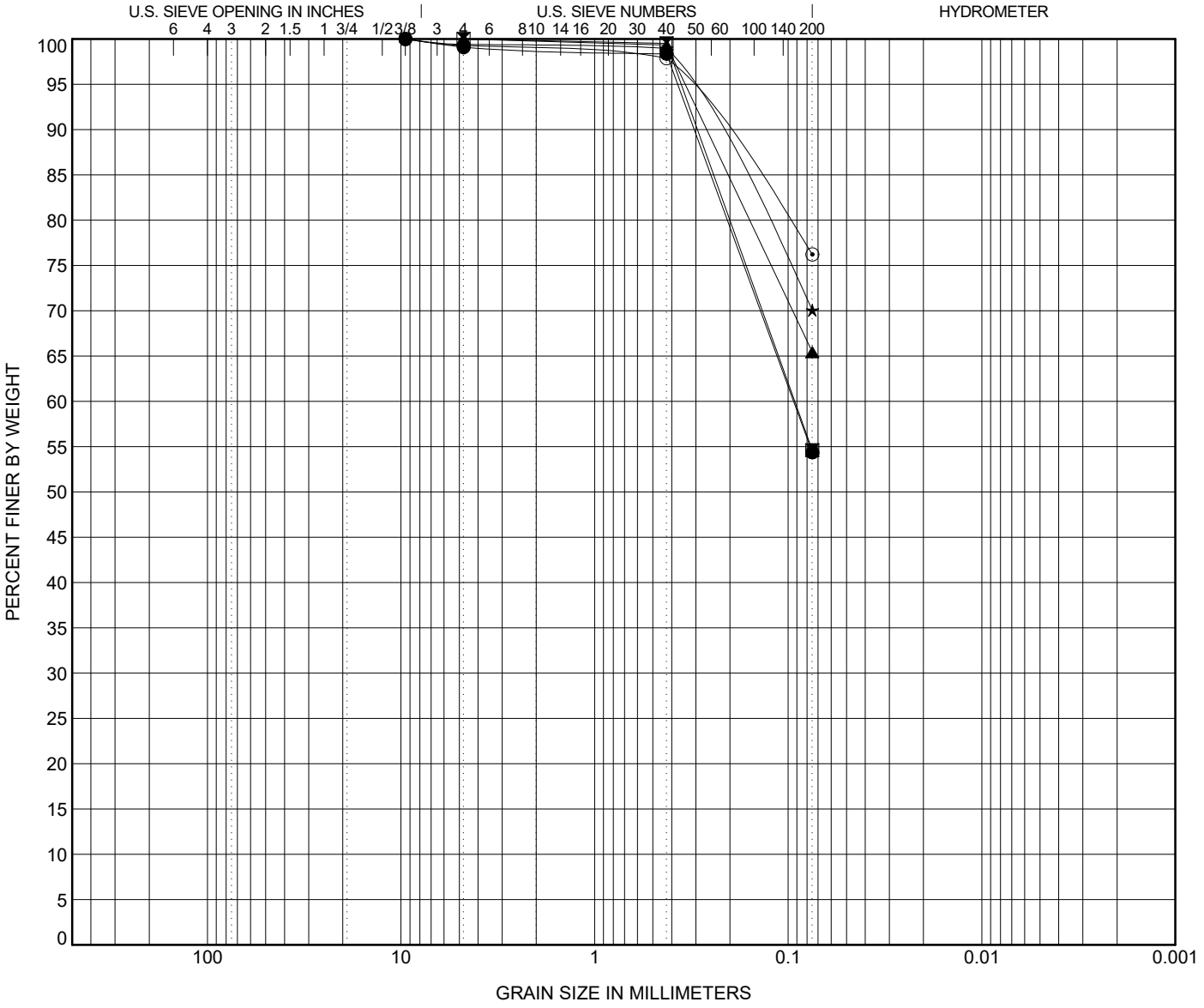
ATTERBERG LIMITS - CQA - GINT STD US LAB.GDT - 1/17/12 14:12 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE ANALYSIS

# GRAIN SIZE DISTRIBUTION

**CLIENT** Luminant **PROJECT NAME** Oak Grove Landfill 1 Cell 2

**PROJECT NUMBER** 113-94788 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|
| ● CL-017 | Lift 1 | SANDY FAT CLAY(CH) | 54 | 18 | 36 | | |
| ⊠ CL-018 | Lift 1 | SANDY FAT CLAY(CH) | 54 | 18 | 36 | | |
| ▲ CL-024 | Lift 1 | SANDY FAT CLAY(CH) | 55 | 17 | 38 | | |
| ★ CL-027 | Lift 1 | LEAN CLAY with SAND(CL) | 48 | 16 | 32 | | |
| ⊙ CL-032 | Lift 1 | LEAN CLAY with SAND(CL) | 46 | 16 | 30 | | |

| BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|
| ● CL-017 | Lift 1 | 9.5 | 0.094 | | | 0.9 | 44.7 | 54.4 | |
| ⊠ CL-018 | Lift 1 | 4.75 | 0.092 | | | 0.0 | 45.4 | 54.6 | |
| ▲ CL-024 | Lift 1 | 4.75 | | | | 0.0 | 34.6 | 65.4 | |
| ★ CL-027 | Lift 1 | 9.5 | | | | 0.6 | 29.4 | 70.1 | |
| ⊙ CL-032 | Lift 1 | 9.5 | | | | 0.7 | 23.1 | 76.2 | |

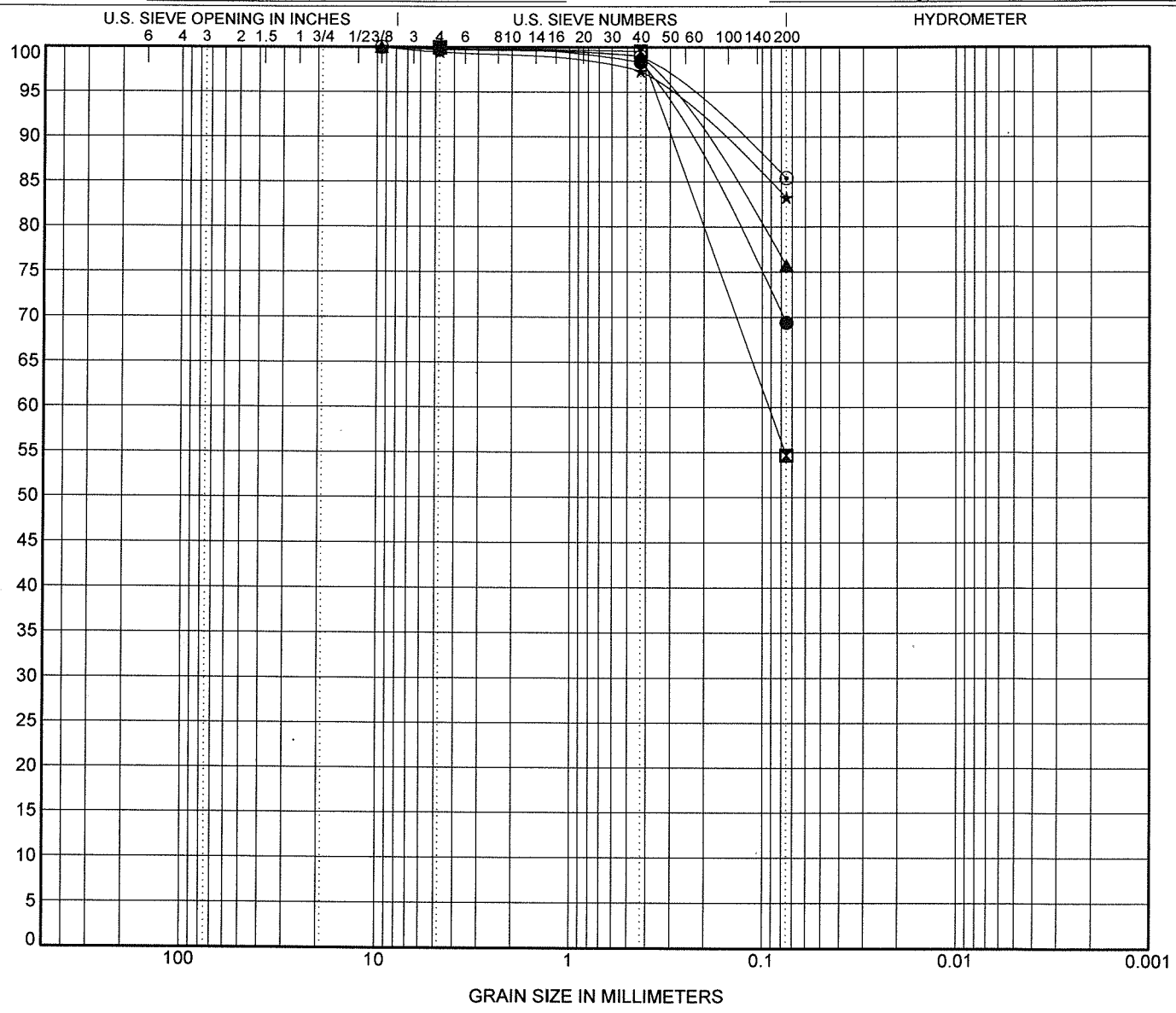
GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/26/12 14:25 - \\HOU1-S-FS2-VM\DATA\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\94788.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | CL-037 | Lift 1 | SANDY LEAN CLAY(CL) | 45 | 16 | 29 | | |
| ⊠ | CL-040 | Lift 1 | SANDY LEAN CLAY(CL) | 45 | 16 | 29 | | |
| ▲ | CL-043 | Lift 1 | LEAN CLAY with SAND(CL) | 48 | 16 | 32 | | |
| ★ | CL-046 | Lift 1 | FAT CLAY with SAND(CH) | 56 | 18 | 38 | | |
| ⊙ | CL-050 | Lift 2 | FAT CLAY(CH) | 65 | 17 | 48 | | |

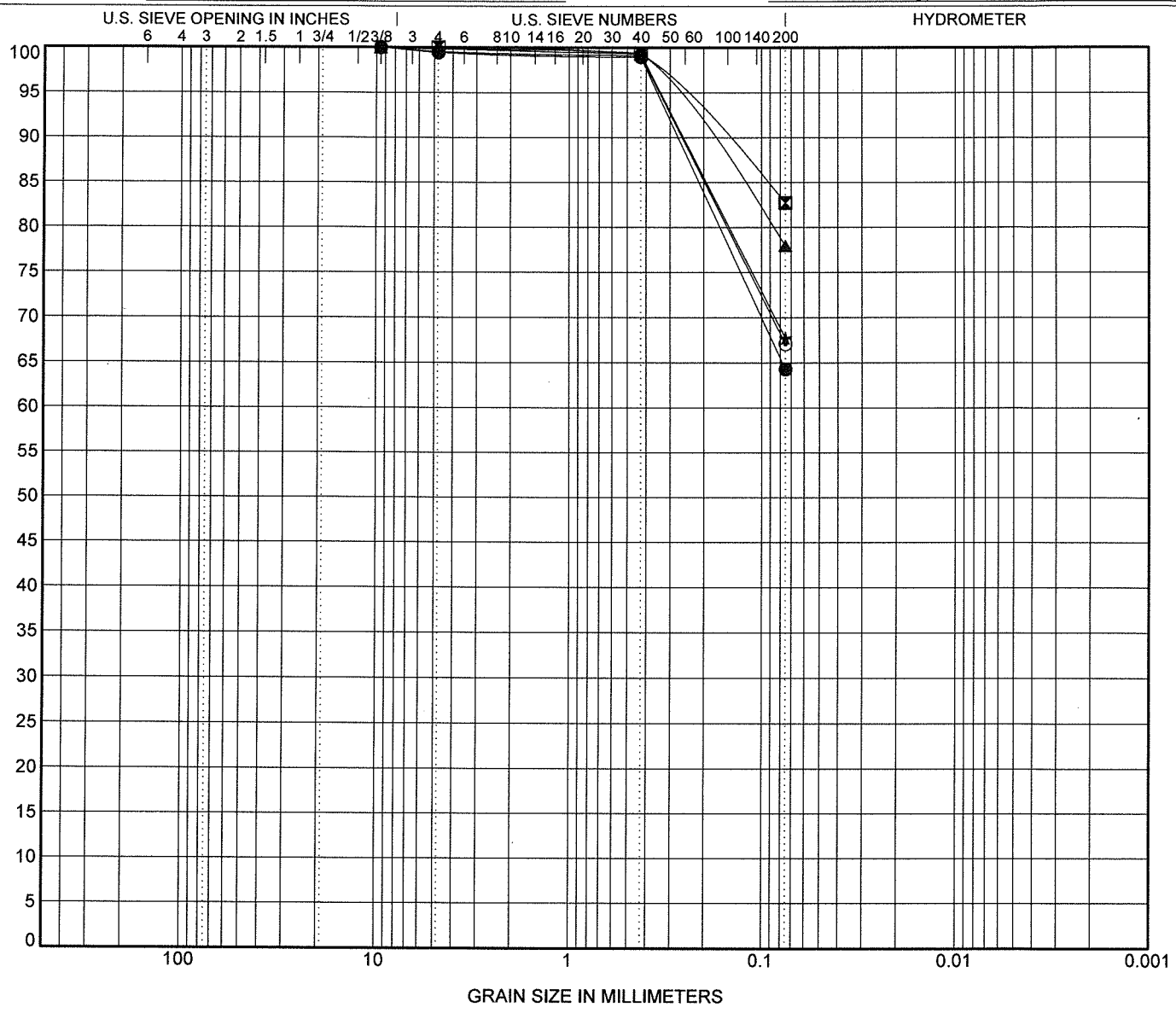
| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-037 | Lift 1 | 4.75 | | | | 0.0 | 30.6 | 69.4 | |
| ⊠ | CL-040 | Lift 1 | 4.75 | 0.092 | | | 0.0 | 45.3 | 54.7 | |
| ▲ | CL-043 | Lift 1 | 9.5 | | | | 0.2 | 24.1 | 75.7 | |
| ★ | CL-046 | Lift 1 | 9.5 | | | | 0.5 | 16.2 | 83.3 | |
| ⊙ | CL-050 | Lift 2 | 9.5 | | | | 0.2 | 14.4 | 85.4 | |

GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/17/12 14:13 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|
| ● CL-057 | Lift 2 | SANDY FAT CLAY(CH) | 54 | 15 | 39 | | |
| ⊠ CL-061 | Lift 2 | FAT CLAY with SAND(CH) | 72 | 17 | 55 | | |
| ▲ CL-071 | Lift 2 | FAT CLAY with SAND(CH) | 62 | 15 | 47 | | |
| ★ CL-079 | Lift 2 | SANDY FAT CLAY(CH) | 55 | 19 | 36 | | |
| ⊙ CL-085 | Lift 2 | SANDY LEAN CLAY(CL) | 47 | 17 | 30 | | |

| BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|
| ● CL-057 | Lift 2 | 9.5 | | | | 0.5 | 35.2 | 64.3 | |
| ⊠ CL-061 | Lift 2 | 4.75 | | | | 0.0 | 17.3 | 82.7 | |
| ▲ CL-071 | Lift 2 | 9.5 | | | | 0.2 | 21.9 | 77.9 | |
| ★ CL-079 | Lift 2 | 9.5 | | | | 0.2 | 32.1 | 67.7 | |
| ⊙ CL-085 | Lift 2 | 9.5 | | | | 0.4 | 32.5 | 67.1 | |

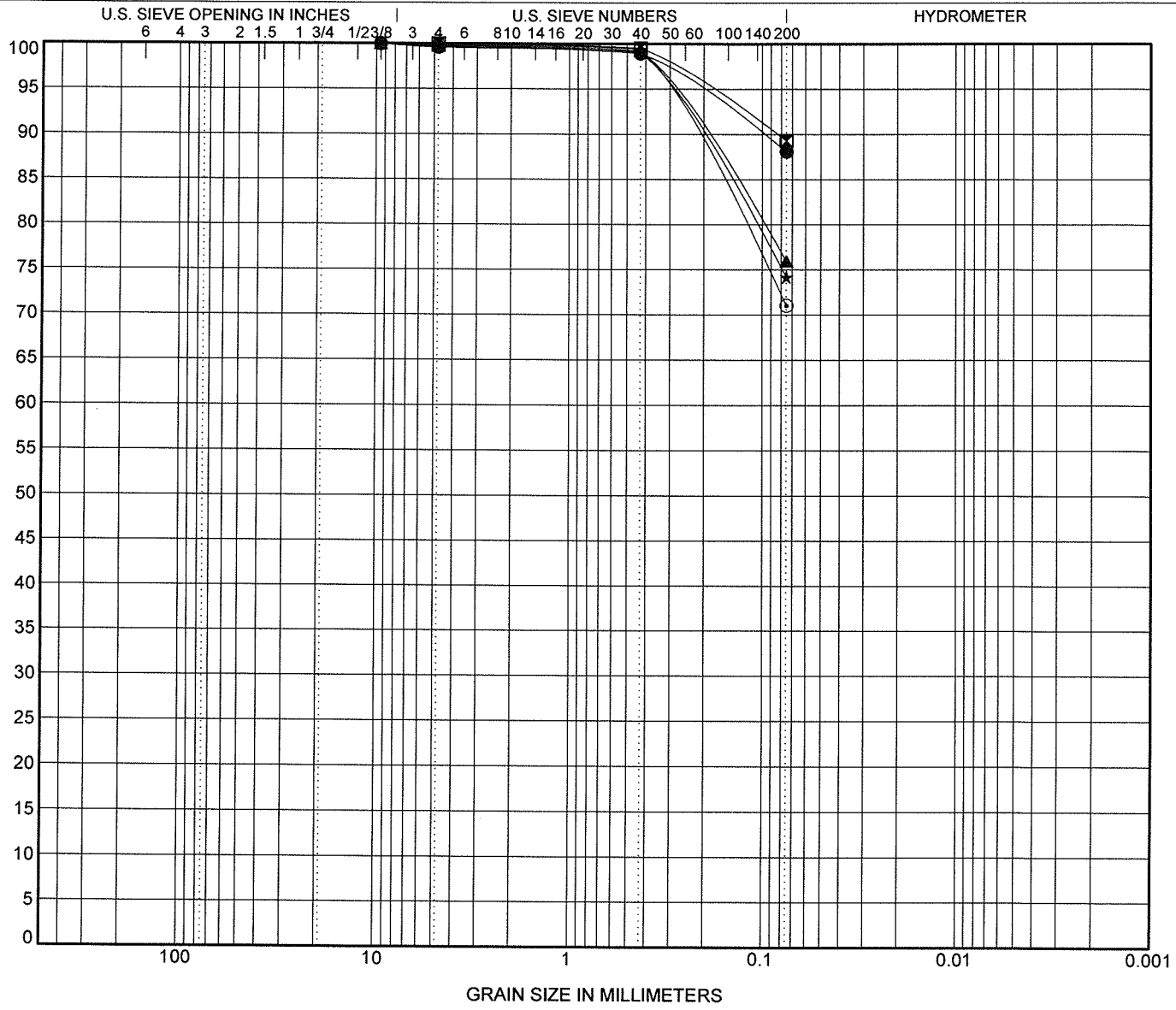
GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/17/12 14:13 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| BOREHOLE | | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | CL-089 | Lift 2 | FAT CLAY(CH) | 59 | 22 | 37 | | |
| ⊠ | CL-093 | Lift 2 | FAT CLAY(CH) | 57 | 21 | 36 | | |
| ▲ | CL-098 | Lift 3 | LEAN CLAY with SAND(CL) | 44 | 16 | 28 | | |
| ★ | CL-104 | Lift 3 | LEAN CLAY with SAND(CL) | 46 | 16 | 30 | | |
| ⊙ | CL-106 | Lift 3 | FAT CLAY with SAND(CH) | 56 | 14 | 42 | | |

| BOREHOLE | | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-089 | Lift 2 | 9.5 | | | | 0.4 | 11.5 | 88.1 | |
| ⊠ | CL-093 | Lift 2 | 4.75 | | | | 0.0 | 10.7 | 89.3 | |
| ▲ | CL-098 | Lift 3 | 9.5 | | | | 0.3 | 23.8 | 75.9 | |
| ★ | CL-104 | Lift 3 | 9.5 | | | | 0.2 | 25.6 | 74.2 | |
| ⊙ | CL-106 | Lift 3 | 9.5 | | | | 0.1 | 28.9 | 71.0 | |

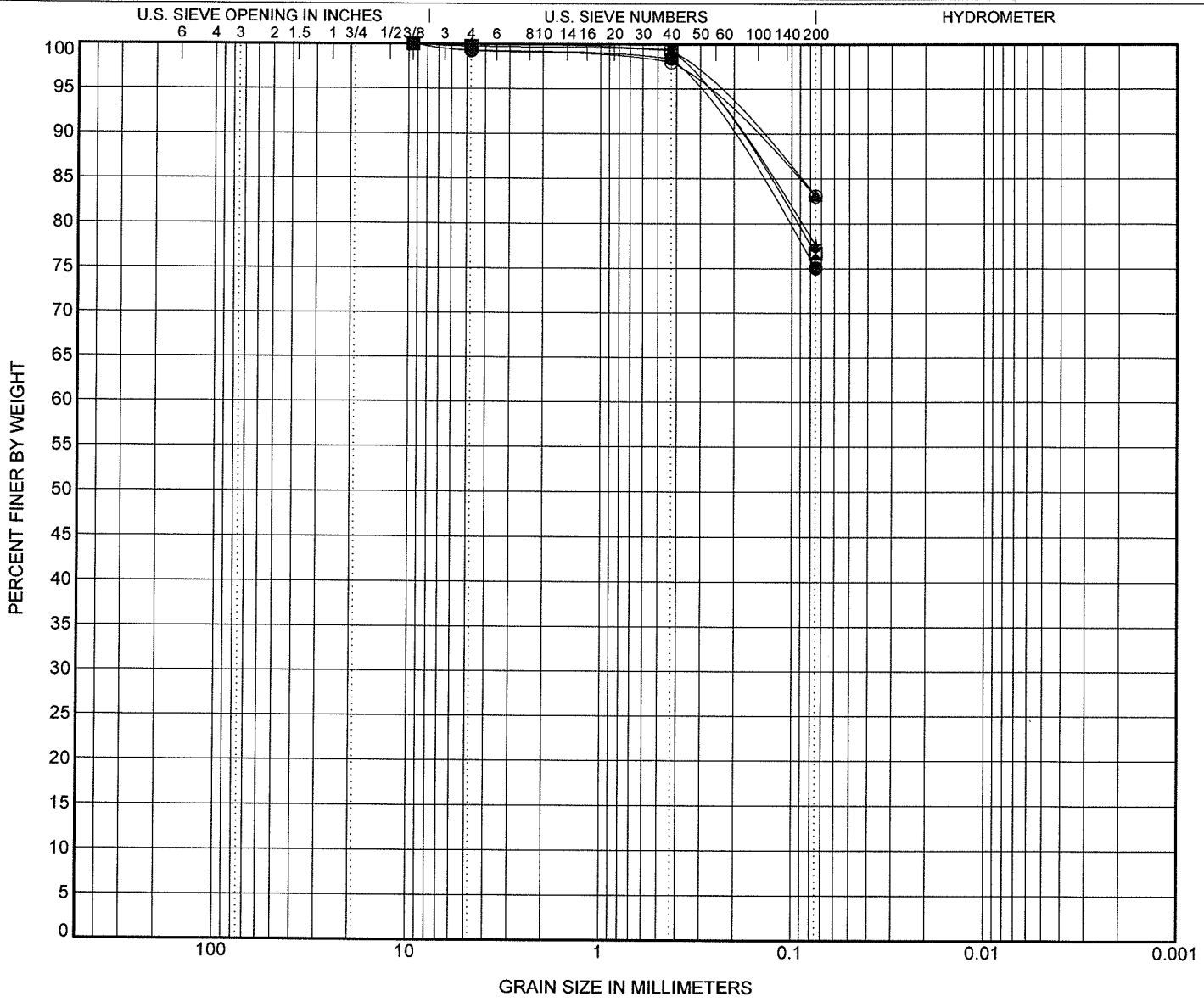
GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/17/12 14:13 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | CL-109 | Lift 3 | FAT CLAY with SAND(CH) | 51 | 13 | 38 | | |
| ⊠ | CL-118 | Lift 3 | LEAN CLAY with SAND(CL) | 49 | 16 | 33 | | |
| ▲ | CL-120 | Lift 3 | FAT CLAY with SAND(CH) | 55 | 18 | 37 | | |
| ★ | CL-127 | Lift 3 | LEAN CLAY with SAND(CL) | 49 | 17 | 32 | | |
| ⊙ | CL-190 | Lift 1 | FAT CLAY with SAND(CH) | 53 | 19 | 34 | | |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-109 | Lift 3 | 9.5 | | | | 0.7 | 24.3 | 75.1 | |
| ⊠ | CL-118 | Lift 3 | 9.5 | | | | 0.2 | 23.1 | 76.7 | |
| ▲ | CL-120 | Lift 3 | 9.5 | | | | 0.2 | 16.6 | 83.2 | |
| ★ | CL-127 | Lift 3 | 4.75 | | | | 0.0 | 22.4 | 77.6 | |
| ⊙ | CL-190 | Lift 1 | 9.5 | | | | 0.7 | 16.2 | 83.0 | |

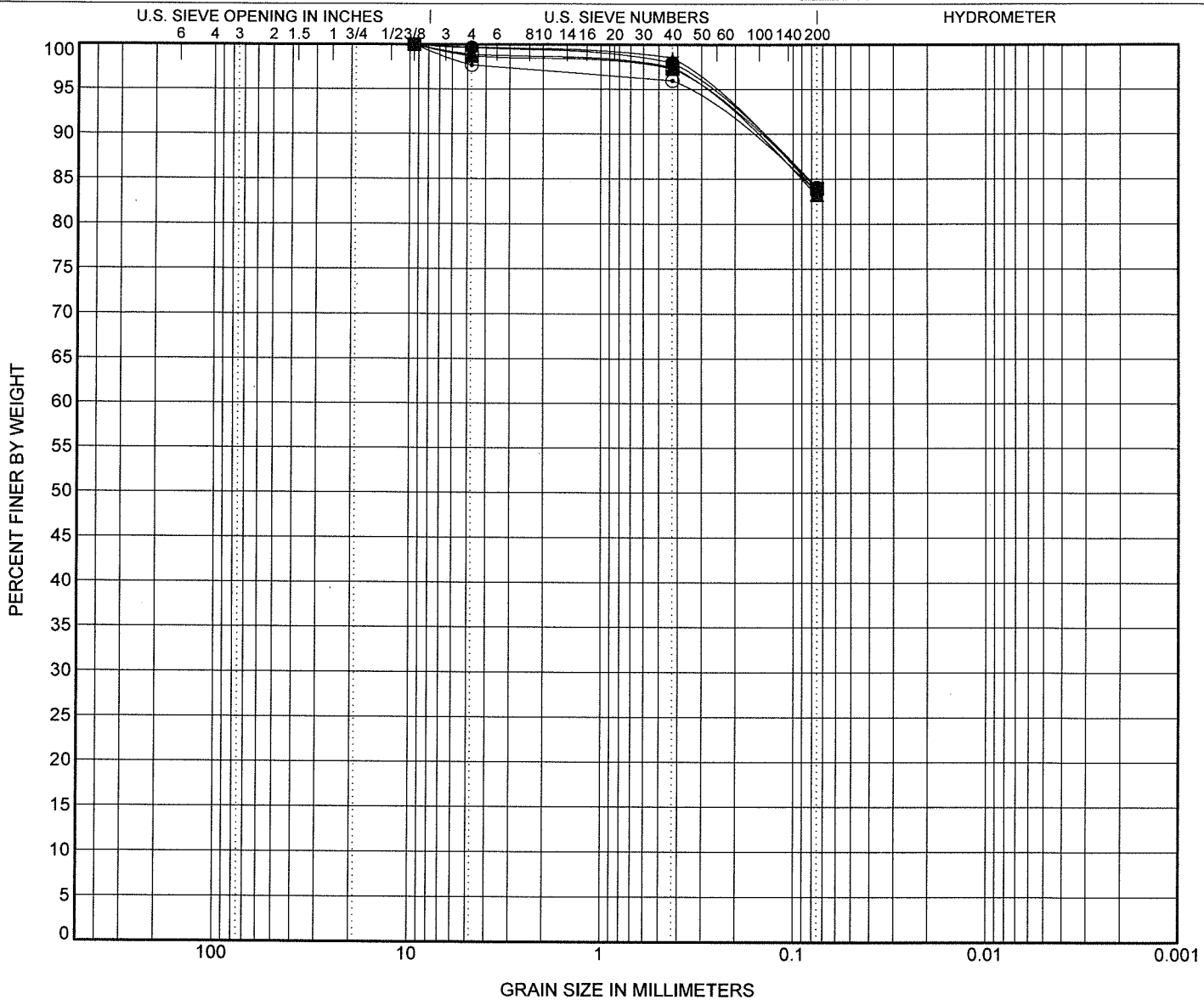
GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/17/12 14:13 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | CL-196 | Lift 1 | FAT CLAY with SAND(CH) | 55 | 19 | 36 | | |
| ⊠ | CL-201 | Lift 1 | FAT CLAY with SAND(CH) | 57 | 19 | 38 | | |
| ▲ | CL-206 | Lift 1 | FAT CLAY with SAND(CH) | 56 | 18 | 38 | | |
| ★ | CL-213 | Lift 2 | FAT CLAY with SAND(CH) | 56 | 18 | 38 | | |
| ⊙ | CL-216 | Lift 2 | FAT CLAY with SAND(CH) | 58 | 19 | 39 | | |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-196 | Lift 1 | 9.5 | | | | 0.3 | 15.6 | 84.0 | |
| ⊠ | CL-201 | Lift 1 | 9.5 | | | | 1.3 | 14.8 | 83.9 | |
| ▲ | CL-206 | Lift 1 | 9.5 | | | | 1.1 | 15.8 | 83.2 | |
| ★ | CL-213 | Lift 2 | 9.5 | | | | 0.3 | 16.2 | 83.5 | |
| ⊙ | CL-216 | Lift 2 | 9.5 | | | | 2.3 | 14.1 | 83.6 | |

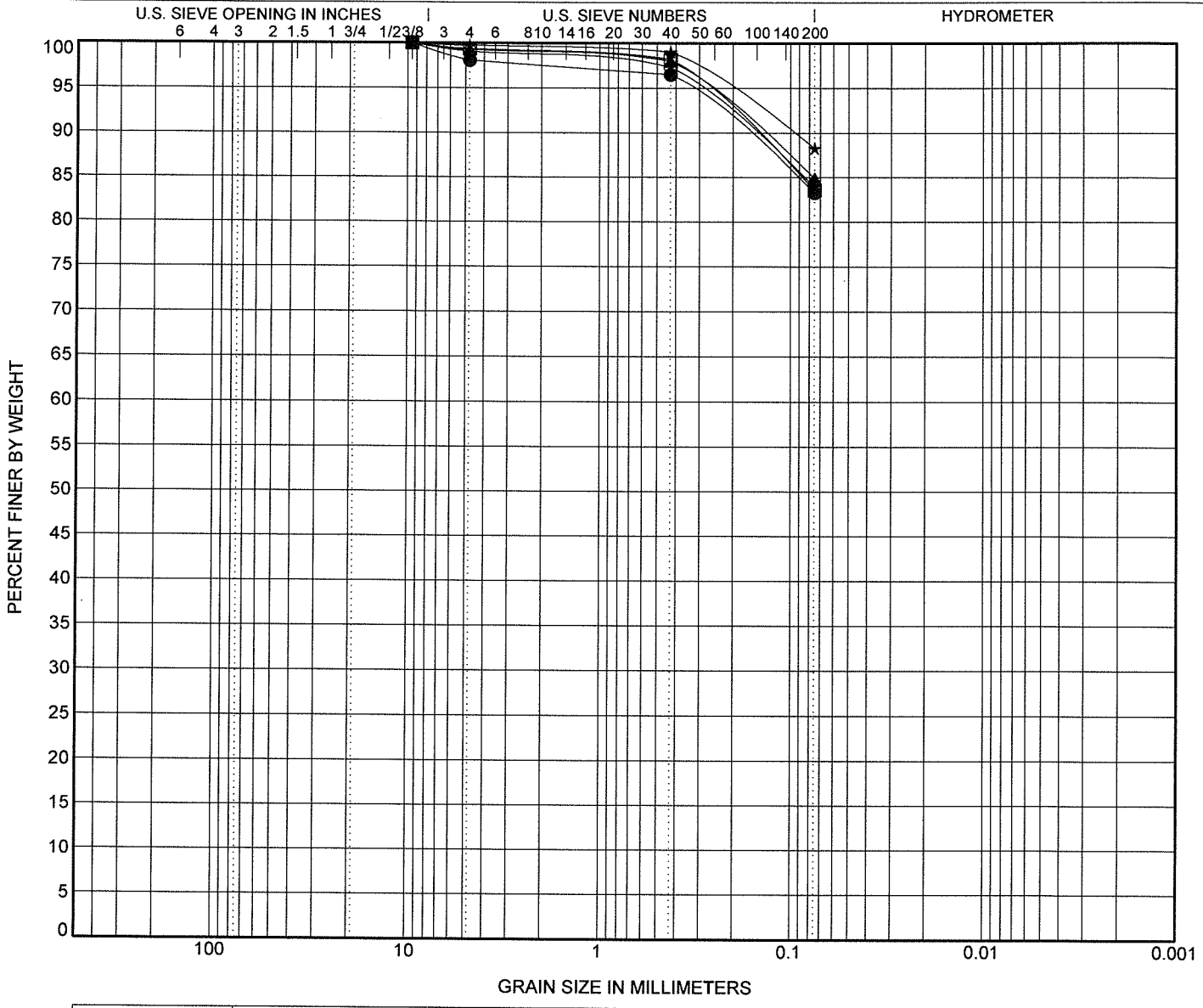
GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/17/12 14:13 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | CL-219 | Lift 2 | FAT CLAY with SAND(CH) | 56 | 18 | 38 | | |
| ⊠ | CL-224 | Lift 2 | FAT CLAY with SAND(CH) | 58 | 17 | 41 | | |
| ▲ | CL-229 | Lift 2 | FAT CLAY with SAND(CH) | 56 | 18 | 38 | | |
| ★ | CL-232 | Lift 3 | FAT CLAY(CH) | 58 | 19 | 39 | | |
| ⊙ | CL-235 | Lift 3 | FAT CLAY with SAND(CH) | 53 | 18 | 35 | | |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-219 | Lift 2 | 9.5 | | | | 1.9 | 14.8 | 83.3 | |
| ⊠ | CL-224 | Lift 2 | 9.5 | | | | 0.6 | 15.8 | 83.5 | |
| ▲ | CL-229 | Lift 2 | 9.5 | | | | 0.7 | 14.4 | 84.9 | |
| ★ | CL-232 | Lift 3 | 9.5 | | | | 0.3 | 11.5 | 88.3 | |
| ⊙ | CL-235 | Lift 3 | 9.5 | | | | 0.9 | 15.2 | 83.9 | |

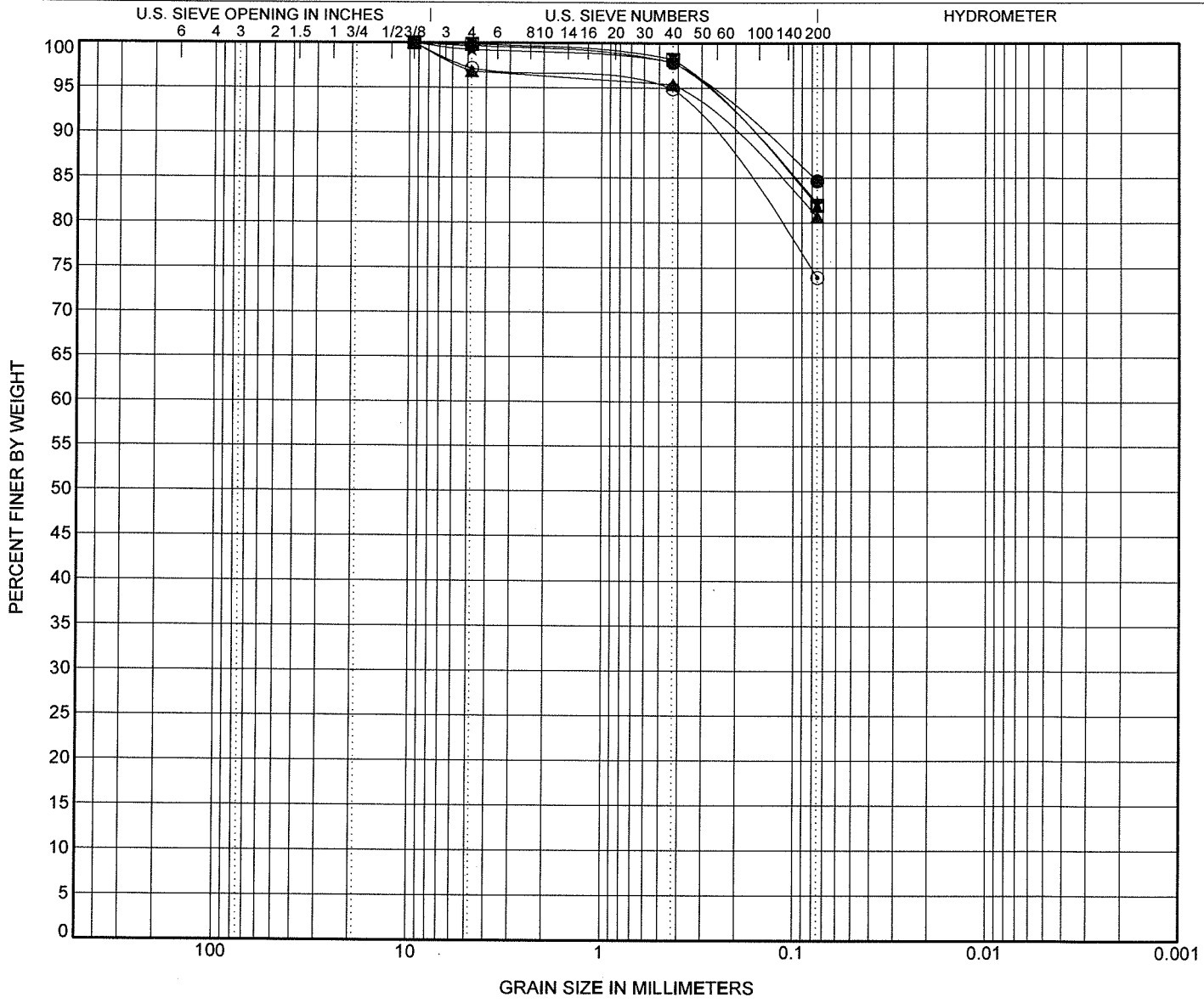
GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/17/12 14:13 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|
| ● CL-238 | Lift 3 | FAT CLAY with SAND(CH) | 55 | 18 | 37 | | |
| ⊠ CL-240 | Lift 3 | FAT CLAY with SAND(CH) | 54 | 18 | 36 | | |
| ▲ CL-243 | Lift 3 | FAT CLAY with SAND(CH) | 53 | 17 | 36 | | |
| ★ CL-250 | Lift 3 | FAT CLAY with SAND(CH) | 52 | 17 | 35 | | |
| ⊙ CL-289 | Lift 4 | FAT CLAY with SAND(CH) | 53 | 19 | 34 | | |

| BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|
| ● CL-238 | Lift 3 | 9.5 | | | | 0.3 | 15.0 | 84.6 | |
| ⊠ CL-240 | Lift 3 | 9.5 | | | | 0.1 | 17.9 | 81.9 | |
| ▲ CL-243 | Lift 3 | 9.5 | | | | 3.2 | 16.2 | 80.6 | |
| ★ CL-250 | Lift 3 | 9.5 | | | | 0.7 | 17.0 | 82.2 | |
| ⊙ CL-289 | Lift 4 | 9.5 | | | | 2.8 | 23.2 | 73.9 | |



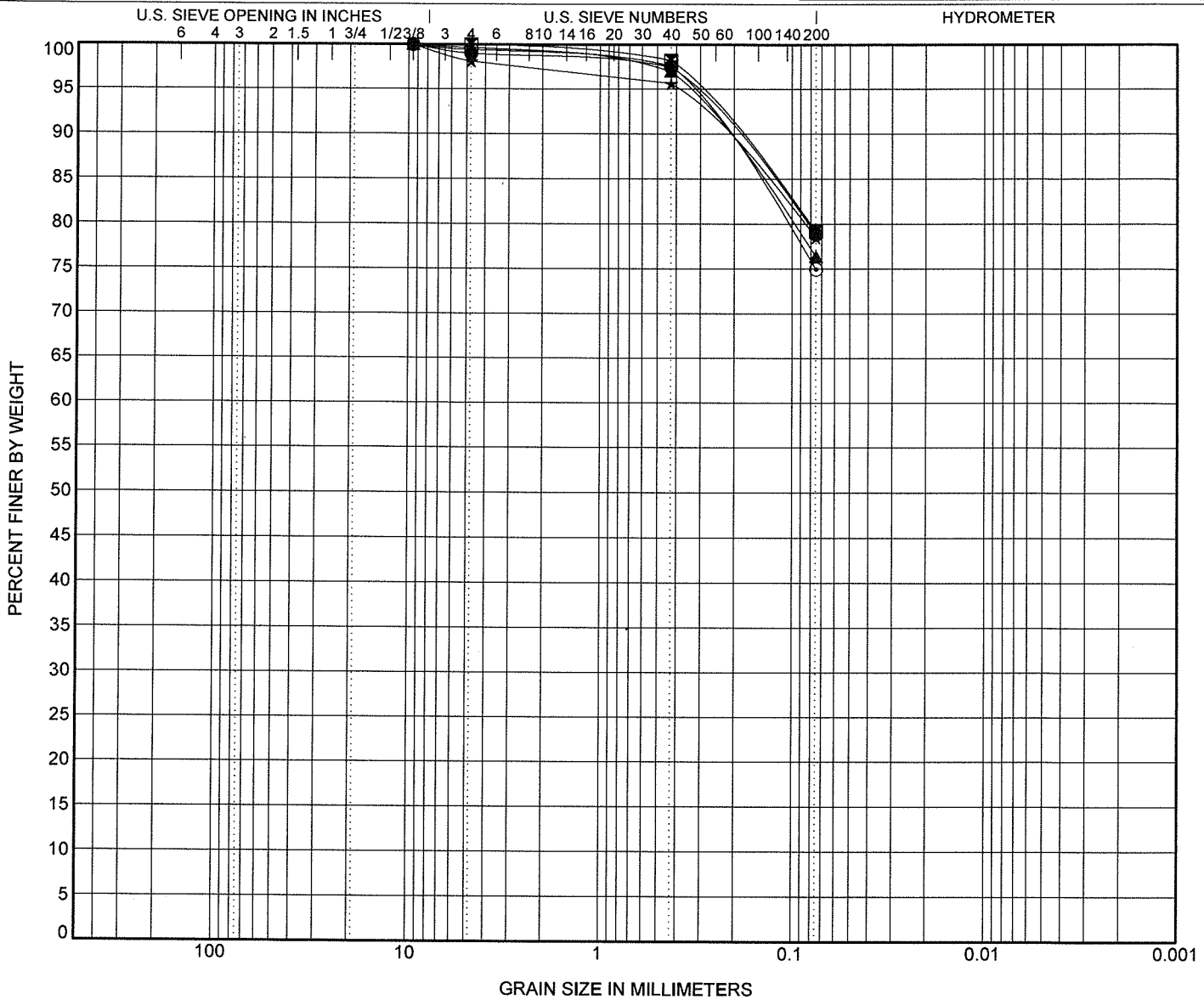
GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/17/12 14:13 - P:\113-9478801.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\9478B.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|
| ● CL-291 | Lift 4 | FAT CLAY with SAND(CH) | 54 | 18 | 36 | | |
| ⊠ CL-294 | Lift 4 | FAT CLAY with SAND(CH) | 59 | 20 | 39 | | |
| ▲ CL-296 | Lift 4 | FAT CLAY with SAND(CH) | 52 | 18 | 34 | | |
| ★ CL-300 | Lift 4 | FAT CLAY with SAND(CH) | 53 | 18 | 35 | | |
| ⊙ CL-305 | Lift 4 | FAT CLAY with SAND(CH) | 54 | 18 | 36 | | |

| BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|
| ● CL-291 | Lift 4 | 9.5 | | | | 1.0 | 20.2 | 78.9 | |
| ⊠ CL-294 | Lift 4 | 4.75 | | | | 0.0 | 20.8 | 79.2 | |
| ▲ CL-296 | Lift 4 | 9.5 | | | | 0.3 | 23.3 | 76.4 | |
| ★ CL-300 | Lift 4 | 9.5 | | | | 1.9 | 19.6 | 78.5 | |
| ⊙ CL-305 | Lift 4 | 9.5 | | | | 0.5 | 24.5 | 74.9 | |

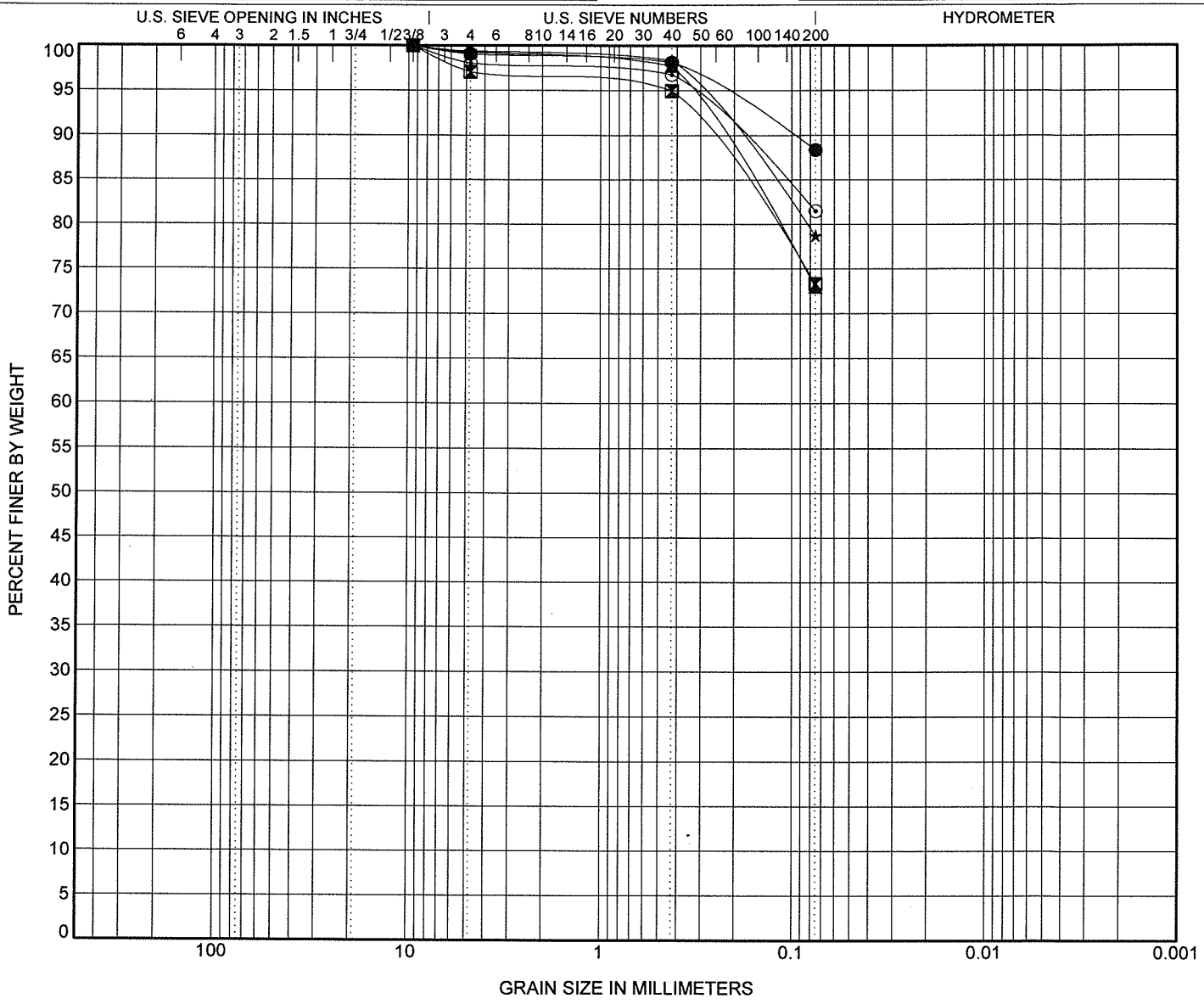
GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/17/12 14:13 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

Golder Associates

**CLIENT** Luminant **PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801 **PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | CL-308 | Lift 4 | FAT CLAY(CH) | 55 | 18 | 37 | | |
| ⊠ | CL-312 | Lift 4 | FAT CLAY with SAND(CH) | 53 | 17 | 36 | | |
| ▲ | CL-316 | Lift 4 | FAT CLAY with SAND(CH) | 51 | 17 | 34 | | |
| ★ | CL-339 | Lift 4 | FAT CLAY with SAND(CH) | 53 | 18 | 35 | | |
| ⊙ | CL-344 | Lift 4 | FAT CLAY with SAND(CH) | 54 | 18 | 36 | | |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-308 | Lift 4 | 9.5 | | | | 0.9 | 10.7 | 88.4 | |
| ⊠ | CL-312 | Lift 4 | 9.5 | | | | 2.9 | 23.8 | 73.3 | |
| ▲ | CL-316 | Lift 4 | 9.5 | | | | 0.7 | 26.4 | 72.9 | |
| ★ | CL-339 | Lift 4 | 9.5 | | | | 0.6 | 20.7 | 78.7 | |
| ⊙ | CL-344 | Lift 4 | 9.5 | | | | 2.0 | 16.6 | 81.5 | |

GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/17/12 14:13 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# GRAIN SIZE DISTRIBUTION

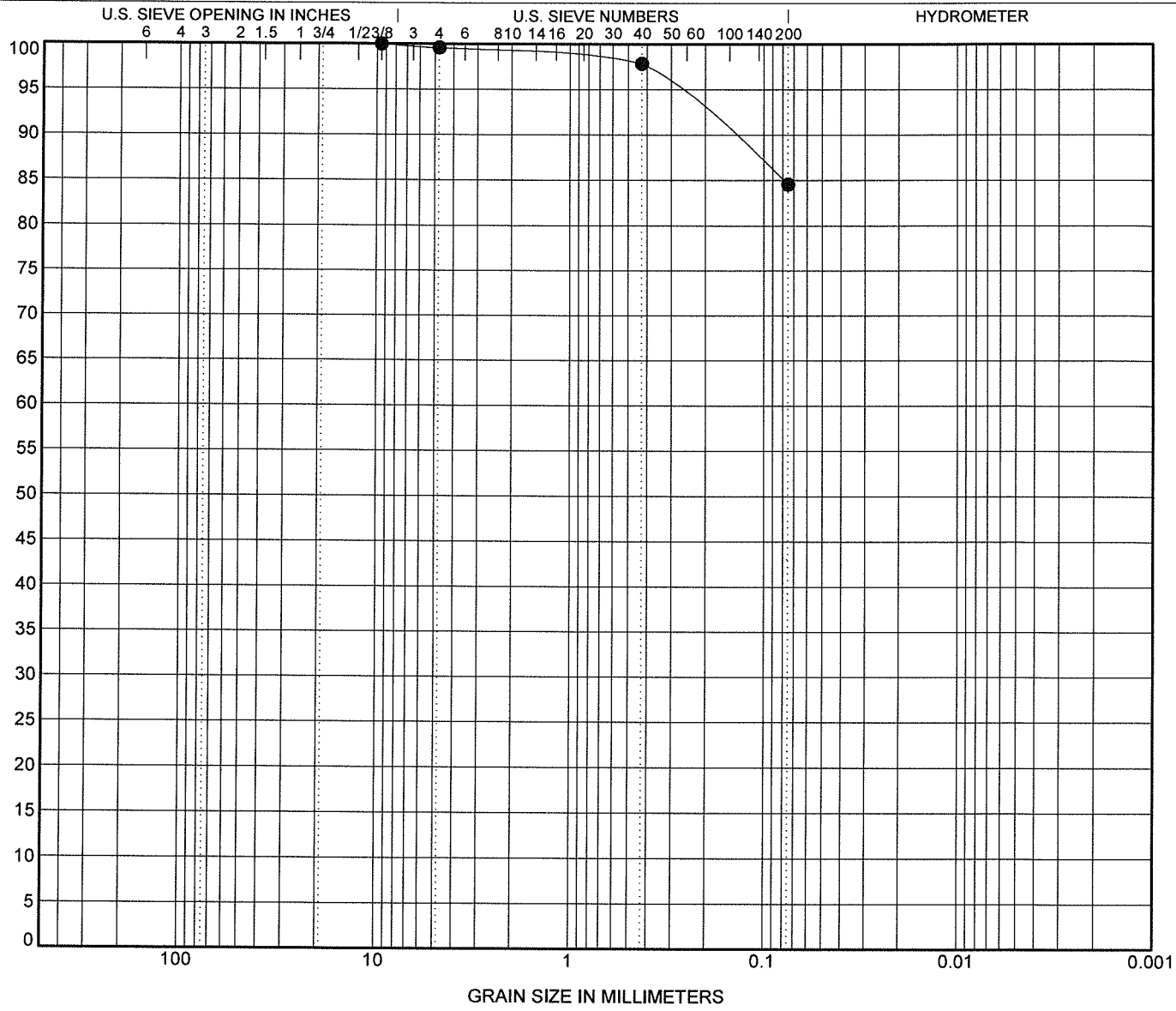
Golder Associates

**CLIENT** Luminant

**PROJECT NAME** Oak Grove FGD-B Pond CQA

**PROJECT NUMBER** 113-9478801

**PROJECT LOCATION** Robertson County, Texas




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | **CL-347** | **Lift 4** | **FAT CLAY with SAND(CH)** | **54** | **18** | **36** | | |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | **CL-347** | **Lift 4** | **9.5** | | | | **0.4** | **15.0** | **84.6** | |



GRAIN SIZE - CQA - GINT STD US LAB.GDT - 1/17/12 14:13 - P:\113-94788.01 LUMINANT OG FGD-B CQA\LAB RESULTS\BACKUP OF GINT FILE\94788.1GINT.GPJ

# HYDRAULIC CONDUCTIVITY

## FLEXIBLE W[illegible] TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-017 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.42 | 3.71 |
| Diameter, cm | 7.15 | 2.813 |
| Area, $cm^2$ | 40.10 | |
| Volume, $cm^3$ | 377.84 | |
| Wet Mass, g | 767.5 | |
| Wt. wet soil + tare, gm | 201.88 | |
| Wt. dry soil + tare, gm | 172.46 | |
| Wt. tare, gm | 9.71 | |
| Moisture Content, % | 18.1% | |
| Dry Density, pcf | 107.3 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.57 | |
| Saturation, % | 85.7% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 26.5

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.24 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0006

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.45 | 3.722 |
| Diameter, cm | 7.19 | 2.829 |
| Area, $cm^2$ | 40.55 | |
| Volume, $cm^3$ | 383.38 | |
| Wet Mass, g | 785.3 | |
| Wt. wet soil + tare, gm | 785.31 | |
| Wt. dry soil + tare, gm | 639.18 | |
| Wt. tare, gm | 8.22 | |
| Moisture Content, % | 23.2% | |
| Dry Density, pcf | 103.8 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.62 | |
| Saturation, % | 100% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.5 | 0.35 | 0 | | 0.040 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 2 | 10 | 130 | 25.5 | 0.39 | 1 | 4.3E-06 | 0.041 | 0.959 | 1.84E-07 | 22 | 0.956 | 1.76E-07 |
| 4 | 35 | 145 | 24.5 | 0.43 | 1 | 3.9E-06 | 0.043 | 0.957 | 1.72E-07 | 22 | 0.956 | 1.65E-07 |
| 8 | 14 | 219 | 23.5 | 0.47 | 1 | 2.6E-06 | 0.045 | 0.955 | 1.19E-07 | 22 | 0.956 | 1.14E-07 |
| 16 | 45 | 511 | 21.6 | 0.55 | 1.9 | 1.1E-06 | 0.049 | 0.906 | 1.09E-07 | 22 | 0.956 | 1.04E-07 |
| 26 | 51 | 606 | 19.8 | 0.62 | 1.8 | 9.3E-07 | 0.054 | 0.902 | 9.58E-08 | 22 | 0.956 | 9.16E-08 |
| 34 | 2 | 431 | 18.6 | 0.67 | 1.2 | 1.3E-06 | 0.058 | 0.930 | 9.46E-08 | 22 | 0.956 | 9.04E-08 |
| 39 | 42 | 340 | 17.7 | 0.71 | 0.9 | 1.7E-06 | 0.061 | 0.945 | 9.42E-08 | 22 | 0.956 | 9.00E-08 |
| 47 | 52 | 490 | 16.5 | 0.76 | 1.2 | 1.2E-06 | 0.066 | 0.921 | 9.53E-08 | 22 | 0.956 | 9.11E-08 |
| 57 | 49 | 597 | 15.2 | 0.81 | 1.3 | 9.5E-07 | 0.072 | 0.906 | 9.34E-08 | 22 | 0.956 | 8.93E-08 |
| 63 | 52 | 363 | 14.5 | 0.84 | 0.7 | 1.6E-06 | 0.076 | 0.947 | 8.53E-08 | 22 | 0.956 | 8.15E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **8.80E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | AQ |
| DATE: | 10/14/2011 | DATE: | 10/18/2011 |

**GEOTECHNICAL TESTING LABORATORY**
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**HOUSTON, TEXAS**

# FLEXIBLE W/ TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-018 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.35 | 3.683 |
| Diameter, cm | 7.26 | 2.857 |
| Area, $cm^2$ | 41.36 | |
| Volume, $cm^3$ | 386.91 | |
| Wet Mass, g | 780.9 | |
| Wt. wet soil + tare, gm | 202.46 | |
| Wt. dry soil + tare, gm | 170.71 | |
| Wt. tare, gm | 8.26 | |
| Moisture Content, % | 19.5% | |
| Dry Density, pcf | 105.4 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.60 | |
| Saturation, % | 88.1% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.4

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.23 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.40 | 3.699 |
| Diameter, cm | 7.30 | 2.874 |
| Area, $cm^2$ | 41.85 | |
| Volume, $cm^3$ | 393.23 | |
| Wet Mass, g | 791.9 | |
| Wt. wet soil + tare, gm | 802.30 | |
| Wt. dry soil + tare, gm | 660.09 | |
| Wt. tare, gm | 10.4 | |
| Moisture Content, % | 21.9% | |
| Dry Density, pcf | 103.1 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.63 | |
| Saturation, % | 93.2% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.4 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 1 | 45 | 105 | 26.7 | 0.38 | 0.7 | 5.2E-06 | 0.040 | 0.972 | 1.45E-07 | 22 | 0.956 | 1.39E-07 |
| 4 | 19 | 154 | 25.9 | 0.41 | 0.8 | 3.5E-06 | 0.041 | 0.967 | 1.17E-07 | 22 | 0.956 | 1.12E-07 |
| 9 | 15 | 296 | 24.8 | 0.46 | 1.1 | 1.8E-06 | 0.043 | 0.953 | 8.85E-08 | 22 | 0.956 | 8.45E-08 |
| 13 | 1 | 226 | 24.1 | 0.49 | 0.7 | 2.4E-06 | 0.044 | 0.969 | 7.54E-08 | 22 | 0.956 | 7.20E-08 |
| 20 | 32 | 451 | 22.9 | 0.53 | 1.2 | 1.2E-06 | 0.047 | 0.944 | 6.93E-08 | 22 | 0.956 | 6.62E-08 |
| 28 | 44 | 492 | 21.6 | 0.59 | 1.3 | 1.1E-06 | 0.050 | 0.936 | 7.35E-08 | 22 | 0.956 | 7.03E-08 |
| 39 | 32 | 648 | 20.2 | 0.64 | 1.4 | 8.4E-07 | 0.053 | 0.925 | 6.50E-08 | 22 | 0.956 | 6.21E-08 |
| 45 | 21 | 349 | 19.5 | 0.67 | 0.7 | 1.6E-06 | 0.055 | 0.961 | 6.15E-08 | 22 | 0.956 | 5.87E-08 |
| 55 | 20 | 599 | 18.4 | 0.72 | 1.1 | 9.1E-07 | 0.059 | 0.935 | 6.07E-08 | 22 | 0.956 | 5.80E-08 |
| 65 | 27 | 607 | 17.4 | 0.76 | 1 | 9.0E-07 | 0.063 | 0.937 | 5.78E-08 | 22 | 0.956 | 5.53E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **5.85E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | AQ |
| DATE: | 10/14/2011 | DATE: | 10/18/2011 |

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**HOUSTON, TEXAS**

## FLEXIBLE W/ TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-024 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.25 | 3.247 |
| Diameter, cm | 7.28 | 2.866 |
| Area, $cm^2$ | 41.62 | |
| Volume, $cm^3$ | 343.26 | |
| Wet Mass, g | 676.8 | |
| Wt. wet soil + tare, gm | 234.37 | |
| Wt. dry soil + tare, gm | 189.16 | |
| Wt. tare, gm | 10.43 | |
| Moisture Content, % | 25.3% | |
| Dry Density, pcf | 98.2 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.72 | |
| Saturation, % | 95.4% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.8

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.20 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.20 | 3.23 |
| Diameter, cm | 7.28 | 2.865 |
| Area, $cm^2$ | 41.59 | |
| Volume, $cm^3$ | 341.23 | |
| Wet Mass, g | 680.6 | |
| Wt. wet soil + tare, gm | 687.30 | |
| Wt. dry soil + tare, gm | 554.66 | |
| Wt. tare, gm | 6.8 | |
| Moisture Content, % | 24.2% | |
| Dry Density, pcf | 100.2 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.68 | |
| Saturation, % | 95.9% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.8 | 0.85 | 0 | | 0.039 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 2 | 23 | 143 | 27.3 | 0.87 | 0.5 | 3.3E-06 | 0.039 | 0.980 | 6.62E-08 | 22 | 0.956 | 6.33E-08 |
| 5 | 38 | 195 | 26.9 | 0.89 | 0.4 | 2.4E-06 | 0.040 | 0.984 | 3.94E-08 | 22 | 0.956 | 3.76E-08 |
| 11 | 40 | 362 | 26.2 | 0.92 | 0.7 | 1.3E-06 | 0.041 | 0.971 | 3.85E-08 | 22 | 0.956 | 3.68E-08 |
| 16 | 43 | 303 | 25.7 | 0.94 | 0.5 | 1.6E-06 | 0.042 | 0.979 | 3.34E-08 | 22 | 0.956 | 3.19E-08 |
| 24 | 55 | 492 | 24.9 | 0.97 | 0.8 | 9.7E-07 | 0.043 | 0.965 | 3.43E-08 | 22 | 0.956 | 3.28E-08 |
| 36 | 17 | 682 | 24.0 | 1.01 | 0.9 | 7.0E-07 | 0.045 | 0.959 | 2.90E-08 | 22 | 0.956 | 2.78E-08 |
| 41 | 39 | 322 | 23.6 | 1.02 | 0.4 | 1.5E-06 | 0.046 | 0.982 | 2.75E-08 | 22 | 0.956 | 2.63E-08 |
| 51 | 32 | 593 | 22.9 | 1.05 | 0.7 | 8.0E-07 | 0.048 | 0.967 | 2.72E-08 | 22 | 0.956 | 2.60E-08 |
| 61 | 39 | 607 | 22.3 | 1.08 | 0.6 | 7.8E-07 | 0.049 | 0.971 | 2.34E-08 | 22 | 0.956 | 2.24E-08 |
| 66 | 28 | 289 | 22.0 | 1.09 | 0.3 | 1.6E-06 | 0.050 | 0.985 | 2.48E-08 | 22 | 0.956 | 2.37E-08 |
| 76 | 1 | 573 | 21.5 | 1.11 | 0.5 | 8.3E-07 | 0.051 | 0.974 | 2.15E-08 | 22 | 0.956 | 2.05E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **2.32E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | AQ |
| DATE: | 10/14/2011 | DATE: | 10/18/2011 |

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**HOUSTON, TEXAS**

# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-027 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.78 | 3.458 |
| Diameter, cm | 7.24 | 2.852 |
| Area, $cm^2$ | 41.22 | |
| Volume, $cm^3$ | 362.01 | |
| Wet Mass, g | 716.7 | |
| Wt. wet soil + tare, gm | 214.30 | |
| Wt. dry soil + tare, gm | 175.71 | |
| Wt. tare, gm | 8.2 | |
| Moisture Content, % | 23.0% | |
| Dry Density, pcf | 100.4 | |
| Specific Gravity | 2.6 | |
| Void Ratio | 0.62 | |
| Saturation, % | 97.3% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.1

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.21 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.75 | 3.445 |
| Diameter, cm | 7.28 | 2.867 |
| Area, $cm^2$ | 41.65 | |
| Volume, $cm^3$ | 364.45 | |
| Wet Mass, g | 722.5 | |
| Wt. wet soil + tare, gm | 730.70 | |
| Wt. dry soil + tare, gm | 588.75 | |
| Wt. tare, gm | 8.2 | |
| Moisture Content, % | 24.5% | |
| Dry Density, pcf | 99.4 | |
| Specific Gravity | 2.6 | |
| Void Ratio | 0.63 | |
| Saturation, % | 100.6% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.1 | 0.85 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 4 | 56 | 296 | 27.1 | 0.89 | 1 | 1.7E-06 | 0.040 | 0.960 | 7.01E-08 | 22 | 0.956 | 6.70E-08 |
| 7 | 30 | 154 | 26.7 | 0.91 | 0.4 | 3.3E-06 | 0.040 | 0.984 | 5.41E-08 | 22 | 0.956 | 5.17E-08 |
| 14 | 48 | 438 | 25.7 | 0.95 | 1 | 1.2E-06 | 0.042 | 0.958 | 5.02E-08 | 22 | 0.956 | 4.80E-08 |
| 21 | 20 | 392 | 25.0 | 0.98 | 0.7 | 1.3E-06 | 0.043 | 0.970 | 4.02E-08 | 22 | 0.956 | 3.84E-08 |
| 27 | 18 | 358 | 24.3 | 1.01 | 0.7 | 1.4E-06 | 0.045 | 0.969 | 4.55E-08 | 22 | 0.956 | 4.34E-08 |
| 35 | 37 | 499 | 23.5 | 1.04 | 0.8 | 1.0E-06 | 0.046 | 0.963 | 3.88E-08 | 22 | 0.956 | 3.70E-08 |
| 44 | 31 | 534 | 22.7 | 1.07 | 0.8 | 9.6E-07 | 0.048 | 0.961 | 3.77E-08 | 22 | 0.956 | 3.60E-08 |
| 49 | 14 | 283 | 22.3 | 1.09 | 0.4 | 1.8E-06 | 0.049 | 0.980 | 3.59E-08 | 22 | 0.956 | 3.43E-08 |
| 61 | 51 | 757 | 21.2 | 1.13 | 1.1 | 6.8E-07 | 0.052 | 0.943 | 3.97E-08 | 22 | 0.956 | 3.80E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **3.63E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/18/2011 | DATE: | 10/25/2011 |

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**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-032 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.94 | 3.519 |
| Diameter, cm | 7.19 | 2.832 |
| Area, $cm^2$ | 40.64 | |
| Volume, $cm^3$ | 363.24 | |
| Wet Mass, g | 717.3 | |
| Wt. wet soil + tare, gm | 208.90 | |
| Wt. dry soil + tare, gm | 170.63 | |
| Wt. tare, gm | 8.4 | |
| Moisture Content, % | 23.6% | |
| Dry Density, pcf | 99.7 | |
| Specific Gravity | 2.6 | |
| Void Ratio | 0.63 | |
| Saturation, % | 97.8% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.0

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.89 | 3.501 |
| Diameter, cm | 7.25 | 2.855 |
| Area, $cm^2$ | 41.30 | |
| Volume, $cm^3$ | 367.28 | |
| Wet Mass, g | 722.2 | |
| Wt. wet soil + tare, gm | 728.90 | |
| Wt. dry soil + tare, gm | 584.83 | |
| Wt. tare, gm | 6.8 | |
| Moisture Content, % | 24.9% | |
| Dry Density, pcf | 98.2 | |
| Specific Gravity | 2.6 | |
| Void Ratio | 0.65 | |
| Saturation, % | 99.4% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.0 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 3 | 48 | 228 | 27.3 | 0.38 | 0.7 | 2.3E-06 | 0.039 | 0.973 | 6.36E-08 | 22 | 0.956 | 6.08E-08 |
| 8 | 42 | 294 | 26.9 | 0.40 | 0.4 | 1.8E-06 | 0.039 | 0.984 | 2.85E-08 | 22 | 0.956 | 2.72E-08 |
| 15 | 2 | 380 | 26.5 | 0.41 | 0.4 | 1.4E-06 | 0.040 | 0.984 | 2.24E-08 | 22 | 0.956 | 2.14E-08 |
| 22 | 37 | 455 | 26.1 | 0.43 | 0.4 | 1.2E-06 | 0.041 | 0.984 | 1.90E-08 | 22 | 0.956 | 1.81E-08 |
| 28 | 1 | 324 | 25.9 | 0.44 | 0.2 | 1.6E-06 | 0.041 | 0.992 | 1.34E-08 | 22 | 0.956 | 1.28E-08 |
| 36 | 37 | 516 | 25.6 | 0.45 | 0.3 | 1.0E-06 | 0.041 | 0.988 | 1.28E-08 | 22 | 0.956 | 1.22E-08 |
| 43 | 15 | 398 | 25.4 | 0.46 | 0.2 | 1.3E-06 | 0.042 | 0.992 | 1.11E-08 | 22 | 0.956 | 1.06E-08 |
| 55 | 48 | 753 | 25.0 | 0.47 | 0.4 | 7.0E-07 | 0.042 | 0.983 | 1.20E-08 | 22 | 0.956 | 1.15E-08 |
| 67 | 3 | 675 | 24.6 | 0.49 | 0.4 | 7.8E-07 | 0.043 | 0.983 | 1.36E-08 | 22 | 0.956 | 1.30E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.18E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/21/2011 | DATE: | 10/25/2011 |

**GEOTECHNICAL TESTING LABORATORY**
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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-037 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.22 | 3.631 |
| Diameter, cm | 7.23 | 2.848 |
| Area, $cm^2$ | 41.10 | |
| Volume, $cm^3$ | 379.05 | |
| Wet Mass, g | 732.9 | |
| Wt. wet soil + tare, gm | 185.50 | |
| Wt. dry soil + tare, gm | 153.22 | |
| Wt. tare, gm | 9.8 | |
| Moisture Content, % | 22.5% | |
| Dry Density, pcf | 98.5 | |
| Specific Gravity | 2.6 | |
| Void Ratio | 0.65 | |
| Saturation, % | 90.4% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.5

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.15 | 3.603 |
| Diameter, cm | 7.22 | 2.841 |
| Area, $cm^2$ | 40.90 | |
| Volume, $cm^3$ | 374.28 | |
| Wet Mass, g | 737.9 | |
| Wt. wet soil + tare, gm | 748.10 | |
| Wt. dry soil + tare, gm | 600.01 | |
| Wt. tare, gm | 10.4 | |
| Moisture Content, % | 25.1% | |
| Dry Density, pcf | 98.3 | |
| Specific Gravity | 2.6 | |
| Void Ratio | 0.65 | |
| Saturation, % | 100.5% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.5 | 0.85 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 6 | 6 | 366 | 27.8 | 0.88 | 0.7 | 1.5E-06 | 0.039 | 0.973 | 4.04E-08 | 22 | 0.956 | 3.86E-08 |
| 12 | 34 | 388 | 27.4 | 0.90 | 0.4 | 1.4E-06 | 0.039 | 0.984 | 2.20E-08 | 22 | 0.956 | 2.10E-08 |
| 20 | 5 | 451 | 27.1 | 0.91 | 0.3 | 1.2E-06 | 0.040 | 0.988 | 1.43E-08 | 22 | 0.956 | 1.37E-08 |
| 25 | 27 | 322 | 26.9 | 0.92 | 0.2 | 1.7E-06 | 0.040 | 0.992 | 1.35E-08 | 22 | 0.956 | 1.29E-08 |
| 34 | 2 | 515 | 26.6 | 0.93 | 0.3 | 1.0E-06 | 0.041 | 0.988 | 1.28E-08 | 22 | 0.956 | 1.22E-08 |
| 41 | 28 | 446 | 26.3 | 0.94 | 0.3 | 1.2E-06 | 0.041 | 0.988 | 1.50E-08 | 22 | 0.956 | 1.43E-08 |
| 49 | 39 | 491 | 26.0 | 0.95 | 0.3 | 1.1E-06 | 0.042 | 0.988 | 1.38E-08 | 22 | 0.956 | 1.32E-08 |
| 60 | 23 | 644 | 25.6 | 0.97 | 0.4 | 8.4E-07 | 0.042 | 0.983 | 1.43E-08 | 22 | 0.956 | 1.36E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.33E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/21/2011 | DATE: | 10/25/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-040 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.18 | 3.616 |
| Diameter, cm | 7.23 | 2.848 |
| Area, $cm^2$ | 41.10 | |
| Volume, $cm^3$ | 377.48 | |
| Wet Mass, g | 731.5 | |
| Wt. wet soil + tare, gm | 193.90 | |
| Wt. dry soil + tare, gm | 158.93 | |
| Wt. tare, gm | 8.2 | |
| Moisture Content, % | 23.2% | |
| Dry Density, pcf | 98.1 | |
| Specific Gravity | 2.63 | |
| Void Ratio | 0.67 | |
| Saturation, % | 90.8% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.9

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.12 | 3.591 |
| Diameter, cm | 7.19 | 2.832 |
| Area, $cm^2$ | 40.64 | |
| Volume, $cm^3$ | 370.67 | |
| Wet Mass, g | 736.6 | |
| Wt. wet soil + tare, gm | 744.60 | |
| Wt. dry soil + tare, gm | 599.41 | |
| Wt. tare, gm | 8.2 | |
| Moisture Content, % | 24.6% | |
| Dry Density, pcf | 99.6 | |
| Specific Gravity | 2.63 | |
| Void Ratio | 0.65 | |
| Saturation, % | 99.6% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.9 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 2 | 34 | 154 | 27.0 | 0.39 | 0.9 | 3.5E-06 | 0.039 | 0.965 | 1.25E-07 | 22 | 0.956 | 1.19E-07 |
| 6 | 33 | 239 | 26.3 | 0.42 | 0.7 | 2.2E-06 | 0.040 | 0.972 | 6.42E-08 | 22 | 0.956 | 6.13E-08 |
| 9 | 41 | 188 | 25.9 | 0.43 | 0.4 | 2.9E-06 | 0.041 | 0.984 | 4.71E-08 | 22 | 0.956 | 4.50E-08 |
| 15 | 14 | 333 | 25.3 | 0.46 | 0.6 | 1.6E-06 | 0.042 | 0.975 | 4.11E-08 | 22 | 0.956 | 3.92E-08 |
| 24 | 28 | 554 | 24.4 | 0.49 | 0.9 | 9.7E-07 | 0.044 | 0.961 | 3.87E-08 | 22 | 0.956 | 3.70E-08 |
| 30 | 6 | 338 | 23.9 | 0.51 | 0.5 | 1.6E-06 | 0.045 | 0.978 | 3.58E-08 | 22 | 0.956 | 3.42E-08 |
| 38 | 19 | 493 | 23.2 | 0.54 | 0.7 | 1.1E-06 | 0.046 | 0.968 | 3.56E-08 | 22 | 0.956 | 3.40E-08 |
| 46 | 24 | 485 | 22.6 | 0.57 | 0.6 | 1.1E-06 | 0.047 | 0.972 | 3.18E-08 | 22 | 0.956 | 3.04E-08 |
| 51 | 48 | 324 | 22.2 | 0.58 | 0.4 | 1.7E-06 | 0.048 | 0.981 | 3.22E-08 | 22 | 0.956 | 3.08E-08 |
| 57 | 7 | 319 | 21.8 | 0.60 | 0.4 | 1.7E-06 | 0.049 | 0.980 | 3.34E-08 | 22 | 0.956 | 3.19E-08 |
| 62 | 11 | 304 | 21.4 | 0.62 | 0.4 | 1.8E-06 | 0.050 | 0.980 | 3.57E-08 | 22 | 0.956 | 3.42E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **3.18E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/21/2011 | DATE: | 10/25/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-043 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.08 | 3.573 |
| Diameter, cm | 7.24 | 2.850 |
| Area, $cm^2$ | 41.16 | |
| Volume, $cm^3$ | 373.52 | |
| Wet Mass, g | 735.4 | |
| Wt. wet soil + tare, gm | 218.40 | |
| Wt. dry soil + tare, gm | 176.97 | |
| Wt. tare, gm | 9.3 | |
| Moisture Content, % | 24.7% | |
| Dry Density, pcf | 98.5 | |
| Specific Gravity | 2.64 | |
| Void Ratio | 0.67 | |
| Saturation, % | 97.0% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.3

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.04 | 3.561 |
| Diameter, cm | 7.23 | 2.846 |
| Area, $cm^2$ | 41.04 | |
| Volume, $cm^3$ | 371.22 | |
| Wet Mass, g | 742.4 | |
| Wt. wet soil + tare, gm | 749.10 | |
| Wt. dry soil + tare, gm | 604.68 | |
| Wt. tare, gm | 7 | |
| Moisture Content, % | 24.2% | |
| Dry Density, pcf | 100.5 | |
| Specific Gravity | 2.64 | |
| Void Ratio | 0.64 | |
| Saturation, % | 99.8% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.3 | 0.85 | 0 | | 0.039 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 5 | 33 | 333 | 26.7 | 0.87 | 0.6 | 1.6E-06 | 0.040 | 0.976 | 3.90E-08 | 22 | 0.956 | 3.72E-08 |
| 13 | 14 | 461 | 26.3 | 0.89 | 0.4 | 1.1E-06 | 0.041 | 0.984 | 1.90E-08 | 22 | 0.956 | 1.81E-08 |
| 22 | 28 | 554 | 25.9 | 0.91 | 0.4 | 9.6E-07 | 0.042 | 0.983 | 1.61E-08 | 22 | 0.956 | 1.54E-08 |
| 28 | 7 | 339 | 25.7 | 0.92 | 0.2 | 1.6E-06 | 0.042 | 0.992 | 1.32E-08 | 22 | 0.956 | 1.26E-08 |
| 36 | 19 | 492 | 25.4 | 0.93 | 0.3 | 1.1E-06 | 0.043 | 0.987 | 1.38E-08 | 22 | 0.956 | 1.32E-08 |
| 44 | 3 | 464 | 25.1 | 0.94 | 0.3 | 1.1E-06 | 0.043 | 0.987 | 1.49E-08 | 22 | 0.956 | 1.42E-08 |
| 49 | 51 | 348 | 24.8 | 0.95 | 0.3 | 1.5E-06 | 0.044 | 0.987 | 2.01E-08 | 22 | 0.956 | 1.92E-08 |
| 56 | 19 | 388 | 24.5 | 0.96 | 0.3 | 1.4E-06 | 0.044 | 0.987 | 1.82E-08 | 22 | 0.956 | 1.74E-08 |
| 63 | 24 | 425 | 24.2 | 0.98 | 0.3 | 1.2E-06 | 0.045 | 0.987 | 1.69E-08 | 22 | 0.956 | 1.61E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.67E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/21/2011 | DATE: | 10/25/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-046 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.35 | 3.68 |
| Diameter, cm | 7.22 | 2.843 |
| Area, $cm^2$ | 40.96 | |
| Volume, $cm^3$ | 382.82 | |
| Wet Mass, g | 766.1 | |
| Wt. wet soil + tare, gm | 231.40 | |
| Wt. dry soil + tare, gm | 191.49 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 22.0% | |
| Dry Density, pcf | 102.4 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.65 | |
| Saturation, % | 91.9% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.4

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.23 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.35 | 3.68 |
| Diameter, cm | 7.26 | 2.860 |
| Area, $cm^2$ | 41.45 | |
| Volume, $cm^3$ | 387.41 | |
| Wet Mass, g | 775.8 | |
| Wt. wet soil + tare, gm | 785.60 | |
| Wt. dry soil + tare, gm | 633.41 | |
| Wt. tare, gm | 10 | |
| Moisture Content, % | 24.4% | |
| Dry Density, pcf | 100.4 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.68 | |
| Saturation, % | 97.3% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.4 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 5 | 33 | 333 | 26.5 | 0.39 | 0.9 | 1.6E-06 | 0.040 | 0.964 | 6.02E-08 | 22 | 0.956 | 5.75E-08 |
| 11 | 36 | 363 | 26.0 | 0.41 | 0.5 | 1.5E-06 | 0.041 | 0.980 | 3.10E-08 | 22 | 0.956 | 2.97E-08 |
| 17 | 32 | 356 | 25.6 | 0.42 | 0.4 | 1.5E-06 | 0.041 | 0.983 | 2.57E-08 | 22 | 0.956 | 2.45E-08 |
| 22 | 23 | 291 | 25.3 | 0.44 | 0.3 | 1.9E-06 | 0.042 | 0.987 | 2.38E-08 | 22 | 0.956 | 2.28E-08 |
| 28 | 18 | 355 | 25.0 | 0.45 | 0.3 | 1.5E-06 | 0.042 | 0.987 | 1.98E-08 | 22 | 0.956 | 1.89E-08 |
| 38 | 35 | 617 | 24.6 | 0.46 | 0.4 | 8.9E-07 | 0.043 | 0.983 | 1.55E-08 | 22 | 0.956 | 1.48E-08 |
| 47 | 45 | 550 | 24.2 | 0.48 | 0.4 | 1.0E-06 | 0.044 | 0.982 | 1.77E-08 | 22 | 0.956 | 1.69E-08 |
| 57 | 26 | 581 | 23.8 | 0.50 | 0.4 | 9.4E-07 | 0.045 | 0.982 | 1.70E-08 | 22 | 0.956 | 1.63E-08 |
| 67 | 1 | 575 | 23.4 | 0.51 | 0.4 | 9.5E-07 | 0.045 | 0.982 | 1.75E-08 | 22 | 0.956 | 1.67E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.62E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/21/2011 | DATE: | 10/25/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | |
| PROJECT NUMBER | 113-94788 | | |
| SAMPLE ID | CL-050 | L-2 | |
| SAMPLE TYPE | UD | | |

| | |
|---|---|
| Board # | 5 |
| Flow Pump | 1 |
| Flow Pump Speed | 11 |
| Technician | AK |

COMMENTS

**Sample Data, Initial**

| | | | |
|---|---|---|---|
| Height, inches | 2.926 | B-Value, f | 0.99 |
| Diameter, inches | 2.844 | Cell Pres. | 90.0 |
| Area, cm² | 40.98 | Bot. Pres. | 80.0 |
| Volume, cm³ | 304.60 | Top Pres. | 80.0 |
| Mass, g | 601.31 | Tot. B.P. | 80.0 |
| Moisture Content, % | 22.95 | Head, max. | 151.23 |
| Dry Density, pcf | 100.19 | Head, min. | 151.23 |
| Spec. Gravity(assumed) | 2.750 | Max. Grad. | 20.44 |
| Volume Solids, cm³ | 177.84 | Min. Grad. | 20.44 |
| Volume Voids, cm³ | 126.76 | | |
| Void Ratio | 0.71 | | |
| Saturation, % | 88.6% | | |

**Sample Data, Final**

| | |
|---|---|
| Height, inches | 2.913 |
| Diameter, inches | 2.840 |
| Area, cm² | 40.87 |
| Volume, cm³ | 302.39 |
| Mass, g | 612.15 |
| Moisture Content, % | 25.17 |
| Dry Density, pcf | 100.92 |
| Volume Solids, cm³ | 177.84 |
| Volume Voids, cm³ | 124.55 |
| Void Ratio | 0.70 |
| Saturation, % | 98.8% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 601.31 | 620.77 |
| Wt Soil & Tare, f | g | 489.06 | 497.70 |
| Wt Tare | g | 0.00 | 8.73 |
| Wt Moisture Lost | g | 112.25 | 123.07 |
| Wt Dry Soil | g | 489.06 | 488.97 |
| Water Content | % | 22.95% | 25.17% |

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 1.27E-05 cm³/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/21/11 | 40837 | 15 | 35 | 21.7 | 0 | 0 | 0 | 0 | 2.15 | 151.23 | 20.44 | 1.5E-08 |
| 10/21/11 | 40837 | 15 | 40 | 21.7 | 5 | 5 | 300 | 300 | 2.15 | 151.23 | 20.44 | 1.5E-08 |
| 10/21/11 | 40837 | 15 | 45 | 21.7 | 5 | 10 | 300 | 600 | 2.15 | 151.23 | 20.44 | 1.5E-08 |
| 10/21/11 | 40837 | 15 | 50 | 21.7 | 5 | 15 | 300 | 900 | 2.15 | 151.23 | 20.44 | 1.5E-08 * |
| 10/21/11 | 40837 | 15 | 55 | 21.7 | 5 | 20 | 300 | 1200 | 2.15 | 151.23 | 20.44 | 1.5E-08 * |
| 10/21/11 | 40837 | 16 | 0 | 21.7 | 5 | 25 | 300 | 1500 | 2.15 | 151.23 | 20.44 | 1.5E-08 * |
| 10/21/11 | 40837 | 16 | 5 | 21.7 | 5 | 30 | 300 | 1800 | 2.15 | 151.23 | 20.44 | 1.5E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.5E-08 cm/sec **

| | |
|---|---|
| DATE | 10/21/11 |
| CHECK | AK |
| REVIEW | PWL |

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | Board # | 6 |
| PROJECT NUMBER | 113-94788 | Flow Pump | 1 |
| SAMPLE ID | CL-057 / L-2 | Flow Pump Speed | 11 |
| SAMPLE TYPE | UD | Technician | AK |

COMMENTS:

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 2.922 | B-Value, f | 1.00 |
| Diameter, inches | 2.836 | Cell Pres. | 90.0 |
| Area, cm² | 40.75 | Bot. Pres. | 80.0 |
| Volume, cm³ | 302.47 | Top Pres. | 80.0 |
| Mass, g | 589.15 | Tot. B.P. | 80.0 |
| Moisture Content, % | 18.68 | Head, max. | 177.26 |
| Dry Density, pcf | 102.41 | Head, min. | 177.26 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 23.82 |
| Volume Solids, cm³ | 183.86 | Min. Grad. | 23.82 |
| Volume Voids, cm³ | 118.61 | | |
| Void Ratio | 0.65 | | |
| Saturation, % | 78.2% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 2.930 |
| Diameter, inches | 2.845 |
| Area, cm² | 41.01 |
| Volume, cm³ | 305.23 |
| Mass, g | 611.63 |
| Moisture Content, % | 23.21 |
| Dry Density, pcf | 101.49 |
| Volume Solids, cm³ | 183.86 |
| Volume Voids, cm³ | 121.36 |
| Void Ratio | 0.66 |
| Saturation, % | 94.9% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 589.15 | 620.01 |
| Wt Soil & Tare, f | g | 496.43 | 504.83 |
| Wt Tare | g | 0.00 | 8.49 |
| Wt Moisture Lost | g | 92.72 | 115.18 |
| Wt Dry Soil | g | 496.43 | 496.34 |
| Water Content | % | 18.68% | 23.21% |

DESCRIPTION: Reddish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 1.27E-05 cm³/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/21/11 | 40837 | 16 | 20 | 21.7 | 0 | 0 | 0 | 0 | 2.52 | 177.26 | 23.82 | 1.3E-08 |
| 10/21/11 | 40837 | 16 | 25 | 21.7 | 5 | 5 | 300 | 300 | 2.52 | 177.26 | 23.82 | 1.3E-08 |
| 10/21/11 | 40837 | 16 | 30 | 21.7 | 5 | 10 | 300 | 600 | 2.52 | 177.26 | 23.82 | 1.3E-08 |
| 10/21/11 | 40837 | 16 | 35 | 21.7 | 5 | 15 | 300 | 900 | 2.52 | 177.26 | 23.82 | 1.3E-08 * |
| 10/21/11 | 40837 | 16 | 40 | 21.7 | 5 | 20 | 300 | 1200 | 2.52 | 177.26 | 23.82 | 1.3E-08 * |
| 10/21/11 | 40837 | 16 | 45 | 21.7 | 5 | 25 | 300 | 1500 | 2.52 | 177.26 | 23.82 | 1.3E-08 * |
| 10/21/11 | 40837 | 16 | 50 | 21.7 | 5 | 30 | 300 | 1800 | 2.52 | 177.26 | 23.82 | 1.3E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.3E-08 cm/sec **

| | |
|---|---|
| DATE | 10/21/11 |
| CHECK | AIV |
| REVIEW | JWM |

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 4 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-061 | L-2 | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | AK | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.923 | B-Value, f | 0.99 | Height, inches | 2.934 |
| Diameter, inches | 2.851 | Cell Pres. | 90.0 | Diameter, inches | 2.866 |
| Area, cm² | 41.19 | Bot. Pres. | 80.0 | Area, cm² | 41.62 |
| Volume, cm³ | 305.78 | Top Pres. | 80.0 | Volume, cm³ | 310.17 |
| Mass, g | 609.18 | Tot. B.P. | 80.0 | Mass, g | 624.30 |
| Moisture Content, % | 21.49 | Head, max. | 77.37 | Moisture Content, % | 24.51 |
| Dry Density, pcf | 102.32 | Head, min. | 77.37 | Dry Density, pcf | 100.87 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 10.38 | Volume Solids, cm³ | 185.71 |
| Volume Solids, cm³ | 185.71 | Min. Grad. | 10.38 | Volume Voids, cm³ | 124.46 |
| Volume Voids, cm³ | 120.07 | | | Void Ratio | 0.67 |
| Void Ratio | 0.65 | | | Saturation, % | 98.7% |
| Saturation, % | 89.7% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 609.18 | 632.50 |
| Wt Soil & Tare, f | g | 501.42 | 509.66 |
| Wt Tare | g | 0.00 | 8.42 |
| Wt Moisture Lost | g | 107.76 | 122.84 |
| Wt Dry Soil | g | 501.42 | 501.24 |
| Water Content | % | 21.49% | 24.51% |

Flow Pump Rate: 1.27E-05 cm³/sec

USCS: (CH)

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/21/11 | 40837 | 14 | 35 | 21.5 | 0 | 0 | 0 | 0 | 1.10 | 77.37 | 10.38 | 2.9E-08 |
| 10/21/11 | 40837 | 14 | 40 | 21.5 | 5 | 5 | 300 | 300 | 1.10 | 77.37 | 10.38 | 2.9E-08 |
| 10/21/11 | 40837 | 14 | 45 | 21.5 | 5 | 10 | 300 | 600 | 1.10 | 77.37 | 10.38 | 2.9E-08 |
| 10/21/11 | 40837 | 14 | 50 | 21.5 | 5 | 15 | 300 | 900 | 1.10 | 77.37 | 10.38 | 2.9E-08 * |
| 10/21/11 | 40837 | 14 | 55 | 21.5 | 5 | 20 | 300 | 1200 | 1.10 | 77.37 | 10.38 | 2.9E-08 * |
| 10/21/11 | 40837 | 15 | 0 | 21.5 | 5 | 25 | 300 | 1500 | 1.10 | 77.37 | 10.38 | 2.9E-08 * |
| 10/21/11 | 40837 | 15 | 5 | 21.5 | 5 | 30 | 300 | 1800 | 1.10 | 77.37 | 10.38 | 2.9E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.9E-08 cm/sec **

DATE 10/21/11
CHECK AIC
REVIEW

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 3 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-071 | L-2 | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | AK | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.902 | B-Value, f | 0.99 | Height, inches | 2.953 |
| Diameter, inches | 2.848 | Cell Pres. | 90.0 | Diameter, inches | 2.852 |
| Area, cm² | 41.10 | Bot. Pres. | 80.0 | Area, cm² | 41.22 |
| Volume, cm³ | 302.95 | Top Pres. | 80.0 | Volume, cm³ | 309.14 |
| Mass, g | 601.90 | Tot. B.P. | 80.0 | Mass, g | 624.94 |
| Moisture Content, % | 18.87 | Head, max. | 106.92 | Moisture Content, % | 23.42 |
| Dry Density, pcf | 104.30 | Head, min. | 106.92 | Dry Density, pcf | 102.21 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 14.25 | Volume Solids, cm³ | 187.54 |
| Volume Solids, cm³ | 187.54 | Min. Grad. | 14.25 | Volume Voids, cm³ | 121.59 |
| Volume Voids, cm³ | 115.40 | | | Void Ratio | 0.65 |
| Void Ratio | 0.62 | | | Saturation, % | 97.5% |
| Saturation, % | 82.8% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 601.90 | 632.96 |
| Wt Soil & Tare, f | g | 506.37 | 514.44 |
| Wt Tare | g | 0.00 | 8.28 |
| Wt Moisture Lost | g | 95.53 | 118.52 |
| Wt Dry Soil | g | 506.37 | 506.16 |
| Water Content | % | 18.87% | 23.42% |

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 1.27E-05 cm³/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/21/11 | 40837 | 13 | 20 | 21.5 | 0 | 0 | 0 | 0 | 1.52 | 106.92 | 14.25 | 2.1E-08 |
| 10/21/11 | 40837 | 13 | 25 | 21.5 | 5 | 5 | 300 | 300 | 1.52 | 106.92 | 14.25 | 2.1E-08 |
| 10/21/11 | 40837 | 13 | 30 | 21.5 | 5 | 10 | 300 | 600 | 1.52 | 106.92 | 14.25 | 2.1E-08 |
| 10/21/11 | 40837 | 13 | 35 | 21.5 | 5 | 15 | 300 | 900 | 1.52 | 106.92 | 14.25 | 2.1E-08 * |
| 10/21/11 | 40837 | 13 | 40 | 21.5 | 5 | 20 | 300 | 1200 | 1.52 | 106.92 | 14.25 | 2.1E-08 * |
| 10/21/11 | 40837 | 13 | 45 | 21.5 | 5 | 25 | 300 | 1500 | 1.52 | 106.92 | 14.25 | 2.1E-08 * |
| 10/21/11 | 40837 | 13 | 50 | 21.5 | 5 | 30 | 300 | 1800 | 1.52 | 106.92 | 14.25 | 2.1E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.1E-08 cm/sec **

| | |
|---|---|
| DATE | 10/21/11 |
| CHECK | AJA |
| REVIEW | JWR |

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | Board # | 1 |
| PROJECT NUMBER | 113-94788 | Flow Pump | 1 |
| SAMPLE ID | CL-079 L-2 | Flow Pump Speed | 12 |
| SAMPLE TYPE | UD | Technician | AK |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 2.922 | B-Value, f | 1.00 |
| Diameter, inches | 2.813 | Cell Pres. | 90.0 |
| Area, cm² | 40.10 | Bot. Pres. | 80.0 |
| Volume, cm³ | 297.58 | Top Pres. | 80.0 |
| Mass, g | 591.05 | Tot. B.P. | 80.0 |
| Moisture Content, % | 23.15 | Head, max. | 149.12 |
| Dry Density, pcf | 100.64 | Head, min. | 149.12 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 20.15 |
| Volume Solids, cm³ | 177.75 | Min. Grad. | 20.15 |
| Volume Voids, cm³ | 119.83 | | |
| Void Ratio | 0.67 | | |
| Saturation, % | 92.7% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 2.913 |
| Diameter, inches | 2.803 |
| Area, cm² | 39.81 |
| Volume, cm³ | 294.56 |
| Mass, g | 594.48 |
| Moisture Content, % | 23.87 |
| Dry Density, pcf | 101.67 |
| Volume Solids, cm³ | 177.75 |
| Volume Voids, cm³ | 116.81 |
| Void Ratio | 0.66 |
| Saturation, % | 98.1% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 591.05 | 602.72 |
| Wt Soil & Tare, f | g | 479.93 | 488.21 |
| Wt Tare | g | 0.00 | 8.44 |
| Wt Moisture Lost | g | 111.12 | 114.51 |
| Wt Dry Soil | g | 479.93 | 479.77 |
| Water Content | % | 23.15% | 23.87% |

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 5.48E-06 cm³/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/21/11 | 40837 | 11 | 25 | 21.4 | 0 | 0 | 0 | 0 | 2.12 | 149.12 | 20.15 | 6.6E-09 |
| 10/21/11 | 40837 | 11 | 30 | 21.4 | 5 | 5 | 300 | 300 | 2.12 | 149.12 | 20.15 | 6.6E-09 |
| 10/21/11 | 40837 | 11 | 35 | 21.4 | 5 | 10 | 300 | 600 | 2.12 | 149.12 | 20.15 | 6.6E-09 |
| 10/21/11 | 40837 | 11 | 40 | 21.4 | 5 | 15 | 300 | 900 | 2.12 | 149.12 | 20.15 | 6.6E-09 * |
| 10/21/11 | 40837 | 11 | 45 | 21.4 | 5 | 20 | 300 | 1200 | 2.12 | 149.12 | 20.15 | 6.6E-09 * |
| 10/21/11 | 40837 | 11 | 50 | 21.4 | 5 | 25 | 300 | 1500 | 2.12 | 149.12 | 20.15 | 6.6E-09 * |
| 10/21/11 | 40837 | 11 | 55 | 21.4 | 5 | 30 | 300 | 1800 | 2.12 | 149.12 | 20.15 | 6.6E-09 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 6.6E-09 cm/sec **

DATE 10/21/11
CHECK AIV
REVIEW JWM

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | Board # | 1 |
| PROJECT NUMBER | 113-94788 | Flow Pump | 1 |
| SAMPLE ID | CL-085 L-2 | Flow Pump Speed | 12 |
| SAMPLE TYPE | UD | Technician | AK |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 2.925 | B-Value, f | 0.98 |
| Diameter, inches | 2.842 | Cell Pres. | 90.0 |
| Area, $cm^2$ | 40.93 | Bot. Pres. | 80.0 |
| Volume, $cm^3$ | 304.06 | Top Pres. | 80.0 |
| Mass, g | 602.40 | Tot. B.P. | 80.0 |
| Moisture Content, % | 22.17 | Head, max. | 166.00 |
| Dry Density, pcf | 101.19 | Head, min. | 166.00 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 22.20 |
| Volume Solids, $cm^3$ | 182.63 | Min. Grad. | 22.20 |
| Volume Voids, $cm^3$ | 121.43 | | |
| Void Ratio | 0.66 | | |
| Saturation, % | 90.0% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 2.944 |
| Diameter, inches | 2.852 |
| Area, $cm^2$ | 41.22 |
| Volume, $cm^3$ | 308.20 |
| Mass, g | 615.70 |
| Moisture Content, % | 24.86 |
| Dry Density, pcf | 99.84 |
| Volume Solids, $cm^3$ | 182.63 |
| Volume Voids, $cm^3$ | 125.57 |
| Void Ratio | 0.69 |
| Saturation, % | 97.6% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 602.40 | 623.79 |
| Wt Soil & Tare, f | g | 493.10 | 501.21 |
| Wt Tare | g | 0.00 | 8.18 |
| Wt Moisture Lost | g | 109.30 | 122.58 |
| Wt Dry Soil | g | 493.10 | 493.03 |
| Water Content | % | 22.17% | 24.86% |

DESCRIPTION: Reddish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 5.48E-06 $cm^3$/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/23/11 | 40839 | 9 | 25 | 21.4 | 0 | 0 | 0 | 0 | 2.36 | 166.00 | 22.20 | 5.8E-09 |
| 10/23/11 | 40839 | 9 | 30 | 21.4 | 5 | 5 | 300 | 300 | 2.36 | 166.00 | 22.20 | 5.8E-09 |
| 10/23/11 | 40839 | 9 | 35 | 21.4 | 5 | 10 | 300 | 600 | 2.36 | 166.00 | 22.20 | 5.8E-09 |
| 10/23/11 | 40839 | 9 | 40 | 21.4 | 5 | 15 | 300 | 900 | 2.36 | 166.00 | 22.20 | 5.8E-09 * |
| 10/23/11 | 40839 | 9 | 45 | 21.4 | 5 | 20 | 300 | 1200 | 2.36 | 166.00 | 22.20 | 5.8E-09 * |
| 10/23/11 | 40839 | 9 | 50 | 21.4 | 5 | 25 | 300 | 1500 | 2.36 | 166.00 | 22.20 | 5.8E-09 * |
| 10/23/11 | 40839 | 9 | 55 | 21.4 | 5 | 30 | 300 | 1800 | 2.36 | 166.00 | 22.20 | 5.8E-09 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 5.8E-09 cm/sec **

DATE 10/23/11
CHECK AIL
REVIEW JWM

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | Board # | 3 |
| PROJECT NUMBER | 113-94788 | Flow Pump | 1 |
| SAMPLE ID | CL-089 L-2 | Flow Pump Speed | 12 |
| SAMPLE TYPE | UD | Technician | AK |

COMMENTS

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.919 | B-Value, f | 0.98 | Height, inches | 2.962 |
| Diameter, inches | 2.854 | Cell Pres. | 90.0 | Diameter, inches | 2.882 |
| Area, cm² | 41.27 | Bot. Pres. | 80.0 | Area, cm² | 42.09 |
| Volume, cm³ | 306.01 | Top Pres. | 80.0 | Volume, cm³ | 316.64 |
| Mass, g | 614.17 | Tot. B.P. | 80.0 | Mass, g | 636.14 |
| Moisture Content, % | 20.16 | Head, max. | 122.39 | Moisture Content, % | 24.46 |
| Dry Density, pcf | 104.22 | Head, min. | 122.39 | Dry Density, pcf | 100.72 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 16.27 | Volume Solids, cm³ | 189.30 |
| Volume Solids, cm³ | 189.30 | Min. Grad. | 16.27 | Volume Voids, cm³ | 127.34 |
| Volume Voids, cm³ | 116.71 | | | Void Ratio | 0.67 |
| Void Ratio | 0.62 | | | Saturation, % | 98.2% |
| Saturation, % | 88.3% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 614.17 | 644.59 |
| Wt Soil & Tare, f | g | 511.11 | 519.58 |
| Wt Tare | g | 0.00 | 8.54 |
| Wt Moisture Lost | g | 103.06 | 125.01 |
| Wt Dry Soil | g | 511.11 | 511.04 |
| Water Content | % | 20.16% | 24.46% |

DESCRIPTION: Reddish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 5.48E-06 cm³/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/23/11 | 40839 | 10 | 40 | 21.6 | 0 | 0 | 0 | 0 | 1.74 | 122.39 | 16.27 | 7.7E-09 |
| 10/23/11 | 40839 | 10 | 45 | 21.6 | 5 | 5 | 300 | 300 | 1.74 | 122.39 | 16.27 | 7.7E-09 |
| 10/23/11 | 40839 | 10 | 50 | 21.6 | 5 | 10 | 300 | 600 | 1.74 | 122.39 | 16.27 | 7.7E-09 |
| 10/23/11 | 40839 | 10 | 55 | 21.6 | 5 | 15 | 300 | 900 | 1.74 | 122.39 | 16.27 | 7.7E-09 * |
| 10/23/11 | 40839 | 11 | 0 | 21.6 | 5 | 20 | 300 | 1200 | 1.74 | 122.39 | 16.27 | 7.7E-09 * |
| 10/23/11 | 40839 | 11 | 5 | 21.6 | 5 | 25 | 300 | 1500 | 1.74 | 122.39 | 16.27 | 7.7E-09 * |
| 10/23/11 | 40839 | 11 | 10 | 21.6 | 5 | 30 | 300 | 1800 | 1.74 | 122.39 | 16.27 | 7.7E-09 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 7.7E-09 cm/sec **

DATE 10/23/11
CHECK AK
REVIEW

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | Board # | 4 |
| PROJECT NUMBER | 113-94788 | Flow Pump | 1 |
| SAMPLE ID | CL-093 L-2 | Flow Pump Speed | 11 |
| SAMPLE TYPE | UD | Technician | AK |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 2.920 | B-Value, f | 0.98 |
| Diameter, inches | 2.852 | Cell Pres. | 90.0 |
| Area, cm² | 41.22 | Bot. Pres. | 80.0 |
| Volume, cm³ | 305.68 | Top Pres. | 80.0 |
| Mass, g | 608.69 | Tot. B.P. | 80.0 |
| Moisture Content, % | 21.34 | Head, max. | 125.21 |
| Dry Density, pcf | 102.40 | Head, min. | 125.21 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 16.74 |
| Volume Solids, cm³ | 185.79 | Min. Grad. | 16.74 |
| Volume Voids, cm³ | 119.90 | | |
| Void Ratio | 0.65 | | |
| Saturation, % | 89.3% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 2.944 |
| Diameter, inches | 2.851 |
| Area, cm² | 41.19 |
| Volume, cm³ | 307.98 |
| Mass, g | 621.05 |
| Moisture Content, % | 23.81 |
| Dry Density, pcf | 101.63 |
| Volume Solids, cm³ | 185.79 |
| Volume Voids, cm³ | 122.19 |
| Void Ratio | 0.66 |
| Saturation, % | 97.7% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 608.69 | 629.40 |
| Wt Soil & Tare, f | g | 501.62 | 510.00 |
| Wt Tare | g | 0.00 | 8.49 |
| Wt Moisture Lost | g | 107.07 | 119.40 |
| Wt Dry Soil | g | 501.62 | 501.51 |
| Water Content | % | 21.34% | 23.81% |

DESCRIPTION: Reddish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 1.27E-05 cm³/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/23/11 | 40839 | 11 | 20 | 21.6 | 0 | 0 | 0 | 0 | 1.78 | 125.21 | 16.74 | 1.8E-08 |
| 10/23/11 | 40839 | 11 | 25 | 21.6 | 5 | 5 | 300 | 300 | 1.78 | 125.21 | 16.74 | 1.8E-08 |
| 10/23/11 | 40839 | 11 | 30 | 21.6 | 5 | 10 | 300 | 600 | 1.78 | 125.21 | 16.74 | 1.8E-08 |
| 10/23/11 | 40839 | 11 | 35 | 21.6 | 5 | 15 | 300 | 900 | 1.78 | 125.21 | 16.74 | 1.8E-08 * |
| 10/23/11 | 40839 | 11 | 40 | 21.6 | 5 | 20 | 300 | 1200 | 1.78 | 125.21 | 16.74 | 1.8E-08 * |
| 10/23/11 | 40839 | 11 | 45 | 21.6 | 5 | 25 | 300 | 1500 | 1.78 | 125.21 | 16.74 | 1.8E-08 * |
| 10/23/11 | 40839 | 11 | 50 | 21.6 | 5 | 30 | 300 | 1800 | 1.78 | 125.21 | 16.74 | 1.8E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.8E-08 cm/sec **

| | |
|---|---|
| DATE | 10/23/11 |
| CHECK | AV |
| REVIEW | [illegible] |

## FLEXIBLE W[illegible]TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-098 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.22 | 3.629 |
| Diameter, cm | 7.22 | 2.844 |
| Area, $cm^2$ | 40.98 | |
| Volume, $cm^3$ | 377.78 | |
| Wet Mass, g | 758.5 | |
| Wt. wet soil + tare, gm | 264.90 | |
| Wt. dry soil + tare, gm | 218.40 | |
| Wt. tare, gm | 6.8 | |
| Moisture Content, % | 22.0% | |
| Dry Density, pcf | 102.7 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.64 | |
| Saturation, % | 92.7% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.6

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.19 | 3.618 |
| Diameter, cm | 7.17 | 2.822 |
| Area, $cm^2$ | 40.35 | |
| Volume, $cm^3$ | 370.83 | |
| Wet Mass, g | 764.5 | |
| Wt. wet soil + tare, gm | 774.20 | |
| Wt. dry soil + tare, gm | 636.62 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 22.0% | |
| Dry Density, pcf | 105.5 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.60 | |
| Saturation, % | 99.3% | |

| Minutes | Seconds | $\Delta t$ (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.6 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 4 | 23 | 263 | 26.6 | 0.39 | 1 | 2.1E-06 | 0.040 | 0.960 | 8.33E-08 | 22 | 0.956 | 7.96E-08 |
| 11 | 38 | 435 | 25.7 | 0.43 | 0.9 | 1.2E-06 | 0.041 | 0.963 | 4.69E-08 | 22 | 0.956 | 4.48E-08 |
| 18 | 8 | 390 | 25.0 | 0.46 | 0.7 | 1.4E-06 | 0.042 | 0.970 | 4.18E-08 | 22 | 0.956 | 3.99E-08 |
| 26 | 55 | 527 | 24.3 | 0.49 | 0.7 | 1.0E-06 | 0.044 | 0.969 | 3.19E-08 | 22 | 0.956 | 3.05E-08 |
| 34 | 6 | 431 | 23.7 | 0.51 | 0.6 | 1.3E-06 | 0.045 | 0.973 | 3.42E-08 | 22 | 0.956 | 3.27E-08 |
| 42 | 12 | 486 | 23.2 | 0.53 | 0.5 | 1.1E-06 | 0.046 | 0.977 | 2.58E-08 | 22 | 0.956 | 2.47E-08 |
| 48 | 44 | 392 | 22.7 | 0.55 | 0.5 | 1.4E-06 | 0.047 | 0.977 | 3.28E-08 | 22 | 0.956 | 3.13E-08 |
| 55 | 1 | 377 | 22.3 | 0.57 | 0.4 | 1.4E-06 | 0.048 | 0.981 | 2.77E-08 | 22 | 0.956 | 2.65E-08 |
| 60 | 10 | 309 | 22.0 | 0.58 | 0.3 | 1.7E-06 | 0.049 | 0.985 | 2.57E-08 | 22 | 0.956 | 2.45E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **2.68E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/20/2011 | DATE: | 10/25/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | | | | |
|---|---|---|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX | Cell Pressure = | 80 | psi |
| PROJECT NUMBER: | 113-94788.1 | Backwater Pressure = | 70 | psi |
| SAMPLE ID: | CL-104 | Run Number = | 1 | |
| LIFT NUMBER: | Lift 3 | | | |

| **Sample Data, Initial** | | inches |
|---|---|---|
| Height, cm | 8.74 | 3.44 |
| Diameter, cm | 7.24 | 2.850 |
| Area, $cm^2$ | 41.16 | |
| Volume, $cm^3$ | 359.62 | |
| Wet Mass, g | 725.5 | |
| Wt. wet soil + tare, gm | 127.60 | |
| Wt. dry soil + tare, gm | 110.01 | |
| Wt. tare, gm | 9.8 | |
| Moisture Content, % | 17.6% | |
| Dry Density, pcf | 107.1 | |
| Specific Gravity | 2.6 | |
| Void Ratio | 0.51 | |
| Saturation, % | 88.6% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.0

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.21 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

| **Sample Data, Final** | | inches |
|---|---|---|
| Height, cm | 8.84 | 3.481 |
| Diameter, cm | 7.25 | 2.856 |
| Area, $cm^2$ | 41.33 | |
| Volume, $cm^3$ | 365.44 | |
| Wet Mass, g | 741.3 | |
| Wt. wet soil + tare, gm | 749.10 | |
| Wt. dry soil + tare, gm | 619.85 | |
| Wt. tare, gm | 7.9 | |
| Moisture Content, % | 21.1% | |
| Dry Density, pcf | 104.5 | |
| Specific Gravity | 2.6 | |
| Void Ratio | 0.55 | |
| Saturation, % | 99.4% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.0 | 0.85 | 0 | | 0.040 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 1 | 38 | 98 | 27.0 | 0.85 | 0 | 5.2E-06 | 0.040 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 4 | 21 | 163 | 26.4 | 0.87 | 0.6 | 3.1E-06 | 0.041 | 0.976 | 7.75E-08 | 22 | 0.956 | 7.41E-08 |
| 9 | 21 | 300 | 25.5 | 0.91 | 0.9 | 1.7E-06 | 0.042 | 0.962 | 6.61E-08 | 22 | 0.956 | 6.31E-08 |
| 12 | 47 | 206 | 24.9 | 0.94 | 0.6 | 2.5E-06 | 0.043 | 0.974 | 6.54E-08 | 22 | 0.956 | 6.25E-08 |
| 18 | 2 | 315 | 24.0 | 0.97 | 0.9 | 1.6E-06 | 0.045 | 0.959 | 6.73E-08 | 22 | 0.956 | 6.43E-08 |
| 22 | 45 | 283 | 23.3 | 1.00 | 0.7 | 1.8E-06 | 0.047 | 0.967 | 5.99E-08 | 22 | 0.956 | 5.72E-08 |
| 26 | 56 | 251 | 22.7 | 1.03 | 0.6 | 2.0E-06 | 0.048 | 0.971 | 5.94E-08 | 22 | 0.956 | 5.68E-08 |
| 32 | 39 | 343 | 22.0 | 1.05 | 0.7 | 1.5E-06 | 0.050 | 0.965 | 5.27E-08 | 22 | 0.956 | 5.03E-08 |
| 40 | 23 | 464 | 21.1 | 1.09 | 0.9 | 1.1E-06 | 0.052 | 0.953 | 5.27E-08 | 22 | 0.956 | 5.04E-08 |
| 45 | 33 | 310 | 20.5 | 1.12 | 0.6 | 1.6E-06 | 0.054 | 0.968 | 5.39E-08 | 22 | 0.956 | 5.15E-08 |
| 53 | 57 | 504 | 19.6 | 1.15 | 0.9 | 1.0E-06 | 0.056 | 0.949 | 5.28E-08 | 22 | 0.956 | 5.04E-08 |
| 59 | 38 | 341 | 19.0 | 1.18 | 0.6 | 1.5E-06 | 0.058 | 0.965 | 5.34E-08 | 22 | 0.956 | 5.10E-08 |
| 65 | 37 | 359 | 18.4 | 1.20 | 0.6 | 1.4E-06 | 0.061 | 0.964 | 5.26E-08 | 22 | 0.956 | 5.02E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **5.08E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/23/2011 | DATE: | 10/25/2011 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-106 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.65 | 3.798 |
| Diameter, cm | 7.14 | 2.812 |
| Area, $cm^2$ | 40.07 | |
| Volume, $cm^3$ | 386.52 | |
| Wet Mass, g | 752.2 | |
| Wt. wet soil + tare, gm | 158.90 | |
| Wt. dry soil + tare, gm | 133.05 | |
| Wt. tare, gm | 10 | |
| Moisture Content, % | 21.0% | |
| Dry Density, pcf | 100.4 | |
| Specific Gravity | 2.58 | |
| Void Ratio | 0.60 | |
| Saturation, % | 89.7% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.0

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.24 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0006

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.61 | 3.782 |
| Diameter, cm | 7.13 | 2.809 |
| Area, $cm^2$ | 39.98 | |
| Volume, $cm^3$ | 384.07 | |
| Wet Mass, g | 758.1 | |
| Wt. wet soil + tare, gm | 766.20 | |
| Wt. dry soil + tare, gm | 619.52 | |
| Wt. tare, gm | 8.2 | |
| Moisture Content, % | 24.0% | |
| Dry Density, pcf | 99.3 | |
| Specific Gravity | 2.58 | |
| Void Ratio | 0.62 | |
| Saturation, % | 99.7% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.0 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 2 | 54 | 174 | 27.3 | 0.38 | 0.7 | 3.3E-06 | 0.039 | 0.973 | 9.12E-08 | 22 | 0.956 | 8.72E-08 |
| 7 | 12 | 258 | 26.9 | 0.40 | 0.4 | 2.2E-06 | 0.039 | 0.984 | 3.55E-08 | 22 | 0.956 | 3.39E-08 |
| 9 | 45 | 153 | 26.7 | 0.40 | 0.2 | 3.8E-06 | 0.040 | 0.992 | 3.01E-08 | 22 | 0.956 | 2.87E-08 |
| 16 | 26 | 401 | 26.3 | 0.42 | 0.4 | 1.4E-06 | 0.040 | 0.984 | 2.34E-08 | 22 | 0.956 | 2.24E-08 |
| 23 | 42 | 436 | 26.0 | 0.43 | 0.3 | 1.3E-06 | 0.041 | 0.988 | 1.63E-08 | 22 | 0.956 | 1.56E-08 |
| 27 | 48 | 246 | 25.8 | 0.44 | 0.2 | 2.4E-06 | 0.041 | 0.992 | 1.94E-08 | 22 | 0.956 | 1.85E-08 |
| 33 | 17 | 329 | 25.6 | 0.45 | 0.2 | 1.8E-06 | 0.041 | 0.992 | 1.46E-08 | 22 | 0.956 | 1.40E-08 |
| 38 | 37 | 320 | 25.4 | 0.46 | 0.2 | 1.8E-06 | 0.042 | 0.992 | 1.52E-08 | 22 | 0.956 | 1.45E-08 |
| 45 | 24 | 407 | 25.2 | 0.46 | 0.2 | 1.4E-06 | 0.042 | 0.992 | 1.20E-08 | 22 | 0.956 | 1.15E-08 |
| 50 | 32 | 308 | 25.0 | 0.47 | 0.2 | 1.9E-06 | 0.042 | 0.992 | 1.60E-08 | 22 | 0.956 | 1.53E-08 |
| 57 | 56 | 444 | 24.7 | 0.49 | 0.3 | 1.3E-06 | 0.043 | 0.987 | 1.69E-08 | 22 | 0.956 | 1.62E-08 |
| 65 | 39 | 463 | 24.4 | 0.50 | 0.3 | 1.2E-06 | 0.044 | 0.987 | 1.64E-08 | 22 | 0.956 | 1.57E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.47E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/20/2011 | DATE: | 10/25/2011 |

**GEOTECHNICAL TESTING LABORATORY**
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## FLEXIBLE W[illegible]TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | | | | |
|---|---|---|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX | Cell Pressure = | 80 | psi |
| PROJECT NUMBER: | 113-94788.1 | Backwater Pressure = | 70 | psi |
| SAMPLE ID: | CL-109 | Run Number = | 1 | |
| LIFT NUMBER: | Lift 3 | | | |

| **Sample Data, Initial** | | inches |
|---|---|---|
| Height, cm | 9.41 | 3.705 |
| Diameter, cm | 7.27 | 2.863 |
| Area, $cm^2$ | 41.53 | |
| Volume, $cm^3$ | 390.86 | |
| Wet Mass, g | 807.3 | |
| Wt. wet soil + tare, gm | 161.50 | |
| Wt. dry soil + tare, gm | 143.13 | |
| Wt. tare, gm | 10 | |
| Moisture Content, % | 13.8% | |
| Dry Density, pcf | 113.3 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.49 | |
| Saturation, % | 76.4% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.7

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.23 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

| **Sample Data, Final** | | inches |
|---|---|---|
| Height, cm | 9.63 | 3.792 |
| Diameter, cm | 7.34 | 2.888 |
| Area, $cm^2$ | 42.26 | |
| Volume, $cm^3$ | 407.06 | |
| Wet Mass, g | 845.5 | |
| Wt. wet soil + tare, gm | 854.60 | |
| Wt. dry soil + tare, gm | 707.71 | |
| Wt. tare, gm | 9.3 | |
| Moisture Content, % | 21.0% | |
| Dry Density, pcf | 107.1 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.57 | |
| Saturation, % | 99.1% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.7 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 2 | 1 | 121 | 27.0 | 0.38 | 0.7 | 4.5E-06 | 0.039 | 0.973 | 1.25E-07 | 22 | 0.956 | 1.19E-07 |
| 4 | 11 | 130 | 26.3 | 0.41 | 0.7 | 4.2E-06 | 0.040 | 0.972 | 1.20E-07 | 22 | 0.956 | 1.14E-07 |
| 6 | 41 | 150 | 25.6 | 0.44 | 0.7 | 3.6E-06 | 0.041 | 0.971 | 1.07E-07 | 22 | 0.956 | 1.02E-07 |
| 10 | 51 | 250 | 24.5 | 0.48 | 1.1 | 2.2E-06 | 0.043 | 0.952 | 1.06E-07 | 22 | 0.956 | 1.02E-07 |
| 14 | 8 | 197 | 23.7 | 0.51 | 0.8 | 2.8E-06 | 0.045 | 0.964 | 1.01E-07 | 22 | 0.956 | 9.66E-08 |
| 17 | 3 | 175 | 23.0 | 0.54 | 0.7 | 3.1E-06 | 0.046 | 0.968 | 1.03E-07 | 22 | 0.956 | 9.81E-08 |
| 20 | 54 | 231 | 22.2 | 0.58 | 0.8 | 2.4E-06 | 0.048 | 0.961 | 9.26E-08 | 22 | 0.956 | 8.84E-08 |
| 26 | 8 | 314 | 21.2 | 0.62 | 1 | 1.7E-06 | 0.051 | 0.949 | 9.00E-08 | 22 | 0.956 | 8.60E-08 |
| 30 | 58 | 290 | 20.4 | 0.65 | 0.8 | 1.9E-06 | 0.053 | 0.958 | 8.09E-08 | 22 | 0.956 | 7.73E-08 |
| 40 | 35 | 577 | 19.0 | 0.71 | 1.4 | 9.4E-07 | 0.057 | 0.920 | 7.83E-08 | 22 | 0.956 | 7.49E-08 |
| 45 | 42 | 307 | 18.3 | 0.73 | 0.7 | 1.8E-06 | 0.059 | 0.959 | 7.51E-08 | 22 | 0.956 | 7.18E-08 |
| 51 | 32 | 350 | 17.6 | 0.76 | 0.7 | 1.6E-06 | 0.062 | 0.957 | 6.88E-08 | 22 | 0.956 | 6.58E-08 |
| 56 | 58 | 326 | 17.0 | 0.79 | 0.6 | 1.7E-06 | 0.064 | 0.961 | 6.56E-08 | 22 | 0.956 | 6.27E-08 |
| 63 | 19 | 381 | 16.3 | 0.82 | 0.7 | 1.4E-06 | 0.067 | 0.953 | 6.89E-08 | 22 | 0.956 | 6.58E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **6.65E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/23/2011 | DATE: | 10/25/2011 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-118 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.82 | 3.866 |
| Diameter, cm | 7.19 | 2.829 |
| Area, $cm^2$ | 40.55 | |
| Volume, $cm^3$ | 398.22 | |
| Wet Mass, g | 791.2 | |
| Wt. wet soil + tare, gm | 248.00 | |
| Wt. dry soil + tare, gm | 213.48 | |
| Wt. tare, gm | 8.1 | |
| Moisture Content, % | 16.8% | |
| Dry Density, pcf | 106.1 | |
| Specific Gravity | 2.55 | |
| Void Ratio | 0.50 | |
| Saturation, % | 85.9% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.0

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.24 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0006

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.87 | 3.887 |
| Diameter, cm | 7.20 | 2.834 |
| Area, $cm^2$ | 40.70 | |
| Volume, $cm^3$ | 401.80 | |
| Wet Mass, g | 799.7 | |
| Wt. wet soil + tare, gm | 809.40 | |
| Wt. dry soil + tare, gm | 663.51 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 22.3% | |
| Dry Density, pcf | 101.5 | |
| Specific Gravity | 2.55 | |
| Void Ratio | 0.57 | |
| Saturation, % | 100.4% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.0 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 1 | 50 | 110 | 27.4 | 0.37 | 0.6 | 5.3E-06 | 0.039 | 0.977 | 1.24E-07 | 22 | 0.956 | 1.18E-07 |
| 3 | 41 | 111 | 27.2 | 0.38 | 0.2 | 5.2E-06 | 0.039 | 0.992 | 4.09E-08 | 22 | 0.956 | 3.90E-08 |
| 7 | 6 | 205 | 26.9 | 0.40 | 0.3 | 2.8E-06 | 0.039 | 0.988 | 3.36E-08 | 22 | 0.956 | 3.21E-08 |
| 10 | 33 | 207 | 26.7 | 0.40 | 0.2 | 2.8E-06 | 0.040 | 0.992 | 2.23E-08 | 22 | 0.956 | 2.13E-08 |
| 18 | 0 | 447 | 26.3 | 0.42 | 0.4 | 1.3E-06 | 0.040 | 0.984 | 2.11E-08 | 22 | 0.956 | 2.02E-08 |
| 22 | 30 | 270 | 26.1 | 0.43 | 0.2 | 2.2E-06 | 0.041 | 0.992 | 1.75E-08 | 22 | 0.956 | 1.68E-08 |
| 29 | 30 | 420 | 25.9 | 0.44 | 0.2 | 1.4E-06 | 0.041 | 0.992 | 1.14E-08 | 22 | 0.956 | 1.09E-08 |
| 39 | 0 | 570 | 25.6 | 0.45 | 0.3 | 1.0E-06 | 0.041 | 0.988 | 1.28E-08 | 22 | 0.956 | 1.22E-08 |
| 53 | 49 | 889 | 25.2 | 0.46 | 0.4 | 6.5E-07 | 0.042 | 0.983 | 1.11E-08 | 22 | 0.956 | 1.06E-08 |
| 64 | 24 | 635 | 24.9 | 0.48 | 0.3 | 9.2E-07 | 0.043 | 0.987 | 1.18E-08 | 22 | 0.956 | 1.13E-08 |
| 77 | 29 | 785 | 24.5 | 0.49 | 0.4 | 7.4E-07 | 0.043 | 0.983 | 1.30E-08 | 22 | 0.956 | 1.24E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.14E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/20/2011 | DATE: | 10/25/2011 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-120 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.86 | 3.49 |
| Diameter, cm | 7.21 | 2.838 |
| Area, $cm^2$ | 40.81 | |
| Volume, $cm^3$ | 361.78 | |
| Wet Mass, g | 721.5 | |
| Wt. wet soil + tare, gm | 194.70 | |
| Wt. dry soil + tare, gm | 165.36 | |
| Wt. tare, gm | 8.3 | |
| Moisture Content, % | 18.7% | |
| Dry Density, pcf | 104.9 | |
| Specific Gravity | 2.55 | |
| Void Ratio | 0.52 | |
| Saturation, % | 92.1% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.1

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.91 | 3.507 |
| Diameter, cm | 7.32 | 2.883 |
| Area, $cm^2$ | 42.12 | |
| Volume, $cm^3$ | 375.16 | |
| Wet Mass, g | 734.4 | |
| Wt. wet soil + tare, gm | 742.30 | |
| Wt. dry soil + tare, gm | 599.17 | |
| Wt. tare, gm | 8.1 | |
| Moisture Content, % | 24.2% | |
| Dry Density, pcf | 98.3 | |
| Specific Gravity | 2.55 | |
| Void Ratio | 0.62 | |
| Saturation, % | 99.9% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.1 | 0.85 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 4 | 21 | 261 | 27.5 | 0.87 | 0.6 | 2.0E-06 | 0.039 | 0.977 | 4.75E-08 | 22 | 0.956 | 4.54E-08 |
| 7 | 32 | 191 | 27.3 | 0.88 | 0.2 | 2.7E-06 | 0.039 | 0.992 | 2.16E-08 | 22 | 0.956 | 2.07E-08 |
| 14 | 54 | 442 | 26.8 | 0.90 | 0.5 | 1.2E-06 | 0.040 | 0.980 | 2.40E-08 | 22 | 0.956 | 2.29E-08 |
| 21 | 31 | 397 | 26.4 | 0.92 | 0.4 | 1.3E-06 | 0.041 | 0.984 | 2.17E-08 | 22 | 0.956 | 2.07E-08 |
| 28 | 34 | 423 | 26.0 | 0.94 | 0.4 | 1.2E-06 | 0.042 | 0.983 | 2.07E-08 | 22 | 0.956 | 1.98E-08 |
| 38 | 1 | 567 | 25.5 | 0.96 | 0.5 | 9.2E-07 | 0.042 | 0.979 | 1.97E-08 | 22 | 0.956 | 1.89E-08 |
| 44 | 21 | 380 | 25.2 | 0.97 | 0.3 | 1.4E-06 | 0.043 | 0.987 | 1.78E-08 | 22 | 0.956 | 1.70E-08 |
| 52 | 58 | 517 | 24.8 | 0.99 | 0.4 | 1.0E-06 | 0.044 | 0.983 | 1.78E-08 | 22 | 0.956 | 1.70E-08 |
| 63 | 46 | 648 | 24.3 | 1.01 | 0.5 | 8.1E-07 | 0.045 | 0.978 | 1.82E-08 | 22 | 0.956 | 1.74E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.76E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/23/2011 | DATE: | 10/25/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-127 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.61 | 3.39 |
| Diameter, cm | 7.22 | 2.841 |
| Area, $cm^2$ | 40.90 | |
| Volume, $cm^3$ | 352.15 | |
| Wet Mass, g | 736.1 | |
| Wt. wet soil + tare, gm | 136.20 | |
| Wt. dry soil + tare, gm | 118.94 | |
| Wt. tare, gm | 6.7 | |
| Moisture Content, % | 15.4% | |
| Dry Density, pcf | 113.0 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.49 | |
| Saturation, % | 84.7% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.5

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.21 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.76 | 3.45 |
| Diameter, cm | 7.30 | 2.874 |
| Area, $cm^2$ | 41.85 | |
| Volume, $cm^3$ | 366.76 | |
| Wet Mass, g | 760.7 | |
| Wt. wet soil + tare, gm | 770.30 | |
| Wt. dry soil + tare, gm | 635.58 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 21.5% | |
| Dry Density, pcf | 106.5 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.58 | |
| Saturation, % | 99.9% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.5 | 0.35 | 0 | | 0.037 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 3 | 24 | 204 | 27.5 | 0.39 | 1 | 2.5E-06 | 0.038 | 0.962 | 9.71E-08 | 22 | 0.956 | 9.28E-08 |
| 7 | 34 | 250 | 26.7 | 0.42 | 0.8 | 2.0E-06 | 0.040 | 0.968 | 6.52E-08 | 22 | 0.956 | 6.23E-08 |
| 11 | 19 | 225 | 26.0 | 0.45 | 0.7 | 2.2E-06 | 0.041 | 0.971 | 6.51E-08 | 22 | 0.956 | 6.22E-08 |
| 15 | 32 | 253 | 25.3 | 0.48 | 0.7 | 2.0E-06 | 0.042 | 0.971 | 5.96E-08 | 22 | 0.956 | 5.69E-08 |
| 21 | 46 | 374 | 24.4 | 0.52 | 0.9 | 1.4E-06 | 0.044 | 0.961 | 5.41E-08 | 22 | 0.956 | 5.17E-08 |
| 27 | 37 | 351 | 23.6 | 0.55 | 0.8 | 1.4E-06 | 0.045 | 0.964 | 5.30E-08 | 22 | 0.956 | 5.07E-08 |
| 32 | 2 | 265 | 23.0 | 0.58 | 0.6 | 1.9E-06 | 0.046 | 0.972 | 5.39E-08 | 22 | 0.956 | 5.15E-08 |
| 37 | 23 | 321 | 22.3 | 0.60 | 0.7 | 1.6E-06 | 0.048 | 0.966 | 5.38E-08 | 22 | 0.956 | 5.14E-08 |
| 44 | 36 | 433 | 21.4 | 0.64 | 0.9 | 1.2E-06 | 0.050 | 0.955 | 5.40E-08 | 22 | 0.956 | 5.16E-08 |
| 50 | 27 | 351 | 20.7 | 0.67 | 0.7 | 1.4E-06 | 0.052 | 0.964 | 5.34E-08 | 22 | 0.956 | 5.10E-08 |
| 56 | 31 | 364 | 20.0 | 0.70 | 0.7 | 1.4E-06 | 0.054 | 0.962 | 5.35E-08 | 22 | 0.956 | 5.11E-08 |
| 62 | 34 | 363 | 19.3 | 0.73 | 0.7 | 1.4E-06 | 0.056 | 0.961 | 5.58E-08 | 22 | 0.956 | 5.33E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **5.17E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/23/2011 | DATE: | 10/25/2011 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-190 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.03 | 3.555 |
| Diameter, cm | 7.17 | 2.823 |
| Area, $cm^2$ | 40.38 | |
| Volume, $cm^3$ | 364.63 | |
| Wet Mass, g | 718.2 | |
| Wt. wet soil + tare, gm | 156.20 | |
| Wt. dry soil + tare, gm | 127.95 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 23.9% | |
| Dry Density, pcf | 99.2 | |
| Specific Gravity | 2.64 | |
| Void Ratio | 0.66 | |
| Saturation, % | 95.6% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.2

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.02 | 3.55 |
| Diameter, cm | 7.18 | 2.825 |
| Area, $cm^2$ | 40.44 | |
| Volume, $cm^3$ | 364.63 | |
| Wet Mass, g | 726.1 | |
| Wt. wet soil + tare, gm | 733.80 | |
| Wt. dry soil + tare, gm | 590.22 | |
| Wt. tare, gm | 7.8 | |
| Moisture Content, % | 24.7% | |
| Dry Density, pcf | 99.7 | |
| Specific Gravity | 2.64 | |
| Void Ratio | 0.65 | |
| Saturation, % | 99.7% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.2 | 0.85 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 4 | 20 | 260 | 27.6 | 0.87 | 0.6 | 2.1E-06 | 0.039 | 0.977 | 4.89E-08 | 22 | 0.956 | 4.67E-08 |
| 12 | 17 | 477 | 26.8 | 0.91 | 0.8 | 1.1E-06 | 0.040 | 0.968 | 3.68E-08 | 22 | 0.956 | 3.52E-08 |
| 18 | 8 | 351 | 26.4 | 0.92 | 0.4 | 1.5E-06 | 0.041 | 0.984 | 2.52E-08 | 22 | 0.956 | 2.41E-08 |
| 22 | 11 | 243 | 26.1 | 0.94 | 0.3 | 2.2E-06 | 0.041 | 0.988 | 2.76E-08 | 22 | 0.956 | 2.64E-08 |
| 26 | 48 | 277 | 25.8 | 0.95 | 0.3 | 1.9E-06 | 0.042 | 0.987 | 2.45E-08 | 22 | 0.956 | 2.34E-08 |
| 35 | 45 | 537 | 25.3 | 0.97 | 0.5 | 1.0E-06 | 0.043 | 0.979 | 2.16E-08 | 22 | 0.956 | 2.07E-08 |
| 39 | 11 | 206 | 25.1 | 0.98 | 0.2 | 2.6E-06 | 0.043 | 0.991 | 2.26E-08 | 22 | 0.956 | 2.16E-08 |
| 42 | 39 | 208 | 24.9 | 0.99 | 0.2 | 2.6E-06 | 0.044 | 0.991 | 2.26E-08 | 22 | 0.956 | 2.16E-08 |
| 52 | 44 | 605 | 24.4 | 1.01 | 0.5 | 8.9E-07 | 0.044 | 0.978 | 2.00E-08 | 22 | 0.956 | 1.91E-08 |
| 60 | 46 | 482 | 24.0 | 1.02 | 0.4 | 1.1E-06 | 0.045 | 0.982 | 2.04E-08 | 22 | 0.956 | 1.95E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **2.04E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/26/2011 | DATE: | 11/1/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-196 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.32 | 3.668 |
| Diameter, cm | 7.21 | 2.840 |
| Area, $cm^2$ | 40.87 | |
| Volume, $cm^3$ | 380.76 | |
| Wet Mass, g | 768.4 | |
| Wt. wet soil + tare, gm | 149.30 | |
| Wt. dry soil + tare, gm | 128.06 | |
| Wt. tare, gm | 10 | |
| Moisture Content, % | 18.0% | |
| Dry Density, pcf | 106.7 | |
| Specific Gravity | 2.56 | |
| Void Ratio | 0.50 | |
| Saturation, % | 92.7% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.5

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.23 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.40 | 3.702 |
| Diameter, cm | 7.29 | 2.872 |
| Area, $cm^2$ | 41.80 | |
| Volume, $cm^3$ | 393.00 | |
| Wet Mass, g | 786.4 | |
| Wt. wet soil + tare, gm | 796.00 | |
| Wt. dry soil + tare, gm | 655.71 | |
| Wt. tare, gm | 9.7 | |
| Moisture Content, % | 21.7% | |
| Dry Density, pcf | 102.6 | |
| Specific Gravity | 2.56 | |
| Void Ratio | 0.56 | |
| Saturation, % | 99.8% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.5 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 1 | 17 | 77 | 27.2 | 0.36 | 0.3 | 7.1E-06 | 0.039 | 0.988 | 8.33E-08 | 22 | 0.956 | 7.96E-08 |
| 5 | 5 | 228 | 26.6 | 0.39 | 0.6 | 2.4E-06 | 0.040 | 0.976 | 5.79E-08 | 22 | 0.956 | 5.54E-08 |
| 11 | 36 | 391 | 25.8 | 0.42 | 0.8 | 1.4E-06 | 0.041 | 0.967 | 4.67E-08 | 22 | 0.956 | 4.47E-08 |
| 20 | 45 | 549 | 24.8 | 0.46 | 1 | 1.0E-06 | 0.043 | 0.957 | 4.36E-08 | 22 | 0.956 | 4.17E-08 |
| 31 | 22 | 637 | 23.8 | 0.50 | 1 | 8.6E-07 | 0.045 | 0.955 | 3.93E-08 | 22 | 0.956 | 3.76E-08 |
| 43 | 45 | 743 | 22.7 | 0.55 | 1.1 | 7.4E-07 | 0.047 | 0.948 | 3.91E-08 | 22 | 0.956 | 3.74E-08 |
| 53 | 18 | 573 | 22.0 | 0.58 | 0.7 | 9.6E-07 | 0.049 | 0.966 | 3.31E-08 | 22 | 0.956 | 3.16E-08 |
| 61 | 46 | 508 | 21.4 | 0.60 | 0.6 | 1.1E-06 | 0.050 | 0.970 | 3.29E-08 | 22 | 0.956 | 3.14E-08 |
| 67 | 32 | 346 | 21.0 | 0.62 | 0.4 | 1.6E-06 | 0.051 | 0.980 | 3.27E-08 | 22 | 0.956 | 3.12E-08 |
| | | | | | | | | | | | PERMEABILITY REPORTED AS | **3.29E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/26/2011 | DATE: | 11/1/2011 |

**GEOTECHNICAL TESTING LABORATORY**

**GOLDER ASSOCIATES**

**HOUSTON, TEXAS**

# FLEXIBLE W/ TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-201 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.29 | 3.657 |
| Diameter, cm | 7.10 | 2.797 |
| Area, $cm^2$ | 39.64 | |
| Volume, $cm^3$ | 368.21 | |
| Wet Mass, g | 713.3 | |
| Wt. wet soil + tare, gm | 159.10 | |
| Wt. dry soil + tare, gm | 128.93 | |
| Wt. tare, gm | 8.3 | |
| Moisture Content, % | 25.0% | |
| Dry Density, pcf | 96.7 | |
| Specific Gravity | 2.56 | |
| Void Ratio | 0.65 | |
| Saturation, % | 98.2% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.9

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.23 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0006

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.27 | 3.651 |
| Diameter, cm | 7.16 | 2.817 |
| Area, $cm^2$ | 40.21 | |
| Volume, $cm^3$ | 372.89 | |
| Wet Mass, g | 719.5 | |
| Wt. wet soil + tare, gm | 726.20 | |
| Wt. dry soil + tare, gm | 575.42 | |
| Wt. tare, gm | 6.8 | |
| Moisture Content, % | 26.5% | |
| Dry Density, pcf | 95.2 | |
| Specific Gravity | 2.56 | |
| Void Ratio | 0.68 | |
| Saturation, % | 100.0% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.9 | 0.85 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 4 | 27 | 267 | 27.6 | 0.86 | 0.3 | 2.1E-06 | 0.039 | 0.988 | 2.48E-08 | 22 | 0.956 | 2.37E-08 |
| 11 | 51 | 444 | 27.4 | 0.87 | 0.2 | 1.3E-06 | 0.039 | 0.992 | 9.99E-09 | 22 | 0.956 | 9.55E-09 |
| 18 | 43 | 412 | 27.2 | 0.88 | 0.2 | 1.4E-06 | 0.040 | 0.992 | 1.09E-08 | 22 | 0.956 | 1.04E-08 |
| 27 | 28 | 525 | 26.9 | 0.89 | 0.3 | 1.1E-06 | 0.040 | 0.988 | 1.30E-08 | 22 | 0.956 | 1.24E-08 |
| 38 | 27 | 659 | 26.6 | 0.90 | 0.3 | 8.5E-07 | 0.041 | 0.988 | 1.04E-08 | 22 | 0.956 | 9.98E-09 |
| 50 | 52 | 745 | 26.3 | 0.92 | 0.3 | 7.6E-07 | 0.041 | 0.988 | 9.36E-09 | 22 | 0.956 | 8.94E-09 |
| 68 | 43 | 1071 | 26.0 | 0.93 | 0.3 | 5.3E-07 | 0.042 | 0.988 | 6.59E-09 | 22 | 0.956 | 6.30E-09 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **9.40E-09** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/26/2011 | DATE: | 11/1/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 5 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-206 | | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.923 | B-Value, f | 1.00 | Height, inches | 2.939 |
| Diameter, inches | 2.851 | Cell Pres. | 90.0 | Diameter, inches | 2.871 |
| Area, cm² | 41.19 | Bot. Pres. | 80.0 | Area, cm² | 41.77 |
| Volume, cm³ | 305.78 | Top Pres. | 80.0 | Volume, cm³ | 311.79 |
| Mass, g | 609.73 | Tot. B.P. | 80.0 | Mass, g | 622.80 |
| Moisture Content, % | 21.48 | Head, max. | 130.83 | Moisture Content, % | 24.09 |
| Dry Density, pcf | 102.42 | Head, min. | 130.83 | Dry Density, pcf | 100.45 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 17.53 | Volume Solids, cm³ | 185.89 |
| Volume Solids, cm³ | 185.89 | Min. Grad. | 17.53 | Volume Voids, cm³ | 125.90 |
| Volume Voids, cm³ | 119.89 | | | Void Ratio | 0.68 |
| Void Ratio | 0.64 | | | Saturation, % | 96.0% |
| Saturation, % | 89.9% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 609.73 | 630.91 |
| Wt Soil & Tare, f | g | 501.90 | 510.06 |
| Wt Tare | g | 0.00 | 8.35 |
| Wt Moisture Lost | g | 107.83 | 120.85 |
| Wt Dry Soil | g | 501.90 | 501.71 |
| Water Content | % | 21.48% | 24.09% |

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 1.27E-05 cm³/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/26/11 | 40842 | 11 | 0 | 21.9 | 0 | 0 | 0 | 0 | 1.86 | 130.83 | 17.53 | 1.7E-08 |
| 10/26/11 | 40842 | 11 | 5 | 21.9 | 5 | 5 | 300 | 300 | 1.86 | 130.83 | 17.53 | 1.7E-08 |
| 10/26/11 | 40842 | 11 | 10 | 21.9 | 5 | 10 | 300 | 600 | 1.86 | 130.83 | 17.53 | 1.7E-08 |
| 10/26/11 | 40842 | 11 | 15 | 21.9 | 5 | 15 | 300 | 900 | 1.86 | 130.83 | 17.53 | 1.7E-08 * |
| 10/26/11 | 40842 | 11 | 20 | 21.9 | 5 | 20 | 300 | 1200 | 1.86 | 130.83 | 17.53 | 1.7E-08 * |
| 10/26/11 | 40842 | 11 | 25 | 21.9 | 5 | 25 | 300 | 1500 | 1.86 | 130.83 | 17.53 | 1.7E-08 * |
| 10/26/11 | 40842 | 11 | 30 | 21.9 | 5 | 30 | 300 | 1800 | 1.86 | 130.83 | 17.53 | 1.7E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.7E-08 cm/sec **

DATE 10/26/11
CHECK AK
REVIEW

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | Board # | 4 | COMMENTS | |
| PROJECT NUMBER | 113-94788 | Flow Pump | 1 | | |
| SAMPLE ID | CL-213 | Flow Pump Speed | 11 | | |
| SAMPLE TYPE | UD | Technician | SDM | | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.181 | B-Value, f | 0.98 | Height, inches | 2.164 |
| Diameter, inches | 2.848 | Cell Pres. | 90.0 | Diameter, inches | 2.852 |
| Area, cm² | 41.10 | Bot. Pres. | 80.0 | Area, cm² | 41.22 |
| Volume, cm³ | 227.68 | Top Pres. | 80.0 | Volume, cm³ | 226.54 |
| Mass, g | 432.15 | Tot. B.P. | 80.0 | Mass, g | 437.38 |
| Moisture Content, % | 24.51 | Head, max. | 163.89 | Moisture Content, % | 26.02 |
| Dry Density, pcf | 95.12 | Head, min. | 163.89 | Dry Density, pcf | 95.60 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 29.82 | Volume Solids, cm³ | 128.55 |
| Volume Solids, cm³ | 128.55 | Min. Grad. | 29.82 | Volume Voids, cm³ | 97.99 |
| Volume Voids, cm³ | 99.13 | | | Void Ratio | 0.76 |
| Void Ratio | 0.77 | | | Saturation, % | 92.1% |
| Saturation, % | 85.8% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 432.15 | 445.35 |
| Wt Soil & Tare, f | g | 347.08 | 355.11 |
| Wt Tare | g | 0.00 | 8.24 |
| Wt Moisture Lost | g | 85.07 | 90.24 |
| Wt Dry Soil | g | 347.08 | 346.87 |
| Water Content | % | 24.51% | 26.02% |

Flow Pump Rate: 1.27E-05 cm³/sec

USCS: (CH)

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/26/11 | 40842 | 11 | 30 | 21.9 | 0 | 0 | 0 | 0 | 2.33 | 163.89 | 29.82 | 9.9E-09 |
| 10/26/11 | 40842 | 11 | 35 | 21.9 | 5 | 5 | 300 | 300 | 2.33 | 163.89 | 29.82 | 9.9E-09 |
| 10/26/11 | 40842 | 11 | 40 | 21.9 | 5 | 10 | 300 | 600 | 2.33 | 163.89 | 29.82 | 9.9E-09 |
| 10/26/11 | 40842 | 11 | 45 | 21.9 | 5 | 15 | 300 | 900 | 2.33 | 163.89 | 29.82 | 9.9E-09 * |
| 10/26/11 | 40842 | 11 | 50 | 21.9 | 5 | 20 | 300 | 1200 | 2.33 | 163.89 | 29.82 | 9.9E-09 * |
| 10/26/11 | 40842 | 11 | 55 | 21.9 | 5 | 25 | 300 | 1500 | 2.33 | 163.89 | 29.82 | 9.9E-09 * |
| 10/26/11 | 40842 | 12 | 0 | 21.9 | 5 | 30 | 300 | 1800 | 2.33 | 163.89 | 29.82 | 9.9E-09 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 9.9E-09 cm/sec **

DATE 10/26/11
CHECK AK
REVIEW AWM

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 3 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-216 | | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.917 | B-Value, f | 0.98 | Height, inches | 2.931 |
| Diameter, inches | 2.873 | Cell Pres. | 90.0 | Diameter, inches | 2.886 |
| Area, $cm^2$ | 41.82 | Bot. Pres. | 80.0 | Area, $cm^2$ | 42.20 |
| Volume, $cm^3$ | 309.88 | Top Pres. | 80.0 | Volume, $cm^3$ | 314.20 |
| Mass, g | 631.96 | Tot. B.P. | 80.0 | Mass, g | 642.56 |
| Moisture Content, % | 19.50 | Head, max. | 142.09 | Moisture Content, % | 21.51 |
| Dry Density, pcf | 106.49 | Head, min. | 142.09 | Dry Density, pcf | 105.02 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 19.09 | Volume Solids, $cm^3$ | 195.86 |
| Volume Solids, $cm^3$ | 195.86 | Min. Grad. | 19.09 | Volume Voids, $cm^3$ | 118.34 |
| Volume Voids, $cm^3$ | 114.03 | | | Void Ratio | 0.60 |
| Void Ratio | 0.58 | | | Saturation, % | 96.1% |
| Saturation, % | 90.5% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 631.96 | 650.52 |
| Wt Soil & Tare, f | g | 528.82 | 536.86 |
| Wt Tare | g | 0.00 | 8.44 |
| Wt Moisture Lost | g | 103.14 | 113.66 |
| Wt Dry Soil | g | 528.82 | 528.42 |
| Water Content | % | 19.50% | 21.51% |

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 2.45E-05 $cm^3$/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 10/26/11 | 40842 | 12 | 0 | 21.9 | 0 | 0 | 0 | 0 | 2.02 | 142.09 | 19.09 | 2.9E-08 | |
| 10/26/11 | 40842 | 12 | 5 | 21.9 | 5 | 5 | 300 | 300 | 2.02 | 142.09 | 19.09 | 2.9E-08 | |
| 10/26/11 | 40842 | 12 | 10 | 21.9 | 5 | 10 | 300 | 600 | 2.02 | 142.09 | 19.09 | 2.9E-08 | |
| 10/26/11 | 40842 | 12 | 15 | 21.9 | 5 | 15 | 300 | 900 | 2.02 | 142.09 | 19.09 | 2.9E-08 | * |
| 10/26/11 | 40842 | 12 | 20 | 21.9 | 5 | 20 | 300 | 1200 | 2.02 | 142.09 | 19.09 | 2.9E-08 | * |
| 10/26/11 | 40842 | 12 | 25 | 21.9 | 5 | 25 | 300 | 1500 | 2.02 | 142.09 | 19.09 | 2.9E-08 | * |
| 10/26/11 | 40842 | 12 | 30 | 21.9 | 5 | 30 | 300 | 1800 | 2.02 | 142.09 | 19.09 | 2.9E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.9E-08 cm/sec **

DATE 10/26/11
CHECK AK
REVIEW

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 1 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-219 | | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.913 | B-Value, f | 0.99 | Height, inches | 2.917 |
| Diameter, inches | 2.842 | Cell Pres. | 90.0 | Diameter, inches | 2.845 |
| Area, $cm^2$ | 40.93 | Bot. Pres. | 80.0 | Area, $cm^2$ | 41.01 |
| Volume, $cm^3$ | 302.82 | Top Pres. | 80.0 | Volume, $cm^3$ | 303.87 |
| Mass, g | 595.88 | Tot. B.P. | 80.0 | Mass, g | 605.59 |
| Moisture Content, % | 22.10 | Head, max. | 175.85 | Moisture Content, % | 24.09 |
| Dry Density, pcf | 100.56 | Head, min. | 175.85 | Dry Density, pcf | 100.22 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 23.73 | Volume Solids, $cm^3$ | 180.75 |
| Volume Solids, $cm^3$ | 180.75 | Min. Grad. | 23.73 | Volume Voids, $cm^3$ | 123.12 |
| Volume Voids, $cm^3$ | 122.07 | | | Void Ratio | 0.68 |
| Void Ratio | 0.68 | | | Saturation, % | 95.5% |
| Saturation, % | 88.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 595.88 | 613.62 |
| Wt Soil & Tare, f | g | 488.02 | 496.11 |
| Wt Tare | g | 0.00 | 8.32 |
| Wt Moisture Lost | g | 107.86 | 117.51 |
| Wt Dry Soil | g | 488.02 | 487.79 |
| Water Content | % | 22.10% | 24.09% |

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 1.27E-05 $cm^3$/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP ($^0$C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/26/11 | 40842 | 13 | 15 | 21.9 | 0 | 0 | 0 | 0 | 2.50 | 175.85 | 23.73 | 1.3E-08 |
| 10/26/11 | 40842 | 13 | 20 | 21.9 | 5 | 5 | 300 | 300 | 2.50 | 175.85 | 23.73 | 1.3E-08 |
| 10/26/11 | 40842 | 13 | 25 | 21.9 | 5 | 10 | 300 | 600 | 2.50 | 175.85 | 23.73 | 1.3E-08 |
| 10/26/11 | 40842 | 13 | 30 | 21.9 | 5 | 15 | 300 | 900 | 2.50 | 175.85 | 23.73 | 1.3E-08 * |
| 10/26/11 | 40842 | 13 | 35 | 21.9 | 5 | 20 | 300 | 1200 | 2.50 | 175.85 | 23.73 | 1.3E-08 * |
| 10/26/11 | 40842 | 13 | 40 | 21.9 | 5 | 25 | 300 | 1500 | 2.50 | 175.85 | 23.73 | 1.3E-08 * |
| 10/26/11 | 40842 | 13 | 45 | 21.9 | 5 | 30 | 300 | 1800 | 2.50 | 175.85 | 23.73 | 1.3E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.3E-08 cm/sec **

| | |
|---|---|
| DATE | 10/26/11 |
| CHECK | AK |
| REVIEW | MWM |

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 12 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-224, | | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.923 | B-Value, f | 0.99 | Height, inches | 2.929 |
| Diameter, inches | 2.835 | Cell Pres. | 90.0 | Diameter, inches | 2.844 |
| Area, cm² | 40.73 | Bot. Pres. | 80.0 | Area, cm² | 40.98 |
| Volume, cm³ | 302.36 | Top Pres. | 80.0 | Volume, cm³ | 304.91 |
| Mass, g | 588.14 | Tot. B.P. | 80.0 | Mass, g | 601.94 |
| Moisture Content, % | 22.05 | Head, max. | 157.56 | Moisture Content, % | 24.91 |
| Dry Density, pcf | 99.45 | Head, min. | 157.56 | Dry Density, pcf | 98.62 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 21.18 | Volume Solids, cm³ | 178.48 |
| Volume Solids, cm³ | 178.48 | Min. Grad. | 21.18 | Volume Voids, cm³ | 126.43 |
| Volume Voids, cm³ | 123.88 | | | Void Ratio | 0.71 |
| Void Ratio | 0.69 | | | Saturation, % | 95.0% |
| Saturation, % | 85.8% | | | | |

Flow Pump Rate: 2.45E-05 cm³/sec

USCS: (CH)

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 588.14 | 609.73 |
| Wt Soil & Tare, f | g | 481.89 | 489.79 |
| Wt Tare | g | 0.00 | 8.36 |
| Wt Moisture Lost | g | 106.25 | 119.94 |
| Wt Dry Soil | g | 481.89 | 481.43 |
| Water Content | % | 22.05% | 24.91% |

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/26/11 | 40842 | 15 | 0 | 21.9 | 0 | 0 | 0 | 0 | 2.24 | 157.56 | 21.18 | 2.7E-08 |
| 10/26/11 | 40842 | 15 | 5 | 21.9 | 5 | 5 | 300 | 300 | 2.24 | 157.56 | 21.18 | 2.7E-08 |
| 10/26/11 | 40842 | 15 | 10 | 21.9 | 5 | 10 | 300 | 600 | 2.24 | 157.56 | 21.18 | 2.7E-08 |
| 10/26/11 | 40842 | 15 | 15 | 21.9 | 5 | 15 | 300 | 900 | 2.24 | 157.56 | 21.18 | 2.7E-08 * |
| 10/26/11 | 40842 | 15 | 20 | 21.9 | 5 | 20 | 300 | 1200 | 2.24 | 157.56 | 21.18 | 2.7E-08 * |
| 10/26/11 | 40842 | 15 | 25 | 21.9 | 5 | 25 | 300 | 1500 | 2.24 | 157.56 | 21.18 | 2.7E-08 * |
| 10/26/11 | 40842 | 15 | 30 | 21.9 | 5 | 30 | 300 | 1800 | 2.24 | 157.56 | 21.18 | 2.7E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.7E-08 cm/sec **

DATE 10/26/11
CHECK AR
REVIEW

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 10 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-229 | | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.917 | B-Value, f | 0.99 | Height, inches | 2.915 |
| Diameter, inches | 2.850 | Cell Pres. | 90.0 | Diameter, inches | 2.852 |
| Area, $cm^2$ | 41.16 | Bot. Pres. | 80.0 | Area, $cm^2$ | 41.22 |
| Volume, $cm^3$ | 304.94 | Top Pres. | 80.0 | Volume, $cm^3$ | 305.16 |
| Mass, g | 607.50 | Tot. B.P. | 80.0 | Mass, g | 616.49 |
| Moisture Content, % | 21.62 | Head, max. | 182.88 | Moisture Content, % | 23.42 |
| Dry Density, pcf | 102.21 | Head, min. | 182.88 | Dry Density, pcf | 102.14 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 24.70 | Volume Solids, $cm^3$ | 185.00 |
| Volume Solids, $cm^3$ | 185.00 | Min. Grad. | 24.70 | Volume Voids, $cm^3$ | 120.16 |
| Volume Voids, $cm^3$ | 119.94 | | | Void Ratio | 0.65 |
| Void Ratio | 0.65 | | | Saturation, % | 97.4% |
| Saturation, % | 90.0% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 607.50 | 624.62 |
| Wt Soil & Tare, f | g | 499.51 | 507.70 |
| Wt Tare | g | 0.00 | 8.44 |
| Wt Moisture Lost | g | 107.99 | 116.92 |
| Wt Dry Soil | g | 499.51 | 499.26 |
| Water Content | % | 21.62% | 23.42% |

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 2.45E-05 $cm^3$/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | Permeability (cm/sec) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | | |
| 10/26/11 | 40842 | 13 | 45 | 21.9 | 0 | 0 | 0 | 0 | 2.60 | 182.88 | 24.70 | 2.3E-08 | |
| 10/26/11 | 40842 | 13 | 50 | 21.9 | 5 | 5 | 300 | 300 | 2.60 | 182.88 | 24.70 | 2.3E-08 | |
| 10/26/11 | 40842 | 13 | 55 | 21.9 | 5 | 10 | 300 | 600 | 2.60 | 182.88 | 24.70 | 2.3E-08 | |
| 10/26/11 | 40842 | 14 | 0 | 21.9 | 5 | 15 | 300 | 900 | 2.60 | 182.88 | 24.70 | 2.3E-08 | * |
| 10/26/11 | 40842 | 14 | 5 | 21.9 | 5 | 20 | 300 | 1200 | 2.60 | 182.88 | 24.70 | 2.3E-08 | * |
| 10/26/11 | 40842 | 14 | 10 | 21.9 | 5 | 25 | 300 | 1500 | 2.60 | 182.88 | 24.70 | 2.3E-08 | * |
| 10/26/11 | 40842 | 14 | 15 | 21.9 | 5 | 30 | 300 | 1800 | 2.60 | 182.88 | 24.70 | 2.3E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS.** 2.3E-08 cm/sec **

| | |
|---|---|
| DATE | 10/26/11 |
| CHECK | AC |
| REVIEW | [illegible] |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | |
|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX |
| PROJECT NUMBER | 113-94788 |
| SAMPLE ID | CL-232. |
| SAMPLE TYPE | UD |

| | |
|---|---|
| Board # | 11 |
| Flow Pump | 1 |
| Flow Pump Speed | 10 |
| Technician | SDM |

COMMENTS

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 2.926 | B-Value, f | 0.99 |
| Diameter, inches | 2.834 | Cell Pres. | 90.0 |
| Area, $cm^2$ | 40.70 | Bot. Pres. | 80.0 |
| Volume, $cm^3$ | 302.46 | Top Pres. | 80.0 |
| Mass, g | 591.67 | Tot. B.P. | 80.0 |
| Moisture Content, % | 18.90 | Head, max. | 128.72 |
| Dry Density, pcf | 102.67 | Head, min. | 128.72 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 17.05 |
| Volume Solids, $cm^3$ | 184.31 | Min. Grad. | 17.05 |
| Volume Voids, $cm^3$ | 118.15 | | |
| Void Ratio | 0.64 | | |
| Saturation, % | 79.6% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 2.973 |
| Diameter, inches | 2.846 |
| Area, $cm^2$ | 41.04 |
| Volume, $cm^3$ | 309.92 |
| Mass, g | 613.85 |
| Moisture Content, % | 23.36 |
| Dry Density, pcf | 100.19 |
| Volume Solids, $cm^3$ | 184.31 |
| Volume Voids, $cm^3$ | 125.62 |
| Void Ratio | 0.68 |
| Saturation, % | 92.5% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 591.67 | 621.76 |
| Wt Soil & Tare, f | g | 497.63 | 505.63 |
| Wt Tare | g | 0.00 | 8.40 |
| Wt Moisture Lost | g | 94.04 | 116.13 |
| Wt Dry Soil | g | 497.63 | 497.23 |
| Water Content | % | 18.90% | 23.36% |

DESCRIPTION
Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate 2.45E-05 $cm^3$/sec

USCS (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) | |
| 10/26/11 | 40842 | 14 | 25 | 21.9 | 0 | 0 | 0 | 0 | 1.83 | 128.72 | 17.05 | 3.4E-08 | |
| 10/26/11 | 40842 | 14 | 30 | 21.9 | 5 | 5 | 300 | 300 | 1.83 | 128.72 | 17.05 | 3.4E-08 | |
| 10/26/11 | 40842 | 14 | 35 | 21.9 | 5 | 10 | 300 | 600 | 1.83 | 128.72 | 17.05 | 3.4E-08 | * |
| 10/26/11 | 40842 | 14 | 40 | 21.9 | 5 | 15 | 300 | 900 | 1.83 | 128.72 | 17.05 | 3.4E-08 | * |
| 10/26/11 | 40842 | 14 | 45 | 21.9 | 5 | 20 | 300 | 1200 | 1.83 | 128.72 | 17.05 | 3.4E-08 | * |
| 10/26/11 | 40842 | 14 | 50 | 21.9 | 5 | 25 | 300 | 1500 | 1.83 | 128.72 | 17.05 | 3.4E-08 | * |
| 10/26/11 | 40842 | 14 | 55 | 21.9 | 5 | 30 | 300 | 1800 | 1.83 | 128.72 | 17.05 | 3.4E-08 | * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.4E-08 cm/sec **

DATE 10/26/11
CHECK AC
REVIEW TWM

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 13 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-235. | | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.925 | B-Value, f | 0.98 | Height, inches | 2.940 |
| Diameter, inches | 2.862 | Cell Pres. | 90.0 | Diameter, inches | 2.873 |
| Area, cm² | 41.50 | Bot. Pres. | 80.0 | Area, cm² | 41.82 |
| Volume, cm³ | 308.36 | Top Pres. | 80.0 | Volume, cm³ | 312.33 |
| Mass, g | 627.68 | Tot. B.P. | 80.0 | Mass, g | 639.37 |
| Moisture Content, % | 19.48 | Head, max. | 164.60 | Moisture Content, % | 21.70 |
| Dry Density, pcf | 106.31 | Head, min. | 164.60 | Dry Density, pcf | 104.96 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 22.04 | Volume Solids, cm³ | 194.58 |
| Volume Solids, cm³ | 194.58 | Min. Grad. | 22.04 | Volume Voids, cm³ | 117.75 |
| Volume Voids, cm³ | 113.78 | | | Void Ratio | 0.61 |
| Void Ratio | 0.58 | | | Saturation, % | 96.8% |
| Saturation, % | 89.9% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 627.68 | 647.46 |
| Wt Soil & Tare, f | g | 525.36 | 533.49 |
| Wt Tare | g | 0.00 | 8.33 |
| Wt Moisture Lost | g | 102.32 | 113.97 |
| Wt Dry Soil | g | 525.36 | 525.16 |
| Water Content | % | 19.48% | 21.70% |

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 2.45E-05 cm³/sec  USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/26/11 | 40842 | 15 | 30 | 21.9 | 0 | 0 | 0 | 0 | 2.34 | 164.60 | 22.04 | 2.5E-08 |
| 10/26/11 | 40842 | 15 | 35 | 21.9 | 5 | 5 | 300 | 300 | 2.34 | 164.60 | 22.04 | 2.5E-08 |
| 10/26/11 | 40842 | 15 | 40 | 21.9 | 5 | 10 | 300 | 600 | 2.34 | 164.60 | 22.04 | 2.5E-08 |
| 10/26/11 | 40842 | 15 | 45 | 21.9 | 5 | 15 | 300 | 900 | 2.34 | 164.60 | 22.04 | 2.5E-08 * |
| 10/26/11 | 40842 | 15 | 50 | 21.9 | 5 | 20 | 300 | 1200 | 2.34 | 164.60 | 22.04 | 2.5E-08 * |
| 10/26/11 | 40842 | 15 | 55 | 21.9 | 5 | 25 | 300 | 1500 | 2.34 | 164.60 | 22.04 | 2.5E-08 * |
| 10/26/11 | 40842 | 16 | 0 | 21.9 | 5 | 30 | 300 | 1800 | 2.34 | 164.60 | 22.04 | 2.5E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.5E-08 cm/sec **

| | |
|---|---|
| DATE | 10/26/11 |
| CHECK | AK |
| REVIEW | |

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 14 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-238 | | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.914 | B-Value, f | 0.98 | Height, inches | 2.893 |
| Diameter, inches | 2.853 | Cell Pres. | 90.0 | Diameter, inches | 2.839 |
| Area, $cm^2$ | 41.24 | Bot. Pres. | 80.0 | Area, $cm^2$ | 40.84 |
| Volume, $cm^3$ | 305.27 | Top Pres. | 80.0 | Volume, $cm^3$ | 300.10 |
| Mass, g | 584.21 | Tot. B.P. | 80.0 | Mass, g | 590.71 |
| Moisture Content, % | 25.37 | Head, max. | 193.44 | Moisture Content, % | 26.77 |
| Dry Density, pcf | 95.25 | Head, min. | 193.44 | Dry Density, pcf | 96.89 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 26.32 | Volume Solids, $cm^3$ | 172.58 |
| Volume Solids, $cm^3$ | 172.58 | Min. Grad. | 26.32 | Volume Voids, $cm^3$ | 127.52 |
| Volume Voids, $cm^3$ | 132.69 | | | Void Ratio | 0.74 |
| Void Ratio | 0.77 | | | Saturation, % | 97.8% |
| Saturation, % | 89.1% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 584.21 | 598.66 |
| Wt Soil & Tare, f | g | 465.98 | 474.00 |
| Wt Tare | g | 0.00 | 8.29 |
| Wt Moisture Lost | g | 118.23 | 124.66 |
| Wt Dry Soil | g | 465.98 | 465.71 |
| Water Content | % | 25.37% | 26.77% |

DESCRIPTION
Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate 1.27E-05 $cm^3$/sec

USCS (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP ($^0$C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/26/11 | 40842 | 16 | 5 | 21.9 | 0 | 0 | 0 | 0 | 2.75 | 193.44 | 26.32 | 1.1E-08 |
| 10/26/11 | 40842 | 16 | 10 | 21.9 | 5 | 5 | 300 | 300 | 2.75 | 193.44 | 26.32 | 1.1E-08 |
| 10/26/11 | 40842 | 16 | 15 | 21.9 | 5 | 10 | 300 | 600 | 2.75 | 193.44 | 26.32 | 1.1E-08 |
| 10/26/11 | 40842 | 16 | 20 | 21.9 | 5 | 15 | 300 | 900 | 2.75 | 193.44 | 26.32 | 1.1E-08 * |
| 10/26/11 | 40842 | 16 | 25 | 21.9 | 5 | 20 | 300 | 1200 | 2.75 | 193.44 | 26.32 | 1.1E-08 * |
| 10/26/11 | 40842 | 16 | 30 | 21.9 | 5 | 25 | 300 | 1500 | 2.75 | 193.44 | 26.32 | 1.1E-08 * |
| 10/26/11 | 40842 | 16 | 35 | 21.9 | 5 | 30 | 300 | 1800 | 2.75 | 193.44 | 26.32 | 1.1E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.1E-08 cm/sec **

DATE 10/26/11
CHECK AIC
REVIEW MM

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-240 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.01 | 3.549 |
| Diameter, cm | 7.22 | 2.844 |
| Area, $cm^2$ | 40.98 | |
| Volume, $cm^3$ | 369.45 | |
| Wet Mass, g | 753.4 | |
| Wt. wet soil + tare, gm | 178.80 | |
| Wt. dry soil + tare, gm | 152.97 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 18.1% | |
| Dry Density, pcf | 107.8 | |
| Specific Gravity | 2.62 | |
| Void Ratio | 0.52 | |
| Saturation, % | 91.5% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.2

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.18 | 3.614 |
| Diameter, cm | 7.30 | 2.875 |
| Area, $cm^2$ | 41.88 | |
| Volume, $cm^3$ | 384.46 | |
| Wet Mass, g | 777.2 | |
| Wt. wet soil + tare, gm | 783.90 | |
| Wt. dry soil + tare, gm | 642.68 | |
| Wt. tare, gm | 6.8 | |
| Moisture Content, % | 22.2% | |
| Dry Density, pcf | 103.2 | |
| Specific Gravity | 2.62 | |
| Void Ratio | 0.58 | |
| Saturation, % | 99.7% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.2 | 0.35 | 0 | | 0.037 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 1 | 20 | 80 | 27.8 | 0.37 | 0.4 | 6.6E-06 | 0.038 | 0.985 | 1.01E-07 | 22 | 0.956 | 9.65E-08 |
| 4 | 43 | 203 | 27.5 | 0.38 | 0.3 | 2.6E-06 | 0.038 | 0.988 | 3.02E-08 | 22 | 0.956 | 2.88E-08 |
| 7 | 44 | 181 | 27.3 | 0.39 | 0.2 | 2.9E-06 | 0.039 | 0.992 | 2.27E-08 | 22 | 0.956 | 2.17E-08 |
| 12 | 6 | 262 | 27.1 | 0.40 | 0.2 | 2.0E-06 | 0.039 | 0.992 | 1.58E-08 | 22 | 0.956 | 1.51E-08 |
| 19 | 8 | 422 | 26.8 | 0.41 | 0.3 | 1.3E-06 | 0.039 | 0.988 | 1.49E-08 | 22 | 0.956 | 1.42E-08 |
| 27 | 14 | 486 | 26.6 | 0.42 | 0.2 | 1.1E-06 | 0.040 | 0.992 | 8.68E-09 | 22 | 0.956 | 8.30E-09 |
| 35 | 3 | 469 | 26.4 | 0.42 | 0.2 | 1.1E-06 | 0.040 | 0.992 | 9.07E-09 | 22 | 0.956 | 8.67E-09 |
| 41 | 59 | 416 | 26.2 | 0.43 | 0.2 | 1.3E-06 | 0.040 | 0.992 | 1.03E-08 | 22 | 0.956 | 9.85E-09 |
| 49 | 56 | 477 | 26.0 | 0.44 | 0.2 | 1.1E-06 | 0.041 | 0.992 | 9.06E-09 | 22 | 0.956 | 8.66E-09 |
| 59 | 2 | 546 | 25.8 | 0.45 | 0.2 | 9.7E-07 | 0.041 | 0.992 | 7.98E-09 | 22 | 0.956 | 7.63E-09 |
| 65 | 45 | 403 | 25.7 | 0.45 | 0.1 | 1.3E-06 | 0.041 | 0.996 | 5.42E-09 | 22 | 0.956 | 5.18E-09 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **7.83E-09** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/27/2011 | DATE: | 11/1/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-243 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.12 | 3.591 |
| Diameter, cm | 7.26 | 2.858 |
| Area, $cm^2$ | 41.39 | |
| Volume, $cm^3$ | 377.51 | |
| Wet Mass, g | 759.8 | |
| Wt. wet soil + tare, gm | 138.90 | |
| Wt. dry soil + tare, gm | 117.93 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 19.4% | |
| Dry Density, pcf | 105.2 | |
| Specific Gravity | 2.68 | |
| Void Ratio | 0.59 | |
| Saturation, % | 88.2% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 26.9

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.18 | 3.613 |
| Diameter, cm | 7.22 | 2.841 |
| Area, $cm^2$ | 40.90 | |
| Volume, $cm^3$ | 375.32 | |
| Wet Mass, g | 772.3 | |
| Wt. wet soil + tare, gm | 780.10 | |
| Wt. dry soil + tare, gm | 640.79 | |
| Wt. tare, gm | 7.98 | |
| Moisture Content, % | 22.0% | |
| Dry Density, pcf | 105.2 | |
| Specific Gravity | 2.68 | |
| Void Ratio | 0.59 | |
| Saturation, % | 100.1% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.9 | 0.85 | 0 | | 0.040 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 2 | 58 | 178 | 26.9 | 0.85 | 0 | 3.0E-06 | 0.040 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 7 | 59 | 301 | 26.4 | 0.87 | 0.5 | 1.8E-06 | 0.041 | 0.980 | 3.62E-08 | 22 | 0.956 | 3.46E-08 |
| 14 | 51 | 412 | 25.9 | 0.89 | 0.5 | 1.3E-06 | 0.042 | 0.979 | 2.70E-08 | 22 | 0.956 | 2.58E-08 |
| 19 | 42 | 291 | 25.5 | 0.91 | 0.4 | 1.8E-06 | 0.042 | 0.983 | 3.11E-08 | 22 | 0.956 | 2.97E-08 |
| 26 | 19 | 397 | 25.1 | 0.92 | 0.4 | 1.3E-06 | 0.043 | 0.983 | 2.32E-08 | 22 | 0.956 | 2.21E-08 |
| 30 | 47 | 268 | 24.8 | 0.94 | 0.3 | 2.0E-06 | 0.044 | 0.987 | 2.60E-08 | 22 | 0.956 | 2.49E-08 |
| 37 | 42 | 415 | 24.4 | 0.95 | 0.4 | 1.3E-06 | 0.044 | 0.982 | 2.29E-08 | 22 | 0.956 | 2.18E-08 |
| 43 | 44 | 362 | 24.1 | 0.96 | 0.3 | 1.5E-06 | 0.045 | 0.987 | 1.99E-08 | 22 | 0.956 | 1.90E-08 |
| 49 | 38 | 354 | 23.8 | 0.98 | 0.3 | 1.5E-06 | 0.046 | 0.986 | 2.06E-08 | 22 | 0.956 | 1.97E-08 |
| 54 | 1 | 263 | 23.6 | 0.99 | 0.2 | 2.0E-06 | 0.046 | 0.991 | 1.86E-08 | 22 | 0.956 | 1.78E-08 |
| 60 | 4 | 363 | 23.3 | 1.00 | 0.3 | 1.5E-06 | 0.047 | 0.986 | 2.06E-08 | 22 | 0.956 | 1.97E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.90E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/27/2011 | DATE: | 11/1/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-250 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.82 | 3.471 |
| Diameter, cm | 7.24 | 2.852 |
| Area, $cm^2$ | 41.22 | |
| Volume, $cm^3$ | 363.37 | |
| Wet Mass, g | 749.5 | |
| Wt. wet soil + tare, gm | 180.00 | |
| Wt. dry soil + tare, gm | 152.25 | |
| Wt. tare, gm | 10 | |
| Moisture Content, % | 19.5% | |
| Dry Density, pcf | 107.7 | |
| Specific Gravity | 2.68 | |
| Void Ratio | 0.55 | |
| Saturation, % | 94.6% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 26.4

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.21 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.88 | 3.498 |
| Diameter, cm | 7.30 | 2.874 |
| Area, $cm^2$ | 41.85 | |
| Volume, $cm^3$ | 371.86 | |
| Wet Mass, g | 765.9 | |
| Wt. wet soil + tare, gm | 774.50 | |
| Wt. dry soil + tare, gm | 637.57 | |
| Wt. tare, gm | 8.6 | |
| Moisture Content, % | 21.8% | |
| Dry Density, pcf | 105.5 | |
| Specific Gravity | 2.68 | |
| Void Ratio | 0.58 | |
| Saturation, % | 99.8% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.4 | 0.35 | 0 | | 0.040 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 2 | 6 | 126 | 25.9 | 0.37 | 0.5 | 4.1E-06 | 0.041 | 0.980 | 8.40E-08 | 22 | 0.956 | 8.03E-08 |
| 9 | 35 | 449 | 25.0 | 0.41 | 0.9 | 1.1E-06 | 0.042 | 0.962 | 4.45E-08 | 22 | 0.956 | 4.25E-08 |
| 10 | 58 | 83 | 24.8 | 0.42 | 0.2 | 6.2E-06 | 0.043 | 0.991 | 5.31E-08 | 22 | 0.956 | 5.07E-08 |
| 15 | 17 | 259 | 24.4 | 0.43 | 0.4 | 2.0E-06 | 0.043 | 0.983 | 3.48E-08 | 22 | 0.956 | 3.32E-08 |
| 20 | 38 | 321 | 24.0 | 0.45 | 0.4 | 1.6E-06 | 0.044 | 0.982 | 2.86E-08 | 22 | 0.956 | 2.73E-08 |
| 29 | 2 | 504 | 23.4 | 0.47 | 0.6 | 1.0E-06 | 0.045 | 0.973 | 2.82E-08 | 22 | 0.956 | 2.69E-08 |
| 37 | 37 | 515 | 22.8 | 0.50 | 0.6 | 1.0E-06 | 0.047 | 0.972 | 2.83E-08 | 22 | 0.956 | 2.71E-08 |
| 47 | 9 | 572 | 22.2 | 0.52 | 0.6 | 9.0E-07 | 0.048 | 0.971 | 2.63E-08 | 22 | 0.956 | 2.51E-08 |
| 56 | 11 | 542 | 21.7 | 0.54 | 0.5 | 9.5E-07 | 0.049 | 0.975 | 2.36E-08 | 22 | 0.956 | 2.26E-08 |
| 64 | 5 | 474 | 21.3 | 0.56 | 0.4 | 1.1E-06 | 0.050 | 0.980 | 2.20E-08 | 22 | 0.956 | 2.10E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **2.39E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 10/27/2011 | DATE: | 11/1/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 6 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-291 | L-4 | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.919 | B-Value, f | 0.98 | Height, inches | 2.934 |
| Diameter, inches | 2.848 | Cell Pres. | 90.0 | Diameter, inches | 2.865 |
| Area, cm² | 41.10 | Bot. Pres. | 80.0 | Area, cm² | 41.59 |
| Volume, cm³ | 304.72 | Top Pres. | 80.0 | Volume, cm³ | 309.96 |
| Mass, g | 621.12 | Tot. B.P. | 80.0 | Mass, g | 633.19 |
| Moisture Content, % | 19.93 | Head, max. | 152.64 | Moisture Content, % | 22.26 |
| Dry Density, pcf | 106.06 | Head, min. | 152.64 | Dry Density, pcf | 104.26 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 20.48 | Volume Solids, cm³ | 191.82 |
| Volume Solids, cm³ | 191.82 | Min. Grad. | 20.48 | Volume Voids, cm³ | 118.14 |
| Volume Voids, cm³ | 112.90 | | | Void Ratio | 0.62 |
| Void Ratio | 0.59 | | | Saturation, % | 97.6% |
| Saturation, % | 91.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 621.12 | 644.11 |
| Wt Soil & Tare, f | g | 517.91 | 528.38 |
| Wt Tare | g | 0.00 | 8.45 |
| Wt Moisture Lost | g | 103.21 | 115.73 |
| Wt Dry Soil | g | 517.91 | 519.93 |
| Water Content | % | 19.93% | 22.26% |

DESCRIPTION
Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate 2.45E-05 cm³/sec

USCS (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 11/07/11 | 40854 | 9 | 35 | 20.9 | 0 | 0 | 0 | 0 | 2.17 | 152.64 | 20.48 | 2.8E-08 |
| 11/07/11 | 40854 | 9 | 40 | 20.9 | 5 | 5 | 300 | 300 | 2.17 | 152.64 | 20.48 | 2.8E-08 |
| 11/07/11 | 40854 | 9 | 45 | 20.9 | 5 | 10 | 300 | 600 | 2.17 | 152.64 | 20.48 | 2.8E-08 |
| 11/07/11 | 40854 | 9 | 50 | 20.9 | 5 | 15 | 300 | 900 | 2.17 | 152.64 | 20.48 | 2.8E-08 * |
| 11/07/11 | 40854 | 9 | 55 | 20.9 | 5 | 20 | 300 | 1200 | 2.17 | 152.64 | 20.48 | 2.8E-08 * |
| 11/07/11 | 40854 | 10 | 0 | 20.9 | 5 | 25 | 300 | 1500 | 2.17 | 152.64 | 20.48 | 2.8E-08 * |
| 11/07/11 | 40854 | 10 | 5 | 20.9 | 5 | 30 | 300 | 1800 | 2.17 | 152.64 | 20.48 | 2.8E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.8E-08 cm/sec **

DATE 11/7/11
CHECK RWM
REVIEW RK

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 7 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-297 | L-4 | Flow Pump Speed | 10 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.924 | B-Value, f | 1.00 | Height, inches | 2.954 |
| Diameter, inches | 2.840 | Cell Pres. | 90.0 | Diameter, inches | 2.861 |
| Area, $cm^2$ | 40.87 | Bot. Pres. | 80.0 | Area, $cm^2$ | 41.48 |
| Volume, $cm^3$ | 303.53 | Top Pres. | 80.0 | Volume, $cm^3$ | 311.20 |
| Mass, g | 630.68 | Tot. B.P. | 80.0 | Mass, g | 649.32 |
| Moisture Content, % | 16.97 | Head, max. | 103.40 | Moisture Content, % | 20.43 |
| Dry Density, pcf | 110.84 | Head, min. | 103.40 | Dry Density, pcf | 108.11 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 13.78 | Volume Solids, $cm^3$ | 199.69 |
| Volume Solids, $cm^3$ | 199.69 | Min. Grad. | 13.78 | Volume Voids, $cm^3$ | 111.51 |
| Volume Voids, $cm^3$ | 103.84 | | | Void Ratio | 0.56 |
| Void Ratio | 0.52 | | | Saturation, % | 98.8% |
| Saturation, % | 88.1% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 630.68 | 657.72 |
| Wt Soil & Tare, f | g | 539.16 | 547.58 |
| Wt Tare | g | 0.00 | 8.52 |
| Wt Moisture Lost | g | 91.52 | 110.14 |
| Wt Dry Soil | g | 539.16 | 539.06 |
| Water Content | % | 16.97% | 20.43% |

DESCRIPTION
Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate 2.45E-05 $cm^3$/sec  USCS (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 11/07/11 | 40854 | 10 | 30 | 20.9 | 0 | 0 | 0 | 0 | 1.47 | 103.40 | 13.78 | 4.2E-08 |
| 11/07/11 | 40854 | 10 | 35 | 20.9 | 5 | 5 | 300 | 300 | 1.47 | 103.40 | 13.78 | 4.2E-08 |
| 11/07/11 | 40854 | 10 | 40 | 20.9 | 5 | 10 | 300 | 600 | 1.47 | 103.40 | 13.78 | 4.2E-08 |
| 11/07/11 | 40854 | 10 | 45 | 20.9 | 5 | 15 | 300 | 900 | 1.47 | 103.40 | 13.78 | 4.2E-08 * |
| 11/07/11 | 40854 | 10 | 50 | 20.9 | 5 | 20 | 300 | 1200 | 1.47 | 103.40 | 13.78 | 4.2E-08 * |
| 11/07/11 | 40854 | 10 | 55 | 20.9 | 5 | 25 | 300 | 1500 | 1.47 | 103.40 | 13.78 | 4.2E-08 * |
| 11/07/11 | 40854 | 11 | 0 | 20.9 | 5 | 30 | 300 | 1800 | 1.47 | 103.40 | 13.78 | 4.2E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.2E-08 cm/sec **

DATE 11/7/11
CHECK
REVIEW

## FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | |
|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | Board # | 8 |
| PROJECT NUMBER | 113-94788 | Flow Pump | 1 |
| SAMPLE ID | CL-306 L-4 | Flow Pump Speed | 11 |
| SAMPLE TYPE | UD | Technician | SDM |

COMMENTS

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.917 | B-Value, f | 1.00 | Height, inches | 2.925 |
| Diameter, inches | 2.844 | Cell Pres. | 90.0 | Diameter, inches | 2.834 |
| Area, cm² | 40.98 | Bot. Pres. | 80.0 | Area, cm² | 40.70 |
| Volume, cm³ | 303.66 | Top Pres. | 80.0 | Volume, cm³ | 302.35 |
| Mass, g | 619.31 | Tot. B.P. | 80.0 | Mass, g | 626.59 |
| Moisture Content, % | 20.13 | Head, max. | 165.30 | Moisture Content, % | 21.55 |
| Dry Density, pcf | 105.94 | Head, min. | 165.30 | Dry Density, pcf | 106.39 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 22.25 | Volume Solids, cm³ | 190.93 |
| Volume Solids, cm³ | 190.93 | Min. Grad. | 22.25 | Volume Voids, cm³ | 111.42 |
| Volume Voids, cm³ | 112.73 | | | Void Ratio | 0.58 |
| Void Ratio | 0.59 | | | Saturation, % | 99.7% |
| Saturation, % | 92.1% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 619.31 | 634.79 |
| Wt Soil & Tare, f | g | 515.52 | 523.75 |
| Wt Tare | g | 0.00 | 8.38 |
| Wt Moisture Lost | g | 103.79 | 111.04 |
| Wt Dry Soil | g | 515.52 | 515.37 |
| Water Content | % | 20.13% | 21.55% |

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 1.27E-05 cm³/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 11/07/11 | 40854 | 11 | 5 | 20.9 | 0 | 0 | 0 | 0 | 2.35 | 165.30 | 22.25 | 1.4E-08 |
| 11/07/11 | 40854 | 11 | 10 | 20.9 | 5 | 5 | 300 | 300 | 2.35 | 165.30 | 22.25 | 1.4E-08 |
| 11/07/11 | 40854 | 11 | 15 | 20.9 | 5 | 10 | 300 | 600 | 2.35 | 165.30 | 22.25 | 1.4E-08 |
| 11/07/11 | 40854 | 11 | 20 | 20.9 | 5 | 15 | 300 | 900 | 2.35 | 165.30 | 22.25 | 1.4E-08 * |
| 11/07/11 | 40854 | 11 | 25 | 20.9 | 5 | 20 | 300 | 1200 | 2.35 | 165.30 | 22.25 | 1.4E-08 * |
| 11/07/11 | 40854 | 11 | 30 | 20.9 | 5 | 25 | 300 | 1500 | 2.35 | 165.30 | 22.25 | 1.4E-08 * |
| 11/07/11 | 40854 | 11 | 35 | 20.9 | 5 | 30 | 300 | 1800 | 2.35 | 165.30 | 22.25 | 1.4E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.4E-08 cm/sec **

| | |
|---|---|
| DATE | 11/7/11 |
| CHECK | MWM |
| REVIEW | BJ |

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 9 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-310 | L-4 | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.926 | B-Value, f | 0.99 | Height, inches | 2.938 |
| Diameter, inches | 2.869 | Cell Pres. | 90.0 | Diameter, inches | 2.871 |
| Area, cm² | 41.71 | Bot. Pres. | 80.0 | Area, cm² | 41.77 |
| Volume, cm³ | 309.97 | Top Pres. | 80.0 | Volume, cm³ | 311.68 |
| Mass, g | 630.57 | Tot. B.P. | 80.0 | Mass, g | 640.18 |
| Moisture Content, % | 21.11 | Head, max. | 175.85 | Moisture Content, % | 22.95 |
| Dry Density, pcf | 104.82 | Head, min. | 175.85 | Dry Density, pcf | 104.24 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 23.56 | Volume Solids, cm³ | 192.84 |
| Volume Solids, cm³ | 192.84 | Min. Grad. | 23.56 | Volume Voids, cm³ | 118.84 |
| Volume Voids, cm³ | 117.13 | | | Void Ratio | 0.62 |
| Void Ratio | 0.61 | | | Saturation, % | 100.6% |
| Saturation, % | 93.8% | | | | |

Flow Pump Rate: 1.27E-05 cm³/sec

USCS: (CH)

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 630.57 | 648.29 |
| Wt Soil & Tare, f | g | 520.67 | 528.82 |
| Wt Tare | g | 0.00 | 8.30 |
| Wt Moisture Lost | g | 109.90 | 119.47 |
| Wt Dry Soil | g | 520.67 | 520.52 |
| Water Content | % | 21.11% | 22.95% |

DESCRIPTION
Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 11/07/11 | 40854 | 11 | 40 | 20.9 | 0 | 0 | 0 | 0 | 2.50 | 175.85 | 23.56 | 1.3E-08 |
| 11/07/11 | 40854 | 11 | 45 | 20.9 | 5 | 5 | 300 | 300 | 2.50 | 175.85 | 23.56 | 1.3E-08 |
| 11/07/11 | 40854 | 11 | 50 | 20.9 | 5 | 10 | 300 | 600 | 2.50 | 175.85 | 23.56 | 1.3E-08 |
| 11/07/11 | 40854 | 11 | 55 | 20.9 | 5 | 15 | 300 | 900 | 2.50 | 175.85 | 23.56 | 1.3E-08 * |
| 11/07/11 | 40854 | 12 | 0 | 20.9 | 5 | 20 | 300 | 1200 | 2.50 | 175.85 | 23.56 | 1.3E-08 * |
| 11/07/11 | 40854 | 12 | 5 | 20.9 | 5 | 25 | 300 | 1500 | 2.50 | 175.85 | 23.56 | 1.3E-08 * |
| 11/07/11 | 40854 | 12 | 10 | 20.9 | 5 | 30 | 300 | 1800 | 2.50 | 175.85 | 23.56 | 1.3E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.3E-08 cm/sec **

DATE 11/7/11
CHECK TWN
REVIEW AW

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 10 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-316 | L-4 | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.919 | B-Value, f | 1.00 | Height, inches | 2.930 |
| Diameter, inches | 2.849 | Cell Pres. | 90.0 | Diameter, inches | 2.853 |
| Area, cm² | 41.13 | Bot. Pres. | 80.0 | Area, cm² | 41.24 |
| Volume, cm³ | 304.94 | Top Pres. | 80.0 | Volume, cm³ | 306.95 |
| Mass, g | 615.63 | Tot. B.P. | 80.0 | Mass, g | 624.79 |
| Moisture Content, % | 20.66 | Head, max. | 187.81 | Moisture Content, % | 22.45 |
| Dry Density, pcf | 104.41 | Head, min. | 187.81 | Dry Density, pcf | 103.73 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 25.24 | Volume Solids, cm³ | 188.97 |
| Volume Solids, cm³ | 188.97 | Min. Grad. | 25.24 | Volume Voids, cm³ | 117.97 |
| Volume Voids, cm³ | 115.96 | | | Void Ratio | 0.62 |
| Void Ratio | 0.61 | | | Saturation, % | 97.1% |
| Saturation, % | 90.9% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 615.63 | 632.81 |
| Wt Soil & Tare, f | g | 510.23 | 518.28 |
| Wt Tare | g | 0.00 | 8.18 |
| Wt Moisture Lost | g | 105.40 | 114.53 |
| Wt Dry Soil | g | 510.23 | 510.10 |
| Water Content | % | 20.66% | 22.45% |

Flow Pump Rate: 1.27E-05 cm³/sec

USCS: (CH)

DESCRIPTION: Yellowish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 11/07/11 | 40854 | 12 | 10 | 20.9 | 0 | 0 | 0 | 0 | 2.67 | 187.81 | 25.24 | 1.2E-08 |
| 11/07/11 | 40854 | 12 | 15 | 20.9 | 5 | 5 | 300 | 300 | 2.67 | 187.81 | 25.24 | 1.2E-08 |
| 11/07/11 | 40854 | 12 | 20 | 20.9 | 5 | 10 | 300 | 600 | 2.67 | 187.81 | 25.24 | 1.2E-08 |
| 11/07/11 | 40854 | 12 | 25 | 20.9 | 5 | 15 | 300 | 900 | 2.67 | 187.81 | 25.24 | 1.2E-08 * |
| 11/07/11 | 40854 | 12 | 30 | 20.9 | 5 | 20 | 300 | 1200 | 2.67 | 187.81 | 25.24 | 1.2E-08 * |
| 11/07/11 | 40854 | 12 | 35 | 20.9 | 5 | 25 | 300 | 1500 | 2.67 | 187.81 | 25.24 | 1.2E-08 * |
| 11/07/11 | 40854 | 12 | 40 | 20.9 | 5 | 30 | 300 | 1800 | 2.67 | 187.81 | 25.24 | 1.2E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.2E-08 cm/sec **

DATE 11/7/11
CHECK
REVIEW

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-324 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.43 | 3.318 |
| Diameter, cm | 7.21 | 2.837 |
| Area, $cm^2$ | 40.78 | |
| Volume, $cm^3$ | 343.70 | |
| Wet Mass, g | 690.7 | |
| Wt. wet soil + tare, gm | 194.33 | |
| Wt. dry soil + tare, gm | 158.48 | |
| Wt. tare, gm | 6.9 | |
| Moisture Content, % | 23.7% | |
| Dry Density, pcf | 101.4 | |
| Specific Gravity | 2.68 | |
| Void Ratio | 0.65 | |
| Saturation, % | 97.6% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.5

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.21 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.46 | 3.33 |
| Diameter, cm | 7.24 | 2.852 |
| Area, $cm^2$ | 41.22 | |
| Volume, $cm^3$ | 348.61 | |
| Wet Mass, g | 697.6 | |
| Wt. wet soil + tare, gm | 707.40 | |
| Wt. dry soil + tare, gm | 567.00 | |
| Wt. tare, gm | 10 | |
| Moisture Content, % | 25.2% | |
| Dry Density, pcf | 99.7 | |
| Specific Gravity | 2.68 | |
| Void Ratio | 0.68 | |
| Saturation, % | 99.8% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.5 | 0.85 | 0 | | 0.039 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 2 | 24 | 144 | 26.6 | 0.89 | 0.9 | 3.4E-06 | 0.040 | 0.964 | 1.28E-07 | 22 | 0.956 | 1.22E-07 |
| 5 | 11 | 167 | 25.9 | 0.92 | 0.7 | 3.0E-06 | 0.042 | 0.971 | 8.80E-08 | 22 | 0.956 | 8.41E-08 |
| 12 | 21 | 430 | 24.5 | 0.97 | 1.4 | 1.2E-06 | 0.044 | 0.938 | 7.38E-08 | 22 | 0.956 | 7.06E-08 |
| 20 | 22 | 481 | 23.2 | 1.03 | 1.3 | 1.0E-06 | 0.047 | 0.939 | 6.50E-08 | 22 | 0.956 | 6.21E-08 |
| 26 | 5 | 343 | 22.9 | 1.04 | 0.3 | 1.4E-06 | 0.048 | 0.986 | 2.08E-08 | 22 | 0.956 | 1.99E-08 |
| 35 | 3 | 538 | 21.2 | 1.11 | 1.7 | 9.2E-07 | 0.052 | 0.912 | 8.51E-08 | 22 | 0.956 | 8.13E-08 |
| 47 | 9 | 726 | 19.8 | 1.17 | 1.4 | 6.8E-07 | 0.056 | 0.922 | 5.57E-08 | 22 | 0.956 | 5.32E-08 |
| 52 | 6 | 297 | 19.3 | 1.19 | 0.5 | 1.7E-06 | 0.057 | 0.971 | 4.87E-08 | 22 | 0.956 | 4.66E-08 |
| 61 | 17 | 551 | 18.4 | 1.22 | 0.9 | 9.0E-07 | 0.061 | 0.945 | 5.05E-08 | 22 | 0.956 | 4.83E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **5.74E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 11/9/2011 | DATE: | 11/17/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE W[illegible]RIAXIAL PERMEABILITY

ASTM D 5084 METHO[illegible]CONSTANT VOLUME - FALLING HEAD

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX | | Cell Pressure = | 80 | psi |
| PROJECT NUMBER: | 113-94788.1 | | Backwater Pressure = | 70 | psi |
| SAMPLE ID: | CL-329 | | Run Number = | 1 | |
| LIFT NUMBER: | Lift 4 | | | | |

| **Sample Data, Initial** | | inches |
|---|---|---|
| Height, cm | 9.39 | 3.695 |
| Diameter, cm | 7.16 | 2.820 |
| Area, cm² | 40.30 | |
| Volume, cm³ | 378.18 | |
| Wet Mass, g | 750.7 | |
| Wt. wet soil + tare, gm | 240.40 | |
| Wt. dry soil + tare, gm | 198.50 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 22.2% | |
| Dry Density, pcf | 101.3 | |
| Specific Gravity | 2.57 | |
| Void Ratio | 0.58 | |
| Saturation, % | 98.0% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 26.5

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 cm²

$M_2$ = 1.04

**Sample Constants:**

S = 0.23 cm⁻¹

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0006

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

| **Sample Data, Final** | | inches |
|---|---|---|
| Height, cm | 9.36 | 3.685 |
| Diameter, cm | 7.21 | 2.840 |
| Area, cm² | 40.87 | |
| Volume, cm³ | 382.53 | |
| Wet Mass, g | 756.6 | |
| Wt. wet soil + tare, gm | 764.90 | |
| Wt. dry soil + tare, gm | 621.61 | |
| Wt. tare, gm | 8.4 | |
| Moisture Content, % | 23.4% | |
| Dry Density, pcf | 100.0 | |
| Specific Gravity | 2.57 | |
| Void Ratio | 0.60 | |
| Saturation, % | 99.6% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.5 | 0.35 | 0 | | 0.040 | 1.000 | 0.00E+00 | 23 | 0.931 | 0.00E+00 |
| 2 | 45 | 165 | 26.0 | 0.37 | 0.5 | 3.4E-06 | 0.041 | 0.980 | 6.96E-08 | 23 | 0.931 | 6.48E-08 |
| 5 | 10 | 145 | 25.6 | 0.39 | 0.4 | 3.9E-06 | 0.041 | 0.983 | 6.43E-08 | 23 | 0.931 | 5.98E-08 |
| 8 | 17 | 187 | 25.2 | 0.40 | 0.4 | 3.0E-06 | 0.042 | 0.983 | 5.07E-08 | 23 | 0.931 | 4.72E-08 |
| 13 | 3 | 286 | 24.6 | 0.43 | 0.6 | 2.0E-06 | 0.043 | 0.974 | 5.12E-08 | 23 | 0.931 | 4.77E-08 |
| 16 | 18 | 195 | 24.1 | 0.45 | 0.5 | 2.9E-06 | 0.044 | 0.978 | 6.39E-08 | 23 | 0.931 | 5.95E-08 |
| 20 | 21 | 243 | 23.7 | 0.46 | 0.4 | 2.3E-06 | 0.045 | 0.982 | 4.16E-08 | 23 | 0.931 | 3.88E-08 |
| 24 | 25 | 244 | 23.3 | 0.48 | 0.4 | 2.3E-06 | 0.046 | 0.982 | 4.22E-08 | 23 | 0.931 | 3.93E-08 |
| 29 | 16 | 291 | 22.9 | 0.50 | 0.4 | 1.9E-06 | 0.046 | 0.981 | 3.61E-08 | 23 | 0.931 | 3.36E-08 |
| 34 | 53 | 337 | 22.4 | 0.52 | 0.5 | 1.7E-06 | 0.048 | 0.976 | 4.00E-08 | 23 | 0.931 | 3.72E-08 |
| 40 | 24 | 331 | 22.0 | 0.53 | 0.4 | 1.7E-06 | 0.048 | 0.981 | 3.31E-08 | 23 | 0.931 | 3.08E-08 |
| 48 | 24 | 480 | 21.5 | 0.55 | 0.5 | 1.2E-06 | 0.050 | 0.975 | 2.93E-08 | 23 | 0.931 | 2.73E-08 |
| 53 | 25 | 301 | 21.0 | 0.58 | 0.5 | 1.9E-06 | 0.051 | 0.975 | 4.80E-08 | 23 | 0.931 | 4.47E-08 |
| 59 | 13 | 348 | 20.6 | 0.59 | 0.4 | 1.6E-06 | 0.052 | 0.979 | 3.38E-08 | 23 | 0.931 | 3.15E-08 |
| 64 | 26 | 313 | 20.3 | 0.60 | 0.3 | 1.8E-06 | 0.053 | 0.984 | 2.86E-08 | 23 | 0.931 | 2.66E-08 |
| 68 | 5 | 219 | 20.0 | 0.62 | 0.3 | 2.6E-06 | 0.054 | 0.984 | 4.15E-08 | 23 | 0.931 | 3.86E-08 |
| 74 | 17 | 372 | 19.8 | 0.62 | 0.2 | 1.5E-06 | 0.054 | 0.989 | 1.64E-08 | 23 | 0.931 | 1.53E-08 |
| 77 | 29 | 192 | 19.6 | 0.63 | 0.2 | 2.9E-06 | 0.055 | 0.989 | 3.22E-08 | 23 | 0.931 | 3.00E-08 |
| 79 | 36 | 127 | 19.4 | 0.64 | 0.2 | 4.4E-06 | 0.055 | 0.989 | 4.92E-08 | 23 | 0.931 | 4.58E-08 |
| 83 | 4 | 208 | 19.3 | 0.64 | 0.1 | 2.7E-06 | 0.056 | 0.994 | 1.51E-08 | 23 | 0.931 | 1.40E-08 |
| 86 | 54 | 230 | 19.0 | 0.66 | 0.3 | 2.4E-06 | 0.057 | 0.983 | 4.18E-08 | 23 | 0.931 | 3.89E-08 |
| 90 | 2 | 188 | 18.9 | 0.66 | 0.1 | 3.0E-06 | 0.057 | 0.994 | 1.70E-08 | 23 | 0.931 | 1.59E-08 |
| 94 | 44 | 282 | 18.7 | 0.67 | 0.2 | 2.0E-06 | 0.058 | 0.988 | 2.30E-08 | 23 | 0.931 | 2.15E-08 |
| 97 | 21 | 157 | 18.6 | 0.67 | 0.1 | 3.6E-06 | 0.058 | 0.994 | 2.08E-08 | 23 | 0.931 | 1.93E-08 |
| 100 | 13 | 172 | 18.4 | 0.68 | 0.2 | 3.3E-06 | 0.059 | 0.988 | 3.85E-08 | 23 | 0.931 | 3.58E-08 |
| 106 | 3 | 350 | 18.2 | 0.69 | 0.2 | 1.6E-06 | 0.059 | 0.988 | 1.91E-08 | 23 | 0.931 | 1.78E-08 |
| 111 | 39 | 336 | 18.0 | 0.70 | 0.2 | 1.7E-06 | 0.060 | 0.988 | 2.02E-08 | 23 | 0.931 | 1.88E-08 |
| 114 | 2 | 143 | 17.9 | 0.70 | 0.1 | 3.9E-06 | 0.061 | 0.994 | 2.38E-08 | 23 | 0.931 | 2.21E-08 |
| 116 | 23 | 141 | 17.8 | 0.71 | 0.1 | 4.0E-06 | 0.061 | 0.994 | 2.42E-08 | 23 | 0.931 | 2.26E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **2.03E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | MR | CHECKED: | JBF |
| DATE: | 11/11/2011 | DATE: | 11/17/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE W[illegible]TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | | | | |
|---|---|---|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX | Cell Pressure = | 80 | psi |
| PROJECT NUMBER: | 113-94788.1 | Backwater Pressure = | 70 | psi |
| SAMPLE ID: | CL-333 | Run Number = | 1 | |
| LIFT NUMBER: | Lift 4 | | | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.67 | 3.415 |
| Diameter, cm | 7.30 | 2.875 |
| Area, $cm^2$ | 41.88 | |
| Volume, $cm^3$ | 363.29 | |
| Wet Mass, g | 733.8 | |
| Wt. wet soil + tare, gm | 194.90 | |
| Wt. dry soil + tare, gm | 161.10 | |
| Wt. tare, gm | 9.9 | |
| Moisture Content, % | 22.4% | |
| Dry Density, pcf | 103.0 | |
| Specific Gravity | 2.68 | |
| Void Ratio | 0.62 | |
| Saturation, % | 96.1% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.6

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.21 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.67 | 3.415 |
| Diameter, cm | 7.28 | 2.866 |
| Area, $cm^2$ | 41.62 | |
| Volume, $cm^3$ | 361.02 | |
| Wet Mass, g | 739.2 | |
| Wt. wet soil + tare, gm | 747.40 | |
| Wt. dry soil + tare, gm | 612.46 | |
| Wt. tare, gm | 8.2 | |
| Moisture Content, % | 22.3% | |
| Dry Density, pcf | 104.4 | |
| Specific Gravity | 2.68 | |
| Void Ratio | 0.60 | |
| Saturation, % | 99.5% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.6 | 0.85 | 0 | | 0.038 | 1.000 | 0.00E+00 | 23 | 0.931 | 0.00E+00 |
| 3 | 24 | 204 | 28.2 | 0.87 | 0.4 | 2.4E-06 | 0.038 | 0.985 | 3.74E-08 | 23 | 0.931 | 3.49E-08 |
| 8 | 28 | 304 | 28.0 | 0.87 | 0.2 | 1.6E-06 | 0.038 | 0.992 | 1.26E-08 | 23 | 0.931 | 1.17E-08 |
| 12 | 26 | 238 | 27.8 | 0.88 | 0.2 | 2.1E-06 | 0.039 | 0.992 | 1.62E-08 | 23 | 0.931 | 1.51E-08 |
| 19 | 30 | 424 | 27.6 | 0.89 | 0.2 | 1.2E-06 | 0.039 | 0.992 | 9.18E-09 | 23 | 0.931 | 8.55E-09 |
| 28 | 23 | 533 | 27.5 | 0.90 | 0.1 | 9.3E-07 | 0.039 | 0.996 | 3.66E-09 | 23 | 0.931 | 3.41E-09 |
| 34 | 2 | 339 | 27.3 | 0.90 | 0.2 | 1.5E-06 | 0.039 | 0.992 | 1.16E-08 | 23 | 0.931 | 1.08E-08 |
| 47 | 30 | 808 | 27.0 | 0.92 | 0.3 | 6.2E-07 | 0.040 | 0.988 | 7.42E-09 | 23 | 0.931 | 6.91E-09 |
| 52 | 36 | 306 | 26.9 | 0.92 | 0.1 | 1.6E-06 | 0.040 | 0.996 | 6.53E-09 | 23 | 0.931 | 6.08E-09 |
| 58 | 46 | 370 | 26.8 | 0.92 | 0.1 | 1.3E-06 | 0.040 | 0.996 | 5.42E-09 | 23 | 0.931 | 5.05E-09 |
| 63 | 35 | 289 | 26.7 | 0.93 | 0.1 | 1.7E-06 | 0.040 | 0.996 | 6.97E-09 | 23 | 0.931 | 6.49E-09 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **6.13E-09** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | JBF |
| DATE: | 11/9/2011 | DATE: | 11/17/2011 |

**GEOTECHNICAL TESTING LABORATORY**
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## FLEXIBLE W[illegible]RIAXIAL PERMEABILITY

ASTM D 5084 METHOD [illegible], CONSTANT VOLUME - FALLING HEAD

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX | | Cell Pressure = | 80 | psi |
| PROJECT NUMBER: | 113-94788.1 | | Backwater Pressure = | 70 | psi |
| SAMPLE ID: | CL-337 | | Run Number = | 1 | |
| LIFT NUMBER: | Lift 4 | | | | |

| **Sample Data, Initial** | | inches |
|---|---|---|
| Height, cm | 9.22 | 3.63 |
| Diameter, cm | 7.21 | 2.840 |
| Area, $cm^2$ | 40.87 | |
| Volume, $cm^3$ | 376.82 | |
| Wet Mass, g | 755.8 | |
| Wt. wet soil + tare, gm | 201.70 | |
| Wt. dry soil + tare, gm | 166.80 | |
| Wt. tare, gm | 10 | |
| Moisture Content, % | 22.3% | |
| Dry Density, pcf | 102.4 | |
| Specific Gravity | 2.66 | |
| Void Ratio | 0.62 | |
| Saturation, % | 95.3% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.7

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.23 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

| **Sample Data, Final** | | inches |
|---|---|---|
| Height, cm | 9.17 | 3.609 |
| Diameter, cm | 7.22 | 2.842 |
| Area, $cm^2$ | 40.93 | |
| Volume, $cm^3$ | 375.17 | |
| Wet Mass, g | 761.0 | |
| Wt. wet soil + tare, gm | 769.40 | |
| Wt. dry soil + tare, gm | 626.16 | |
| Wt. tare, gm | 8.5 | |
| Moisture Content, % | 23.2% | |
| Dry Density, pcf | 102.7 | |
| Specific Gravity | 2.66 | |
| Void Ratio | 0.62 | |
| Saturation, % | 100.2% | |

| Minutes | Seconds | $\Delta t$ (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.7 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 23 | 0.931 | 0.00E+00 |
| 2 | 32 | 152 | 26.9 | 0.38 | 0.8 | 3.6E-06 | 0.039 | 0.969 | 1.14E-07 | 23 | 0.931 | 1.06E-07 |
| 5 | 38 | 186 | 26.4 | 0.40 | 0.5 | 2.9E-06 | 0.040 | 0.980 | 5.89E-08 | 23 | 0.931 | 5.49E-08 |
| 8 | 56 | 198 | 25.9 | 0.42 | 0.5 | 2.7E-06 | 0.041 | 0.980 | 5.65E-08 | 23 | 0.931 | 5.26E-08 |
| 12 | 3 | 187 | 25.5 | 0.44 | 0.4 | 2.9E-06 | 0.042 | 0.983 | 4.86E-08 | 23 | 0.931 | 4.52E-08 |
| 16 | 36 | 273 | 24.9 | 0.46 | 0.6 | 2.0E-06 | 0.043 | 0.974 | 5.14E-08 | 23 | 0.931 | 4.79E-08 |
| 19 | 42 | 186 | 24.5 | 0.48 | 0.4 | 2.9E-06 | 0.043 | 0.983 | 5.10E-08 | 23 | 0.931 | 4.75E-08 |
| 23 | 4 | 202 | 24.2 | 0.49 | 0.3 | 2.7E-06 | 0.044 | 0.987 | 3.56E-08 | 23 | 0.931 | 3.31E-08 |
| 26 | 28 | 204 | 23.9 | 0.51 | 0.3 | 2.7E-06 | 0.044 | 0.987 | 3.57E-08 | 23 | 0.931 | 3.32E-08 |
| 30 | 4 | 216 | 23.5 | 0.52 | 0.4 | 2.5E-06 | 0.045 | 0.982 | 4.59E-08 | 23 | 0.931 | 4.27E-08 |
| 33 | 53 | 229 | 23.2 | 0.53 | 0.3 | 2.4E-06 | 0.046 | 0.986 | 3.28E-08 | 23 | 0.931 | 3.06E-08 |
| 37 | 49 | 236 | 22.8 | 0.55 | 0.4 | 2.3E-06 | 0.047 | 0.981 | 4.34E-08 | 23 | 0.931 | 4.04E-08 |
| 42 | 17 | 268 | 22.5 | 0.56 | 0.3 | 2.0E-06 | 0.047 | 0.986 | 2.90E-08 | 23 | 0.931 | 2.70E-08 |
| 45 | 19 | 182 | 22.2 | 0.58 | 0.3 | 3.0E-06 | 0.048 | 0.986 | 4.33E-08 | 23 | 0.931 | 4.03E-08 |
| 48 | 30 | 191 | 22.0 | 0.58 | 0.2 | 2.8E-06 | 0.049 | 0.990 | 2.77E-08 | 23 | 0.931 | 2.58E-08 |
| 52 | 32 | 242 | 21.8 | 0.59 | 0.2 | 2.2E-06 | 0.049 | 0.990 | 2.21E-08 | 23 | 0.931 | 2.06E-08 |
| 56 | 10 | 218 | 21.5 | 0.60 | 0.3 | 2.5E-06 | 0.050 | 0.985 | 3.74E-08 | 23 | 0.931 | 3.49E-08 |
| 61 | 28 | 318 | 21.1 | 0.62 | 0.4 | 1.7E-06 | 0.051 | 0.980 | 3.50E-08 | 23 | 0.931 | 3.26E-08 |
| 64 | 50 | 202 | 20.9 | 0.63 | 0.2 | 2.7E-06 | 0.051 | 0.990 | 2.77E-08 | 23 | 0.931 | 2.58E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **2.85E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | MR | CHECKED: | JBF |
| DATE: | 11/11/2011 | DATE: | 11/17/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-341 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 8.95 | 3.523 |
| Diameter, cm | 7.19 | 2.832 |
| Area, $cm^2$ | 40.64 | |
| Volume, $cm^3$ | 363.66 | |
| Wet Mass, g | 729.4 | |
| Wt. wet soil + tare, gm | 160.90 | |
| Wt. dry soil + tare, gm | 133.40 | |
| Wt. tare, gm | 8.3 | |
| Moisture Content, % | 22.0% | |
| Dry Density, pcf | 102.6 | |
| Specific Gravity | 2.67 | |
| Void Ratio | 0.62 | |
| Saturation, % | 94.1% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 29.2

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 8.94 | 3.519 |
| Diameter, cm | 7.17 | 2.824 |
| Area, $cm^2$ | 40.41 | |
| Volume, $cm^3$ | 361.19 | |
| Wet Mass, g | 734.9 | |
| Wt. wet soil + tare, gm | 741.50 | |
| Wt. dry soil + tare, gm | 603.19 | |
| Wt. tare, gm | 6.7 | |
| Moisture Content, % | 23.2% | |
| Dry Density, pcf | 103.1 | |
| Specific Gravity | 2.67 | |
| Void Ratio | 0.62 | |
| Saturation, % | 100.4% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 29.2 | 0.85 | 0 | | 0.037 | 1.000 | 0.00E+00 | 23 | 0.931 | 0.00E+00 |
| 1 | 46 | 106 | 28.8 | 0.87 | 0.4 | 5.0E-06 | 0.037 | 0.985 | 7.50E-08 | 23 | 0.931 | 6.98E-08 |
| 3 | 40 | 114 | 28.5 | 0.88 | 0.3 | 4.6E-06 | 0.038 | 0.989 | 5.28E-08 | 23 | 0.931 | 4.91E-08 |
| 15 | 42 | 722 | 27.4 | 0.92 | 1.1 | 7.3E-07 | 0.039 | 0.957 | 3.24E-08 | 23 | 0.931 | 3.02E-08 |
| 20 | 17 | 275 | 27.0 | 0.94 | 0.4 | 1.9E-06 | 0.040 | 0.984 | 3.10E-08 | 23 | 0.931 | 2.89E-08 |
| 27 | 35 | 438 | 26.5 | 0.96 | 0.5 | 1.2E-06 | 0.041 | 0.980 | 2.49E-08 | 23 | 0.931 | 2.32E-08 |
| 32 | 31 | 296 | 26.2 | 0.97 | 0.3 | 1.8E-06 | 0.041 | 0.988 | 2.23E-08 | 23 | 0.931 | 2.07E-08 |
| 42 | 32 | 601 | 25.5 | 1.00 | 0.7 | 8.8E-07 | 0.042 | 0.970 | 2.66E-08 | 23 | 0.931 | 2.47E-08 |
| 47 | 12 | 280 | 25.2 | 1.01 | 0.3 | 1.9E-06 | 0.043 | 0.987 | 2.46E-08 | 23 | 0.931 | 2.29E-08 |
| 51 | 45 | 273 | 25.0 | 1.02 | 0.2 | 1.9E-06 | 0.043 | 0.991 | 1.69E-08 | 23 | 0.931 | 1.57E-08 |
| 55 | 4 | 199 | 24.8 | 1.03 | 0.2 | 2.7E-06 | 0.044 | 0.991 | 2.34E-08 | 23 | 0.931 | 2.18E-08 |
| 58 | 13 | 189 | 24.6 | 1.04 | 0.2 | 2.8E-06 | 0.044 | 0.991 | 2.48E-08 | 23 | 0.931 | 2.31E-08 |
| 62 | 30 | 257 | 24.4 | 1.05 | 0.2 | 2.1E-06 | 0.045 | 0.991 | 1.84E-08 | 23 | 0.931 | 1.72E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **1.95E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | MR | CHECKED: | JBF |
| DATE: | 11/11/2011 | DATE: | 11/17/2011 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

## FLEXIBLE W[illegible]TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant/Oak Grove FGD-B CQA/TX |
| PROJECT NUMBER: | 113-94788.1 |
| SAMPLE ID: | CL-346 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

**Sample Data, Initial**

| | | inches |
|---|---|---|
| Height, cm | 9.09 | 3.577 |
| Diameter, cm | 7.24 | 2.852 |
| Area, $cm^2$ | 41.22 | |
| Volume, $cm^3$ | 374.46 | |
| Wet Mass, g | 782.0 | |
| Wt. wet soil + tare, gm | 194.80 | |
| Wt. dry soil + tare, gm | 161.50 | |
| Wt. tare, gm | 7.7 | |
| Moisture Content, % | 21.7% | |
| Dry Density, pcf | 107.1 | |
| Specific Gravity | 2.65 | |
| Void Ratio | 0.54 | |
| Saturation, % | 105.5% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 28.4

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.22 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

**Sample Data, Final**

| | | inches |
|---|---|---|
| Height, cm | 9.09 | 3.58 |
| Diameter, cm | 7.33 | 2.885 |
| Area, $cm^2$ | 42.17 | |
| Volume, $cm^3$ | 383.50 | |
| Wet Mass, g | 792.0 | |
| Wt. wet soil + tare, gm | 801.80 | |
| Wt. dry soil + tare, gm | 673.74 | |
| Wt. tare, gm | 9.8 | |
| Moisture Content, % | 19.3% | |
| Dry Density, pcf | 108.0 | |
| Specific Gravity | 2.65 | |
| Void Ratio | 0.53 | |
| Saturation, % | 96.3% | |

| Minutes | Seconds | $\Delta t$ (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.4 | 0.85 | 0 | | 0.038 | 1.000 | 0.00E+00 | 23 | 0.931 | 0.00E+00 |
| 3 | 1 | 181 | 28.0 | 0.87 | 0.4 | 2.9E-06 | 0.038 | 0.985 | 4.53E-08 | 23 | 0.931 | 4.21E-08 |
| 6 | 28 | 207 | 27.7 | 0.88 | 0.3 | 2.6E-06 | 0.039 | 0.988 | 3.00E-08 | 23 | 0.931 | 2.79E-08 |
| 10 | 52 | 264 | 27.5 | 0.89 | 0.2 | 2.0E-06 | 0.039 | 0.992 | 1.58E-08 | 23 | 0.931 | 1.47E-08 |
| 14 | 16 | 204 | 27.4 | 0.89 | 0.1 | 2.6E-06 | 0.039 | 0.996 | 1.02E-08 | 23 | 0.931 | 9.51E-09 |
| 21 | 17 | 421 | 27.2 | 0.90 | 0.2 | 1.3E-06 | 0.040 | 0.992 | 1.00E-08 | 23 | 0.931 | 9.31E-09 |
| 28 | 38 | 441 | 27.0 | 0.91 | 0.2 | 1.2E-06 | 0.040 | 0.992 | 9.62E-09 | 23 | 0.931 | 8.96E-09 |
| 35 | 37 | 419 | 26.9 | 0.91 | 0.1 | 1.3E-06 | 0.040 | 0.996 | 5.07E-09 | 23 | 0.931 | 4.72E-09 |
| 43 | 30 | 473 | 26.8 | 0.92 | 0.1 | 1.1E-06 | 0.040 | 0.996 | 4.51E-09 | 23 | 0.931 | 4.20E-09 |
| 50 | 53 | 443 | 26.7 | 0.92 | 0.1 | 1.2E-06 | 0.040 | 0.996 | 4.84E-09 | 23 | 0.931 | 4.50E-09 |
| 58 | 8 | 435 | 26.6 | 0.92 | 0.1 | 1.2E-06 | 0.041 | 0.996 | 4.95E-09 | 23 | 0.931 | 4.61E-09 |
| 67 | 10 | 542 | 26.5 | 0.93 | 0.1 | 9.8E-07 | 0.041 | 0.996 | 3.99E-09 | 23 | 0.931 | 3.71E-09 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **4.26E-09** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | MR | CHECKED: | JBF |
| DATE: | 11/11/2011 | DATE: | 11.17/11 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 4 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-350A | L-4 | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | TW/AK | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.930 | B-Value, f | 0.99 | Height, inches | 2.940 |
| Diameter, inches | 2.851 | Cell Pres. | 90.0 | Diameter, inches | 2.873 |
| Area, cm² | 41.19 | Bot. Pres. | 80.0 | Area, cm² | 41.82 |
| Volume, cm³ | 306.52 | Top Pres. | 80.0 | Volume, cm³ | 312.33 |
| Mass, g | 629.24 | Tot. B.P. | 80.0 | Mass, g | 642.74 |
| Moisture Content, % | 18.86 | Head, max. | 126.61 | Moisture Content, % | 21.41 |
| Dry Density, pcf | 107.77 | Head, min. | 126.61 | Dry Density, pcf | 105.77 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 16.95 | Volume Solids, cm³ | 196.07 |
| Volume Solids, cm³ | 196.07 | Min. Grad. | 16.95 | Volume Voids, cm³ | 116.26 |
| Volume Voids, cm³ | 110.45 | | | Void Ratio | 0.59 |
| Void Ratio | 0.56 | | | Saturation, % | 97.5% |
| Saturation, % | 90.4% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 629.24 | 650.81 |
| Wt Soil & Tare, f | g | 529.38 | 537.50 |
| Wt Tare | g | 0.00 | 8.33 |
| Wt Moisture Lost | g | 99.86 | 113.31 |
| Wt Dry Soil | g | 529.38 | 529.17 |
| Water Content | % | 18.86% | 21.41% |

DESCRIPTION
Reddish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate 1.27E-05 cm³/sec  USCS (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 11/11/11 | 40858 | 11 | 0 | 20.7 | 0 | 0 | 0 | 0 | 1.80 | 126.61 | 16.95 | 1.8E-08 |
| 11/11/11 | 40858 | 11 | 5 | 20.7 | 5 | 5 | 300 | 300 | 1.80 | 126.61 | 16.95 | 1.8E-08 |
| 11/11/11 | 40858 | 11 | 10 | 20.7 | 5 | 10 | 300 | 600 | 1.80 | 126.61 | 16.95 | 1.8E-08 |
| 11/11/11 | 40858 | 11 | 15 | 20.7 | 5 | 15 | 300 | 900 | 1.80 | 126.61 | 16.95 | 1.8E-08 * |
| 11/11/11 | 40858 | 11 | 20 | 20.7 | 5 | 20 | 300 | 1200 | 1.80 | 126.61 | 16.95 | 1.8E-08 * |
| 11/11/11 | 40858 | 11 | 25 | 20.7 | 5 | 25 | 300 | 1500 | 1.80 | 126.61 | 16.95 | 1.8E-08 * |
| 11/11/11 | 40858 | 11 | 30 | 20.7 | 5 | 30 | 300 | 1800 | 1.80 | 126.61 | 16.95 | 1.8E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.8E-08 cm/sec **

DATE 11/11/11
CHECK AK
REVIEW PWM

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/OAK GROVE LF 1 CELL 2 CQA/TX | | Board # | 3 | COMMENTS |
| PROJECT NUMBER | 113-94788 | | Flow Pump | 1 | |
| SAMPLE ID | CL-354A | L-4 | Flow Pump Speed | 11 | |
| SAMPLE TYPE | UD | | Technician | TW/AK | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 2.908 | B-Value, f | 0.99 | Height, inches | 2.930 |
| Diameter, inches | 2.848 | Cell Pres. | 90.0 | Diameter, inches | 2.860 |
| Area, $cm^2$ | 41.10 | Bot. Pres. | 80.0 | Area, $cm^2$ | 41.45 |
| Volume, $cm^3$ | 303.57 | Top Pres. | 80.0 | Volume, $cm^3$ | 308.45 |
| Mass, g | 611.64 | Tot. B.P. | 80.0 | Mass, g | 626.95 |
| Moisture Content, % | 19.66 | Head, max. | 134.35 | Moisture Content, % | 22.65 |
| Dry Density, pcf | 105.07 | Head, min. | 134.35 | Dry Density, pcf | 103.41 |
| Spec. Gravity(assumed) | 2.700 | Max. Grad. | 18.05 | Volume Solids, $cm^3$ | 189.31 |
| Volume Solids, $cm^3$ | 189.31 | Min. Grad. | 18.05 | Volume Voids, $cm^3$ | 119.14 |
| Volume Voids, $cm^3$ | 114.26 | | | Void Ratio | 0.63 |
| Void Ratio | 0.60 | | | Saturation, % | 97.2% |
| Saturation, % | 87.9% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 611.64 | 635.07 |
| Wt Soil & Tare, f | g | 511.15 | 519.31 |
| Wt Tare | g | 0.00 | 8.34 |
| Wt Moisture Lost | g | 100.49 | 115.76 |
| Wt Dry Soil | g | 511.15 | 510.97 |
| Water Content | % | 19.66% | 22.65% |

DESCRIPTION: Dark Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

Flow Pump Rate: 1.27E-05 $cm^3$/sec

USCS: (CH)

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP ($^0$C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 11/11/11 | 40858 | 9 | 45 | 20.5 | 0 | 0 | 0 | 0 | 1.91 | 134.35 | 18.05 | 1.7E-08 |
| 11/11/11 | 40858 | 9 | 50 | 20.5 | 5 | 5 | 300 | 300 | 1.91 | 134.35 | 18.05 | 1.7E-08 |
| 11/11/11 | 40858 | 9 | 55 | 20.5 | 5 | 10 | 300 | 600 | 1.91 | 134.35 | 18.05 | 1.7E-08 |
| 11/11/11 | 40858 | 10 | 0 | 20.5 | 5 | 15 | 300 | 900 | 1.91 | 134.35 | 18.05 | 1.7E-08 * |
| 11/11/11 | 40858 | 10 | 5 | 20.5 | 5 | 20 | 300 | 1200 | 1.91 | 134.35 | 18.05 | 1.7E-08 * |
| 11/11/11 | 40858 | 10 | 10 | 20.5 | 5 | 25 | 300 | 1500 | 1.91 | 134.35 | 18.05 | 1.7E-08 * |
| 11/11/11 | 40858 | 10 | 15 | 20.5 | 5 | 30 | 300 | 1800 | 1.91 | 134.35 | 18.05 | 1.7E-08 * |

TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.7E-08 cm/sec **

DATE 11/11/11
CHECK AK
REVIEW [illegible]

# APPENDIX C
# STRUCTURAL FILL FIELD MOISTURE/DENSITY TEST RESULTS

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-001 | 07/11/11 | 5020 | 2790 | 1 | 95.6 | 19.0 | QCL-2-4 | 96.7 | 22.0 | 99 | -3.0 | PASS | AK |
| SF-002 | 07/11/11 | 5250 | 2910 | 1 | 97.5 | 16.6 | QCL-2-4 | 96.7 | 22.0 | 101 | -5.4 | PASS | AK |
| SF-003 | 07/15/11 | 5410 | 2910 | 1 | 99.0 | 18.0 | QCL-2-4 | 96.7 | 22.0 | 102 | -4.0 | PASS | AK |
| SF-004 | 07/15/11 | 5260 | 2855 | 2 | 94.4 | 18.4 | QCL-2-4 | 96.7 | 22.0 | 98 | -3.6 | PASS | AK |
| SF-005 | 07/15/11 | 5120 | 2815 | 2 | 90.2 | 21.4 | QCL-A-2 | 92.9 | 24.6 | 97 | -3.2 | PASS | AK |
| SF-006 | 07/22/11 | 8020 | 2750 | 3 | 104.4 | 13.4 | QCL-2-7 | 104.4 | 17.8 | 100 | -4.4 | PASS | AK |
| SF-007 | 07/22/11 | 4920 | 2715 | 3 | 109.4 | 13.0 | QCL-FGDB-04A | 110.0 | 15.9 | 99 | -2.9 | PASS | AK |
| SF-008 | 07/22/11 | 5640 | 2915 | 2 | 106.1 | 15.4 | QCL-2-7 | 104.4 | 17.8 | 102 | -2.4 | PASS | AK |
| SF-009 | 07/22/11 | 5750 | 3030 | 2 | 103.6 | 19.8 | QCL-2-7 | 104.4 | 17.8 | 99 | 2.0 | PASS | AK |
| SF-010 | 07/22/11 | 5645 | 2915 | 2 | 107.0 | 16.9 | QCL-FGDB-04A | 110.0 | 15.9 | 97 | 1.0 | PASS | AK |
| SF-011 | 07/22/11 | 5585 | 2865 | 2 | 102.3 | 16.4 | QCL-2-7 | 104.4 | 17.8 | 98 | -1.4 | PASS | AK |
| SF-012 | 07/22/11 | 5826 | 3010 | 1 | 103.6 | 15.3 | QCL-2-7 | 104.4 | 17.8 | 99 | -2.5 | PASS | AK |
| SF-013 | 07/22/11 | 5790 | 3130 | 1 | 102.8 | 18.4 | QCL-2-7 | 104.4 | 17.8 | 98 | 0.6 | PASS | AK |
| SF-014 | 07/22/11 | 5410 | 3005 | 2 | 99.9 | 18.7 | QCL-2-7 | 104.4 | 17.8 | 96 | 0.9 | PASS | AK |
| SF-015 | 07/23/11 | 5340 | 2945 | 3 | 108.0 | 15.7 | QCL-FGDB-04A | 110.0 | 15.9 | 98 | -0.2 | PASS | AK |
| SF-016 | 07/23/11 | 5380 | 2945 | 2 | 106.6 | 12.5 | QCL-2-7 | 104.4 | 17.8 | 102 | -5.3 | PASS | AK |
| SF-017 | 07/23/11 | 5285 | 2990 | 2 | 104.8 | 14.5 | QCL-2-7 | 104.4 | 17.8 | 100 | -3.3 | PASS | AK |
| SF-018 | 07/23/11 | 5445 | 3030 | 2 | 98.1 | 10.0 | QCL-2-4 | 96.7 | 22.0 | 101 | -12.0 | PASS | AK |
| SF-019 | 07/23/11 | 5410 | 3105 | 2 | 104.6 | 10.5 | QCL-2-7 | 104.4 | 17.8 | 100 | -7.3 | PASS | AK |
| SF-020 | 07/23/11 | 5300 | 3080 | 4 | 110.2 | 13.3 | QCL-FGDB-04A | 110.0 | 15.9 | 100 | -2.6 | PASS | AK |
| SF-021 | 07/23/11 | 5440 | 2950 | 1 | 102.2 | 18.0 | QCL-2-7 | 104.4 | 17.8 | 98 | 0.2 | PASS | AK |
| SF-022 | 07/25/11 | 5200 | 2975 | 4 | 111.5 | 13.4 | QCL-FGDB-04A | 110.0 | 15.9 | 101 | -2.5 | PASS | AK |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-023 | 07/25/11 | 5360 | 2785 | 3 | 109.7 | 15.5 | QCL-FGDB-04A | 110.0 | 15.9 | 100 | -0.4 | PASS | AK |
| SF-024 | 07/25/11 | 5455 | 2875 | 4 | 107.3 | 15.6 | QCL-FGDB-04A | 110.0 | 15.9 | 98 | -0.3 | PASS | AK |
| SF-025 | 07/25/11 | 5375 | 2850 | 3 | 110.7 | 18.9 | QCL-FGDB-04A | 110.0 | 15.9 | 101 | 3.0 | PASS | AK |
| SF-026 | 07/25/11 | 5470 | 3090 | 3 | 118.4 | 11.5 | QCL-FGDB-04A | 110.0 | 15.9 | 108 | -4.4 | PASS | AK |
| SF-027 | 07/25/11 | 5345 | 3050 | 4 | 110.6 | 14.9 | QCL-FGDB-04A | 110.0 | 15.9 | 101 | -1.0 | PASS | AK |
| SF-028 | 07/25/11 | 5310 | 2980 | 4 | 106.2 | 17.1 | QCL-2-7 | 104.4 | 17.8 | 102 | -0.7 | PASS | AK |
| SF-029 | 07/25/11 | 5640 | 3175 | 2 | 113.1 | 15.8 | QCL-FGDB-04A | 110.0 | 15.9 | 103 | -0.1 | PASS | AK |
| SF-030 | 07/25/11 | 5585 | 3115 | 2 | 106.8 | 19.6 | QCL-2-7 | 104.4 | 17.8 | 102 | 1.8 | PASS | AK |
| SF-031 | 07/26/11 | 5695 | 2895 | 3 | 107.5 | 18.0 | QCL-FGDB-04A | 110.0 | 15.9 | 98 | 2.1 | PASS | AK |
| SF-032 | 07/26/11 | 5620 | 3055 | 4 | 107.3 | 17.6 | QCL-FGDB-04A | 110.0 | 15.9 | 98 | 1.7 | PASS | AK |
| SF-033 | 07/27/11 | 5785 | 2935 | 3 | 109.9 | 13.3 | QCL-FGDB-04A | 110.0 | 15.9 | 100 | -2.6 | PASS | AK |
| SF-034 | 07/27/11 | 5595 | 2865 | 3 | 116.4 | 10.2 | QCL-FGDB-04A | 110.0 | 15.9 | 106 | -5.7 | PASS | AK |
| SF-035 | 07/27/11 | 5650 | 3140 | 3 | 108.0 | 15.5 | QCL-FGDB-04A | 110.0 | 15.9 | 98 | -0.4 | PASS | AK |
| SF-036 | 07/27/11 | 5710 | 3150 | 3 | 105.0 | 16.8 | QCL-FGDB-04A | 110.0 | 15.9 | 95 | 0.9 | PASS | AK |
| SF-037 | 07/27/11 | 5740 | 3050 | 3 | 107.5 | 16.0 | QCL-FGDB-04A | 110.0 | 15.9 | 98 | 0.1 | PASS | AK |
| SF-038 | 07/27/11 | 5090 | 3090 | 3 | 106.3 | 17.3 | QCL-FGDB-04A | 110.0 | 15.9 | 97 | 1.4 | PASS | AK |
| SF-039 | 07/27/11 | 5700 | 3150 | 3 | 101.8 | 16.4 | QCL-2-4 | 96.7 | 22.0 | 105 | -5.6 | PASS | AK |
| SF-040 | 07/27/11 | 5760 | 3150 | 3 | 108.4 | 15.4 | QCL-FGDB-04A | 110.0 | 15.9 | 99 | -0.5 | PASS | AK |
| SF-041 | 07/28/11 | 5635 | 2845 | 4 | 104.5 | 17.7 | QCL-FGDB-04A | 110.0 | 15.9 | 95 | 1.8 | PASS | AK |
| SF-042 | 07/28/11 | 5850 | 3050 | 4 | 103.7 | 17.0 | QCL-2-4 | 96.7 | 22.0 | 107 | -5.0 | PASS | AK |
| SF-043 | 07/28/11 | 5950 | 3050 | 4 | 111.6 | 16.1 | QCL-FGDB-04A | 110.0 | 15.9 | 101 | 0.2 | PASS | AK |
| SF-044 | 07/28/11 | 5685 | 2995 | 4 | 108.5 | 15.3 | QCL-FGDB-04A | 110.0 | 15.9 | 99 | -0.6 | PASS | AK |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-045 | 07/28/11 | 5580 | 2905 | 4 | 104.7 | 18.9 | QCL-FGDB-04A | 110.0 | 15.9 | 95 | 3.0 | PASS | AK |
| SF-046 | 08/11/11 | 5425 | 2955 | 5 | 101.2 | 13.0 | QCL-2-7 | 104.4 | 17.8 | 97 | -4.8 | PASS | AK |
| SF-047 | 08/11/11 | 5500 | 3050 | 5 | 94.9 | 12.3 | QCL-2-4 | 96.7 | 22.0 | 98 | -9.7 | PASS | AK |
| SF-048 | 08/11/11 | 5580 | 3110 | 5 | 101.8 | 12.8 | QCL-2-7 | 104.4 | 17.8 | 98 | -5.0 | PASS | AK |
| SF-049 | 08/11/11 | 5480 | 2890 | 5 | 94.9 | 12.2 | QCL-2-4 | 96.7 | 22.0 | 98 | -9.8 | PASS | AK |
| SF-050 | 08/11/11 | 5575 | 2975 | 5 | 100.5 | 13.2 | QCL-2-7 | 104.4 | 17.8 | 96 | -4.6 | PASS | AK |
| SF-051 | 08/11/11 | 5650 | 2945 | 5 | 105.3 | 13.2 | QCL-2-7 | 104.4 | 17.8 | 101 | -4.6 | PASS | AK |
| SF-052 | 08/11/11 | 5550 | 2815 | 5 | 95.2 | 10.7 | QCL-2-4 | 96.7 | 22.0 | 98 | -11.3 | PASS | AK |
| SF-053 | 08/11/11 | 5635 | 2890 | 5 | 96.4 | 11.9 | QCL-2-4 | 96.7 | 22.0 | 100 | -10.1 | PASS | AK |
| SF-054 | 08/11/11 | 5725 | 2975 | 5 | 97.8 | 12.8 | QCL-2-4 | 96.7 | 22.0 | 101 | -9.2 | PASS | AK |
| SF-055 | 08/11/11 | 5250 | 3025 | 5 | 95.6 | 12.2 | QCL-2-4 | 96.7 | 22.0 | 99 | -9.8 | PASS | AK |
| SF-056 | 08/11/11 | 5440 | 3120 | 5 | 104.1 | 11.6 | QCL-2-7 | 104.4 | 17.8 | 100 | -6.2 | PASS | AK |
| SF-057 | 08/11/11 | 5510 | 3190 | 5 | 92.9 | 14.7 | QCL-2-4 | 96.7 | 22.0 | 96 | -7.3 | PASS | AK |
| SF-058 | 08/11/11 | 4850 | 2630 | 5 | 106.5 | 16.3 | QCL-2-7 | 104.4 | 17.8 | 102 | -1.5 | PASS | AK |
| SF-059 | 08/11/11 | 4940 | 2620 | 5 | 96.3 | 13.6 | QCL-2-4 | 96.7 | 22.0 | 100 | -8.4 | PASS | AK |
| SF-060 | 08/11/11 | 5000 | 2680 | 5 | 97.8 | 11.3 | QCL-2-4 | 96.7 | 22.0 | 101 | -10.7 | PASS | AK |
| SF-061 | 08/11/11 | 5070 | 2750 | 5 | 97.7 | 9.7 | QCL-2-4 | 96.7 | 22.0 | 101 | -12.3 | PASS | AK |
| SF-062 | 08/11/11 | 5130 | 2820 | 5 | 92.4 | 13.0 | QCL-2-4 | 96.7 | 22.0 | 96 | -9.0 | PASS | AK |
| SF-063 | 08/11/11 | 5040 | 2625 | 5 | 96.3 | 12.2 | QCL-2-4 | 96.7 | 22.0 | 100 | -9.8 | PASS | AK |
| SF-064 | 08/11/11 | 5100 | 2700 | 5 | 112.4 | 10.5 | QCL-FGDB-04A | 110.0 | 15.9 | 102 | -5.4 | PASS | AK |
| SF-065 | 08/11/11 | 5180 | 2775 | 5 | 97.2 | 12.1 | QCL-2-4 | 96.7 | 22.0 | 101 | -9.9 | PASS | AK |
| SF-066 | 08/11/11 | 5300 | 2575 | 1 | 91.7 | 11.3 | QCL-2-4 | 96.7 | 22.0 | 95 | -10.7 | PASS | AK |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-067 | 08/12/11 | 5485 | 2600 | 1 | 93.7 | 10.2 | QCL-2-4 | 96.7 | 22.0 | 97 | -11.8 | PASS | AK |
| SF-068 | 08/12/11 | 5560 | 2650 | 1 | 92.5 | 13.2 | QCL-2-4 | 96.7 | 22.0 | 96 | -8.8 | PASS | AK |
| SF-069 | 08/12/11 | 5370 | 2730 | 1 | 92.5 | 10.8 | QCL-2-4 | 96.7 | 22.0 | 96 | -11.2 | PASS | AK |
| SF-070 | 08/12/11 | 5370 | 2675 | 1 | 96.1 | 10.0 | QCL-2-4 | 96.7 | 22.0 | 99 | -12.0 | PASS | AK |
| SF-071 | 08/12/11 | 5250 | 2730 | 5 | 97.2 | 10.7 | QCL-2-4 | 96.7 | 22.0 | 101 | -11.3 | PASS | AK |
| SF-072 | 08/12/11 | 5305 | 2800 | 5 | 94.0 | 14.8 | QCL-2-4 | 96.7 | 22.0 | 97 | -7.2 | PASS | AK |
| SF-073 | 08/18/11 | 5370 | 2875 | 6 | 101.3 | 13.8 | QCL-2-7 | 104.4 | 17.8 | 97 | -4.0 | PASS | AK |
| SF-074 | 08/18/11 | 5440 | 2950 | 6 | 95.0 | 14.1 | QCL-2-4 | 96.7 | 22.0 | 98 | -7.9 | PASS | AK |
| SF-075 | 08/18/11 | 5510 | 3025 | 6 | 100.5 | 13.2 | QCL-2-7 | 104.4 | 17.8 | 96 | -4.6 | PASS | AK |
| SF-076 | 08/18/11 | 5425 | 2810 | 6 | 105.2 | 13.3 | QCL-2-7 | 104.4 | 17.8 | 101 | -4.5 | PASS | AK |
| SF-077 | 08/18/11 | 5505 | 2880 | 6 | 101.8 | 13.2 | QCL-2-7 | 104.4 | 17.8 | 98 | -4.6 | PASS | AK |
| SF-078 | 08/18/11 | 5585 | 2955 | 6 | 94.9 | 13.0 | QCL-2-4 | 96.7 | 22.0 | 98 | -9.0 | PASS | AK |
| SF-079 | 08/18/11 | 5510 | 2715 | 6 | 92.5 | 13.7 | QCL-2-4 | 96.7 | 22.0 | 96 | -8.3 | PASS | AK |
| SF-080 | 08/18/11 | 5575 | 2805 | 6 | 101.8 | 13.2 | QCL-2-7 | 104.4 | 17.8 | 98 | -4.6 | PASS | AK |
| SF-081 | 08/18/11 | 5650 | 2880 | 6 | 95.0 | 14.1 | QCL-2-4 | 96.7 | 22.0 | 98 | -7.9 | PASS | AK |
| SF-082 | 09/01/11 | 5305 | 3090 | 5 | 100.6 | 14.9 | QCL-008 | 102.1 | 17.9 | 99 | -3.0 | PASS | MPD |
| SF-083 | 09/01/11 | 5395 | 3160 | 5 | 99.4 | 16.0 | QCL-008 | 102.1 | 17.9 | 97 | -1.9 | PASS | MPD |
| SF-084 | 09/01/11 | 5510 | 3295 | 5 | 102.2 | 17.0 | QCL-008 | 102.1 | 17.9 | 100 | -0.9 | PASS | MPD |
| SF-085 | 09/01/11 | 5695 | 2940 | 6 | 97.8 | 17.3 | QCL-008 | 102.1 | 17.9 | 96 | -0.6 | PASS | MPD |
| SF-086 | 09/01/11 | 5645 | 3005 | 6 | 97.7 | 15.2 | QCL-008 | 102.1 | 17.9 | 96 | -2.7 | PASS | MPD |
| SF-087 | 09/01/11 | 5750 | 3030 | 6 | 98.0 | 14.9 | QCL-008 | 102.1 | 17.9 | 96 | -3.0 | PASS | MPD |
| SF-088 | 09/01/11 | 5745 | 3140 | 6 | 99.4 | 17.3 | QCL-008 | 102.1 | 17.9 | 97 | -0.6 | PASS | MPD |

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-089 | 09/02/11 | 5580 | 3800 | 6 | 99.8 | 16.2 | QCL-008 | 102.1 | 17.9 | 98 | -1.7 | PASS | MPD |
| SF-090 | 09/02/11 | 5680 | 3190 | 6 | 97.2 | 16.7 | QCL-008 | 102.1 | 17.9 | 95 | -1.2 | PASS | MPD |
| SF-091 | 09/02/11 | 5645 | 3265 | 6 | 100.9 | 17.6 | QCL-008 | 102.1 | 17.9 | 99 | -0.3 | PASS | MPD |
| SF-092 | 09/02/11 | 5570 | 3295 | 6 | 98.9 | 16.4 | QCL-008 | 102.1 | 17.9 | 97 | -1.5 | PASS | MPD |
| SF-093 | 09/02/11 | 5450 | 3220 | 6 | 99.1 | 14.9 | QCL-008 | 102.1 | 17.9 | 97 | -3.0 | PASS | MPD |
| SF-094 | 09/02/11 | 5410 | 3060 | 6 | 97.6 | 15.0 | QCL-008 | 102.1 | 17.9 | 96 | -2.9 | PASS | MPD |
| SF-095 | 09/02/11 | 5280 | 3050 | 6 | 100.0 | 14.9 | QCL-008 | 102.1 | 17.9 | 98 | -3.0 | PASS | MPD |
| SF-096 | 09/02/11 | 5250 | 2890 | 6 | 99.7 | 15.1 | QCL-008 | 102.1 | 17.9 | 98 | -2.8 | PASS | MPD |
| SF-097 | 09/02/11 | 5075 | 2860 | 6 | 99.7 | 15.6 | QCL-008 | 102.1 | 17.9 | 98 | -2.3 | PASS | MPD |
| SF-098 | 09/02/11 | 5780 | 2675 | 6 | 100.1 | 15.8 | QCL-008 | 102.1 | 17.9 | 98 | -2.1 | PASS | MPD |
| SF-099 | 09/02/11 | 5065 | 2715 | 6 | 100.8 | 16.1 | QCL-008 | 102.1 | 17.9 | 99 | -1.8 | PASS | MPD |
| SF-100 | 09/02/11 | 4900 | 2605 | 6 | 100.3 | 14.9 | QCL-008 | 102.1 | 17.9 | 98 | -3.0 | PASS | MPD |
| SF-101 | 09/08/11 | 5330 | 2575 | 2 | 101.5 | 15.2 | QCL-008 | 102.1 | 17.9 | 99 | -2.7 | PASS | MPD |
| SF-102 | 09/08/11 | 5460 | 2685 | 2 | 100.4 | 15.9 | QCL-008 | 102.1 | 17.9 | 98 | -2.0 | PASS | MPD |
| SF-103 | 09/08/11 | 5570 | 2795 | 7 | 100.9 | 15.5 | QCL-008 | 102.1 | 17.9 | 99 | -2.4 | PASS | MPD |
| SF-104 | 09/08/11 | 5710 | 2940 | 7 | 99.0 | 16.2 | QCL-008 | 102.1 | 17.9 | 97 | -1.7 | PASS | MPD |
| SF-105 | 09/08/11 | 5735 | 3115 | 7 | 97.9 | 17.0 | QCL-008 | 102.1 | 17.9 | 96 | -0.9 | PASS | MPD |
| SF-106 | 09/08/11 | 5570 | 2950 | 7 | 97.4 | 18.0 | QCL-008 | 102.1 | 17.9 | 95 | 0.1 | PASS | MPD |
| SF-107 | 09/08/11 | 5450 | 2810 | 7 | 98.0 | 15.0 | QCL-008 | 102.1 | 17.9 | 96 | -2.9 | PASS | MPD |
| SF-108 | 09/08/11 | 5365 | 2720 | 2 | 97.3 | 17.0 | QCL-008 | 102.1 | 17.9 | 95 | -0.9 | PASS | MPD |
| SF-109 | 09/08/11 | 5230 | 2610 | 2 | 99.6 | 15.3 | QCL-008 | 102.1 | 17.9 | 98 | -2.6 | PASS | MPD |
| SF-110 | 09/08/11 | 5140 | 2630 | 7 | 100.3 | 15.4 | QCL-008 | 102.1 | 17.9 | 98 | -2.5 | PASS | MPD |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-111 | 09/08/11 | 5300 | 2825 | 7 | 97.8 | 15.2 | QCL-008 | 102.1 | 17.9 | 96 | -2.7 | PASS | MPD |
| SF-112 | 09/08/11 | 5190 | 3015 | 7 | 98.7 | 15.6 | QCL-008 | 102.1 | 17.9 | 97 | -2.3 | PASS | MPD |
| SF-113 | 09/08/11 | 5650 | 3190 | 7 | 97.8 | 15.4 | QCL-008 | 102.1 | 17.9 | 96 | -2.5 | PASS | MPD |
| SF-114 | 09/09/11 | 5670 | 3290 | 7 | 97.7 | 15.6 | QCL-008 | 102.1 | 17.9 | 96 | -2.3 | PASS | MPD |
| SF-115 | 09/09/11 | 5480 | 3215 | 7 | 100.5 | 14.9 | QCL-008 | 102.1 | 17.9 | 98 | -3.0 | PASS | MPD |
| SF-116 | 09/09/11 | 5320 | 3035 | 7 | 100.6 | 15.1 | QCL-008 | 102.1 | 17.9 | 99 | -2.8 | PASS | MPD |
| SF-117 | 09/09/11 | 5250 | 2945 | 7 | 97.4 | 15.5 | QCL-008 | 102.1 | 17.9 | 95 | -2.4 | PASS | MPD |
| SF-118 | 09/09/11 | 5050 | 2850 | 7 | 97.4 | 17.0 | QCL-008 | 102.1 | 17.9 | 95 | -0.9 | PASS | MPD |
| SF-119 | 09/09/11 | 5175 | 2790 | 7 | 98.1 | 14.9 | QCL-008 | 102.1 | 17.9 | 96 | -3.0 | PASS | MPD |
| SF-120 | 09/09/11 | 5015 | 2605 | 7 | 100.5 | 15.3 | QCL-008 | 102.1 | 17.9 | 98 | -2.6 | PASS | MPD |
| SF-121 | 09/09/11 | 4850 | 2650 | 7 | 98.8 | 19.2 | QCL-008 | 102.1 | 17.9 | 97 | 1.3 | PASS | MPD |
| SF-122 | 09/09/11 | 5330 | 2520 | 3 | 101.2 | 18.7 | QCL-008 | 102.1 | 17.9 | 99 | 0.8 | PASS | MPD |
| SF-123 | 09/09/11 | 5315 | 2650 | 3 | 97.6 | 18.6 | QCL-008 | 102.1 | 17.9 | 96 | 0.7 | PASS | MPD |
| SF-124 | 09/09/11 | 5500 | 2735 | 8 | 97.3 | 19.0 | QCL-008 | 102.1 | 17.9 | 95 | 1.1 | PASS | MPD |
| SF-125 | 09/09/11 | 5610 | 2865 | 8 | 97.6 | 19.2 | QCL-008 | 102.1 | 17.9 | 96 | 1.3 | PASS | MPD |
| SF-126 | 09/09/11 | 5710 | 2995 | 8 | 99.3 | 18.0 | QCL-008 | 102.1 | 17.9 | 97 | 0.1 | PASS | MPD |
| SF-127 | 09/09/11 | 5240 | 2650 | 3 | 97.3 | 18.1 | QCL-008 | 102.1 | 17.9 | 95 | 0.2 | PASS | MPD |
| SF-128 | 09/09/11 | 5420 | 2810 | 8 | 99.7 | 19.9 | QCL-008 | 102.1 | 17.9 | 98 | 2.0 | PASS | MPD |
| SF-129 | 09/09/11 | 5535 | 2920 | 8 | 97.2 | 18.0 | QCL-008 | 102.1 | 17.9 | 95 | 0.1 | PASS | MPD |
| SF-130 | 09/09/11 | 5660 | 3030 | 8 | 98.4 | 17.5 | QCL-008 | 102.1 | 17.9 | 96 | -0.4 | PASS | MPD |
| SF-131 | 09/09/11 | 5710 | 3190 | 8 | 97.2 | 18.2 | QCL-008 | 102.1 | 17.9 | 95 | 0.3 | PASS | MPD |
| SF-132 | 09/09/11 | 5570 | 3050 | 8 | 97.5 | 17.1 | QCL-008 | 102.1 | 17.9 | 95 | -0.8 | PASS | MPD |

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-133 | 09/09/11 | 5400 | 2915 | 8 | 100.9 | 15.9 | QCL-008 | 102.1 | 17.9 | 99 | -2.0 | PASS | MPD |
| SF-134 | 09/09/11 | 5290 | 2795 | 8 | 98.2 | 18.3 | QCL-008 | 102.1 | 17.9 | 96 | 0.4 | PASS | MPD |
| SF-135 | 09/13/11 | 5150 | 2770 | 8 | 98.8 | 15.3 | QCL-008 | 102.1 | 17.9 | 97 | -2.6 | PASS | MPD |
| SF-136 | 09/13/11 | 5270 | 2805 | 8 | 101.4 | 16.4 | QCL-008 | 102.1 | 17.9 | 99 | -1.5 | PASS | MPD |
| SF-137 | 09/13/11 | 5350 | 3060 | 8 | 97.0 | 15.9 | QCL-008 | 102.1 | 17.9 | 95 | -2.0 | PASS | MPD |
| SF-138 | 09/13/11 | 5655 | 3250 | 8 | 99.8 | 17.4 | QCL-008 | 102.1 | 17.9 | 98 | -0.5 | PASS | MPD |
| SF-139 | 09/14/11 | 4855 | 2660 | 8 | 98.8 | 15.6 | QCL-008 | 102.1 | 17.9 | 97 | -2.3 | PASS | MPD |
| SF-140 | 09/14/11 | 5045 | 2820 | 8 | 97.4 | 15.9 | QCL-008 | 102.1 | 17.9 | 95 | -2.0 | PASS | MPD |
| SF-141 | 09/14/11 | 5205 | 2990 | 8 | 97.8 | 16.0 | QCL-008 | 102.1 | 17.9 | 96 | -1.9 | PASS | MPD |
| SF-142 | 09/14/11 | 5345 | 3110 | 8 | 97.0 | 15.7 | QCL-008 | 102.1 | 17.9 | 95 | -2.2 | PASS | MPD |
| SF-143 | 09/14/11 | 5480 | 3250 | 8 | 100.5 | 14.9 | QCL-008 | 102.1 | 17.9 | 98 | -3.0 | PASS | MPD |
| SF-144 | 09/14/11 | 5590 | 3310 | 8 | 98.7 | 15.3 | QCL-008 | 102.1 | 17.9 | 97 | -2.6 | PASS | MPD |
| SF-145 | 09/14/11 | 5350 | 2550 | 4 | 97.2 | 16.7 | QCL-008 | 102.1 | 17.9 | 95 | -1.2 | PASS | MPD |
| SF-146 | 09/14/11 | 5395 | 2695 | 4 | 98.2 | 15.1 | QCL-008 | 102.1 | 17.9 | 96 | -2.8 | PASS | MPD |
| SF-147 | 09/14/11 | 5490 | 2795 | 9 | 98.0 | 15.2 | QCL-008 | 102.1 | 17.9 | 96 | -2.7 | PASS | MPD |
| SF-148 | 09/14/11 | 5560 | 2880 | 9 | 98.3 | 16.2 | QCL-008 | 102.1 | 17.9 | 96 | -1.7 | PASS | MPD |
| SF-149 | 09/14/11 | 5675 | 2990 | 9 | 97.2 | 17.0 | QCL-008 | 102.1 | 17.9 | 95 | -0.9 | PASS | MPD |
| SF-150 | 09/14/11 | 5745 | 3090 | 9 | 99.3 | 16.9 | QCL-008 | 102.1 | 17.9 | 97 | -1.0 | PASS | MPD |
| SF-151 | 09/14/11 | 5695 | 3150 | 9 | 97.8 | 16.5 | QCL-008 | 102.1 | 17.9 | 96 | -1.4 | PASS | MPD |
| SF-152 | 09/14/11 | 5545 | 3010 | 9 | 98.5 | 15.4 | QCL-008 | 102.1 | 17.9 | 96 | -2.5 | PASS | MPD |
| SF-153 | 09/14/11 | 5410 | 2890 | 9 | 98.8 | 16.4 | QCL-008 | 102.1 | 17.9 | 97 | -1.5 | PASS | MPD |
| SF-154 | 09/14/11 | 5295 | 2765 | 9 | 97.2 | 18.0 | QCL-008 | 102.1 | 17.9 | 95 | 0.1 | PASS | MPD |

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-155 | 09/14/11 | 5190 | 2650 | 9 | 98.1 | 15.8 | QCL-008 | 102.1 | 17.9 | 96 | -2.1 | PASS | MPD |
| SF-156 | 09/15/11 | 5090 | 2715 | 9 | 92.0 | 21.3 | QCL-2-4 | 96.7 | 22.0 | 95 | -0.7 | PASS | MPD |
| SF-157 | 09/15/11 | 5210 | 2825 | 9 | 94.9 | 23.0 | QCL-2-4 | 96.7 | 22.0 | 98 | 1.0 | PASS | MPD |
| SF-158 | 09/15/11 | 5330 | 2950 | 9 | 93.8 | 19.8 | QCL-2-4 | 96.7 | 22.0 | 97 | -2.2 | PASS | MPD |
| SF-159 | 09/15/11 | 5460 | 3085 | 9 | 96.5 | 19.0 | QCL-2-4 | 96.7 | 22.0 | 100 | -3.0 | PASS | MPD |
| SF-160 | 09/15/11 | 5605 | 3210 | 9 | 93.4 | 19.2 | QCL-2-4 | 96.7 | 22.0 | 97 | -2.8 | PASS | MPD |
| SF-161 | 09/15/11 | 5625 | 3310 | 9 | 94.6 | 19.3 | QCL-2-4 | 96.7 | 22.0 | 98 | -2.7 | PASS | MPD |
| SF-162 | 09/15/11 | 5530 | 3290 | 9 | 94.1 | 22.1 | QCL-2-4 | 96.7 | 22.0 | 97 | 0.1 | PASS | MPD |
| SF-163 | 09/15/11 | 5275 | 3115 | 9 | 97.0 | 18.2 | QCL-008 | 102.1 | 17.9 | 95 | 0.3 | PASS | MPD |
| SF-164 | 09/15/11 | 5795 | 2995 | 9 | 98.2 | 17.2 | QCL-008 | 102.1 | 17.9 | 96 | -0.7 | PASS | MPD |
| SF-165 | 09/15/11 | 5090 | 2865 | 9 | 97.5 | 18.7 | QCL-008 | 102.1 | 17.9 | 95 | 0.8 | PASS | MPD |
| SF-166 | 09/15/11 | 4910 | 2780 | 9 | 97.2 | 19.8 | QCL-008 | 102.1 | 17.9 | 95 | 1.9 | PASS | MPD |
| SF-167 | 09/15/11 | 4950 | 2635 | 9 | 97.3 | 15.8 | QCL-008 | 102.1 | 17.9 | 95 | -2.1 | PASS | MPD |
| SF-168 | 09/16/11 | 5385 | 2545 | 5 | 92.9 | 25.5 | QCL-A-2 | 92.9 | 24.6 | 100 | 0.9 | PASS | MPD |
| SF-169 | 09/16/11 | 5495 | 2670 | 5 | 93.3 | 20.3 | QCL-2-4 | 96.7 | 22.0 | 96 | -1.7 | PASS | MPD |
| SF-170 | 09/16/11 | 5620 | 2805 | 10 | 93.0 | 25.6 | QCL-A-2 | 92.9 | 24.6 | 100 | 1.0 | PASS | MPD |
| SF-171 | 09/16/11 | 5790 | 2995 | 10 | 94.3 | 25.1 | QCL-A-2 | 92.9 | 24.6 | 102 | 0.5 | PASS | MPD |
| SF-172 | 09/16/11 | 5770 | 3105 | 10 | 94.5 | 19.0 | QCL-2-4 | 96.7 | 22.0 | 98 | -3.0 | PASS | MPD |
| SF-173 | 09/16/11 | 5490 | 2830 | 10 | 94.5 | 19.4 | QCL-2-4 | 96.7 | 22.0 | 98 | -2.6 | PASS | MPD |
| SF-174 | 09/16/11 | 5255 | 2610 | 5 | 94.6 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.0 | PASS | MPD |
| SF-175 | 09/22/11 | 5295 | 2775 | 10 | 102.6 | 19.6 | QCL-008 | 102.1 | 17.9 | 100 | 1.7 | PASS | MPD |
| SF-176 | 09/22/11 | 5795 | 2960 | 10 | 96.3 | 22.3 | QCL-2-4 | 96.7 | 22.0 | 100 | 0.3 | PASS | MPD |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-177 | 09/22/11 | 5690 | 3155 | 10 | 101.7 | 19.2 | QCL-008 | 102.1 | 17.9 | 100 | 1.3 | PASS | MPD |
| SF-178 | 09/22/11 | 5685 | 3285 | 10 | 97.1 | 23.1 | QCL-2-4 | 96.7 | 22.0 | 100 | 1.1 | PASS | MPD |
| SF-179 | 09/22/11 | 5580 | 3150 | 10 | 96.6 | 22.8 | QCL-2-4 | 96.7 | 22.0 | 100 | 0.8 | PASS | MPD |
| SF-180 | 09/22/11 | 5465 | 3070 | 10 | 100.5 | 19.7 | QCL-008 | 102.1 | 17.9 | 98 | 1.8 | PASS | MPD |
| SF-181 | 09/22/11 | 5340 | 2965 | 10 | 93.8 | 22.7 | QCL-2-4 | 96.7 | 22.0 | 97 | 0.7 | PASS | MPD |
| SF-182 | 09/22/11 | 5230 | 2850 | 10 | 101.0 | 18.1 | QCL-008 | 102.1 | 17.9 | 99 | 0.2 | PASS | MPD |
| SF-183 | 09/22/11 | 5090 | 2700 | 10 | 102.0 | 16.2 | QCL-008 | 102.1 | 17.9 | 100 | -1.7 | PASS | MPD |
| SF-184 | 09/22/11 | 4880 | 2660 | 10 | 103.4 | 18.0 | QCL-008 | 102.1 | 17.9 | 101 | 0.1 | PASS | MPD |
| SF-185 | 09/22/11 | 5030 | 2790 | 10 | 103.0 | 16.5 | QCL-008 | 102.1 | 17.9 | 101 | -1.4 | PASS | MPD |
| SF-186 | 09/22/11 | 5200 | 2935 | 10 | 95.8 | 22.6 | QCL-2-4 | 96.7 | 22.0 | 99 | 0.6 | PASS | MPD |
| SF-187 | 09/22/11 | 5400 | 3120 | 10 | 97.3 | 20.0 | QCL-2-4 | 96.7 | 22.0 | 101 | -2.0 | PASS | MPD |
| SF-188 | 09/22/11 | 5595 | 3300 | 10 | 94.3 | 20.6 | QCL-2-4 | 96.7 | 22.0 | 98 | -1.4 | PASS | MPD |
| SF-189 | 09/23/11 | 5310 | 2680 | 6 | 97.3 | 22.8 | QCL-2-4 | 96.7 | 22.0 | 101 | 0.8 | PASS | MPD |
| SF-190 | 09/23/11 | 5410 | 2690 | 6 | 96.1 | 22.7 | QCL-2-4 | 96.7 | 22.0 | 99 | 0.7 | PASS | MPD |
| SF-191 | 09/23/11 | 5540 | 2810 | 11 | 92.8 | 21.0 | QCL-2-4 | 96.7 | 22.0 | 96 | -1.0 | PASS | MPD |
| SF-192 | 09/23/11 | 5620 | 2915 | 11 | 94.0 | 21.2 | QCL-2-4 | 96.7 | 22.0 | 97 | -0.8 | PASS | MPD |
| SF-193 | 09/23/11 | 5760 | 3060 | 11 | 94.5 | 24.5 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.5 | PASS | MPD |
| SF-194 | 09/23/11 | 5755 | 3185 | 11 | 97.0 | 20.5 | QCL-2-4 | 96.7 | 22.0 | 100 | -1.5 | PASS | MPD |
| SF-195 | 09/23/11 | 5620 | 3050 | 11 | 92.9 | 22.8 | QCL-2-4 | 96.7 | 22.0 | 96 | 0.8 | PASS | MPD |
| SF-196 | 09/23/11 | 5460 | 3910 | 11 | 94.2 | 23.0 | QCL-2-4 | 96.7 | 22.0 | 97 | 1.0 | PASS | MPD |
| SF-197 | 09/23/11 | 5365 | 2790 | 6 | 97.3 | 20.0 | QCL-2-4 | 96.7 | 22.0 | 101 | -2.0 | PASS | MPD |
| SF-198 | 09/23/11 | 5210 | 2660 | 6 | 96.1 | 24.9 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.9 | PASS | MPD |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-199 | 09/26/11 | 5710 | 2620 | 12 | 99.6 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.0 | PASS | MPD |
| SF-200 | 09/26/11 | 4910 | 2620 | 12 | 98.9 | 21.2 | QCL-2-3 | 101.7 | 20.2 | 97 | 1.0 | PASS | MPD |
| SF-201 | 09/26/11 | 4870 | 2720 | 12 | 101.4 | 19.8 | QCL-2-3 | 101.7 | 20.2 | 100 | -0.4 | PASS | MPD |
| SF-202 | 09/26/11 | 5070 | 2905 | 12 | 98.2 | 18.9 | QCL-2-3 | 101.7 | 20.2 | 97 | -1.3 | PASS | MPD |
| SF-203 | 09/26/11 | 5260 | 3080 | 12 | 104.1 | 18.7 | QCL-2-3 | 101.7 | 20.2 | 102 | -1.5 | PASS | MPD |
| SF-204 | 09/26/11 | 5420 | 3225 | 12 | 102.2 | 22.5 | QCL-2-3 | 101.7 | 20.2 | 100 | 2.3 | PASS | MPD |
| SF-205 | 09/26/11 | 5695 | 3350 | 12 | 104.2 | 18.2 | QCL-2-3 | 101.7 | 20.2 | 102 | -2.0 | PASS | MPD |
| SF-206 | 09/26/11 | 5720 | 3215 | 12 | 94.9 | 19.8 | QCL-2-4 | 96.7 | 22.0 | 98 | -2.2 | PASS | MPD |
| SF-207 | 09/26/11 | 5760 | 3040 | 12 | 97.1 | 19.5 | QCL-2-4 | 96.7 | 22.0 | 100 | -2.5 | PASS | MPD |
| SF-208 | 09/26/11 | 5690 | 2890 | 12 | 92.6 | 22.3 | QCL-2-4 | 96.7 | 22.0 | 96 | 0.3 | PASS | MPD |
| SF-209 | 09/26/11 | 5550 | 2725 | 6 | 93.4 | 22.0 | QCL-2-4 | 96.7 | 22.0 | 97 | 0.0 | PASS | MPD |
| SF-210 | 09/26/11 | 5415 | 2600 | 6 | 94.3 | 22.5 | QCL-2-4 | 96.7 | 22.0 | 98 | 0.5 | PASS | MPD |
| SF-211 | 09/27/11 | 5075 | 2630 | 13 | 99.7 | 17.8 | QCL-008 | 102.1 | 17.9 | 98 | -0.1 | PASS | MPD |
| SF-212 | 09/27/11 | 4915 | 2630 | 13 | 98.1 | 20.2 | QCL-008 | 102.1 | 17.9 | 96 | 2.3 | PASS | MPD |
| SF-213 | 09/27/11 | 4910 | 2780 | 13 | 98.7 | 18.5 | QCL-008 | 102.1 | 17.9 | 97 | 0.6 | PASS | MPD |
| SF-214 | 09/27/11 | 5110 | 2930 | 13 | 97.6 | 20.9 | QCL-2-4 | 96.7 | 22.0 | 101 | -1.1 | PASS | MPD |
| SF-215 | 09/27/11 | 5320 | 3135 | 13 | 98.2 | 19.9 | QCL-008 | 102.1 | 17.9 | 96 | 2.0 | PASS | MPD |
| SF-216 | 09/27/11 | 5550 | 3330 | 13 | 101.3 | 20.8 | QCL-008 | 102.1 | 17.9 | 99 | 2.9 | PASS | MPD |
| SF-217 | 09/27/11 | 5390 | 2565 | 7 | 101.9 | 16.3 | QCL-008 | 102.1 | 17.9 | 100 | -1.6 | PASS | MPD |
| SF-218 | 09/27/11 | 5550 | 2720 | 13 | 97.7 | 15.9 | QCL-008 | 102.1 | 17.9 | 96 | -2.0 | PASS | MPD |
| SF-219 | 09/27/11 | 5700 | 2900 | 13 | 97.9 | 16.6 | QCL-008 | 102.1 | 17.9 | 96 | -1.3 | PASS | MPD |
| SF-220 | 09/27/11 | 5760 | 3045 | 13 | 98.9 | 15.2 | QCL-008 | 102.1 | 17.9 | 97 | -2.7 | PASS | MPD |

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-221 | 09/27/11 | 5745 | 3180 | 13 | 98.7 | 20.1 | QCL-008 | 102.1 | 17.9 | 97 | 2.2 | PASS | MPD |
| SF-222 | 09/27/11 | 5650 | 3300 | 13 | 93.7 | 19.2 | QCL-2-4 | 96.7 | 22.0 | 97 | -2.8 | PASS | MPD |
| SF-223 | 09/27/11 | 5485 | 3280 | 14 | 94.3 | 23.5 | QCL-2-4 | 96.7 | 22.0 | 98 | 1.5 | PASS | MPD |
| SF-224 | 09/27/11 | 5300 | 3095 | 14 | 92.6 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 96 | 2.4 | PASS | MPD |
| SF-225 | 09/27/11 | 5090 | 2905 | 14 | 93.3 | 23.3 | QCL-2-4 | 96.7 | 22.0 | 96 | 1.3 | PASS | MPD |
| SF-226 | 09/27/11 | 4840 | 2705 | 14 | 95.1 | 21.3 | QCL-2-4 | 96.7 | 22.0 | 98 | -0.7 | PASS | MPD |
| SF-227 | 09/27/11 | 4960 | 2635 | 14 | 93.4 | 22.1 | QCL-2-4 | 96.7 | 22.0 | 97 | 0.1 | PASS | MPD |
| SF-228 | 09/27/11 | 5115 | 2630 | 14 | 96.4 | 22.4 | QCL-2-4 | 96.7 | 22.0 | 100 | 0.4 | PASS | MPD |
| SF-229 | 09/27/11 | 5350 | 2515 | 8 | 95.2 | 23.5 | QCL-2-4 | 96.7 | 22.0 | 98 | 1.5 | PASS | MPD |
| SF-230 | 09/27/11 | 5510 | 2690 | 14 | 95.3 | 19.4 | QCL-2-4 | 96.7 | 22.0 | 99 | -2.6 | PASS | MPD |
| SF-231 | 09/27/11 | 5660 | 2840 | 14 | 101.1 | 19.6 | QCL-008 | 102.1 | 17.9 | 99 | 1.7 | PASS | MPD |
| SF-232 | 09/27/11 | 5785 | 3015 | 14 | 100.1 | 18.3 | QCL-008 | 102.1 | 17.9 | 98 | 0.4 | PASS | MPD |
| SF-233 | 09/27/11 | 5710 | 3200 | 14 | 97.8 | 17.1 | QCL-008 | 102.1 | 17.9 | 96 | -0.8 | PASS | MPD |
| SF-234 | 09/28/11 | 5710 | 3220 | 14 | 99.0 | 16.4 | QCL-001 | 99.9 | 19.2 | 99 | -2.8 | PASS | MPD |
| SF-235 | 09/28/11 | 5610 | 3310 | 14 | 97.4 | 17.1 | QCL-001 | 99.9 | 19.2 | 97 | -2.1 | PASS | MPD |
| SF-236 | 09/28/11 | 5425 | 3240 | 15 | 97.6 | 16.5 | QCL-001 | 99.9 | 19.2 | 98 | -2.7 | PASS | MPD |
| SF-237 | 09/28/11 | 5280 | 3085 | 15 | 99.1 | 21.5 | QCL-001 | 99.9 | 19.2 | 99 | 2.3 | PASS | MPD |
| SF-238 | 09/28/11 | 5710 | 2940 | 15 | 102.0 | 21.7 | QCL-001 | 99.9 | 19.2 | 102 | 2.5 | PASS | MPD |
| SF-239 | 09/28/11 | 4965 | 2800 | 15 | 100.3 | 20.4 | QCL-001 | 99.9 | 19.2 | 100 | 1.2 | PASS | MPD |
| SF-240 | 09/28/11 | 4835 | 2655 | 15 | 99.2 | 20.8 | QCL-001 | 99.9 | 19.2 | 99 | 1.6 | PASS | MPD |
| SF-241 | 09/28/11 | 5855 | 3175 | 15 | 98.0 | 15.1 | QCL-008 | 102.1 | 17.9 | 96 | -2.8 | PASS | MPD |
| SF-242 | 09/28/11 | 5690 | 3250 | 15 | 98.8 | 18.0 | QCL-008 | 102.1 | 17.9 | 97 | 0.1 | PASS | MPD |

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-243 | 09/28/11 | 5570 | 3340 | 15 | 99.4 | 15.9 | QCL-008 | 102.1 | 17.9 | 97 | -2.0 | PASS | MPD |
| SF-244 | 09/28/11 | 5295 | 3195 | 16 | 97.8 | 16.2 | QCL-008 | 102.1 | 17.9 | 96 | -1.7 | PASS | MPD |
| SF-245 | 09/28/11 | 5220 | 3020 | 16 | 98.8 | 18.9 | QCL-008 | 102.1 | 17.9 | 97 | 1.0 | PASS | MPD |
| SF-246 | 09/28/11 | 5065 | 2895 | 16 | 100.7 | 19.8 | QCL-008 | 102.1 | 17.9 | 99 | 1.9 | PASS | MPD |
| SF-247 | 09/28/11 | 4905 | 2770 | 16 | 99.4 | 20.8 | QCL-008 | 102.1 | 17.9 | 97 | 2.9 | PASS | MPD |
| SF-248 | 09/28/11 | 4880 | 2640 | 16 | 98.4 | 16.7 | QCL-008 | 102.1 | 17.9 | 96 | -1.2 | PASS | MPD |
| SF-249 | 09/28/11 | 5050 | 2630 | 16 | 97.8 | 16.9 | QCL-008 | 102.1 | 17.9 | 96 | -1.0 | PASS | MPD |
| SF-250 | 09/28/11 | 5185 | 2635 | 16 | 98.3 | 15.8 | QCL-008 | 102.1 | 17.9 | 96 | -2.1 | PASS | MPD |
| SF-251 | 09/29/11 | 5410 | 2585 | 16 | 95.3 | 23.3 | QCL-2-4 | 96.7 | 22.0 | 99 | 1.3 | PASS | MPD |
| SF-252 | 09/29/11 | 5550 | 2720 | 16 | 93.9 | 22.2 | QCL-2-4 | 96.7 | 22.0 | 97 | 0.2 | PASS | MPD |
| SF-253 | 09/29/11 | 5700 | 2890 | 16 | 97.3 | 23.4 | QCL-2-4 | 96.7 | 22.0 | 101 | 1.4 | PASS | MPD |
| SF-254 | 09/29/11 | 5790 | 3015 | 16 | 93.1 | 24.9 | QCL-2-4 | 96.7 | 22.0 | 96 | 2.9 | PASS | MPD |
| SF-255 | 09/29/11 | 5780 | 3135 | 16 | 96.3 | 22.9 | QCL-2-4 | 96.7 | 22.0 | 100 | 0.9 | PASS | MPD |
| SF-256 | 09/29/11 | 5725 | 3220 | 16 | 95.2 | 22.4 | QCL-2-4 | 96.7 | 22.0 | 98 | 0.4 | PASS | MPD |
| SF-257 | 09/29/11 | 5665 | 3305 | 16 | 93.4 | 23.5 | QCL-2-4 | 96.7 | 22.0 | 97 | 1.5 | PASS | MPD |
| SF-258 | 09/29/11 | 5505 | 3305 | 16 | 96.7 | 23.3 | QCL-2-4 | 96.7 | 22.0 | 100 | 1.3 | PASS | MPD |
| SF-259 | 09/29/11 | 5280 | 3195 | 17 | 92.7 | 21.4 | QCL-2-4 | 96.7 | 22.0 | 96 | -0.6 | PASS | MPD |
| SF-260 | 09/29/11 | 5240 | 3050 | 17 | 99.2 | 15.8 | QCL-008 | 102.1 | 17.9 | 97 | -2.1 | PASS | MPD |
| SF-261 | 09/29/11 | 5110 | 2945 | 17 | 99.8 | 20.0 | QCL-008 | 102.1 | 17.9 | 98 | 2.1 | PASS | MPD |
| SF-262 | 09/29/11 | 5005 | 2840 | 17 | 97.1 | 20.4 | QCL-008 | 102.1 | 17.9 | 95 | 2.5 | PASS | MPD |
| SF-263 | 09/29/11 | 4905 | 2770 | 17 | 97.5 | 16.8 | QCL-008 | 102.1 | 17.9 | 95 | -1.1 | PASS | MPD |
| SF-264 | 09/29/11 | 4910 | 2615 | 17 | 96.9 | 19.9 | QCL-2-4 | 96.7 | 22.0 | 100 | -2.1 | PASS | MPD |

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-265 | 09/29/11 | 2670 | 5075 | 17 | 100.4 | 20.1 | QCL-008 | 102.1 | 17.9 | 98 | 2.2 | PASS | MPD |
| SF-266 | 09/29/11 | 2620 | 5180 | 17 | 102.2 | 20.4 | QCL-008 | 102.1 | 17.9 | 100 | 2.5 | PASS | MPD |
| SF-267 | 09/30/11 | 5350 | 2520 | 17 | 99.9 | 17.4 | QCL-001 | 99.9 | 19.2 | 100 | -1.8 | PASS | MPD |
| SF-268 | 09/30/11 | 5490 | 2680 | 17 | 97.1 | 17.2 | QCL-001 | 99.9 | 19.2 | 97 | -2.0 | PASS | MPD |
| SF-269 | 09/30/11 | 5650 | 2850 | 17 | 104.5 | 16.1 | QCL-2-7 | 104.4 | 17.8 | 100 | -1.7 | PASS | MPD |
| SF-270 | 09/30/11 | 5790 | 2995 | 17 | 104.0 | 15.9 | QCL-2-7 | 104.4 | 17.8 | 100 | -1.9 | PASS | MPD |
| SF-271 | 09/30/11 | 5770 | 3150 | 17 | 96.6 | 21.1 | QCL-001 | 99.9 | 19.2 | 97 | 1.9 | PASS | MPD |
| SF-272 | 09/30/11 | 5715 | 3250 | 17 | 95.4 | 21.4 | QCL-2-4 | 96.7 | 22.0 | 99 | -0.6 | PASS | MPD |
| SF-273 | 09/30/11 | 5610 | 3320 | 17 | 98.0 | 20.0 | QCL-001 | 99.9 | 19.2 | 98 | 0.8 | PASS | MPD |
| SF-274 | 09/30/11 | 5460 | 3280 | 18 | 101.0 | 18.5 | QCL-001 | 99.9 | 19.2 | 101 | -0.7 | PASS | MPD |
| SF-275 | 09/30/11 | 5320 | 3140 | 18 | 100.6 | 19.5 | QCL-001 | 99.9 | 19.2 | 101 | 0.3 | PASS | MPD |
| SF-276 | 09/30/11 | 5205 | 3015 | 18 | 95.9 | 16.9 | QCL-001 | 99.9 | 19.2 | 96 | -2.3 | PASS | MPD |
| SF-277 | 09/30/11 | 5095 | 2910 | 18 | 95.4 | 19.0 | QCL-2-4 | 96.7 | 22.0 | 99 | -3.0 | PASS | MPD |
| SF-278 | 09/30/11 | 4940 | 2795 | 18 | 96.2 | 21.0 | QCL-001 | 99.9 | 19.2 | 96 | 1.8 | PASS | MPD |
| SF-279 | 09/30/11 | 4815 | 2665 | 18 | 96.1 | 20.2 | QCL-001 | 99.9 | 19.2 | 96 | 1.0 | PASS | MPD |
| SF-280 | 09/30/11 | 4930 | 2620 | 18 | 96.7 | 20.0 | QCL-001 | 99.9 | 19.2 | 97 | 0.8 | PASS | MPD |
| SF-281 | 09/30/11 | 5095 | 2615 | 18 | 95.9 | 20.1 | QCL-001 | 99.9 | 19.2 | 96 | 0.9 | PASS | MPD |
| SF-282 | 10/01/11 | 5295 | 2525 | 18 | 97.1 | 19.0 | QCL-001 | 99.9 | 19.2 | 97 | -0.2 | PASS | MPD |
| SF-283 | 10/01/11 | 5435 | 2565 | 18 | 98.4 | 20.0 | QCL-001 | 99.9 | 19.2 | 98 | 0.8 | PASS | MPD |
| SF-284 | 10/01/11 | 5545 | 2690 | 18 | 97.4 | 19.2 | QCL-001 | 99.9 | 19.2 | 97 | 0.0 | PASS | MPD |
| SF-285 | 10/01/11 | 5660 | 2795 | 18 | 98.3 | 20.6 | QCL-001 | 99.9 | 19.2 | 98 | 1.4 | PASS | MPD |
| SF-286 | 10/01/11 | 5780 | 2910 | 18 | 101.8 | 15.8 | QCL-2-6 | 105.4 | 18.7 | 97 | -2.9 | PASS | MPD |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-287 | 10/01/11 | 5800 | 3080 | 18 | 95.6 | 20.7 | QCL-001 | 99.9 | 19.2 | 96 | 1.5 | PASS | MPD |
| SF-288 | 10/01/11 | 5790 | 3205 | 18 | 100.6 | 19.4 | QCL-001 | 99.9 | 19.2 | 101 | 0.2 | PASS | MPD |
| SF-289 | 10/01/11 | 5705 | 3305 | 18 | 95.8 | 17.4 | QCL-001 | 99.9 | 19.2 | 96 | -1.8 | PASS | MPD |
| SF-290 | 10/01/11 | 5605 | 3375 | 18 | 99.7 | 19.3 | QCL-001 | 99.9 | 19.2 | 100 | 0.1 | PASS | MPD |
| SF-291 | 10/01/11 | 5460 | 3315 | 19 | 100.8 | 18.4 | QCL-001 | 99.9 | 19.2 | 101 | -0.8 | PASS | MPD |
| SF-292 | 10/01/11 | 5345 | 3210 | 19 | 96.5 | 15.9 | QCL-009 | 99.9 | 17.0 | 97 | -1.1 | PASS | MPD |
| SF-293 | 10/01/11 | 5200 | 3050 | 19 | 93.1 | 20.7 | QCL-2-4 | 96.7 | 22.0 | 96 | -1.3 | PASS | MPD |
| SF-294 | 10/01/11 | 5685 | 2950 | 19 | 93.4 | 21.1 | QCL-2-4 | 96.7 | 22.0 | 97 | -0.9 | PASS | MPD |
| SF-295 | 10/01/11 | 4970 | 2850 | 19 | 92.6 | 21.2 | QCL-2-4 | 96.7 | 22.0 | 96 | -0.8 | PASS | MPD |
| SF-296 | 10/02/11 | 4850 | 2760 | 19 | 94.2 | 22.6 | QCL-2-4 | 96.7 | 22.0 | 97 | 0.6 | PASS | MPD |
| SF-297 | 10/02/11 | 4795 | 2630 | 19 | 99.1 | 19.6 | QCL-2-4 | 96.7 | 22.0 | 102 | -2.4 | PASS | MPD |
| SF-298 | 10/02/11 | 4905 | 2600 | 19 | 102.4 | 18.8 | QCL-2-7 | 104.4 | 17.8 | 98 | 1.0 | PASS | MPD |
| SF-299 | 10/02/11 | 5010 | 2605 | 19 | 103.7 | 19.1 | QCL-2-7 | 104.4 | 17.8 | 99 | 1.3 | PASS | MPD |
| SF-300 | 10/02/11 | 5150 | 2605 | 19 | 102.4 | 19.5 | QCL-2-7 | 104.4 | 17.8 | 98 | 1.7 | PASS | MPD |
| SF-301 | 10/03/11 | 5390 | 2500 | 19 | 102.9 | 18.6 | QCL-2-7 | 104.4 | 17.8 | 99 | 0.8 | PASS | MPD |
| SF-302 | 10/03/11 | 5500 | 2615 | 19 | 103.0 | 18.9 | QCL-2-7 | 104.4 | 17.8 | 99 | 1.1 | PASS | MPD |
| SF-303 | 10/03/11 | 5620 | 2750 | 19 | 103.9 | 18.3 | QCL-2-7 | 104.4 | 17.8 | 100 | 0.5 | PASS | MPD |
| SF-304 | 10/03/11 | 5760 | 2890 | 19 | 103.2 | 19.3 | QCL-2-7 | 104.4 | 17.8 | 99 | 1.5 | PASS | MPD |
| SF-305 | 10/03/11 | 5830 | 3020 | 19 | 101.2 | 15.7 | QCL-2-7 | 104.4 | 17.8 | 97 | -2.1 | PASS | MPD |
| SF-306 | 10/03/11 | 5820 | 3155 | 19 | 99.3 | 19.9 | QCL-001 | 99.9 | 19.2 | 99 | 0.7 | PASS | MPD |
| SF-307 | 10/03/11 | 5780 | 3245 | 19 | 98.0 | 18.2 | QCL-001 | 99.9 | 19.2 | 98 | -1.0 | PASS | MPD |
| SF-308 | 10/03/11 | 5710 | 3305 | 19 | 97.6 | 17.6 | QCL-001 | 99.9 | 19.2 | 98 | -1.6 | PASS | MPD |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-309 | 10/03/11 | 5610 | 3390 | 19 | 98.8 | 21.2 | QCL-001 | 99.9 | 19.2 | 99 | 2.0 | PASS | MPD |
| SF-310 | 10/04/11 | 5405 | 2525 | 20 | 94.4 | 21.4 | QCL-2-4 | 96.7 | 22.0 | 98 | -0.6 | PASS | MPD |
| SF-311 | 10/04/11 | 5580 | 2695 | 20 | 92.1 | 19.8 | QCL-2-4 | 96.7 | 22.0 | 95 | -2.2 | PASS | MPD |
| SF-312 | 10/04/11 | 5705 | 2830 | 20 | 96.8 | 22.1 | QCL-2-4 | 96.7 | 22.0 | 100 | 0.1 | PASS | MPD |
| SF-313 | 10/04/11 | 5200 | 2600 | 20 | 99.9 | 20.4 | QCL-001 | 99.9 | 19.2 | 100 | 1.2 | PASS | MPD |
| SF-314 | 10/04/11 | 5055 | 2605 | 20 | 99.3 | 21.0 | QCL-001 | 99.9 | 19.2 | 99 | 1.8 | PASS | MPD |
| SF-315 | 10/04/11 | 4900 | 2600 | 20 | 102.0 | 19.6 | QCL-001 | 99.9 | 19.2 | 102 | 0.4 | PASS | MPD |
| SF-316 | 10/04/11 | 4830 | 2750 | 20 | 99.5 | 21.0 | QCL-001 | 99.9 | 19.2 | 100 | 1.8 | PASS | MPD |
| SF-317 | 10/04/11 | 4980 | 2850 | 20 | 98.3 | 17.4 | QCL-001 | 99.9 | 19.2 | 98 | -1.8 | PASS | MPD |
| SF-318 | 10/04/11 | 5100 | 2970 | 20 | 97.8 | 19.4 | QCL-001 | 99.9 | 19.2 | 98 | 0.2 | PASS | MPD |
| SF-319 | 10/04/11 | 5220 | 3100 | 20 | 99.1 | 18.9 | QCL-001 | 99.9 | 19.2 | 99 | -0.3 | PASS | MPD |
| SF-320 | 10/04/11 | 5365 | 3215 | 20 | 95.7 | 21.4 | QCL-001 | 99.9 | 19.2 | 96 | 2.2 | PASS | MPD |
| SF-321 | 10/04/11 | 5480 | 3325 | 20 | 97.3 | 19.6 | QCL-001 | 99.9 | 19.2 | 97 | 0.4 | PASS | MPD |
| SF-322 | 10/04/11 | 5615 | 3380 | 20 | 99.6 | 19.3 | QCL-001 | 99.9 | 19.2 | 100 | 0.1 | PASS | MPD |
| SF-323 | 10/04/11 | 5730 | 3295 | 20 | 98.4 | 16.7 | QCL-001 | 99.9 | 19.2 | 98 | -2.5 | PASS | MPD |
| SF-324 | 10/04/11 | 5800 | 3200 | 20 | 97.6 | 17.6 | QCL-001 | 99.9 | 19.2 | 98 | -1.6 | PASS | MPD |
| SF-325 | 10/04/11 | 5800 | 3075 | 20 | 95.8 | 17.8 | QCL-001 | 99.9 | 19.2 | 96 | -1.4 | PASS | MPD |
| SF-326 | 10/04/11 | 5810 | 2960 | 20 | 97.7 | 17.0 | QCL-001 | 99.9 | 19.2 | 98 | -2.2 | PASS | MPD |
| SF-327 | 10/04/11 | 5350 | 2485 | 21 | 96.8 | 18.9 | QCL-001 | 99.9 | 19.2 | 97 | -0.3 | PASS | MPD |
| SF-328 | 10/04/11 | 5500 | 2615 | 21 | 99.0 | 19.8 | QCL-001 | 99.9 | 19.2 | 99 | 0.6 | PASS | MPD |
| SF-329 | 10/04/11 | 5750 | 2890 | 21 | 96.0 | 20.7 | QCL-001 | 99.9 | 19.2 | 96 | 1.5 | PASS | MPD |
| SF-330 | 10/04/11 | 5825 | 3005 | 21 | 97.8 | 20.5 | QCL-001 | 99.9 | 19.2 | 98 | 1.3 | PASS | MPD |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-331 | 10/04/11 | 5820 | 3165 | 21 | 95.3 | 19.2 | QCL-2-4 | 96.7 | 22.0 | 99 | -2.8 | PASS | MPD |
| SF-332 | 10/04/11 | 5710 | 3310 | 21 | 98.4 | 20.9 | QCL-001 | 99.9 | 19.2 | 98 | 1.7 | PASS | MPD |
| SF-333 | 10/04/11 | 5595 | 3400 | 21 | 98.5 | 16.0 | QCL-009 | 99.9 | 17.0 | 99 | -1.0 | PASS | MPD |
| SF-334 | 10/04/11 | 5435 | 3295 | 21 | 98.7 | 21.0 | QCL-2-3 | 101.7 | 20.2 | 97 | 0.8 | PASS | MPD |
| SF-335 | 10/04/11 | 5305 | 3150 | 21 | 97.5 | 23.0 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.8 | PASS | MPD |
| SF-336 | 10/04/11 | 5760 | 3040 | 21 | 103.1 | 20.5 | QCL-2-7 | 104.4 | 17.8 | 99 | 2.7 | PASS | MPD |
| SF-337 | 10/04/11 | 5020 | 2905 | 21 | 104.3 | 19.3 | QCL-2-7 | 104.4 | 17.8 | 100 | 1.5 | PASS | MPD |
| SF-338 | 10/04/11 | 4900 | 2800 | 21 | 105.2 | 18.3 | QCL-2-7 | 104.4 | 17.8 | 101 | 0.5 | PASS | MPD |
| SF-339 | 10/04/11 | 4800 | 2650 | 21 | 107.2 | 17.6 | QCL-FGDB-04A | 110.0 | 15.9 | 97 | 1.7 | PASS | MPD |
| SF-340 | 10/04/11 | 4950 | 2600 | 21 | 103.6 | 17.3 | QCL-2-7 | 104.4 | 17.8 | 99 | -0.5 | PASS | MPD |
| SF-341 | 10/04/11 | 5085 | 2600 | 21 | 101.3 | 19.4 | QCL-2-7 | 104.4 | 17.8 | 97 | 1.6 | PASS | MPD |
| SF-342 | 10/04/11 | 5170 | 2610 | 21 | 102.4 | 20.3 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.5 | PASS | MPD |
| SF-343 | 10/04/11 | 5295 | 2515 | 21 | 104.2 | 19.1 | QCL-2-7 | 104.4 | 17.8 | 100 | 1.3 | PASS | MPD |
| SF-344 | 10/05/11 | 5410 | 2640 | 22 | 96.5 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 100 | 2.3 | PASS | MPD |
| SF-345 | 10/05/11 | 5505 | 2630 | 22 | 93.2 | 22.4 | QCL-2-4 | 96.7 | 22.0 | 96 | 0.4 | PASS | MPD |
| SF-346 | 10/05/11 | 5805 | 2745 | 22 | 94.3 | 21.8 | QCL-2-4 | 96.7 | 22.0 | 98 | -0.2 | PASS | MPD |
| SF-347 | 10/05/11 | 5720 | 2870 | 22 | 94.5 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.0 | PASS | MPD |
| SF-348 | 10/05/11 | 5815 | 3020 | 22 | 97.4 | 22.1 | QCL-2-4 | 96.7 | 22.0 | 101 | 0.1 | PASS | MPD |
| SF-349 | 10/05/11 | 5800 | 3110 | 22 | 97.1 | 22.4 | QCL-2-4 | 96.7 | 22.0 | 100 | 0.4 | PASS | MPD |
| SF-350 | 10/05/11 | 5780 | 3220 | 22 | 92.6 | 23.0 | QCL-2-4 | 96.7 | 22.0 | 96 | 1.0 | PASS | MPD |
| SF-351 | 10/05/11 | 5450 | 3305 | 22 | 93.7 | 20.4 | QCL-2-4 | 96.7 | 22.0 | 97 | -1.6 | PASS | MPD |
| SF-352 | 10/05/11 | 5605 | 3390 | 22 | 94.2 | 24.9 | QCL-2-4 | 96.7 | 22.0 | 97 | 2.9 | PASS | MPD |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-353 | 10/05/11 | 5460 | 3315 | 22 | 93.9 | 21.4 | QCL-2-4 | 96.7 | 22.0 | 97 | -0.6 | PASS | MPD |
| SF-354 | 10/05/11 | 5305 | 3180 | 22 | 94.8 | 21.7 | QCL-2-4 | 96.7 | 22.0 | 98 | -0.3 | PASS | MPD |
| SF-355 | 10/05/11 | 5185 | 3050 | 22 | 93.1 | 25.0 | QCL-A-2 | 92.9 | 24.6 | 100 | 0.4 | PASS | MPD |
| SF-356 | 10/05/11 | 5050 | 2925 | 22 | 94.3 | 23.9 | QCL-2-4 | 96.7 | 22.0 | 98 | 1.9 | PASS | MPD |
| SF-357 | 10/05/11 | 4940 | 2830 | 22 | 94.3 | 22.6 | QCL-2-4 | 96.7 | 22.0 | 98 | 0.6 | PASS | MPD |
| SF-358 | 10/05/11 | 4790 | 2670 | 22 | 93.6 | 20.7 | QCL-2-4 | 96.7 | 22.0 | 97 | -1.3 | PASS | MPD |
| SF-359 | 10/05/11 | 4935 | 2600 | 22 | 93.6 | 20.4 | QCL-2-4 | 96.7 | 22.0 | 97 | -1.6 | PASS | MPD |
| SF-360 | 10/05/11 | 5720 | 2610 | 22 | 94.2 | 22.0 | QCL-2-4 | 96.7 | 22.0 | 97 | 0.0 | PASS | MPD |
| SF-361 | 10/06/11 | 5390 | 2510 | 23 | 97.9 | 21.9 | QCL-2-3 | 101.7 | 20.2 | 96 | 1.7 | PASS | MPD |
| SF-362 | 10/06/11 | 5505 | 2620 | 23 | 98.1 | 21.6 | QCL-2-3 | 101.7 | 20.2 | 96 | 1.4 | PASS | MPD |
| SF-363 | 10/06/11 | 5270 | 2795 | 23 | 99.2 | 21.5 | QCL-2-3 | 101.7 | 20.2 | 98 | 1.3 | PASS | MPD |
| SF-364 | 10/06/11 | 5775 | 2910 | 23 | 102.4 | 21.9 | QCL-2-3 | 101.7 | 20.2 | 101 | 1.7 | PASS | MPD |
| SF-365 | 10/06/11 | 5800 | 3040 | 23 | 98.9 | 22.6 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.4 | PASS | MPD |
| SF-366 | 10/06/11 | 5615 | 3160 | 23 | 102.1 | 20.9 | QCL-2-3 | 101.7 | 20.2 | 100 | 0.7 | PASS | MPD |
| SF-367 | 10/06/11 | 5720 | 3285 | 23 | 99.5 | 21.1 | QCL-2-3 | 101.7 | 20.2 | 98 | 0.9 | PASS | MPD |
| SF-368 | 10/06/11 | 5615 | 3385 | 23 | 98.8 | 21.7 | QCL-2-3 | 101.7 | 20.2 | 97 | 1.5 | PASS | MPD |
| SF-369 | 10/06/11 | 5465 | 3345 | 23 | 98.4 | 21.4 | QCL-2-3 | 101.7 | 20.2 | 97 | 1.2 | PASS | MPD |
| SF-370 | 10/06/11 | 5300 | 3170 | 23 | 98.3 | 21.7 | QCL-2-3 | 101.7 | 20.2 | 97 | 1.5 | PASS | MPD |
| SF-371 | 10/06/11 | 5190 | 3055 | 23 | 97.2 | 18.1 | QCL-2-3 | 101.7 | 20.2 | 96 | -2.1 | PASS | MPD |
| SF-372 | 10/06/11 | 5095 | 2965 | 23 | 99.8 | 19.1 | QCL-2-3 | 101.7 | 20.2 | 98 | -1.1 | PASS | MPD |
| SF-373 | 10/06/11 | 4965 | 2860 | 23 | 96.5 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 100 | 2.4 | PASS | MPD |
| SF-374 | 10/06/11 | 4885 | 2765 | 23 | 98.8 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 102 | 2.2 | PASS | MPD |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-375 | 10/06/11 | 4810 | 2615 | 23 | 96.1 | 19.6 | QCL-2-4 | 96.7 | 22.0 | 99 | -2.4 | PASS | MPD |
| SF-376 | 10/06/11 | 4930 | 2600 | 23 | 95.3 | 23.1 | QCL-2-4 | 96.7 | 22.0 | 99 | 1.1 | PASS | MPD |
| SF-377 | 10/06/11 | 5060 | 2605 | 23 | 93.2 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 96 | 2.0 | PASS | MPD |
| SF-378 | 10/06/11 | 5790 | 2605 | 23 | 96.9 | 23.7 | QCL-2-4 | 96.7 | 22.0 | 100 | 1.7 | PASS | MPD |
| SF-379 | 10/10/11 | 5425 | 2560 | 24 | 99.9 | 20.4 | QCL-2-7 | 104.4 | 17.8 | 96 | 2.6 | PASS | MPD |
| SF-380 | 10/10/11 | 5545 | 2665 | 24 | 103.2 | 19.7 | QCL-2-7 | 104.4 | 17.8 | 99 | 1.9 | PASS | MPD |
| SF-381 | 10/10/11 | 5665 | 2785 | 24 | 101.0 | 18.6 | QCL-2-7 | 104.4 | 17.8 | 97 | 0.8 | PASS | MPD |
| SF-382 | 10/10/11 | 5750 | 2885 | 24 | 99.5 | 20.8 | QCL-2-4 | 96.7 | 22.0 | 103 | -1.2 | PASS | MPD |
| SF-383 | 10/10/11 | 5815 | 3010 | 24 | 100.6 | 17.0 | QCL-2-7 | 104.4 | 17.8 | 96 | -0.8 | PASS | MPD |
| SF-384 | 10/10/11 | 5825 | 3150 | 24 | 105.1 | 19.7 | QCL-2-7 | 104.4 | 17.8 | 101 | 1.9 | PASS | MPD |
| SF-385 | 10/10/11 | 5775 | 3250 | 24 | 104.6 | 17.4 | QCL-2-7 | 104.4 | 17.8 | 100 | -0.4 | PASS | MPD |
| SF-386 | 10/10/11 | 5700 | 3325 | 24 | 105.4 | 15.0 | QCL-2-7 | 104.4 | 17.8 | 101 | -2.8 | PASS | MPD |
| SF-387 | 10/10/11 | 5605 | 3400 | 24 | 104.9 | 18.0 | QCL-2-7 | 104.4 | 17.8 | 100 | 0.2 | PASS | MPD |
| SF-388 | 10/10/11 | 5480 | 3365 | 24 | 102.1 | 17.7 | QCL-2-7 | 104.4 | 17.8 | 98 | -0.1 | PASS | MPD |
| SF-389 | 10/10/11 | 5360 | 3210 | 24 | 100.1 | 21.3 | QCL-001 | 99.9 | 19.2 | 100 | 2.1 | PASS | MPD |
| SF-390 | 10/10/11 | 5195 | 3050 | 24 | 96.9 | 17.8 | QCL-001 | 99.9 | 19.2 | 97 | -1.4 | PASS | MPD |
| SF-391 | 10/10/11 | 5090 | 2965 | 24 | 96.8 | 17.5 | QCL-001 | 99.9 | 19.2 | 97 | -1.7 | PASS | MPD |
| SF-392 | 10/10/11 | 4925 | 2840 | 24 | 100.0 | 20.1 | QCL-001 | 99.9 | 19.2 | 100 | 0.9 | PASS | MPD |
| SF-393 | 10/10/11 | 4800 | 2680 | 24 | 96.7 | 22.7 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.5 | PASS | MPD |
| SF-394 | 10/10/11 | 4920 | 2600 | 24 | 99.4 | 21.7 | QCL-2-3 | 101.7 | 20.2 | 98 | 1.5 | PASS | MPD |
| SF-395 | 10/10/11 | 5165 | 2600 | 24 | 97.9 | 19.2 | QCL-2-3 | 101.7 | 20.2 | 96 | -1.0 | PASS | MPD |
| SF-396 | 10/10/11 | 5300 | 2520 | 24 | 98.7 | 21.9 | QCL-2-3 | 101.7 | 20.2 | 97 | 1.7 | PASS | MPD |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-397 | 10/13/11 | 5300 | 2500 | 25 | 100.8 | 18.0 | QCL-001 | 99.9 | 19.2 | 101 | -1.2 | PASS | MPD |
| SF-398 | 10/13/11 | 5500 | 2600 | 25 | 97.2 | 18.9 | QCL-001 | 99.9 | 19.2 | 97 | -0.3 | PASS | MPD |
| SF-399 | 10/13/11 | 5695 | 2805 | 25 | 98.0 | 16.9 | QCL-001 | 99.9 | 19.2 | 98 | -2.3 | PASS | MPD |
| SF-400 | 10/13/11 | 5810 | 2935 | 25 | 98.7 | 18.7 | QCL-001 | 99.9 | 19.2 | 99 | -0.5 | PASS | MPD |
| SF-401 | 10/13/11 | 5850 | 3000 | 25 | 101.3 | 17.1 | QCL-001 | 99.9 | 19.2 | 101 | -2.1 | PASS | MPD |
| SF-402 | 10/13/11 | 5840 | 3165 | 25 | 99.5 | 18.7 | QCL-001 | 99.9 | 19.2 | 100 | -0.5 | PASS | MPD |
| SF-403 | 10/13/11 | 5750 | 3310 | 25 | 100.3 | 19.6 | QCL-001 | 99.9 | 19.2 | 100 | 0.4 | PASS | MPD |
| SF-404 | 10/13/11 | 5615 | 3405 | 25 | 97.2 | 23.0 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.8 | PASS | MPD |
| SF-405 | 10/13/11 | 5400 | 3300 | 25 | 99.9 | 20.2 | QCL-2-3 | 101.7 | 20.2 | 98 | 0.0 | PASS | MPD |
| SF-406 | 10/13/11 | 5265 | 3150 | 25 | 98.6 | 21.7 | QCL-2-3 | 101.7 | 20.2 | 97 | 1.5 | PASS | MPD |
| SF-407 | 10/13/11 | 5110 | 3005 | 25 | 97.2 | 20.0 | QCL-2-3 | 101.7 | 20.2 | 96 | -0.2 | PASS | MPD |
| SF-408 | 10/13/11 | 5000 | 2900 | 25 | 101.5 | 21.7 | QCL-2-3 | 101.7 | 20.2 | 100 | 1.5 | PASS | MPD |
| SF-409 | 10/13/11 | 4815 | 2735 | 25 | 97.4 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.7 | PASS | MPD |
| SF-410 | 10/13/11 | 4810 | 2605 | 25 | 100.3 | 21.2 | QCL-2-3 | 101.7 | 20.2 | 99 | 1.0 | PASS | MPD |
| SF-411 | 10/13/11 | 4985 | 2600 | 25 | 99.6 | 23.1 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.9 | PASS | MPD |
| SF-412 | 10/13/11 | 5105 | 2600 | 25 | 100.8 | 22.5 | QCL-2-3 | 101.7 | 20.2 | 99 | 2.3 | PASS | MPD |
| SF-413 | 10/13/11 | 5210 | 2595 | 25 | 98.5 | 21.8 | QCL-2-3 | 101.7 | 20.2 | 97 | 1.6 | PASS | MPD |
| SF-414 | 10/16/11 | 5760 | 2890 | 26 | 101.3 | 17.3 | QCL-001 | 99.9 | 19.2 | 101 | -1.9 | PASS | MPD |
| SF-415 | 10/16/11 | 5830 | 3015 | 26 | 95.8 | 20.1 | QCL-001 | 99.9 | 19.2 | 96 | 0.9 | PASS | MPD |
| SF-416 | 10/16/11 | 5815 | 3195 | 26 | 101.4 | 17.8 | QCL-001 | 99.9 | 19.2 | 102 | -1.4 | PASS | MPD |
| SF-417 | 10/16/11 | 5730 | 3510 | 26 | 99.2 | 17.4 | QCL-001 | 99.9 | 19.2 | 99 | -1.8 | PASS | MPD |
| SF-418 | 10/16/11 | 5235 | 3395 | 26 | 96.4 | 20.5 | QCL-001 | 99.9 | 19.2 | 96 | 1.3 | PASS | MPD |



Golder Associates

# STRUCTURAL FILL FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-419 | 10/16/11 | 5490 | 3385 | 26 | 96.8 | 18.0 | QCL-001 | 99.9 | 19.2 | 97 | -1.2 | PASS | MPD |
| SF-420 | 10/16/11 | 5230 | 3215 | 26 | 98.5 | 20.7 | QCL-001 | 99.9 | 19.2 | 99 | 1.5 | PASS | MPD |
| SF-421 | 10/16/11 | 5180 | 3020 | 26 | 101.2 | 16.7 | QCL-001 | 99.9 | 19.2 | 101 | -2.5 | PASS | MPD |
| SF-422 | 10/16/11 | 5090 | 2985 | 26 | 98.0 | 21.0 | QCL-001 | 99.9 | 19.2 | 98 | 1.8 | PASS | MPD |
| SF-423 | 10/16/11 | 4975 | 2880 | 26 | 99.9 | 21.4 | QCL-001 | 99.9 | 19.2 | 100 | 2.2 | PASS | MPD |
| SF-424 | 10/16/11 | 4840 | 2765 | 26 | 98.8 | 21.3 | QCL-001 | 99.9 | 19.2 | 99 | 2.1 | PASS | MPD |
| SF-425 | 10/16/11 | 4815 | 2610 | 26 | 101.0 | 19.6 | QCL-001 | 99.9 | 19.2 | 101 | 0.4 | PASS | MPD |
| SF-426 | 10/16/11 | 4965 | 2600 | 26 | 100.0 | 21.0 | QCL-001 | 99.9 | 19.2 | 100 | 1.8 | PASS | MPD |
| SF-427 | 10/16/11 | 5095 | 2600 | 26 | 99.8 | 20.4 | QCL-001 | 99.9 | 19.2 | 100 | 1.2 | PASS | MPD |
| SF-428 | 10/25/11 | 5200 | 2590 | 1 | 104.0 | 18.3 | QCL-2-7 | 104.4 | 17.8 | 100 | 0.5 | PASS | MPD |
| SF-429 | 10/25/11 | 5215 | 2595 | 2 | 101.9 | 19.9 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.1 | PASS | MPD |
| SF-430 | 10/25/11 | 5195 | 2600 | 3 | 102.6 | 19.1 | QCL-2-7 | 104.4 | 17.8 | 98 | 1.3 | PASS | MPD |
| SF-431 | 10/25/11 | 5190 | 2605 | 4 | 100.8 | 19.5 | QCL-2-7 | 104.4 | 17.8 | 97 | 1.7 | PASS | MPD |
| SF-432 | 10/25/11 | 5195 | 2595 | 5 | 100.3 | 19.4 | QCL-2-7 | 104.4 | 17.8 | 96 | 1.6 | PASS | MPD |
| SF-433 | 10/25/11 | 5205 | 2590 | 6 | 98.6 | 21.4 | QCL-2-3 | 101.7 | 20.2 | 97 | 1.2 | PASS | MPD |
| SF-434 | 10/25/11 | 5195 | 2585 | 7 | 99.0 | 21.9 | QCL-2-3 | 101.7 | 20.2 | 97 | 1.7 | PASS | MPD |

Notes:
1. In situ values determined by nuclear methods: ASTM D-2922 for density and D-3017 for moisture content.
2. "PASS" indicates both a percent compaction exceeding the minimum required compaction (95% Max Dry Density) and a moisture content above the optimum moisture content.



Golder Associates

# PERIMETER ROAD FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| PR-01 | 12/07/11 | 1 | 99.6 | 16.2 | QCL-2-3 | 101.7 | 20.2 | 97.9 | -4.0 | PASS | SAB |
| PR-02 | 12/07/11 | 1 | 102.4 | 15.7 | QCL-2-3 | 101.7 | 20.2 | 100.7 | -4.5 | PASS | SAB |
| PR-03 | 12/07/11 | 1 | 101.7 | 16.7 | QCL-2-3 | 101.7 | 20.2 | 100.0 | -3.5 | PASS | SAB |
| PR-04 | 12/07/11 | 1 | 101.3 | 14.5 | QCL-2-3 | 101.7 | 20.2 | 99.6 | -5.7 | PASS | SAB |
| PR-05 | 12/07/11 | 1 | 102.8 | 12,6 | QCL-2-3 | 101.7 | 20.2 | 101.1 | -7.6 | PASS | SAB |
| PR-06 | 12/07/11 | 1 | 100.3 | 13.2 | QCL-2-3 | 101.7 | 20.2 | 98.6 | -7.0 | PASS | SAB |
| PR-07 | 12/08/11 | 1 | 103.1 | 12.1 | QCL-2-3 | 101.7 | 20.2 | 101.4 | -8.1 | PASS | SAB |
| PR-08 | 12/08/11 | 1 | 102.6 | 14.5 | QCL-2-3 | 101.7 | 20.2 | 100.9 | -5.7 | PASS | SAB |

Notes:
1. In situ values determined by nuclear methods: ASTM D-2922 for density and D-3017 for moisture content.
2. "PASS" indicates a percent compaction exceeding the minimum required compaction (95% Max Dry Density).



Golder Associates

# APPENDIX D
# CLAY LINER FIELD MOISTURE/DENSITY TEST RESULTS

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-001 | 10/07/11 | 5690 | 2915 | 1 | 96.8 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 100 | 2.3 | PASS | MPD |
| CL-002 | 10/07/11 | 5750 | 2980 | 1 | 94.8 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.0 | PASS | MPD |
| CL-003 | 10/07/11 | 5665 | 3010 | 1 | 95.8 | 25.3 | QCL-2-4 | 96.7 | 22.0 | 99 | 3.3 | PASS | MPD |
| CL-004 | 10/07/11 | 5730 | 3080 | 1 | 95.8 | 24.5 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.5 | PASS | MPD |
| CL-005 | 10/07/11 | 5730 | 3175 | 1 | 95.7 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.0 | PASS | MPD |
| CL-006 | 10/07/11 | 5695 | 3205 | 1 | 97.8 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 101 | 2.7 | PASS | MPD |
| CL-007 | 10/07/11 | 5645 | 3245 | 1 | 96.5 | 23.5 | QCL-2-3 | 101.7 | 20.2 | 95 | 3.3 | PASS | MPD |
| CL-008 | 10/07/11 | 5595 | 3305 | 1 | 100.5 | 22.5 | QCL-2-3 | 101.7 | 20.2 | 99 | 2.3 | PASS | MPD |
| CL-009 | 10/07/11 | 5510 | 3215 | 1 | 99.1 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.7 | PASS | MPD |
| CL-010 | 10/07/11 | 5575 | 3180 | 1 | 98.1 | 22.8 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.6 | PASS | MPD |
| CL-011 | 10/07/11 | 5615 | 3115 | 1 | 97.2 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.0 | PASS | MPD |
| CL-012 | 10/07/11 | 5665 | 3095 | 1 | 99.3 | 22.6 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.4 | PASS | MPD |
| CL-013 | 10/07/11 | 5690 | 3015 | 1 | 98.2 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.0 | PASS | MPD |
| CL-014 | 10/07/11 | 5500 | 3085 | 1 | 96.5 | 23.0 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.8 | PASS | MPD |
| CL-015 | 10/07/11 | 5505 | 3160 | 1 | 104.6 | 20.4 | QCL-2-7 | 104.4 | 17.8 | 100 | 2.6 | PASS | MPD |
| CL-016 | 10/07/11 | 5460 | 3180 | 1 | 102.1 | 20.7 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.9 | PASS | MPD |
| CL-017 | 10/08/11 | 5375 | 3105 | 1 | 99.7 | 23.4 | QCL-2-3 | 101.7 | 20.2 | 98 | 3.2 | PASS | MPD |
| CL-018 | 10/08/11 | 5440 | 2670 | 1 | 93.4 | 25.2 | QCL-2-4 | 96.7 | 22.0 | 97 | 3.2 | PASS | MPD |
| CL-019 | 10/08/11 | 5600 | 2820 | 1 | 96.8 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 100 | 2.3 | PASS | MPD |
| CL-020 | 10/08/11 | 5555 | 2905 | 1 | 94.5 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.0 | PASS | MPD |
| CL-021 | 10/08/11 | 5515 | 2985 | 1 | 95.5 | 25.8 | QCL-2-4 | 96.7 | 22.0 | 99 | 3.8 | PASS | MPD |
| CL-022 | 10/08/11 | 5450 | 3000 | 1 | 99.4 | 23.1 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.9 | PASS | MPD |



Golder Associates

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-023 | 10/10/11 | 5475 | 2780 | 1 | 96.9 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 100 | 2.2 | PASS | MPD |
| CL-024 | 10/10/11 | 5470 | 2885 | 1 | 94.1 | 26.9 | QCL-2-4 | 96.7 | 22.0 | 97 | 4.9 | PASS | MPD |
| CL-025 | 10/10/11 | 5375 | 2890 | 1 | 93.7 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 97 | 2.0 | PASS | MPD |
| CL-026 | 10/10/11 | 5380 | 2980 | 1 | 94.7 | 26.9 | QCL-2-4 | 96.7 | 22.0 | 98 | 4.9 | PASS | MPD |
| CL-027 | 10/10/11 | 5285 | 2975 | 1 | 93.7 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 97 | 2.7 | PASS | MPD |
| CL-028 | 10/10/11 | 5310 | 3050 | 1 | 94.2 | 25.4 | QCL-2-4 | 96.7 | 22.0 | 97 | 3.4 | PASS | MPD |
| CL-029 | 10/10/11 | 5265 | 3035 | 1 | 94.8 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.2 | PASS | MPD |
| CL-030 | 10/10/11 | 5140 | 2920 | 1 | 93.9 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 97 | 3.7 | PASS | MPD |
| CL-031 | 10/10/11 | 5750 | 2900 | 1 | 96.4 | 24.6 | QCL-2-4 | 96.7 | 22.0 | 100 | 2.6 | PASS | MPD |
| CL-032 | 10/10/11 | 5250 | 2805 | 1 | 94.0 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 97 | 2.8 | PASS | MPD |
| CL-033 | 10/10/11 | 5375 | 2800 | 1 | 93.5 | 25.3 | QCL-2-4 | 96.7 | 22.0 | 97 | 3.3 | PASS | MPD |
| CL-034 | 10/10/11 | 5320 | 2700 | 1 | 95.0 | 24.9 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.9 | PASS | MPD |
| CL-035 | 10/10/11 | 5430 | 2710 | 1 | 96.1 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.0 | PASS | MPD |
| CL-036 | 10/11/11 | 5040 | 2850 | 1 | 94.2 | 25.9 | QCL-2-4 | 96.7 | 22.0 | 97 | 3.9 | PASS | MPD |
| CL-037 | 10/11/11 | 5130 | 2830 | 1 | 93.3 | 25.3 | QCL-2-4 | 96.7 | 22.0 | 96 | 3.3 | PASS | MPD |
| CL-038 | 10/11/11 | 5150 | 2735 | 1 | 92.6 | 26.5 | QCL-2-4 | 96.7 | 22.0 | 96 | 4.5 | PASS | MPD |
| CL-039 | 10/11/11 | 5260 | 2710 | 1 | 94.8 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.1 | PASS | MPD |
| CL-040 | 10/11/11 | 5270 | 2630 | 1 | 95.2 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 98 | 3.7 | PASS | MPD |
| CL-041 | 10/11/11 | 5355 | 2590 | 1 | 94.0 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 97 | 4.4 | PASS | MPD |
| CL-042 | 10/11/11 | 5095 | 2665 | 1 | 92.7 | 25.1 | QCL-2-4 | 96.7 | 22.0 | 96 | 3.1 | PASS | MPD |
| CL-043 | 10/11/11 | 5050 | 2730 | 1 | 96.3 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 100 | 2.8 | PASS | MPD |
| CL-044 | 10/11/11 | 4955 | 2760 | 1 | 93.0 | 25.8 | QCL-2-4 | 96.7 | 22.0 | 96 | 3.8 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-045 | 10/11/11 | 4895 | 2710 | 1 | 92.5 | 25.6 | QCL-2-4 | 96.7 | 22.0 | 96 | 3.6 | PASS | MPD |
| CL-046 | 10/11/11 | 4885 | 2655 | 1 | 95.7 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.1 | PASS | MPD |
| CL-047 | 10/11/11 | 4945 | 2640 | 1 | 96.1 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.0 | PASS | MPD |
| CL-048 | 10/13/11 | 5525 | 3290 | 2 | 92.4 | 25.4 | QCL-2-4 | 96.7 | 22.0 | 96 | 3.4 | PASS | MPD |
| CL-049 | 10/13/11 | 5650 | 3280 | 2 | 93.4 | 25.2 | QCL-2-4 | 96.7 | 22.0 | 97 | 3.2 | PASS | MPD |
| CL-050 | 10/13/11 | 5640 | 3170 | 2 | 92.1 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 95 | 2.1 | PASS | MPD |
| CL-051 | 10/13/11 | 5750 | 3160 | 2 | 93.8 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 97 | 2.8 | PASS | MPD |
| CL-052 | 10/13/11 | 5745 | 3030 | 2 | 95.7 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.4 | PASS | MPD |
| CL-053 | 10/13/11 | 5740 | 3040 | 2 | 100.8 | 22.5 | QCL-2-3 | 101.7 | 20.2 | 99 | 2.3 | PASS | MPD |
| CL-054 | 10/13/11 | 5680 | 2950 | 2 | 98.7 | 23.3 | QCL-2-3 | 101.7 | 20.2 | 97 | 3.1 | PASS | MPD |
| CL-055 | 10/13/11 | 5690 | 3020 | 2 | 92.6 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 96 | 2.4 | PASS | MPD |
| CL-056 | 10/13/11 | 5610 | 3015 | 2 | 93.9 | 24.9 | QCL-2-4 | 96.7 | 22.0 | 97 | 2.9 | PASS | MPD |
| CL-057 | 10/13/11 | 5530 | 3090 | 2 | 97.6 | 25.1 | QCL-2-4 | 96.7 | 22.0 | 101 | 3.1 | PASS | MPD |
| CL-058 | 10/13/11 | 5575 | 3170 | 2 | 96.9 | 22.4 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.2 | PASS | MPD |
| CL-059 | 10/13/11 | 5470 | 3165 | 2 | 96.6 | 23.4 | QCL-2-3 | 101.7 | 20.2 | 95 | 3.2 | PASS | MPD |
| CL-060 | 10/13/11 | 5450 | 3220 | 2 | 97.5 | 22.5 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.3 | PASS | MPD |
| CL-061 | 10/13/11 | 5375 | 3110 | 2 | 95.3 | 24.5 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.5 | PASS | MPD |
| CL-062 | 10/13/11 | 5480 | 3035 | 2 | 101.4 | 20.9 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.1 | PASS | MPD |
| CL-063 | 10/13/11 | 5460 | 2980 | 2 | 101.4 | 20.2 | QCL-2-7 | 104.4 | 17.8 | 97 | 2.4 | PASS | MPD |
| CL-064 | 10/13/11 | 5550 | 2970 | 2 | 103.4 | 20.2 | QCL-2-7 | 104.4 | 17.8 | 99 | 2.4 | PASS | MPD |
| CL-065 | 10/13/11 | 5595 | 2915 | 2 | 102.6 | 20.7 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.9 | PASS | MPD |
| CL-066 | 10/13/11 | 5585 | 2820 | 2 | 99.2 | 20.8 | QCL-2-7 | 104.4 | 17.8 | 95 | 3.0 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-067 | 10/13/11 | 5495 | 2750 | 2 | 101.3 | 20.6 | QCL-2-7 | 104.4 | 17.8 | 97 | 2.8 | PASS | MPD |
| CL-068 | 10/13/11 | 5505 | 2810 | 2 | 102.9 | 20.8 | QCL-2-7 | 104.4 | 17.8 | 99 | 3.0 | PASS | MPD |
| CL-069 | 10/13/11 | 5405 | 2825 | 2 | 99.0 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.0 | PASS | MPD |
| CL-070 | 10/13/11 | 5410 | 2925 | 2 | 99.9 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.0 | PASS | MPD |
| CL-071 | 10/13/11 | 5325 | 2920 | 2 | 98.0 | 22.6 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.4 | PASS | MPD |
| CL-072 | 10/13/11 | 5330 | 3015 | 2 | 96.9 | 22.4 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.2 | PASS | MPD |
| CL-073 | 10/13/11 | 5220 | 3020 | 2 | 98.7 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.1 | PASS | MPD |
| CL-074 | 10/13/11 | 5180 | 2940 | 2 | 100.4 | 21.0 | QCL-2-7 | 104.4 | 17.8 | 96 | 3.2 | PASS | MPD |
| CL-075 | 10/13/11 | 5235 | 2930 | 2 | 100.3 | 20.3 | QCL-2-7 | 104.4 | 17.8 | 96 | 2.5 | PASS | MPD |
| CL-076 | 10/13/11 | 5250 | 2825 | 2 | 99.5 | 20.5 | QCL-2-7 | 104.4 | 17.8 | 95 | 2.7 | PASS | MPD |
| CL-077 | 10/13/11 | 5325 | 2825 | 2 | 101.0 | 20.7 | QCL-2-7 | 104.4 | 17.8 | 97 | 2.9 | PASS | MPD |
| CL-078 | 10/13/11 | 5320 | 2775 | 2 | 93.0 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 96 | 2.1 | PASS | MPD |
| CL-079 | 10/13/11 | 5375 | 2730 | 2 | 97.3 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 101 | 2.3 | PASS | MPD |
| CL-080 | 10/13/11 | 5415 | 2725 | 2 | 95.4 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.2 | PASS | MPD |
| CL-081 | 10/13/11 | 5400 | 2695 | 2 | 98.4 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.0 | PASS | MPD |
| CL-082 | 10/13/11 | 5360 | 2630 | 2 | 98.4 | 23.7 | QCL-2-3 | 101.7 | 20.2 | 97 | 3.5 | PASS | MPD |
| CL-083 | 10/13/11 | 5300 | 2585 | 2 | 100.8 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 99 | 2.1 | PASS | MPD |
| CL-084 | 10/13/11 | 5300 | 2670 | 2 | 94.6 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.0 | PASS | MPD |
| CL-085 | 10/13/11 | 5225 | 2670 | 2 | 96.2 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.2 | PASS | MPD |
| CL-086 | 10/13/11 | 5205 | 2770 | 2 | 95.7 | 25.9 | QCL-2-4 | 96.7 | 22.0 | 99 | 3.9 | PASS | MPD |
| CL-087 | 10/13/11 | 5130 | 2765 | 2 | 97.5 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 101 | 2.1 | PASS | MPD |
| CL-088 | 10/13/11 | 5120 | 2865 | 2 | 95.9 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.7 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-089 | 10/13/11 | 4985 | 2790 | 2 | 97.1 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 100 | 2.1 | PASS | MPD |
| CL-090 | 10/13/11 | 5060 | 2850 | 2 | 97.2 | 22.6 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.4 | PASS | MPD |
| CL-091 | 10/13/11 | 5095 | 2615 | 2 | 97.7 | 22.7 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.5 | PASS | MPD |
| CL-092 | 10/13/11 | 5080 | 2725 | 2 | 97.2 | 23.4 | QCL-2-3 | 101.7 | 20.2 | 96 | 3.2 | PASS | MPD |
| CL-093 | 10/13/11 | 4940 | 2635 | 2 | 97.9 | 22.8 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.6 | PASS | MPD |
| CL-094 | 10/13/11 | 4870 | 2710 | 2 | 101.7 | 22.4 | QCL-2-3 | 101.7 | 20.2 | 100 | 2.2 | PASS | MPD |
| CL-095 | 10/15/11 | 5785 | 3020 | 3 | 96.5 | 23.0 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.8 | PASS | MPD |
| CL-096 | 10/15/11 | 5780 | 3160 | 3 | 97.9 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.0 | PASS | MPD |
| CL-097 | 10/15/11 | 5690 | 3125 | 3 | 98.0 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.1 | PASS | MPD |
| CL-098 | 10/15/11 | 5695 | 3250 | 3 | 98.9 | 22.8 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.6 | PASS | MPD |
| CL-099 | 10/15/11 | 5620 | 3315 | 3 | 97.4 | 23.5 | QCL-2-3 | 101.7 | 20.2 | 96 | 3.3 | PASS | MPD |
| CL-100 | 10/15/11 | 5570 | 3270 | 3 | 99.3 | 19.8 | QCL-2-7 | 104.4 | 17.8 | 95 | 2.0 | PASS | MPD |
| CL-101 | 10/15/11 | 5470 | 3260 | 3 | 102.2 | 20.9 | QCL-2-7 | 104.4 | 17.8 | 98 | 3.1 | PASS | MPD |
| CL-102 | 10/15/11 | 5465 | 3165 | 3 | 101.3 | 21.0 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.2 | PASS | MPD |
| CL-103 | 10/15/11 | 5570 | 3150 | 3 | 103.6 | 19.9 | QCL-2-7 | 104.4 | 17.8 | 99 | 2.1 | PASS | MPD |
| CL-104 | 10/15/11 | 5550 | 3075 | 3 | 102.4 | 20.4 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.6 | PASS | MPD |
| CL-105 | 10/15/11 | 5605 | 3005 | 3 | 99.1 | 20.9 | QCL-2-7 | 104.4 | 17.8 | 95 | 3.1 | PASS | MPD |
| CL-106 | 10/15/11 | 5705 | 3010 | 3 | 96.1 | 23.7 | QCL-2-3 | 101.7 | 20.2 | 94 | 3.5 | PASS | MPD |
| CL-107 | 10/15/11 | 5765 | 2970 | 3 | 100.9 | 22.4 | QCL-2-3 | 101.7 | 20.2 | 99 | 2.2 | PASS | MPD |
| CL-108 | 10/15/11 | 5685 | 2905 | 3 | 99.0 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.0 | PASS | MPD |
| CL-109 | 10/15/11 | 5650 | 2850 | 3 | 97.8 | 22.8 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.6 | PASS | MPD |
| CL-110 | 10/15/11 | 5590 | 2805 | 3 | 99.4 | 20.8 | QCL-2-7 | 104.4 | 17.8 | 95 | 3.0 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-111 | 10/15/11 | 5610 | 2910 | 3 | 100.3 | 21.5 | QCL-2-7 | 104.4 | 17.8 | 96 | 3.7 | PASS | MPD |
| CL-112 | 10/15/11 | 5560 | 2910 | 3 | 100.4 | 20.4 | QCL-2-7 | 104.4 | 17.8 | 96 | 2.6 | PASS | MPD |
| CL-113 | 10/15/11 | 5470 | 2950 | 3 | 98.2 | 23.1 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.9 | PASS | MPD |
| CL-114 | 10/15/11 | 5550 | 2995 | 3 | 98.4 | 22.7 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.5 | PASS | MPD |
| CL-115 | 10/15/11 | 5490 | 3050 | 3 | 98.0 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.7 | PASS | MPD |
| CL-116 | 10/15/11 | 5395 | 3070 | 3 | 99.5 | 22.4 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.2 | PASS | MPD |
| CL-117 | 10/15/11 | 5430 | 3110 | 3 | 99.1 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.0 | PASS | MPD |
| CL-118 | 10/15/11 | 5350 | 3110 | 3 | 97.3 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.7 | PASS | MPD |
| CL-119 | 10/18/11 | 5485 | 2745 | 3 | 100.3 | 20.6 | QCL-2-7 | 104.4 | 17.8 | 96 | 2.8 | PASS | MPD |
| CL-120 | 10/18/11 | 5525 | 2815 | 3 | 96.7 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.7 | PASS | MPD |
| CL-121 | 10/18/11 | 5395 | 2840 | 3 | 97.2 | 22.4 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.2 | PASS | MPD |
| CL-122 | 10/18/11 | 5440 | 2910 | 3 | 95.2 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.0 | PASS | MPD |
| CL-123 | 10/18/11 | 5365 | 2995 | 3 | 95.4 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.3 | PASS | MPD |
| CL-124 | 10/18/11 | 5305 | 3050 | 3 | 93.4 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 97 | 2.0 | PASS | MPD |
| CL-125 | 10/18/11 | 5245 | 3000 | 3 | 96.8 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.7 | PASS | MPD |
| CL-126 | 10/18/11 | 5310 | 2915 | 3 | 98.9 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.7 | PASS | MPD |
| CL-127 | 10/18/11 | 5390 | 2655 | 3 | 97.4 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.0 | PASS | MPD |
| CL-128 | 10/18/11 | 5385 | 2755 | 3 | 97.8 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.1 | PASS | MPD |
| CL-129 | 10/18/11 | 5235 | 2810 | 3 | 102.2 | 20.4 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.6 | PASS | MPD |
| CL-130 | 10/18/11 | 5225 | 2930 | 3 | 104.8 | 19.8 | QCL-2-7 | 104.4 | 17.8 | 100 | 2.0 | PASS | MPD |
| CL-131 | 10/18/11 | 5175 | 2825 | 3 | 101.8 | 19.9 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.1 | PASS | MPD |
| CL-132 | 10/18/11 | 5050 | 2820 | 3 | 99.0 | 20.9 | QCL-2-7 | 104.4 | 17.8 | 95 | 3.1 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-133 | 10/18/11 | 5000 | 2775 | 3 | 100.0 | 19.8 | QCL-2-7 | 104.4 | 17.8 | 96 | 2.0 | PASS | MPD |
| CL-134 | 10/18/11 | 4940 | 2720 | 3 | 102.9 | 21.4 | QCL-2-7 | 104.4 | 17.8 | 99 | 3.6 | PASS | MPD |
| CL-135 | 10/18/11 | 4815 | 2690 | 3 | 102.0 | 20.8 | QCL-2-7 | 104.4 | 17.8 | 98 | 3.0 | PASS | MPD |
| CL-136 | 10/18/11 | 5010 | 2650 | 3 | 102.9 | 19.8 | QCL-2-7 | 104.4 | 17.8 | 99 | 2.0 | PASS | MPD |
| CL-137 | 10/18/11 | 5110 | 2650 | 3 | 100.6 | 21.2 | QCL-2-7 | 104.4 | 17.8 | 96 | 3.4 | PASS | MPD |
| CL-138 | 10/18/11 | 5150 | 2725 | 3 | 101.5 | 21.5 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.7 | PASS | MPD |
| CL-139 | 10/18/11 | 5285 | 2700 | 3 | 99.7 | 21.1 | QCL-2-7 | 104.4 | 17.8 | 95 | 3.3 | PASS | MPD |
| CL-140 | 10/18/11 | 5280 | 2615 | 3 | 104.8 | 20.2 | QCL-2-7 | 104.4 | 17.8 | 100 | 2.4 | PASS | MPD |
| CL-141 | 10/18/11 | 5340 | 2570 | 3 | 97.7 | 23.7 | QCL-2-3 | 101.7 | 20.2 | 96 | 3.5 | PASS | MPD |
| CL-142 through CL-188[3] | | | | | | | | | | | | | MPD |
| CL-189 | 10/21/11 | 5110 | 2615 | 1 | 99.5 | 24.2 | QCL-2-3 | 101.7 | 20.2 | 98 | 4.0 | PASS | MPD |
| CL-190 | 10/21/11 | 4965 | 2611 | 1 | 98.4 | 22.8 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.6 | PASS | MPD |
| CL-191 | 10/21/11 | 4809 | 2628 | 1 | 99.4 | 24.0 | QCL-2-3 | 101.7 | 20.2 | 98 | 3.8 | PASS | MPD |
| CL-192 | 10/21/11 | 4906 | 2793 | 1 | 98.9 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.1 | PASS | MPD |
| CL-193 | 10/21/11 | 5000 | 2870 | 1 | 97.7 | 23.0 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.8 | PASS | MPD |
| CL-194 | 10/21/11 | 5075 | 2950 | 1 | 99.4 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.0 | PASS | MPD |
| CL-195 | 10/21/11 | 5209 | 3071 | 1 | 99.2 | 21.6 | QCL-2-7 | 104.4 | 17.8 | 95 | 3.8 | PASS | MPD |
| CL-196 | 10/21/11 | 5305 | 3150 | 1 | 101.7 | 21.4 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.6 | PASS | MPD |
| CL-197 | 10/21/11 | 5370 | 3220 | 1 | 99.3 | 21.2 | QCL-2-7 | 104.4 | 17.8 | 95 | 3.4 | PASS | MPD |
| CL-198 | 10/21/11 | 5490 | 3330 | 1 | 101.1 | 20.2 | QCL-2-7 | 104.4 | 17.8 | 97 | 2.4 | PASS | MPD |
| CL-199 | 10/21/11 | 5615 | 3385 | 1 | 100.1 | 20.6 | QCL-2-7 | 104.4 | 17.8 | 96 | 2.8 | PASS | MPD |
| CL-200 | 10/21/11 | 5690 | 3305 | 1 | 95.0 | 24.9 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.9 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-201 | 10/21/11 | 5756 | 3256 | 1 | 93.8 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 97 | 3.5 | PASS | MPD |
| CL-202 | 10/21/11 | 5790 | 3190 | 1 | 92.4 | 25.3 | QCL-2-4 | 96.7 | 22.0 | 96 | 3.3 | PASS | MPD |
| CL-203 | 10/21/11 | 5790 | 3090 | 1 | 98.6 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.7 | PASS | MPD |
| CL-204 | 10/21/11 | 5800 | 2955 | 1 | 96.8 | 23.2 | QCL-2-3 | 101.7 | 20.2 | 95 | 3.0 | PASS | MPD |
| CL-205 | 10/21/11 | 5700 | 2850 | 1 | 98.7 | 22.5 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.3 | PASS | MPD |
| CL-206 | 10/21/11 | 5600 | 2840 | 1 | 97.5 | 23.6 | QCL-2-3 | 101.7 | 20.2 | 96 | 3.4 | PASS | MPD |
| CL-207 | 10/21/11 | 5516 | 2660 | 1 | 99.2 | 20.8 | QCL-2-7 | 104.4 | 17.8 | 95 | 3.0 | PASS | MPD |
| CL-208 | 10/21/11 | 5420 | 2555 | 1 | 99.8 | 21.1 | QCL-2-7 | 104.4 | 17.8 | 96 | 3.3 | PASS | MPD |
| CL-209 | 10/21/11 | 5285 | 2530 | 1 | 99.5 | 20.6 | QCL-2-7 | 104.4 | 17.8 | 95 | 2.8 | PASS | MPD |
| CL-210 | 10/22/11 | 5100 | 2610 | 2 | 95.2 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.7 | PASS | MPD |
| CL-211 | 10/22/11 | 5010 | 2611 | 2 | 94.7 | 25.0 | QCL-2-4 | 96.7 | 22.0 | 98 | 3.0 | PASS | MPD |
| CL-212 | 10/22/11 | 4900 | 2611 | 2 | 96.5 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 100 | 2.0 | PASS | MPD |
| CL-213 | 10/22/11 | 4820 | 2715 | 2 | 95.2 | 24.6 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.6 | PASS | MPD |
| CL-214 | 10/22/11 | 4901 | 2793 | 2 | 93.7 | 25.4 | QCL-2-4 | 96.7 | 22.0 | 97 | 3.4 | PASS | MPD |
| CL-215 | 10/22/11 | 5015 | 2900 | 2 | 92.3 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 95 | 3.7 | PASS | MPD |
| CL-216 | 10/22/11 | 5700 | 2985 | 2 | 95.3 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.0 | PASS | MPD |
| CL-217 | 10/22/11 | 5250 | 3100 | 2 | 95.2 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.2 | PASS | MPD |
| CL-218 | 10/22/11 | 5350 | 3200 | 2 | 92.9 | 25.2 | QCL-2-4 | 96.7 | 22.0 | 96 | 3.2 | PASS | MPD |
| CL-219 | 10/22/11 | 5400 | 3270 | 2 | 96.4 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 100 | 3.5 | PASS | MPD |
| CL-220 | 10/22/11 | 5635 | 3370 | 2 | 99.3 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.1 | PASS | MPD |
| CL-221 | 10/22/11 | 5710 | 3310 | 2 | 96.5 | 23.0 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.8 | PASS | MPD |
| CL-222 | 10/22/11 | 5786 | 3211 | 2 | 97.6 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.0 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-223 | 10/22/11 | 5800 | 3115 | 2 | 97.9 | 22.5 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.3 | PASS | MPD |
| CL-224 | 10/22/11 | 5785 | 3065 | 2 | 92.3 | 26.0 | QCL-2-4 | 96.7 | 22.0 | 95 | 4.0 | PASS | MPD |
| CL-225 | 10/22/11 | 5800 | 2970 | 2 | 95.9 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.2 | PASS | MPD |
| CL-226 | 10/22/11 | 5694 | 2835 | 2 | 95.8 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.1 | PASS | MPD |
| CL-227 | 10/22/11 | 5600 | 2740 | 2 | 98.9 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.1 | PASS | MPD |
| CL-228 | 10/22/11 | 5500 | 2650 | 2 | 98.3 | 22.6 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.4 | PASS | MPD |
| CL-229 | 10/22/11 | 5400 | 2535 | 2 | 97.0 | 23.5 | QCL-2-3 | 101.7 | 20.2 | 95 | 3.3 | PASS | MPD |
| CL-230 | 10/22/11 | 5303 | 2514 | 2 | 101.4 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 100 | 2.0 | PASS | MPD |
| CL-231 | 10/24/11 | 5150 | 2611 | 3 | 98.1 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.1 | PASS | MPD |
| CL-232 | 10/24/11 | 5050 | 2611 | 3 | 97.9 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.1 | PASS | MPD |
| CL-233 | 10/24/11 | 4850 | 2612 | 3 | 99.0 | 23.0 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.8 | PASS | MPD |
| CL-234 | 10/24/11 | 4959 | 2844 | 3 | 100.6 | 22.5 | QCL-2-3 | 101.7 | 20.2 | 99 | 2.3 | PASS | MPD |
| CL-235 | 10/24/11 | 5100 | 2965 | 3 | 100.9 | 20.0 | QCL-2-7 | 104.4 | 17.8 | 97 | 2.2 | PASS | MPD |
| CL-236 | 10/24/11 | 5205 | 3050 | 3 | 99.4 | 21.2 | QCL-2-7 | 104.4 | 17.8 | 95 | 3.4 | PASS | MPD |
| CL-237 | 10/24/11 | 5360 | 3195 | 3 | 100.6 | 20.5 | QCL-2-7 | 104.4 | 17.8 | 96 | 2.7 | PASS | MPD |
| CL-238 | 10/24/11 | 5430 | 3290 | 3 | 98.6 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.0 | PASS | MPD |
| CL-239 | 10/24/11 | 5615 | 3355 | 3 | 97.0 | 22.5 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.3 | PASS | MPD |
| CL-240 | 10/24/11 | 5710 | 3295 | 3 | 101.2 | 21.4 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.6 | PASS | MPD |
| CL-241 | 10/24/11 | 5775 | 3210 | 3 | 102.3 | 19.8 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.0 | PASS | MPD |
| CL-242 | 10/24/11 | 5790 | 3050 | 3 | 100.8 | 21.4 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.6 | PASS | MPD |
| CL-243 | 10/24/11 | 5765 | 2920 | 3 | 98.4 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.7 | PASS | MPD |
| CL-244 | 10/24/11 | 5690 | 2850 | 3 | 97.5 | 23.2 | QCL-2-3 | 101.7 | 20.2 | 96 | 3.0 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-245 | 10/24/11 | 5610 | 2850 | 3 | 99.9 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.7 | PASS | MPD |
| CL-246 | 10/24/11 | 5560 | 2710 | 3 | 97.2 | 23.1 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.9 | PASS | MPD |
| CL-247 | 10/24/11 | 5495 | 2690 | 3 | 96.9 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.0 | PASS | MPD |
| CL-248 | 10/24/11 | 5435 | 2625 | 3 | 96.9 | 22.6 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.4 | PASS | MPD |
| CL-249 | 10/24/11 | 5385 | 2515 | 3 | 98.4 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.1 | PASS | MPD |
| CL-250 | 10/24/11 | 5303 | 2514 | 3 | 100.9 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 99 | 2.0 | PASS | MPD |
| CL-251 | 10/24/11 | 5270 | 2550 | 3 | 96.8 | 23.6 | QCL-2-3 | 101.7 | 20.2 | 95 | 3.4 | PASS | MPD |
| CL-252 through CL-272[3] | | | | | | | | | | | | | MPD |
| CL-273 | 10/26/11 | 5216 | 2598 | 1 | 99.3 | 20.7 | QCL-2-7 | 104.4 | 17.8 | 95 | 2.9 | PASS | MPD |
| CL-274 | 10/26/11 | 5190 | 2608 | 2 | 102.9 | 20.5 | QCL-2-7 | 104.4 | 17.8 | 99 | 2.7 | PASS | MPD |
| CL-275 | 10/26/11 | 5205 | 2605 | 3 | 100.9 | 21.2 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.4 | PASS | MPD |
| CL-276[3] | | | | | | | | | | | | | MPD |
| CL-277 | 10/29/11 | 4810 | 2710 | 1 | 93.2 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 96 | 2.2 | PASS | MPD |
| CL-278 | 10/29/11 | 5814 | 3034 | 1 | 93.7 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 97 | 2.0 | PASS | MPD |
| CL-279 | 10/29/11 | 5350 | 2490 | 1 | 95.2 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 98 | 2.8 | PASS | MPD |
| CL-280 | 10/29/11 | 5124 | 2995 | 2 | 97.0 | 22.7 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.5 | PASS | MPD |
| CL-281 | 10/29/11 | 5708 | 2862 | 2 | 97.6 | 22.8 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.6 | PASS | MPD |
| CL-282 | 10/29/11 | 5065 | 2612 | 2 | 98.4 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.7 | PASS | MPD |
| CL-283 | 10/29/11 | 5410 | 3273 | 3 | 99.8 | 20.8 | QCL-2-7 | 104.4 | 17.8 | 96 | 3.0 | PASS | MPD |
| CL-284 | 10/29/11 | 5506 | 2640 | 3 | 99.3 | 20.9 | QCL-2-7 | 104.4 | 17.8 | 95 | 3.1 | PASS | MPD |
| CL-285 | 10/29/11 | 4829 | 2615 | 3 | 100.7 | 20.3 | QCL-2-7 | 104.4 | 17.8 | 96 | 2.5 | PASS | MPD |
| CL-286 | 10/29/11 | 5706 | 3314 | 4 | 102.6 | 20.0 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.2 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-287 through CL-289[3] | | | | | | | | | | | | | MPD |
| CL-290 | 11/03/11 | 4960 | 2795 | 4 | 95.6 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 99 | 2.2 | PASS | MPD |
| CL-291 | 11/03/11 | 5080 | 2880 | 4 | 96.0 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 99 | 3.5 | PASS | MPD |
| CL-292 | 11/03/11 | 5785 | 2980 | 4 | 97.4 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 101 | 2.0 | PASS | MPD |
| CL-293 | 11/03/11 | 4925 | 2650 | 4 | 98.3 | 22.8 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.6 | PASS | MPD |
| CL-294 | 11/03/11 | 5030 | 2750 | 4 | 98.9 | 22.9 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.7 | PASS | MPD |
| CL-295 | 11/03/11 | 5700 | 2841 | 4 | 97.2 | 23.3 | QCL-2-3 | 101.7 | 20.2 | 96 | 3.1 | PASS | MPD |
| CL-296 | 11/03/11 | 5225 | 2910 | 4 | 99.4 | 23.7 | QCL-2-3 | 101.7 | 20.2 | 98 | 3.5 | PASS | MPD |
| CL-297 | 11/03/11 | 5270 | 2870 | 4 | 100.0 | 22.5 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.3 | PASS | MPD |
| CL-298 | 11/03/11 | 5626 | 2771 | 4 | 97.2 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.0 | PASS | MPD |
| CL-299 | 11/03/11 | 5055 | 2665 | 4 | 99.3 | 23.1 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.9 | PASS | MPD |
| CL-300 | 11/03/11 | 5175 | 2630 | 4 | 100.2 | 22.7 | QCL-2-3 | 101.7 | 20.2 | 99 | 2.5 | PASS | MPD |
| CL-301 | 11/03/11 | 5220 | 2700 | 4 | 98.5 | 22.6 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.4 | PASS | MPD |
| CL-302 | 11/03/11 | 5310 | 2795 | 4 | 101.2 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 100 | 2.0 | PASS | MPD |
| CL-303 | 11/03/11 | 5360 | 2750 | 4 | 98.3 | 22.6 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.4 | PASS | MPD |
| CL-304 | 11/03/11 | 5270 | 2640 | 4 | 99.4 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 98 | 2.0 | PASS | MPD |
| CL-305 | 11/03/11 | 5410 | 2690 | 4 | 100.6 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 99 | 2.0 | PASS | MPD |
| CL-306 | 11/03/11 | 5320 | 2590 | 4 | 101.4 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 100 | 2.0 | PASS | MPD |
| CL-307 | 11/03/11 | 5095 | 2610 | 4 | 97.7 | 22.8 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.6 | PASS | MPD |
| CL-308 | 11/03/11 | 4965 | 2616 | 4 | 98.4 | 23.1 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.9 | PASS | MPD |
| CL-309 | 11/03/11 | 4896 | 2783 | 4 | 98.8 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.0 | PASS | MPD |
| CL-310 | 11/04/11 | 5520 | 2795 | 4 | 99.0 | 22.8 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.6 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-311 | 11/04/11 | 5610 | 2840 | 4 | 97.1 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 95 | 2.0 | PASS | MPD |
| CL-312 | 11/04/11 | 5500 | 2800 | 4 | 98.8 | 23.2 | QCL-2-3 | 101.7 | 20.2 | 97 | 3.0 | PASS | MPD |
| CL-313 | 11/04/11 | 5595 | 2940 | 4 | 100.3 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 99 | 2.1 | PASS | MPD |
| CL-314 | 11/04/11 | 5410 | 2825 | 4 | 101.3 | 21.3 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.5 | PASS | MPD |
| CL-315 | 11/04/11 | 5505 | 2910 | 4 | 103.1 | 20.9 | QCL-2-7 | 104.4 | 17.8 | 99 | 3.1 | PASS | MPD |
| CL-316 | 11/04/11 | 5510 | 2995 | 4 | 100.5 | 20.4 | QCL-2-7 | 104.4 | 17.8 | 96 | 2.6 | PASS | MPD |
| CL-317 | 11/04/11 | 5420 | 2905 | 4 | 102.2 | 21.3 | QCL-2-7 | 104.4 | 17.8 | 98 | 3.5 | PASS | MPD |
| CL-318 | 11/04/11 | 5330 | 2920 | 4 | 100.9 | 21.5 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.7 | PASS | MPD |
| CL-319 | 11/04/11 | 5315 | 2990 | 4 | 100.8 | 21.7 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.9 | PASS | MPD |
| CL-320 | 11/04/11 | 5275 | 3045 | 4 | 102.6 | 21.1 | QCL-2-7 | 104.4 | 17.8 | 98 | 3.3 | PASS | MPD |
| CL-321 | 11/04/11 | 5365 | 3131 | 4 | 100.0 | 20.1 | QCL-2-7 | 104.4 | 17.8 | 96 | 2.3 | PASS | MPD |
| CL-322 | 11/04/11 | 5410 | 3055 | 4 | 103.8 | 20.8 | QCL-2-7 | 104.4 | 17.8 | 99 | 3.0 | PASS | MPD |
| CL-323 | 11/04/11 | 5450 | 3020 | 4 | 101.1 | 19.9 | QCL-2-7 | 104.4 | 17.8 | 97 | 2.1 | PASS | MPD |
| CL-324 | 11/04/11 | 5310 | 3175 | 4 | 100.1 | 21.7 | QCL-2-7 | 104.4 | 17.8 | 96 | 3.9 | PASS | MPD |
| CL-325 | 11/04/11 | 5219 | 3077 | 4 | 102.0 | 21.4 | QCL-2-7 | 104.4 | 17.8 | 98 | 3.6 | PASS | MPD |
| CL-326 | 11/04/11 | 5124 | 2990 | 4 | 102.6 | 20.7 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.9 | PASS | MPD |
| CL-327 | 11/04/11 | 5007 | 2889 | 4 | 100.8 | 21.6 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.8 | PASS | MPD |
| CL-328 | 11/04/11 | 5395 | 3260 | 4 | 101.0 | 21.3 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.5 | PASS | MPD |
| CL-329 | 11/07/11 | 5480 | 2905 | 4 | 98.0 | 23.0 | QCL-2-3 | 101.7 | 20.2 | 96 | 2.8 | PASS | MPD |
| CL-330 | 11/07/11 | 5415 | 3000 | 4 | 96.9 | 23.2 | QCL-2-3 | 101.7 | 20.2 | 95 | 3.0 | PASS | MPD |
| CL-331 | 11/07/11 | 5505 | 3100 | 4 | 99.3 | 23.7 | QCL-2-3 | 101.7 | 20.2 | 98 | 3.5 | PASS | MPD |
| CL-332 | 11/07/11 | 5600 | 3189 | 4 | 103.0 | 20.7 | QCL-2-7 | 104.4 | 17.8 | 99 | 2.9 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-333 | 11/07/11 | 5679 | 3338 | 4 | 102.4 | 20.4 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.6 | PASS | MPD |
| CL-334 | 11/07/11 | 5670 | 2980 | 4 | 101.3 | 20.9 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.1 | PASS | MPD |
| CL-335 | 11/07/11 | 5580 | 3090 | 4 | 100.8 | 21.1 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.3 | PASS | MPD |
| CL-336 | 11/07/11 | 5760 | 3020 | 4 | 102.2 | 20.2 | QCL-2-7 | 104.4 | 17.8 | 98 | 2.4 | PASS | MPD |
| CL-337 | 11/07/11 | 5695 | 3100 | 4 | 101.1 | 21.6 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.8 | PASS | MPD |
| CL-338 | 11/07/11 | 5710 | 3165 | 4 | 101.7 | 20.7 | QCL-2-7 | 104.4 | 17.8 | 97 | 2.9 | PASS | MPD |
| CL-339 | 11/07/11 | 5600 | 3200 | 4 | 106.3 | 19.9 | QCL-2-7 | 104.4 | 17.8 | 102 | 2.1 | PASS | MPD |
| CL-340 | 11/07/11 | 5620 | 3275 | 4 | 101.4 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 100 | 2.0 | PASS | MPD |
| CL-341 | 11/07/11 | 5570 | 3330 | 4 | 99.0 | 22.6 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.4 | PASS | MPD |
| CL-342 | 11/07/11 | 5535 | 3280 | 4 | 98.3 | 23.2 | QCL-2-3 | 101.7 | 20.2 | 97 | 3.0 | PASS | MPD |
| CL-343 | 11/08/11 | 5571 | 3390 | 4 | 97.3 | 23.2 | QCL-2-3 | 101.7 | 20.2 | 96 | 3.0 | PASS | MPD |
| CL-344 | 11/08/11 | 5670 | 3343 | 4 | 97.6 | 23.9 | QCL-2-3 | 101.7 | 20.2 | 96 | 3.7 | PASS | MPD |
| CL-345 | 11/08/11 | 5750 | 3240 | 4 | 98.9 | 22.8 | QCL-2-3 | 101.7 | 20.2 | 97 | 2.6 | PASS | MPD |
| CL-346 | 11/08/11 | 5794 | 3084 | 4 | 101.7 | 22.2 | QCL-2-3 | 101.7 | 20.2 | 100 | 2.0 | PASS | MPD |
| CL-347 | 11/08/11 | 5785 | 2930 | 4 | 101.2 | 22.3 | QCL-2-3 | 101.7 | 20.2 | 100 | 2.1 | PASS | MPD |
| CL-348 | 11/08/11 | 5730 | 2885 | 4 | 101.0 | 21.2 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.4 | PASS | MPD |
| CL-349 | 11/08/11 | 5641 | 2780 | 4 | 101.3 | 20.9 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.1 | PASS | MPD |
| CL-350 | 11/09/11 | 5580 | 2715 | 4 | 100.0 | 21.0 | QCL-2-7 | 104.4 | 17.8 | 96 | 3.2 | PASS | MPD |
| CL-351 | 11/09/11 | 5491 | 2635 | 4 | 104.8 | 20.0 | QCL-2-7 | 104.4 | 17.8 | 100 | 2.2 | PASS | MPD |
| CL-352 | 11/09/11 | 5423 | 2557 | 4 | 101.9 | 21.1 | QCL-2-7 | 104.4 | 17.8 | 98 | 3.3 | PASS | MPD |
| CL-353 | 11/09/11 | 5365 | 2495 | 4 | 101.3 | 21.4 | QCL-2-7 | 104.4 | 17.8 | 97 | 3.6 | PASS | MPD |
| CL-354 | 11/09/11 | 5303 | 2514 | 4 | 99.6 | 20.6 | QCL-2-7 | 104.4 | 17.8 | 95 | 2.8 | PASS | MPD |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT POWER
## OAK GROVE SES
## FGD-B POND
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-355 | 11/09/11 | 5275 | 2565 | 4 | 104.1 | 20.4 | QCL-2-7 | 104.4 | 17.8 | 100 | 2.6 | PASS | MPD |
| CL-356 | 11/09/11 | 5210 | 2600 | 4 | 102.6 | 21.9 | QCL-2-7 | 104.4 | 17.8 | 98 | 4.1 | PASS | MPD |

Notes:
1. In situ values determined by nuclear methods: ASTM D-2922 for density and D-3017 for moisture content.
2. "PASS" indicates both a percent compaction exceeding the minimum required compaction (95% Max Dry Density) and a moisture content above the optimum moisture content.
3. Test numbers not applicable due to a total rework of Lift 4.

# DRIVE CYLINDER AND NUCLEAR GAUGE COMPARISON

## DRIVE CYLINDER AND NUCLEAR GAUGE COMPARISON

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-001 | Test Number: | CL-001 |
| Wet Density: | 122.4 | Wet Density: | 120.3 |
| Percent Moisture: | 25.4 | Percent Moisture: | 24.3 |
| Dry Density: | 97.6 | Dry Density: | 96.8 |

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-020 | Test Number: | CL-020 |
| Wet Density: | 116.0 | Wet Density: | 117.2 |
| Percent Moisture: | 25 | Percent Moisture: | 24 |
| Dry Density: | 92.8 | Dry Density: | 94.5 |

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-023 | Test Number: | CL-023 |
| Wet Density: | 119.1 | Wet Density: | 120.3 |
| Percent Moisture: | 25.5 | Percent Moisture: | 24.2 |
| Dry Density: | 94.9 | Dry Density: | 96.9 |

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-036 | Test Number: | CL-036 |
| Wet Density: | 121.1 | Wet Density: | 118.6 |
| Percent Moisture: | 25.2 | Percent Moisture: | 25.9 |
| Dry Density: | 96.7 | Dry Density: | 94.2 |

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-189 | Test Number: | CL-189 |
| Wet Density: | 123.9 | Wet Density: | 123.6 |
| Percent Moisture: | 23.8 | Percent Moisture: | 24.2 |
| Dry Density: | 100.1 | Dry Density: | 99.5 |

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-210 | Test Number: | CL-210 |
| Wet Density: | 121.0 | Wet Density: | 118.7 |
| Percent Moisture: | 25 | Percent Moisture: | 24.7 |
| Dry Density: | 96.8 | Dry Density: | 95.2 |

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-231 | Test Number: | CL-231 |
| Wet Density: | 122.1 | Wet Density: | 120.0 |
| Percent Moisture: | 22 | Percent Moisture: | 22.3 |
| Dry Density: | 100.1 | Dry Density: | 98.1 |

# APPENDIX E
# CLAY LINER MOISTURE CONTENTS

## LABORATORY AND FIELD MOISTURE CONTENT COMPARISON

| TEST NO. | LABORATORY MOISTURE CONTENT (%) | FIELD MOISTURE CONTENT (%) | DIFFERENCE |
|---|---|---|---|
| CL-001 | 25.4 | 24.3 | 1.1 |
| CL-019 | 25.8 | 24.3 | 1.5 |
| CL-020 | 25.0 | 24.0 | 1.0 |
| CL-023 | 25.5 | 24.2 | 1.3 |
| CL-025 | 23.5 | 24.0 | -0.5 |
| CL-036 | 25.2 | 25.9 | -0.7 |
| CL-038 | 26.2 | 24.5 | 1.7 |
| CL-143 | 24.4 | 24.0 | 0.4 |
| CL-189 | 23.8 | 24.2 | -0.4 |
| CL-191 | 23.6 | 24.0 | -0.4 |
| CL-211 | 26.6 | 25.0 | 1.6 |
| CL-210 | 25.0 | 24.7 | 0.3 |
| CL-231 | 22.0 | 22.3 | -0.3 |
| CL-233 | 23.1 | 22.3 | 0.8 |

# APPENDIX F
# GEOMEMBRANE MATERIAL INVENTORY

POLY-FLEX, INC.

Material Pre-Certification List

1475622

| | | | |
|---|---|---|---|
| Date: | 9/9/2011 | Material Type: | 60HDT Short |
| Project Number: | 310750 | Material Quantity: | 72 |
| Customer/Project: | Luminant FGD | Completed by: | CM |

| # | Blend | Roll Number | Weight | Roll Description |
|---|---|---|---|---|
| 1 | 8240229 | GR - 6 - 05 - 0243 - X | 2,318 | 23' X 300' X .060HDT Short |
| 2 | 8161498 | GR - 6 - 06 - 1073 - X | 3,885 | 23' X 450' X .060HDT Short |
| 3 | 8161515 | GR - 6 - 06 - 1247 - X | 2,440 | 23' X 305' X .060HDT Short |
| 4 | 8161516 | GR - 6 - 06 - 1250 - X | 2,591 | 23' X 320' X .060HDT Short |
| 5 | 8161516 | GR - 6 - 06 - 1273 - X | 2,397 | 23' X 300' X .060HDT Short |
| 6 | 8151516 | GR - 6 - 06 - 1277 - X | 2,606 | 23' X 330' X .060HDT Short |
| 7 | 8240232 | GT - 6 - 04 - 1060 - X | 2,415 | 23' X 300' X .060HDT Short |
| 8 | 8241871 | GT - 6 - 05 - 0682 - X | 3,125 | 23' X 405' X .060HDT Short |
| 9 | 8241871 | GT - 6 - 05 - 0695 - X | 2,515 | 23' X 320' X .060HDT Short |
| 10 | 8250590 | GT - 6 - 05 - 2212 - X | 2,400 | 23' X 325' X .060HDT Short |
| 11 | 8260288 | GT - 6 - 06 - 0957 - X | 3,147 | 23' X 410' X .060HDT Short |
| 12 | 8270666 | HT0 - 6 - 07 - 4534 - 5 | 3,930 | 23' X 500' X .060HDT |
| 13 | 8270647 | HT1 - 6 - 07 - 4312 - X | 2,507 | 23' X 325' X .060HDT Short |
| 14 | 8270648 | HT1 - 6 - 07 - 4355 - X | 3,050 | 23' X 395' X .060HDT Short |
| 15 | 8280552 | HT1 - 6 - 08 - 1549 - X | 2,134 | 23' X 285' X .060HDT Short |
| 16 | 8280589 | HT1 - 6 - 08 - 4055 - X | 2,400 | 23' X 310' X .060HDT Short |
| 17 | C081230L01 | HT1 - 6 - 09 - 4083 - X | 2,534 | 23' X 326' X .060HDT Short |
| 18 | 8290035 | HT1 - 6 - 09 - 4371 - X | 2,660 | 23' X 320' X .060HDT Short |
| 19 | 8290035 | HT1 - 6 - 09 - 4374 - X | 2,448 | 23' X 300' X .060HDT Short |
| 20 | 8290045 | HT1 - 6 - 09 - 4447 - X | 2,892 | 23' X 370' X .060HDT Short |
| 21 | 8290047 | HT1 - 6 - 09 - 4553 - X | 2,808 | 23' X 360' X .060HDT Short |
| 22 | 8290047 | HT1 - 6 - 09 - 4554 - X | 2,792 | 23' X 360' X .060HDT Short |
| 23 | 8290047 | HT1 - 6 - 09 - 4568 - X | 2,326 | 23' X 300' X .060HDT Short |
| 24 | 8290042 | HT1 - 6 - 09 - 6329 - X | 2,904 | 23' X 360' X .060HDT Short |
| 25 | 8290042 | HT1 - 6 - 09 - 6346 - X | 3,233 | 23' X 400' X .060HDT Short |
| 26 | 8290306 | HT1 - 6 - 09 - 6602 - X | 3,140 | 23' X 400' X .060HDT Short |
| 27 | CL200402F2 | HT1 - 6 - 10 - 1005 - X | 2,190 | 23' X 287' X .060HDT Short |
| 28 | 8201312 | HT1 - 6 - 11 - 1161 - X | 2,210 | 23' X 290' X .060HDT Short |
| 29 | 8270677 | HT2 - 6 - 07 - 4070 - X | 3,002 | 23' X 380' X .060HDT Short |
| 30 | 8271044 | HT2 - 6 - 07 - 4152 - X | 3,240 | 23' X 427' X .060HDT Short |
| 31 | 8271145 | HT2 - 6 - 07 - 4212 - X | 3,356 | 23' X 430' X .060HDT Short |
| 32 | 8281004 | HT2 - 6 - 08 - 1353 - X | 2,892 | 23' X 280' X .060HDT Short |
| 33 | 8281004 | HT2 - 6 - 08 - 1359 - X | 2,332 | 23' X 300' X .060HDT Short |
| 34 | 8281217 | HT2 - 6 - 08 - 1597 - X | 2,165 | 23' X 290' X .060HDT Short |
| 35 | 8281219 | HT2 - 6 - 08 - 1657 - X | 2,160 | 23' X 285' X .060HDT Short |
| 36 | 8281221 | HT2 - 6 - 08 - 1757 - X | 2,097 | 23' X 280' X .060HDT Short |
| 37 | 8271795 | HT2 - 6 - 08 - 4061 - X | 2,672 | 23' X 350' X .060HDT Short |

| | | | | |
|---|---|---|---|---|
| 38 | 8271795 | HT2 - 6 - 08 - 4065 - X | 3,436 | 23' X 450' X .060HDT Short |
| 39 | 8280961 | HT2 - 6 - 08 - 4463 - X | 3,065 | 23' X 385' X .060HDT Short |
| 40 | 8281175 | HT2 - 6 - 08 - 4522 - X | 3,692 | 23' X 345' X .060HDT Short |
| 41 | C081226L03 | HT2 - 6 - 09 - 1087 - X | 2,185 | 23' X 285' X .060HDT Short |
| 42 | C081226L03 | HT2 - 6 - 09 - 1112 - X | 2,195 | 23' X 290' X .060HDT Short |
| 43 | C090101L04 | HT2 - 6 - 09 - 1266 - X | 2,250 | 23' X 295' X .060HDT Short |
| 44 | C081231L02 | HT2 - 6 - 09 - 1322 - X | 2,280 | 23' X 295' X .060HDT Short |
| 45 | C081231L02 | HT2 - 6 - 09 - 1324 - X | 2,260 | 23' X 295' X .060HDT Short |
| 46 | C081231L02 | HT2 - 6 - 09 - 1349 - X | 2,225 | 23' X 290' X .060HDT Short |
| 47 | C081231L02 | HT2 - 6 - 09 - 1351 - X | 2,195 | 23' X 285' X .060HDT Short |
| 48 | 8290036 | HT2 - 6 - 09 - 1492 - X | 2,285 | 23' X 300' X .060HDT Short |
| 49 | 8290021 | HT2 - 6 - 09 - 4018 - X | 2,206 | 23' X 284' X .060HDT Short |
| 50 | CL200608F2 | HT2 - 6 - 10 - 4002 - X | 2,920 | 23' X 365' X .060HDT Short |
| 51 | CL200608F2 | HT2 - 6 - 10 - 4008 - X | 2,420 | 23' X 315' X .060HDT Short |
| 52 | CL200608F2 | HT2 - 6 - 10 - 4009 - X | 2,330 | 23' X 300' X .060HDT Short |
| 53 | CL200608F2 | HT2 - 6 - 10 - 4011 - X | 3,067 | 23' X 420' X .060HDT Short |
| 54 | CL200608F2 | HT2 - 6 - 10 - 4020 - X | 3,305 | 23' X 455' X .060HDT Short |
| 55 | CL200608F2 | HT2 - 6 - 10 - 4030 - X | 2,839 | 23' X 390' X .060HDT Short |
| 56 | CL200608F2 | HT2 - 6 - 10 - 4042 - X | 3,378 | 23' X 465' X .060HDT Short |
| 57 | CL200608F2 | HT2 - 6 - 10 - 4052 - X | 3,685 | 23' X 470' X .060HDT Short |
| 58 | CL200608F2 | HT2 - 6 - 10 - 4062 - X | 3,350 | 23' X 460' X .060HDT Short |
| 59 | CL200406F2 | HT2 - 6 - 10 - 6021 - X | 3,105 | 23' X 390 X .060HDT Short |
| 60 | CL210404F3 | HT2 - 6 - 11 - 1083 - X | 2,280 | 23' X 295' X .060HDT Short |
| 61 | CL310514F2 | HT2 - 6 - 11 - 1121 - X | 3,050 | 23' X 400' X .060HDT Short |
| 62 | CL310514F2 | HT2 - 6 - 11 - 1126 - X | 2,535 | 23' X 340' X .060HDT Short |
| 63 | CL310515F2 | HT2 - 6 - 11 - 1185 - X | 3,080 | 23' X 405' X .060HDT Short |
| 64 | CL310515F2 | HT2 - 6 - 11 - 1198 - X | 3,160 | 23' X 420' X .060HDT Short |
| 65 | CL310515F2 | HT2 - 6 - 11 - 1212 - X | 2,285 | 23' X 300' X .060HDT Short |
| 66 | 8210061 | HT2 - 6 - 11 - 4005 - X | 2,615 | 23' X 335' X .060HDT Short |
| 67 | 8210061 | HT2 - 6 - 11 - 4034 - X | 3,126 | 23' X 395' X .060HDT Short |
| 68 | CL210405F1 | HT2 - 6 - 11 - 4053 - X | 3,620 | 23' X 475' X .060HDT Short |
| 69 | CL210405F1 | HT2 - 6 - 11 - 4075 - X | 3,160 | 23' X 410' X .060HDT Short |
| 70 | CL310515F2 | HT2 - 6 - 11 - 4123 - X | 2,910 | 23' X 375' X .060HDT Short |
| 71 | CL310515F2 | HT2 - 6 - 11 - 4130 - X | 3,190 | 23' X 410' X .060HDT Short |
| 72 | CL310515F2 | HT2 - 6 - 11 - 4142 - X | 2,260 | 23' X 290' X .060HDT Short |

# APPENDIX G
# GEOMEMBRANE RESIN AND ROLL QUALITY CONTROL DOCUMENTS

# CERTIFICATION SHEET

DATE: September 13, 2011

**POLY-FLEX, INC.**
2000 W. Marshall Drive
Grand Prairie, Texas 75051

PROJECT NO: 310750
ORDER NO: Pre-Cert
TRIP NO: Pre-Cert
CERTIFIED BY:

| TEST DESCRIPTION | | THICKNESS | CARBON BLACK | TEAR | PUNCTURE | TENSILE @ YIELD | ELONG @ YIELD | TENSILE @ BREAK | ELONG @ BREAK | CAR. BLK. DISPERSION | DENSITY | NCTL | OXIDATIVE INDUCTION TIME | ASPERITY HEIGHT | OVEN AGING | UV RESISTANCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM METHOD | | D5994 | D1603 | D1004 | D4833 | D6693 | D6693 | D6693 | D6693 | D5596 | D1505 | D5397 | D3895 | GM12 | D3895 | D5885 |
| (modifications) | | min/avg | | | | | | | | | | App. | | | | |
| UNITS | | mils | % | lb | lb | ppi | % | ppi | % | | g/cc | hrs | min. | mils | % | % |
| SPECIFICATION | | 51/57 | 2.0-3.0 | 42 | 90 | 126 | 12 | 90 | 100 | Cat 1or2 | 0.940 | 300 | 100 | 10 | 55 | 50 |
| ROLL NUMBER | BLEND | | | | | | | | | | | | | | | |
| GR-6-05 243-X | 8240229 | 54 / 68 | 2.8 | 52 | 144 | 154 | 17 | 185 | 531 | 1 | 0.947 | Pass | 160 | 24 / 21 | 58 | 70 |
| GT-6-04 1060-X | 8240232 | 54 / 71 | 2.7 | 51 | 148 | 166 | 16 | 145 | 309 | 1 | 0.947 | Pass | 160 | 28 / 28 | 58 | 70 |
| GT-6-05 2212-X | 8250590 | 57 / 65 | 2.7 | 54 | 148 | 161 | 19 | 167 | 448 | 1 | 0.947 | Pass | 160 | 23 / 20 | 58 | 70 |
| GT-6-05 682-X | 8241871 | 62 / 68 | 2.8 | 55 | 145 | 177 | 17 | 180 | 473 | 1 | 0.948 | Pass | 160 | 26 / 24 | 58 | 70 |
| GT-6-05 695-X | 8241871 | 63 / 69 | 2.7 | 50 | 149 | 160 | 17 | 160 | 428 | 1 | 0.948 | Pass | 160 | 27 / 24 | 58 | 70 |

# CERTIFICATION SHEET

DATE: September 13, 2011

PROJECT NO: 310750

ORDER NO: Pre-Cert

TRIP NO: Pre-Cert

CERTIFIED BY:

**POLY-FLEX, INC.**
2000 W. Marshall Drive
Grand Prairie, Texas 75051

| TEST DESCRIPTION | | THICKNESS | CARBON BLACK | TEAR | PUNCTURE | TENSILE @ YIELD | ELONG @ YIELD | TENSILE @ BREAK | ELONG @ BREAK | CAR. BLK. DISPERSION | DENSITY | NCTL | OXIDATIVE INDUCTION TIME | ASPERITY HEIGHT | OVEN AGING | UV RESISTANCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM METHOD | | D5994 | D1603 | D1004 | D4833 | D6693 | D6693 | D6693 | D6693 | D5596 | D1505 | D5397 | D3895 | GM12 | D5885 | D5885 |
| (modifications) | | min/avg | | | | | | | | | | App. | | | | |
| UNITS | | mils | % | lb | lb | ppi | % | ppi | % | | g/cc | hrs | min. | mils | % | % |
| SPECIFICATION | | 51/57 | 2.0-3.0 | 42 | 90 | 126 | 12 | 90 | 100 | Cat 1or2 | 0.940 | 300 | 100 | 10 | 80 | 50 |
| ROLL NUMBER | BLEND | | | | | | | | | | | | | | | |
| GT-6-06 957-X | 8260288 | 58 / 68 | 2.7 | 51 | 156 | 164 | 17 | 177 | 546 | 1 | 0.949 | Pass | 160 | 27 / 25 | 85 | 77 |
| GR-6-06 1247-X | 8161515 | 58 / 60 | 2.4 | 53 | 142 | 164 | 18 | 197 | 554 | 1 | 0.947 | Pass | 194 | 21 / 21 | 85 | 77 |
| GR-6-06 1250-X | 8161516 | 57 / 60 | 2.7 | 49 | 134 | 161 | 16 | 183 | 546 | 1 | 0.947 | Pass | 198 | 21 / 21 | 85 | 77 |
| GR-6-06 1273-X | 8161516 | 57 / 60 | 2.7 | 50 | 142 | 158 | 19 | 159 | 451 | 1 | 0.947 | Pass | 199 | 21 / 21 | 85 | 77 |
| GR-6-06 1277-X | 8161516 | 58 / 60 | 2.5 | 51 | 141 | 163 | 18 | 165 | 482 | 1 | 0.947 | Pass | 199 | 21 / 21 | 85 | 77 |
| HT2-6-08 1353-X | 8281004 | 57 / 60 | 2.8 | 52 | 141 | 149 | 17 | 178 | 556 | 1 | 0.948 | Pass | 196 | 21 / 21 | 85 | 77 |
| HT2-6-08 1359-X | 8281004 | 57 / 60 | 2.7 | 53 | 138 | 155 | 18 | 168 | 485 | 1 | 0.948 | Pass | 196 | 20 / 21 | 85 | 77 |
| HT1-6-08 1549-X | 8280552 | 58 / 60 | 2.4 | 50 | 145 | 161 | 17 | 169 | 505 | 1 | 0.948 | Pass | 194 | 23 / 22 | 85 | 77 |
| HT2-6-08 1597-X | 8281217 | 57 / 60 | 2.7 | 52 | 140 | 163 | 19 | 158 | 469 | 1 | 0.948 | Pass | 190 | 21 / 21 | 85 | 77 |
| HT2-6-08 1657-X | 8281219 | 55 / 60 | 2.6 | 51 | 139 | 160 | 18 | 175 | 513 | 1 | 0.948 | Pass | 193 | 20 / 21 | 85 | 77 |
| HT2-6-08 1757-X | 8281221 | 56 / 60 | 2.8 | 51 | 145 | 159 | 16 | 183 | 576 | 1 | 0.948 | Pass | 194 | 22 / 21 | 85 | 77 |
| HT1-6-08 4055-X | 8280589 | 58 / 62 | 2.7 | 52 | 143 | 162 | 18 | 163 | 474 | 1 | 0.949 | Pass | 193 | 23 / 24 | 85 | 77 |
| HT2-6-07 4070-X | 8270677 | 57 / 60 | 2.5 | 53 | 149 | 162 | 19 | 179 | 529 | 1 | 0.947 | Pass | 195 | 21 / 21 | 85 | 77 |
| HT2-6-07 4152-X | 8271044 | 57 / 60 | 2.6 | 52 | 152 | 174 | 18 | 199 | 571 | 1 | 0.948 | Pass | 199 | 23 / 23 | 85 | 77 |
| HT2-6-07 4212-X | 8271145 | 55 / 60 | 2.4 | 54 | 147 | 169 | 17 | 189 | 564 | 1 | 0.947 | Pass | 196 | 19 / 20 | 85 | 77 |
| HT1-6-07 4312-X | 8270647 | 55 / 68 | 2.6 | 54 | 145 | 173 | 17 | 184 | 516 | 1 | 0.945 | Pass | 206 | 17 / 16 | 85 | 77 |
| HT1-6-07 4355-X | 8270648 | 54 / 68 | 2.6 | 52 | 145 | 166 | 18 | 177 | 531 | 1 | 0.948 | Pass | 198 | 23 / 22 | 85 | 77 |

# CERTIFICATION SHEET

DATE: September 13, 2011

PROJECT NO: 310750

ORDER NO: Pre-Cert

TRIP NO: Pre-Cert

CERTIFIED BY:


**POLY-FLEX, INC.**
2000 W. Marshall Drive
Grand Prairie, Texas 75051


| TEST DESCRIPTION | | THICKNESS | CARBON BLACK | TEAR | PUNCTURE | TENSILE @ YIELD | ELONG @ YIELD | TENSILE @ BREAK | ELONG @ BREAK | CAR. BLK. DISPERSION | DENSITY | NCTL | OXIDATIVE INDUCTION TIME | ASPERITY HEIGHT | OVEN AGING | UV RESISTANCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM METHOD | | D5994 | D1603 | D1004 | D4833 | D6693 | D6693 | D6693 | D6693 | D5596 | D1505 | D5397 | D3895 | GM12 | D5885 | D5885 |
| (modifications) | | min/avg | | | | | | | | | | App. | | | | |
| UNITS | | mils | % | lb | lb | ppi | % | ppi | % | | g/cc | hrs | min. | mils | % | % |
| SPECIFICATION | | 51/57 | 2.0-3.0 | 42 | 90 | 126 | 12 | 90 | 100 | Cat 1or2 | 0.940 | 300 | 100 | 10 | 80 | 50 |
| ROLL NUMBER | BLEND | | | | | | | | | | | | | | | |
| HT2-6-08 4463-X | 8280961 | 58 / 61 | 2.7 | 51 | 142 | 158 | 18 | 167 | 524 | 1 | 0.947 | Pass | 201 | 22 / 21 | 85 | 77 |
| HT2-6-08 4522-X | 8281175 | 57 / 60 | 2.7 | 54 | 142 | 171 | 16 | 185 | 530 | 1 | 0.948 | Pass | 191 | 21 / 21 | 85 | 77 |
| GR-6-06 1073-X | 8161498 | 56 / 60 | 2.5 | 50 | 142 | 162 | 17 | 160 | 369 | 1 | 0.947 | Pass | 194 | 21 / 21 | 85 | 77 |
| HT2-6-08 4061-X | 8271795 | 57 / 60 | 2.9 | 51 | 136 | 154 | 17 | 170 | 500 | 1 | 0.948 | Pass | 171 | 21 / 21 | 85 | 77 |
| HT2-6-08 4065-X | 8271795 | 58 / 60 | 2.7 | 52 | 140 | 156 | 19 | 187 | 580 | 1 | 0.948 | Pass | 180 | 21 / 22 | 85 | 77 |
| HT0-6-07 4534-5 | 8270666 | 58 / 61 | 2.5 | 50 | 144 | 161 | 18 | 152 | 346 | 1 | 0.947 | Pass | 202 | 26 / 22 | 85 | 77 |

# CERTIFICATION SHEET

DATE: September 13, 2011

PROJECT NO: 310750

ORDER NO: Pre-Cert

TRIP NO: Pre-Cert

CERTIFIED BY:


## POLY-FLEX, INC.

2000 W. Marshall Drive
Grand Prairie, Texas 75051


| TEST DESCRIPTION | | THICKNESS | CARBON BLACK | TEAR | PUNCTURE | TENSILE @ YIELD | ELONG @ YIELD | TENSILE @ BREAK | ELONG @ BREAK | CAR. BLK. DISPERSION | DENSITY | NCTL | OXIDATIVE INDUCTION TIME | ASPERITY HEIGHT | OVEN AGING | UV RESISTANCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM METHOD | | D5994 | D1603 | D1004 | D4833 | D6693 | D6693 | D6693 | D6693 | D5596 | D1505 | D5397 | D3895 | D7466 | D5885 | D5885 |
| (modifications) | | min/avg | | | | | | | | | | App. | | | | |
| UNITS | | mils | % | lb | lb | ppi | % | ppi | % | | g/cc | hrs | min. | mils | % | % |
| SPECIFICATION | | 51/57 | 2.0-3.0 | 42 | 90 | 126 | 12 | 90 | 100 | Cat 1or2 | 0.940 | 300 | 100 | 10 | 80 | 50 |
| ROLL NUMBER | BLEND | | | | | | | | | | | | | | | |
| HT2-6-10 6021-X | CL200406F2 | 57 / 61 | 2.5 | 53 | 139 | 156 | 18 | 160 | 478 | 1 | 0.945 | Pass | 145 | 22 / 22 | 85 | 77 |
| HT1-6-10 1005-X | CL200402F2 | 55 / 60 | 2.5 | 48 | 133 | 155 | 19 | 135 | 381 | 1 | 0.947 | Pass | 180 | 22 / 22 | 85 | 77 |
| HT2-6-11 1083-X | CL210404F3 | 55 / 60 | 2.7 | 51 | 143 | 155 | 18 | 168 | 516 | 1 | 0.947 | Pass | 200 | 21 / 21 | 85 | 77 |
| HT2-6-09 1087-X | C081226L03 | 57 / 60 | 2.4 | 50 | 137 | 156 | 18 | 172 | 555 | 1 | 0.946 | Pass | 144 | 20 / 21 | 85 | 77 |
| HT2-6-09 1112-X | C081226L03 | 57 / 60 | 2.4 | 51 | 137 | 152 | 17 | 179 | 578 | 1 | 0.947 | Pass | 144 | 21 / 21 | 85 | 77 |
| HT2-6-11 1121-X | CL310514F2 | 54 / 60 | 2.6 | 51 | 137 | 154 | 18 | 144 | 431 | 1 | 0.947 | Pass | 205 | 21 / 21 | 85 | 77 |
| HT2-6-11 1126-X | CL310514F2 | 54 / 60 | 2.7 | 53 | 144 | 167 | 18 | 153 | 409 | 1 | 0.947 | Pass | 205 | 21 / 21 | 85 | 77 |
| HT1-6-11 1161-X | 8201312 | 54 / 60 | 2.7 | 53 | 142 | 166 | 17 | 155 | 408 | 1 | 0.947 | Pass | 180 | 21 / 21 | 85 | 77 |
| HT2-6-11 1185-X | CL310515F2 | 54 / 60 | 2.7 | 50 | 141 | 154 | 18 | 168 | 532 | 1 | 0.947 | Pass | 120 | 21 / 21 | 85 | 77 |
| HT2-6-11 1198-X | CL310515F2 | 55 / 60 | 2.8 | 50 | 134 | 156 | 19 | 171 | 544 | 1 | 0.947 | Pass | 229 | 21 / 21 | 85 | 77 |
| HT2-6-11 1212-X | CL310515F2 | 54 / 60 | 2.4 | 53 | 131 | 163 | 20 | 169 | 489 | 1 | 0.947 | Pass | 200 | 21 / 21 | 85 | 77 |
| HT2-6-09 1266-X | C090101L04 | 55 / 61 | 2.2 | 50 | 150 | 155 | 18 | 192 | 607 | 1 | 0.947 | Pass | 139 | 22 / 21 | 85 | 77 |
| HT2-6-09 1322-X | C081231L02 | 55 / 61 | 2.4 | 50 | 133 | 154 | 17 | 163 | 535 | 1 | 0.947 | Pass | 157 | 21 / 22 | 85 | 77 |
| HT2-6-09 1324-X | C081231L02 | 55 / 61 | 2.5 | 51 | 131 | 153 | 18 | 161 | 483 | 1 | 0.947 | Pass | 157 | 20 / 21 | 85 | 77 |
| HT2-6-09 1349-X | C081231L02 | 55 / 61 | 2.5 | 55 | 141 | 151 | 16 | 166 | 537 | 1 | 0.946 | Pass | 142 | 21 / 22 | 85 | 77 |
| HT2-6-09 1351-X | C081231L02 | 54 / 60 | 2.3 | 53 | 133 | 162 | 15 | 153 | 471 | 1 | 0.946 | Pass | 142 | 20 / 20 | 85 | 77 |
| HT2-6-09 1492-X | 8290036 | 56 / 61 | 2.7 | 53 | 134 | 164 | 17 | 176 | 528 | 1 | 0.948 | Pass | 176 | 21 / 21 | 85 | 77 |

# CERTIFICATION SHEET

DATE: September 13, 2011

PROJECT NO: 310750

ORDER NO: Pre-Cert

TRIP NO: Pre-Cert

CERTIFIED BY:


## POLY-FLEX, INC.

2000 W. Marshall Drive

Grand Prairie, Texas 75051


| TEST DESCRIPTION | | THICKNESS | CARBON BLACK | TEAR | PUNCTURE | TENSILE @ YIELD | ELONG @ YIELD | TENSILE @ BREAK | ELONG @ BREAK | CAR. BLK. DISPERSION | DENSITY | NCTL | OXIDATIVE INDUCTION TIME | ASPERITY HEIGHT | OVEN AGING | UV RESISTANCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM METHOD | | D5994 | D1603 | D1004 | D4833 | D6693 | D6693 | D6693 | D6693 | D5596 | D1505 | D5397 | D3895 | D7466 | D5885 | D5885 |
| (modifications) | | min/avg | | | | | | | | | | App. | | | | |
| UNITS | | mils | % | lb | lb | ppi | % | ppi | % | | g/cc | hrs | min. | mils | % | % |
| SPECIFICATION | | 51/57 | 2.0-3.0 | 42 | 90 | 126 | 12 | 90 | 100 | Cat 1or2 | 0.940 | 300 | 100 | 10 | 80 | 50 |
| ROLL NUMBER | BLEND | | | | | | | | | | | | | | | |
| HT2-6-10 4002-X | CL200608F2 | 55 / 60 | 2.7 | 52 | 139 | 156 | 18 | 172 | 536 | 1 | 0.948 | Pass | 202 | 22 / 21 | 85 | 77 |
| HT2-6-11 4005-X | 8210061 | 56 / 60 | 2.0 | 50 | 144 | 168 | 18 | 171 | 458 | 1 | 0.946 | Pass | 186 | 21 / 21 | 85 | 77 |
| HT2-6-10 4008-X | CL200608F2 | 55 / 60 | 2.3 | 53 | 139 | 161 | 18 | 151 | 419 | 1 | 0.947 | Pass | 199 | 22 / 22 | 85 | 77 |
| HT2-6-10 4009-X | CL200608F2 | 55 / 60 | 2.3 | 49 | 138 | 151 | 19 | 162 | 526 | 1 | 0.947 | Pass | 199 | 20 / 21 | 85 | 77 |
| HT2-6-10 4011-X | CL200608F2 | 55 / 60 | 2.2 | 53 | 135 | 157 | 17 | 175 | 562 | 1 | 0.947 | Pass | 200 | 21 / 21 | 85 | 77 |
| HT2-6-09 4018-X | 8290021 | 58 / 60 | 2.6 | 52 | 141 | 163 | 19 | 177 | 483 | 1 | 0.949 | Pass | 191 | 21 / 21 | 85 | 77 |
| HT2-6-10 4020-X | CL200608F2 | 55 / 60 | 2.2 | 53 | 136 | 167 | 20 | 168 | 441 | 1 | 0.947 | Pass | 201 | 21 / 20 | 85 | 77 |
| HT2-6-10 4030-X | CL200608F2 | 55 / 60 | 2.3 | 55 | 141 | 171 | 20 | 175 | 532 | 1 | 0.947 | Pass | 193 | 21 / 21 | 85 | 77 |
| HT2-6-11 4034-X | 8210061 | 56 / 60 | 2.5 | 51 | 143 | 169 | 20 | 205 | 551 | 1 | 0.945 | Pass | 179 | 20 / 20 | 85 | 77 |
| HT2-6-10 4042-X | CL200608F2 | 55 / 60 | 2.4 | 54 | 140 | 165 | 19 | 186 | 557 | 1 | 0.947 | Pass | 196 | 22 / 21 | 85 | 77 |
| HT2-6-10 4052-X | CL200608F2 | 55 / 60 | 2.5 | 55 | 136 | 155 | 20 | 164 | 523 | 1 | 0.946 | Pass | 199 | 21 / 22 | 85 | 77 |
| HT2-6-11 4053-X | CL210405F1 | 55 / 60 | 2.7 | 51 | 143 | 150 | 18 | 161 | 494 | 1 | 0.947 | Pass | 227 | 21 / 21 | 85 | 77 |
| HT2-6-10 4062-X | CL200608F2 | 55 / 60 | 2.4 | 53 | 137 | 163 | 17 | 177 | 533 | 1 | 0.948 | Pass | 201 | 21 / 21 | 85 | 77 |
| HT2-6-11 4075-X | CL210405F1 | 54 / 60 | 2.4 | 50 | 147 | 159 | 19 | 160 | 482 | 1 | 0.947 | Pass | 229 | 21 / 21 | 85 | 77 |
| HT1-6-09 4083-X | C081230L01 | 55 / 60 | 2.4 | 53 | 138 | 153 | 18 | 190 | 573 | 1 | 0.947 | Pass | 141 | 21 / 21 | 85 | 77 |
| HT2-6-11 4123-X | CL310515F2 | 55 / 60 | 2.6 | 52 | 144 | 157 | 18 | 152 | 446 | 1 | 0.948 | Pass | 229 | 21 / 21 | 85 | 77 |
| HT2-6-11 4130-X | CL310515F2 | 57 / 61 | 2.4 | 53 | 145 | 165 | 18 | 167 | 484 | 1 | 0.947 | Pass | 240 | 21 / 21 | 85 | 77 |

# CERTIFICATION SHEET

DATE: September 13, 2011

PROJECT NO: 310750

ORDER NO: Pre-Cert

TRIP NO: Pre-Cert

CERTIFIED BY:


**POLY-FLEX, INC.**
2000 W. Marshall Drive
Grand Prairie, Texas 75051


| TEST DESCRIPTION | | THICKNESS | CARBON BLACK | TEAR | PUNCTURE | TENSILE @ YIELD | ELONG @ YIELD | TENSILE @ BREAK | ELONG @ BREAK | CAR. BLK. DISPERSION | DENSITY | NCTL | OXIDATIVE INDUCTION TIME | ASPERITY HEIGHT | OVEN AGING | UV RESISTANCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASTM METHOD | | D5994 | D1603 | D1004 | D4833 | D6693 | D6693 | D6693 | D6693 | D5596 | D1505 | D5397 | D3895 | D7466 | D5885 | D5885 |
| (modifications) | | min/avg | | | | | | | | | | App. | | | | |
| UNITS | | mils | % | lb | lb | ppi | % | ppi | % | | g/cc | hrs | min. | mils | % | % |
| SPECIFICATION | | 51/57 | 2.0-3.0 | 42 | 90 | 126 | 12 | 90 | 100 | Cat 1or2 | 0.940 | 300 | 100 | 10 | 80 | 50 |
| ROLL NUMBER | BLEND | | | | | | | | | | | | | | | |
| HT2-6-11 4142-X | CL310515F2 | 56 / 61 | 2.4 | 51 | 147 | 158 | 18 | 162 | 470 | 1 | 0.947 | Pass | 240 | 22 / 22 | 85 | 77 |
| HT1-6-09 4371-X | 8290035 | 60 / 62 | 2.3 | 55 | 142 | 163 | 18 | 189 | 537 | 1 | 0.946 | Pass | 180 | 21 / 20 | 85 | 77 |
| HT1-6-09 4374-X | 8290035 | 59 / 62 | 2.1 | 55 | 145 | 165 | 18 | 161 | 470 | 1 | 0.946 | Pass | 180 | 25 / 23 | 85 | 77 |
| HT1-6-09 4447-X | 8290045 | 56 / 60 | 2.5 | 51 | 134 | 165 | 18 | 148 | 409 | 1 | 0.947 | Pass | 188 | 21 / 21 | 85 | 77 |
| HT1-6-09 4553-X | 8290047 | 55 / 61 | 2.5 | 54 | 138 | 156 | 19 | 144 | 375 | 1 | 0.948 | Pass | 180 | 22 / 22 | 85 | 77 |
| HT1-6-09 4554-X | 8290047 | 54 / 61 | 2.7 | 54 | 133 | 155 | 18 | 187 | 580 | 1 | 0.948 | Pass | 180 | 21 / 21 | 85 | 77 |
| HT1-6-09 4568-X | 8290047 | 54 / 61 | 2.7 | 51 | 136 | 154 | 19 | 164 | 512 | 1 | 0.949 | Pass | 210 | 21 / 21 | 85 | 77 |
| HT1-6-09 6329-X | 8290042 | 60 / 62 | 2.1 | 57 | 154 | 176 | 18 | 178 | 466 | 1 | 0.949 | Pass | 190 | 21 / 23 | 85 | 77 |
| HT1-6-09 6346-X | 8290042 | 60 / 64 | 2.5 | 57 | 147 | 171 | 19 | 169 | 420 | 1 | 0.947 | Pass | 187 | 21 / 22 | 85 | 77 |
| HT1-6-09 6602-X | 8290306 | 57 / 61 | 2.7 | 56 | 148 | 166 | 17 | 180 | 517 | 1 | 0.949 | Pass | 202 | 22 / 22 | 85 | 77 |
| | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | |

CoA Date: 02/20/2004

# Certificate of Analysis

Shipped To: POLY AMERICA
2000 W. MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Dee Averitte
Fax: 1-972-337-7407

CPC Delivery #: 86565050
PO #: 167018
Weight: 179300 LB
Ship Date: 02/18/2004
Package: BULK
Mode: Hopper Car
Car #: CHVX891103
Seal No: 300803

Product:
MARLEX POLYETHYLENE K306 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours
(not tested on each lot)

Lot Number: 8240229

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.100 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.30 | g/10mi |
| Density | ASTM D1505 | 0.9380 | g/cm3 |

WAIVED BY ANTHYONY BATRAND OF POLY AMERICAN FOR TAILS

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Jackie Edwards
Certification Systems Specialist

For CoA questions contact Peter Scheirman at 713-289-4799

CoA Date: 12/04/2006

# Certificate of Analysis

Shipped To: POLY AMERICA
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax: 1-972-337-7407

CPC Delivery #: 87289272
PO #: 248832
Weight: 189200 LB
Ship Date: 12/04/2006
Package: BULK
Mode: Hopper Car
Car #: CHVX889329
Seal No: 209523

Product:
MARLEX POLYETHYLENE K306 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours
(not tested on each lot)

Lot Number: 8161498

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.2 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 13.70 | g/10mi |
| Density | ASTM D1505 | 0.9370 | g/cm3 |
| Production Date | | 11/21/2006 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Jackie Edwards
Certification Systems Specialist

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 01/12/2007

# Certificate of Analysis

| | |
|---|---|
| Shipped To: POLY AMERICA<br>2000 W MARSHALL<br>GRAND PRAIRIE TX 75051<br>USA | CPC Delivery #: 84203612<br>PO #: 248832<br>Weight: 9000 LB<br>Ship Date: 01/12/2007<br>Package: BULK |
| Recipient: Averitte<br>Fax: | Mode: Hopper Car<br>Car #: CHVX896005<br>Seal No: 209604 |

Product:
MARLEX POLYETHYLENE K306 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours
(not tested on each lot)

Lot Number: 8161515

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 13.00 | g/10mi |
| Density | ASTM D1505 | 0.9370 | g/cm3 |
| Production Date | | 11/24/2006 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP.
**However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Jackie Edwards
Certification Systems Specialist

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 12/07/2006

# Certificate of Analysis

Shipped To: POLY AMERICA
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax: 1-972-337-7407

CPC Delivery #: 87292244
PO #: 248832
Weight: 187300 LB
Ship Date: 12/07/2006
Package: BULK
Mode. Hopper Car
Car #: PSPX002138
Seal No: 209603

Product:
MARLEX POLYETHYLENE K306 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours
(not tested on each lot)

Lot Number: 8161516

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.60 | g/10mi |
| Density | ASTM D1505 | 0.9370 | g/cm3 |
| Production Date | | 11/25/2006 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Jackie Edwards
Certification Systems Specialist

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 02/20/2004

# Certificate of Analysis

Shipped To: POLY AMERICA
2000 W. MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Dee Averitte
Fax: 1-972-337-7407

CPC Delivery #: 86565825
PO #: 167018
Weight: 182600 LB
Ship Date: 02/19/2004
Package: BULK
Mode: Hopper Car
Car #: PLCX042553
Seal No: 300710

Product:
MARLEX POLYETHYLENE K308 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours
(not tested on each lot)

Lot Number: 8240232

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.080 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 12.40 | g/10ml |
| Density | ASTM D1505 | 0.9370 | g/cm3 |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Jackie Edwards
Certification Systems Specialist

For CoA questions contact Shari Ludl at 832-813-4554

FAXED

CoA Date: 03/16/2006

# Certificate of Analysis

Shipped To: POLY AMERICA
2000 W. MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Dee Averitte
Fax:

CPC Delivery #: 86849016
PO #: 197242
Weight: 185100 LB
Ship Date: 03/16/2006
Package: BULK
Mode: Hopper Car
Car #: PSPX002253
Seal No: 152115

Product:
MARLEX POLYETHYLENE K306 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours
(not tested on each lot)

Lot Number: 8241871

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 11.8 | g/10ml |
| Density | ASTM D1505 | 0.937 | g/cm3 |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Jackie Edwards
Certification Systems Specialist

For CoA questions contact Peter Scheirman at 713-289-4799

CoA Date: 05/26/2005

# Certificate of Analysis

Shipped To: POLY AMERICA
2000 W. MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Dee Averitte
Fax:

CPC Delivery #: 86898068
PO #: 201847
Weight: 178500 LB
Ship Date: 05/26/2005
Package: BULK
Mode: Hopper Car
Car #: GOCX058817
Seal No: 157970

Product:
MARLEX POLYETHYLENE K308 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours
(not tested on each lot)

Lot Number: 8250590

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 13.8 | g/10mi |
| Density | ASTM D1505 | 0.939 | g/cm3 |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Jackie Edwards
Certification Systems Specialist

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 03/03/2006

# Certificate of Analysis

Shipped To: POLY AMERICA
2000 W. MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87090490
PO #: 227096
Weight: 181300 LB
Ship Date: 03/02/2006
Package: BULK
Mode: Hopper Car
Car #: PSPX008109
Seal No: 188668

Product:
MARLEX POLYETHYLENE K308 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours
(not tested on each lot)

Lot Number: 8260288

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.40 | g/10mi |
| Density | ASTM D1505 | 0.9370 | g/cm3 |
| Production Date | | 02/20/2006 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Jackie Edwards
Certification Systems Specialist

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 05/29/2007

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87412719
PO #: 260641
Weight: 189200 LB
Ship Date: 05/29/2007
Package: BULK
Mode: Hopper Car
Car #: PSPX002450
Seal No: 227577

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: 8270666

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.10 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 11.1 | g/10ml |
| Density | ASTM D1505 | 0.936 | g/cm3 |
| Production Date | | 04/30/2007 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP.
**However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Paul S. Newbold
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 05/14/2007

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87402126
PO #: 260641
Weight: 185500 LB
Ship Date: 05/14/2007
Package: BULK
Mode: Hopper Car
Car #: GOCX058007
Seal No: 227791

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: 8270647

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.09 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 11.9 | g/10mi |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 04/26/2007 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP.
**However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Paul S. Newbold
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 05/14/2007

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87402127
PO #: 260641
Weight: 189500 LB
Ship Date: 05/14/2007
Package: BULK
Mode: Hopper Car
Car #: CHVX896566
Seal No: 227624

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: 8270648

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.09 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 11.8 | g/10mi |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 04/27/2007 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Paul S. Newbold
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 05/23/2008

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87659318
PO #: 288484
Weight: 191900 LB
Ship Date: 05/23/2008
Package: BULK
Mode: Hopper Car
Car #: CHVX898074
Seal No: 254958

Product:
MARLEX POLYETHYLENE K306 BULK

**Cust #.**
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8280552

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.10 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 12.3 | g/10ml |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 05/06/2008 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

Chevron Phillips

CoA Date: 05/15/2008

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87654613
PO #: 288464
Weight: 190300 LB
Ship Date: 05/15/2008
Package: BULK
Mode: Hopper Car
Car #: PSPX006451
Seal No: 254982

Product:
MARLEX POLYETHYLENE K306 BULK

**Cust # .**
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8280589

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.09 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 12.0 | g/10ml |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 05/12/2008 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

INEOS
Olefins & Polymers USA
A Division of INEOS USA LLC

# CERTIFICATE OF ANALYSIS

Selling Company:
INEOS Olefins & Polymers USA
A Division of INEOS USA LLC
2600 South Shore Blvd. Suite 500
LEAGUE CITY, Texas 77573
United States
Ship To:
POLY-AMERICA LP
2000 W MARSHALL DRIVE
GRAND PRAIRIE TX 75051
*Contact:* DEE AVERITTE
*Fax:*
Sold To:
POLY-AMERICA LP

| | |
|---|---|
| Delivery Doc Number/Item: | 80015860/000010 |
| Print Date / Time: | 12/30/2008/14:00:14 |
| Sales Order Number/Date: | 5119204/ 12/15/2008 |
| Customer PO Number/Date: | 306901/ |
| Shipment Date: | 12/30/2008 |
| Place of Despatch: | 2566 AJV Polyethylene Deer Park |
| Mode of Transport: | 0007 Rail w/o rnbol |
| Transport/Vehicle Number: | ELTX003038 |
| Net Weight: | 182,499.999 LB |



Product Description: G38-10-150 PE PELLETS - BULK
Batch Number: C081230L01

| Characteristic | Method | Result | Unit | Specifications Min | Max |
|---|---|---|---|---|---|
| MI 2.16 (1X) | ASTM D 1238 | 0.1380 | g/10mn | | |
| MI 21.6 (HLMI) | ASTM D 1238 | 12.20 | g/10mn | 10.50 | 14.50 |
| DENSITY (NATURAL) | ASTM D4883-03 | 0.9379 | G/CM3 | 0.9360 | 0.9390 |

APPROVED BY: Quality Assurance Manager.
This certifies that the INEOS Polyethylene meets our specifications for the grade.

THIS REPORT CANNOT BE COPIED OR REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF INEOS. RESULTS APPLY ONLY TO THE ITEMS TESTED. THIS DOCUMENT CONTAINS INFORMATION THAT MAY BE CONFIDENTIAL AND IS INTENDED ONLY FOR THE USE OF THE ADDRESSEE. USE OF THIS INFORMATION BY ANYONE ELSE IS STRICTLY PROHIBITED. IF YOU HAVE RECEIVED THIS IN ERROR, PLEASE NOTIFY US BY PHONE AT 1-800-527-5419.

Chevron Phillips Chemical Company LP

CoA Date: 04/23/2009

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87847432
PO #: 317695
Weight: 187800 LB
Ship Date: 04/23/2009
Package: BULK
Mode: Hopper Car
Car #: PSPX009087
Seal No: 261318

Product:
MARLEX POLYETHYLENE K306 BULK

Cust # .
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8290035

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.09 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 11.8 | g/10mi |
| Density | ASTM D1505 | 0.938 | g/cm3 |
| Production Date | | 04/15/2009 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4637

Chevron Phillips Chemical Company LP

CoA Date: 04/30/2009

# Certificate of Analysis

| | | |
|---|---|---|
| Shipped To: | POLY AMERICA: GP (GEO)<br>2000 W MARSHALL<br>GRAND PRAIRIE TX 75051<br>USA | CPC Delivery #: 87850547<br>PO #: 317695<br>Weight: 188500 LB<br>Ship Date: 04/30/2009<br>Package: BULK |
| Recipient: Averitte<br>Fax: | | Mode: Hopper Car<br>Car #: CHVX889489<br>Seal No: 261250 |

Product:
MARLEX POLYETHYLENE K306 BULK

Cust # .
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8290045

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.10 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.8 | g/10mi |
| Density | ASTM D1505 | 0.936 | g/cm3 |
| Production Date | | 04/17/2009 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4637

Chevron Phillips Chemical Company LP

CoA Date: 04/30/2009

# Certificate of Analysis

| | | | |
|---|---|---|---|
| Shipped To: | POLY AMERICA: GP (GEO)<br>2000 W MARSHALL<br>GRAND PRAIRIE TX 75051<br>USA | CPC Delivery #: 87850550<br>PO #: 317695<br>Weight: 190500 LB<br>Ship Date: 04/30/2009<br>Package: BULK<br>Mode: Hopper Car<br>Car #: CHVX898013<br>Seal No: 260412 |
| Recipient: Averitte<br>Fax: | | | |

Product:
MARLEX POLYETHYLENE K306 BULK

Cust # .
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8290047

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.11 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 12.9 | g/10ml |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 04/17/2009 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4637

Chevron Phillips Chemical Company LP

CoA Date: 04/23/2009

# Certificate of Analysis

| | | |
|---|---|---|
| Shipped To: | POLY AMERICA: GP (GEO)<br>2000 W MARSHALL<br>GRAND PRAIRIE TX 75051<br>USA | CPC Delivery #: 87847431<br>PO #: 317695<br>Weight: 187900 LB<br>Ship Date: 04/23/2009<br>Package: BULK |
| Recipient: Averitte<br>Fax: | | Mode: Hopper Car<br>Car #: CHVX890496<br>Seal No: 261245 |

Product:
MARLEX POLYETHYLENE K306 BULK

Cust # .
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8290042

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.07 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.2 | g/10mi |
| Density | ASTM D1505 | 0.936 | g/cm3 |
| Production Date | | 04/16/2009 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4637

Chevron Phillips Chemical Company LP

CoA Date: 07/10/2009

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87886303
PO #: 324256
Weight: 188900 LB
Ship Date: 07/10/2009
Package: BULK
Mode: Hopper Car
Car #: PSPX002058
Seal No: 261510

Product:
MARLEX POLYETHYLENE K306 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8290306

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.10 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.2 | g/10mi |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 06/17/2009 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4637

Equistar Chemicals, LP
One Houston Center
1221 McKinney
Houston TX 77010

# Certificate Of Analysis

**Certificate of Analysis Contact:**
grand prairie

**Ship-To Address:**
POLY AMERICA INCORPORATED
2000 WEST MARSHALL DRIVE
GRAND PRAIRIE TX 75051
USA

| | | | |
|---|---|---|---|
| **Equistar Material** | : 15132 PETROTHENE® LT371254X01 | **Customer Order No.** | : 347026 |
| **Customer Material** | : LT371254 | **Release Number** | : 20 |
| **Batch Number** | : CL200402F2 | **Customer Number** | : 1725 |
| **Vehicle Number** | : UTCX47051 | **Date Shipped** | : April 07, 2010 |
| **Estimated Quantity** | : 171,800 LBS | **Equistar Order No.** | : 1865242 000010 |
| | | **Delivery Item No.** | : 82279169 000010 |

| Test Description | Test Result | Unit of Measure | |
|---|---|---|---|
| Vehicle ID | UTCX47051 | | |
| Vehicle Type | HOPPER CAR | | |
| Density, Extrudate @ 23C | 0.9382 | g/cc | STM 011 |
| HLMI, 21600g @ 190C | 12.6 | g/10 min. | STM 002 |
| Melt Index, 2160g @ 190C | 0.08 | g/10 min. | STM 002 |

Data reported was generated in an approved Quality Assurance Lab.

Print Date: April 07, 2010 JRROSS
This information is available 24 hours a day at www.CustomerXPRESS.com
Questions ? Call Customer Service: 888-777-0232

**This Certificate of Analysis contains the most current information available as of the print date.**
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CoA Date: 11/14/2010

# Certificate of Analysis

Shipped To: POLY AMERICA: GP
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 88163267
PO #: 365593
Weight: 185800 LB
Ship Date: 11/14/2010
Package: BULK
Mode: Hopper Car
Car #: CEFX050116
Seal No: 269283

Product:
MARLEX POLYETHYLENE K306 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8201312

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.09 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.8 | g/10mi |
| Density | D1505 or D4883 | 0.937 | g/cm3 |
| Production Date | | 11/04/2010 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4807

CoA Date: 05/18/2007

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87406755
PO #: 260641
Weight: 191500 LB
Ship Date: 05/18/2007
Package: BULK
Mode: Hopper Car
Car #: PSPX005830
Seal No: 227654

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: 8270677

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.12 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 14.3 | g/10mi |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 05/02/2007 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP.
**However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Paul S. Newbold
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 08/21/2007

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87471757
PO #: 267662
Weight: 190100 LB
Ship Date: 08/21/2007
Package: BULK
Mode: Hopper Car
Car #: PSPX005864
Seal No: 235929

Product:
MARLEX POLYETHYLENE K306 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8271044

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.10 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 11.4 | g/10ml |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 07/11/2007 | |

**The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Paul S. Newbold
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 08/27/2007

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87474781
PO #: 267662
Weight: 190300 LB
Ship Date: 08/27/2007
Package: BULK
Mode: Hopper Car
Car #: PSPX003036
Seal No: 235770

Product:
MARLEX POLYETHYLENE K306 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8271145

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.10 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 12.6 | g/10ml |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 07/29/2007 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Paul S. Newbold
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 08/05/2008

# Certificate of Analysis

Shipped To: POLY AMERICA; GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87710024
PO #: 293474
Weight: 195100 LB
Ship Date: 08/05/2008
Package: BULK
Mode: Hopper Car
Car #: CHVX898553
Seal No: 266218

Product:
MARLEX POLYETHYLENE K308 BULK

**Cust #.**
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8281004

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.08 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 12.7 | g/10mi |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 07/28/2008 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

Chevron Phillips Chemical Company LP

CoA Date: 09/09/2008

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87732779
PO #: 298302
Weight: 189500 LB
Ship Date: 09/08/2008
Package: BULK
Mode: Hopper Car
Car #: CHVX896316
Seal No: 272182

Product:
MARLEX POLYETHYLENE K306 BULK

**Cust #.**
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8281217

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.08 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 11.7 | g/10mi |
| Density | ASTM D1505 | 0.936 | g/cm3 |
| Production Date | | 09/06/2008 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Tom Scheiman at 832-813-4637

Chevron Phillips

CoA Date: 09/09/2008

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87733686
PO #: 296302
Weight: 188800 LB
Ship Date: 09/09/2008
Package: BULK
Mode: Hopper Car
Car #: CHVX890194
Seal No: 268211

Product:
MARLEX POLYETHYLENE K306 BULK

**Cust # .**
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8281219

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.09 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 11.7 | g/10mi |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 09/07/2008 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

Chevron Phillips

CoA Date: 09/09/2008

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87733689
PO #: 298302
Weight: 189000 LB
Ship Date: 09/09/2008
Package: BULK
Mode: Hopper Car
Car #: GOCX058362
Seal No: 268202

Product:
MARLEX POLYETHYLENE K308 BULK

Cust # .
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8281221

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.09 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 11.6 | g/10ml |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 09/07/2008 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

CoA Date: 12/19/2007

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87553997
PO #: 278195
Weight: 184500 LB
Ship Date: 12/19/2007
Package: BULK
Mode: Hopper Car
Car #: CHVX896877
Seal No: 245901

Product:
MARLEX POLYETHYLENE K306 BULK

NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8271795

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.09 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 11.4 | g/10ml |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 11/28/2007 | |

**The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Paul S. Newbold
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

Chevron Phillips

CoA Date: 07/24/2008

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87701242
PO #: 293474
Weight: 188200 LB
Ship Date: 07/22/2008
Package: BULK
Mode: Hopper Car
Car #: GOCX058416
Seal No: 266383

Product:
MARLEX POLYETHYLENE K306 BULK

Cust # .
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8280961

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.10 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.6 | g/10mi |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 07/21/2008 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP.
**However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

Chevron Phillips

CoA Date: 09/03/2008

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87730148
PO #: 298302
Weight: 192400 LB
Ship Date: 09/03/2008
Package: BULK
Mode: Hopper Car
Car #: CITX703330
Seal No: 268402

Product:
MARLEX POLYETHYLENE K306 BULK

**Cust # .**
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8281175

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.12 | g/10ml |
| HLMI Flow Rate | ASTM D1238 | 11.8 | g/10ml |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 08/29/2008 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Tom Scheirman at 832-813-4637

INEOS
**Olefins & Polymers USA**
**A Division of INEOS USA LLC**

# CERTIFICATE OF ANALYSIS

**Selling Company:**
INEOS Olefins & Polymers USA
A Division of INEOS USA LLC
2600 South Shore Blvd. Suite 500
LEAGUE CITY, Texas 77573
United States
**Ship To:**
POLY-AMERICA LP
2000 W MARSHALL DRIVE
GRAND PRAIRIE TX 75051
*Contact:* DEE AVERITTE
*Fax:*
**Sold To:**
POLY-AMERICA LP

| | |
|---|---|
| Delivery Doc Number/Item: | 89015540/000010 |
| Print Date / Time: | 12/29/2008/14:05:10 |
| Sales Order Number/Date: | 5119198/ 12/15/2008 |
| Customer PO Number/Date: | 306901/ |
| Shipment Date: | 12/29/2008 |
| Place of Despatch: | 2566 AJV Polyethylene Deer Park |
| Mode of Transport: | 0007 Rail w/o Inbol |
| Transport/Vehicle Number: | ELTX001352 |
| Net Weight: | 184,850.001 LB |



Product Description: G36-10-150 PE PELLETS - BULK
Batch Number: C081226L03

| Characteristic | Method | Result | Unit | Specifications Min | Max |
|---|---|---|---|---|---|
| MI 2.16 (1X) | ASTM D 1238 | 0.1380 | g/10mn | | |
| MI 21.6 (HLMI) | ASTM D 1238 | 13.40 | g/10mn | 10.50 | 14.50 |
| DENSITY (NATURAL) | ASTM D4883-03 | 0.9370 | G/CM3 | 0.9360 | 0.9390 |

APPROVED BY: Quality Assurance Manager.
This certifies that the INEOS Polyethylene meets our specifications for the grade.

THIS REPORT CANNOT BE COPIED OR REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF INEOS. RESULTS APPLY ONLY TO THE ITEMS TESTED. THIS DOCUMENT CONTAINS INFORMATION THAT MAY BE CONFIDENTIAL AND IS INTENDED ONLY FOR THE USE OF THE ADDRESSEE. USE OF THIS INFORMATION BY ANYONE ELSE IS STRICTLY PROHIBITED. IF YOU HAVE RECEIVED THIS IN ERROR, PLEASE NOTIFY US BY PHONE AT 1-800-527-5419.

**INEOS**
**Olefins & Polymers USA**
**A Division of INEOS USA LLC**

# CERTIFICATE OF ANALYSIS

Selling Company:
INEOS Olefins & Polymers USA
A Division of INEOS USA LLC
2600 South Shore Blvd. Suite 500
LEAGUE CITY, Texas 77573
United States
Ship To:
POLY-AMERICA LP
2000 W MARSHALL DRIVE
GRAND PRAIRIE TX 75051
*Contact:* DEE AVERITTE
*Fax:*
Sold To:
POLY-AMERICA LP

| | |
|---|---|
| Delivery Doc Number/Item: | 89016455/000010 |
| Print Date / Time: | 01/02/2009/13:30:08 |
| Sales Order Number/Date: | 5119221/ 12/15/2008 |
| Customer PO Number/Date: | 306901/ |
| Shipment Date: | 01/02/2009 |
| Place of Despatch: | 2566 AJV Polyethylene Deer Park |
| Mode of Transport: | 0007 Rail w/o rinbol |
| Transport/Vehicle Number: | ELTX001213 |
| Net Weight: | 135,850.001 LB |



**Product Description:** G36-10-150 PE PELLETS - BULK
**Batch Number:** C090101L04

| Characteristic | Method | Result | Unit | Specifications Min | Specifications Max |
|---|---|---|---|---|---|
| MI 2.16 (1X) | ASTM D 1238 | 0.1100 | g/10mn | | |
| MI 21.6 (HLMI) | ASTM D 1238 | 11.40 | g/10mn | 10.50 | 14.50 |
| DENSITY (NATURAL) | ASTM D4883-03 | 0.9365 | G/CM3 | 0.9360 | 0.9390 |

APPROVED BY: Quality Assurance Manager.
This certifies that the INEOS Polyethylene meets our specifications for the grade.

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**INEOS**
**Olefins & Polymers USA**
**A Division of INEOS USA LLC**

# CERTIFICATE OF ANALYSIS

**Selling Company:**
INEOS Olefins & Polymers USA
A Division of INEOS USA LLC
2600 South Shore Blvd. Suite 500
LEAGUE CITY, Texas 77573
United States
**Ship To:**
POLY-AMERICA LP
2000 W MARSHALL DRIVE
GRAND PRAIRIE TX 75051
*Contact:* DEE AVERITTE
*Fax:*
**Sold To:**
POLY-AMERICA LP

| | |
|---|---|
| Delivery Doc Number/Item: | 89016325/000010 |
| Print Date / Time: | 01/02/2009/11:40:07 |
| Sales Order Number/Date: | 5119191/ 12/15/2008 |
| Customer PO Number/Date: | 306901/ |
| Shipment Date: | 12/31/2008 |
| Place of Despatch: | 2566 AJV Polyethylene Deer Park |
| Mode of Transport: | 0007 Rail w/o rtnbol |
| Transport/Vehicle Number: | ELTX002136 |
| Net Weight: | 184,050.001 LB |

Page 1 of 1

**Product Description:** G36-10-150 PE PELLETS - BULK
**Batch Number:** C081231L02

| Characteristic | Method | Result | Unit | Specifications Min | Max |
|---|---|---|---|---|---|
| MI 2.16 (1X) | ASTM D 1238 | 0.1250 | g/10mn | | |
| MI 21.6 (HLMI) | ASTM D 1238 | 12.20 | g/10mn | 10.50 | 14.50 |
| DENSITY (NATURAL) | ASTM D4883-03 | 0.9378 | G/CM3 | 0.9360 | 0.9390 |

APPROVED BY: Quality Assurance Manager.
This certifies that the INEOS Polyethylene meets our specifications for the grade.

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CoA Date: 04/23/2009

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87847433
PO #: 317695
Weight: 188500 LB
Ship Date: 04/23/2009
Package: BULK
Mode: Hopper Car
Car #: PSPX009079
Seal No: 261319

Product:
MARLEX POLYETHYLENE K306 BULK

Cust # .
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8290036

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.09 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 11.1 | g/10mi |
| Density | ASTM D1505 | 0.937 | g/cm3 |
| Production Date | | 04/15/2009 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP.
**However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4637

Chevron Phillips Chemical Company LP

CoA Date: 04/28/2009

# Certificate of Analysis

Shipped To: POLY AMERICA: GP (GEO)
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 87849439
PO #: 317695
Weight: 189400 LB
Ship Date: 04/28/2009
Package: BULK
Mode: Hopper Car
Car #: GOCX058332
Seal No: 261329

Product:
MARLEX POLYETHYLENE K306 BULK

Cust # .
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8290021

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.10 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 13.1 | g/10mi |
| Density | ASTM D1505 | 0.938 | g/cm3 |
| Production Date | | 04/13/2009 | |

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Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4637

**Equistar Chemicals, LP**
**One Houston Center**
**1221 McKinney**
**Houston TX 77010**

# Certificate Of Analysis

**Certificate of Analysis Contact:**
grand prairie

**Ship-To Address:**
POLY AMERICA INCORPORATED
2000 WEST MARSHALL DRIVE
GRAND PRAIRIE TX 75051
USA

| | | | |
|---|---|---|---|
| **Equistar Material** | : 15132 PETROTHENE® LT371254X01 | **Customer Order No.** | : 352044 |
| **Customer Material** | : LT371254 | **Release Number** | : 80 |
| **Batch Number** | : CL200608F2 | **Customer Number** | : 1725 |
| **Vehicle Number** | : EQUX630108 | **Date Shipped** | : June 17, 2010 |
| **Estimated Quantity** | : 176,450 LBS | **Equistar Order No.** | : 1889279 000010 |
| | | **Delivery Item No.** | : 82311488 000010 |

| Test Description | Test Result | Unit of Measure | |
|---|---|---|---|
| Vehicle ID | EQUX630108 | | |
| Vehicle Type | HOPPER CAR | | |
| Density, Extrudate @ 23C | 0.9366 | g/cc | STM 011 |
| HLMI, 21600g @ 190C | 12.7 | g/10 min. | STM 002 |
| Melt Index, 2160g @ 190C | 0.10 | g/10 min. | STM 002 |

**Melt index test method: ASTM D 1238.**
**Density test method: ASTM D 1505.**

Data reported was generated in an approved Quality Assurance Lab.

**Print Date: June 17, 2010** **JRROSS**
**This information is available 24 hours a day at**
**www.CustomerXPRESS.com**
**Questions ? Call Customer Service: 888-777-0232**

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**One Houston Center**
**1221 McKinney**
**Houston TX 77010**

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**Ship-To Address:**
POLY AMERICA INCORPORATED
2000 WEST MARSHALL DRIVE
GRAND PRAIRIE TX 75051
USA

| | | | |
|---|---|---|---|
| **Equistar Material** | : 15132 PETROTHENE® LT371254X01 | **Customer Order No.** | : 348316 |
| **Customer Material** | : LT371254 | **Release Number** | : 10 |
| **Batch Number** | : CL200406F2 | **Customer Number** | : 1725 |
| **Vehicle Number** | : ALAX61019 | **Date Shipped** | : May 03, 2010 |
| **Estimated Quantity** | : 180,300 LBS | **Equistar Order No.** | : 1870239 000010 |
| | | **Delivery Item No.** | : 82289229 000010 |

| Test Description | Test Result | Unit of Measure | |
|---|---|---|---|
| Vehicle ID | ALAX61019 | | |
| Vehicle Type | HOPPER CAR | | |
| Density, Extrudate @ 23C | 0.9376 | g/cc | STM 011 |
| HLMI, 21600g @ 190C | 11.7 | g/10 min. | STM 002 |
| Melt Index, 2160g @ 190C | 0.08 | g/10 min. | STM 002 |

Melt index test method: ASTM D 1238.
Density test method: ASTM D 1505.

Data reported was generated in an approved Quality Assurance Lab.

Print Date: May 03, 2010 JRROSS
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**One Houston Center**
**1221 McKinney**
**Houston TX 77010**

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2000 WEST MARSHALL DRIVE
GRAND PRAIRIE TX 75051
USA

| | | | |
|---|---|---|---|
| **Equistar Material** | : 15132 PETROTHENE® LT371254X01 | **Customer Order No.** | : 377488 R3 |
| **Batch Number** | : CL210404F3 | **Release Number** | : 30 |
| **Vehicle Number** | : ALAX47258 | **Customer Number** | : 1725 |
| **Estimated Quantity** | : 177,500 LBS | **Date Shipped** | : April 18, 2011 |
| | | **Equistar Order No.** | : 2165392 000010 |
| | | **Delivery Item No.** | : 82791856 000010 |

| Test Description | Test Result | Unit of Measure | |
|---|---|---|---|
| Vehicle ID | ALAX47258 | | |
| Vehicle Type | HOPPER CAR | | |
| Density, Extrudate @ 23C | 0.9368 | g/cc | STM 011 |
| HLMI, 21600g @ 190C | 12.3 | g/10 min. | STM 002 |
| Melt Index, 2160g @ 190C | 0.09 | g/10 min. | STM 002 |

Melt index test method: ASTM D 1238.
Density test method: ASTM D 1505.

Data reported was generated in an approved Quality Assurance Lab.

Print Date: April 18, 2011 JRROSS
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2000 WEST MARSHALL DRIVE
GRAND PRAIRIE TX 75051
USA

| | | | |
|---|---|---|---|
| **Equistar Material** | : 15132 PETROTHENE® LT371254X01 | **Customer Order No.** | : 380090 R2 |
| **Batch Number** | : CL310514F2 | **Release Number** | : 20 |
| **Vehicle Number** | : EQUX621568 | **Customer Number** | : 1725 |
| **Estimated Quantity** | : 177,850 LBS | **Date Shipped** | : May 18, 2011 |
| | | **Equistar Order No.** | : 2198192 000010 |
| | | **Delivery Item No.** | : 82868948 000010 |

| Test Description | Test Result | Unit of Measure | |
|---|---|---|---|
| Vehicle ID | EQUX621568 | | |
| Vehicle Type | HOPPER CAR | | |
| Density, Extrudate @ 23C | 0.9380 | g/cc | STM 011 |
| HLMI, 21600g @ 190C | 11.2 | g/10 min. | STM 002 |
| Melt Index, 2160g @ 190C | 0.09 | g/10 min. | STM 002 |

Melt index test method: ASTM D 1238.
Density test method: ASTM D 1505.

Data reported was generated in an approved Quality Assurance Lab.

Print Date: May 18, 2011 JRROSS
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Questions ? Call Customer Service: 888-777-0232

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**Equistar Chemicals, LP**
**One Houston Center**
**1221 McKinney**
**Houston TX 77010**

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**Ship-To Address:**
POLY AMERICA INCORPORATED
2000 WEST MARSHALL DRIVE
GRAND PRAIRIE TX 75051
USA

| | | | |
|---|---|---|---|
| **Equistar Material** | : 15132 PETROTHENE® LT371254X01 | **Customer Order No.** | : 380090 R3 |
| **Batch Number** | : CL310515F2 | **Release Number** | : 30 |
| **Vehicle Number** | : MLLX98163 | **Customer Number** | : 1725 |
| **Estimated Quantity** | : 177,100 LBS | **Date Shipped** | : May 18, 2011 |
| | | **Equistar Order No.** | : 2198193 000010 |
| | | **Delivery Item No.** | : 82868949 000010 |

| Test Description | Test Result | Unit of Measure | |
|---|---|---|---|
| Vehicle ID | MLLX98163 | | |
| Vehicle Type | HOPPER CAR | | |
| Density, Extrudate @ 23C | 0.9377 | g/cc | STM 011 |
| HLMI, 21600g @ 190C | 11.0 | g/10 min. | STM 002 |
| Melt Index, 2160g @ 190C | 0.07 | g/10 min. | STM 002 |

Melt index test method: ASTM D 1238.
Density test method: ASTM D 1505.

Data reported was generated in an approved Quality Assurance Lab.

Print Date: May 18, 2011 JRROSS
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CoA Date: 03/17/2011

# Certificate of Analysis

Shipped To: POLY AMERICA: GP
2000 W MARSHALL
GRAND PRAIRIE TX 75051
USA

Recipient: Averitte
Fax:

CPC Delivery #: 88230554
PO #: 375253
Weight: 186100 LB
Ship Date: 03/17/2011
Package: BULK
Mode: Hopper Car
Car #: PSPX001206
Seal No: 257539

Product:
MARLEX POLYETHYLENE K306 BULK
NCTL, ASTM D5397-95 Appendix (modified), Avg: >500 Hours (not tested on each lot)

Lot Number: 8210061

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.11 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 13.3 | g/10mi |
| Density | D1505 or D4883 | 0.936 | g/cm3 |
| Production Date | | 01/13/2011 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4607

**Equistar Chemicals, LP**
**One Houston Center**
**1221 McKinney**
**Houston TX 77010**

# Certificate Of Analysis

**Certificate of Analysis Contact:**
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**Ship-To Address:**
POLY AMERICA INCORPORATED
2000 WEST MARSHALL DRIVE
GRAND PRAIRIE TX 75051
USA

| | | | |
|---|---|---|---|
| **Equistar Material** | : 15132 PETROTHENE® LT371254X01 | **Customer Order No.** | : 377488 R2 |
| **Batch Number** | : CL210405F1 | **Release Number** | : 20 |
| **Vehicle Number** | : MLLX97957 | **Customer Number** | : 1725 |
| **Estimated Quantity** | : 181,500 LBS | **Date Shipped** | : April 14, 2011 |
| | | **Equistar Order No.** | : 2165391 000010 |
| | | **Delivery Item No.** | : 82778960 000010 |

| Test Description | Test Result | Unit of Measure | |
|---|---|---|---|
| Vehicle ID | MLLX97957 | | |
| Vehicle Type | HOPPER CAR | | |
| Density, Extrudate @ 23C | 0.9368 | g/cc | STM 011 |
| HLMI, 21600g @ 190C | 12.8 | g/10 min. | STM 002 |
| Melt Index, 2160g @ 190C | 0.10 | g/10 min. | STM 002 |

Melt index test method: ASTM D 1238.
Density test method: ASTM D 1505.

Data reported was generated in an approved Quality Assurance Lab.

Print Date: April 14, 2011 JRROSS
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# APPENDIX H
# SUBGRADE ACCEPTANCE CERTIFICATES

TEXAS ENVIRONMENTAL PLASTICS, LTD.
2500 Farrell Road
Houston, Texas 77073

# SUBGRADE SURFACE ACCEPTANCE

Project Name: Lemmond
Customer: Ranger
Project Number:
Date: 11. 19. 11.
Location:
Partial: Final: 524492

This document only applies to the acceptability of surface conditions for installation of geosynthetic products. Texas Environmental Plastics, Ltd. does not accept responsibility for compaction, elevation or moisture content, nor for the surface condition maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the Owner or Earthwork Contractor.

P-001 THROUGH P-183

For Texas Environmental Plastics, Ltd.:
RON 2 FAITH
Ralph

For Contractor/Owner:
Aaron Paxton

Acceptance Number:_____ Area Accepted:_____/SF Total Area accepted to date:_____/SF

# APPENDIX I
# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Panel Number | Date Deployed | Roll Number | Visual Panel Condition | Minimum Overlap (inches) | Sheet Thickness (mils) | | | | | Panel Edge Thickness (mil) Average Lead | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P-001 | 11/8/2011 | 1121 | OK | 6 | 60 | 62 | 63 | 60 | 61 | 61 | |
| P-002 | 11/8/2011 | 1121 | OK | 6 | 60 | 61 | 63 | 63 | 62 | 62 | |
| P-003 | 11/8/2011 | 1121 | OK | 6 | 62 | 62 | 60 | 61 | 63 | 62 | |
| P-004 | 11/8/2011 | 1121 | OK | 6 | 60 | 62 | 60 | 61 | 63 | 61 | |
| P-005 | 11/8/2011 | 1121 | OK | 6 | 63 | 60 | 62 | 60 | 61 | 61 | |
| P-006 | 11/8/2011 | 1121 | OK | 6 | 60 | 61 | 63 | 63 | 60 | 61 | |
| P-007 | 11/8/2011 | 1121 | OK | 6 | 60 | 61 | 63 | 60 | 62 | 61 | |
| P-008 | 11/8/2011 | 1121 | OK | 6 | 61 | 60 | 63 | 62 | 61 | 61 | |
| P-009 | 11/8/2011 | 1322 | OK | 6 | 60 | 62 | 61 | 60 | 61 | 61 | |
| P-010 | 11/8/2011 | 1322 | OK | 6 | 63 | 60 | 62 | 60 | 61 | 61 | |
| P-011 | 11/8/2011 | 1322 | OK | 6 | 60 | 60 | 62 | 61 | 63 | 61 | |
| P-012 | 11/8/2011 | 1322 | OK | 6 | 60 | 61 | 60 | 63 | 62 | 61 | |
| P-013 | 11/8/2011 | 1322 | OK | 6 | 62 | 60 | 61 | 63 | 62 | 62 | |
| P-014 | 11/8/2011 | 1322 | OK | 6 | 64 | 60 | 62 | 61 | 60 | 61 | |
| P-015 | 11/8/2011 | 4463 | OK | 6 | 60 | 61 | 62 | 60 | 61 | 61 | |
| P-016 | 11/8/2011 | 4463 | OK | 6 | 62 | 62 | 60 | 61 | 63 | 62 | |
| P-017 | 11/8/2011 | 1322 | OK | 6 | 63 | 60 | 61 | 60 | 62 | 61 | |
| P-018 | 11/8/2011 | 4463 | OK | 6 | 62 | 62 | 60 | 61 | 61 | 61 | |
| P-019 | 11/8/2011 | 4463 | OK | 6 | 64 | 64 | 60 | 62 | 61 | 62 | |
| P-020 | 11/8/2011 | 4463 | OK | 6 | 63 | 63 | 60 | 61 | 61 | 62 | |
| P-021 | 11/8/2011 | 4463 | OK | 6 | 60 | 60 | 60 | 63 | 62 | 61 | |
| P-022 | 11/8/2011 | 1277 | OK | 6 | 63 | 60 | 60 | 62 | 61 | 61 | |
| P-023 | 11/8/2011 | 4463 | OK | 6 | 63 | 63 | 62 | 61 | 60 | 62 | |
| P-024 | 11/8/2011 | 1277 | OK | 6 | 61 | 61 | 60 | 62 | 61 | 61 | |
| P-025 | 11/8/2011 | 4005 | OK | 6 | 63 | 63 | 60 | 62 | 61 | 62 | |
| P-026 | 11/8/2011 | 1277 | OK | 6 | 61 | 61 | 63 | 60 | 64 | 62 | |
| P-027 | 11/8/2011 | 1277 | OK | 6 | 63 | 63 | 62 | 61 | 61 | 62 | |
| P-028 | 11/9/2011 | 4312 | OK | 6 | 62 | 62 | 60 | 61 | 61 | 61 | |
| P-029 | 11/9/2011 | 1277 | OK | 6 | 63 | 63 | 60 | 61 | 62 | 62 | |
| P-030 | 11/9/2011 | 4312 | OK | 6 | 62 | 62 | 60 | 61 | 63 | 62 | |
| P-031 | 11/9/2011 | 4374 | OK | 6 | 60 | 61 | 60 | 60 | 63 | 61 | |
| P-032 | 11/9/2011 | 6329 | OK | 6 | 61 | 60 | 62 | 61 | 60 | 61 | |
| P-033 | 11/9/2011 | 1757 | OK | 6 | 60 | 61 | 62 | 62 | 61 | 61 | |
| P-034 | 11/9/2011 | 4018 | OK | 6 | 63 | 60 | 60 | 61 | 62 | 61 | |
| P-035 | 11/9/2011 | 1266 | OK | 6 | 63 | 60 | 61 | 61 | 62 | 61 | |
| P-036 | 11/10/2011 | 4534 | OK | 6 | 63 | 63 | 60 | 62 | 61 | 62 | |

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Panel Number | Date Deployed | Roll Number | Visual Panel Condition | Minimum Overlap (inches) | Sheet Thickness (mils) | | | | | Panel Edge Thickness (mil) Average Lead | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P-037 | 11/10/2011 | 1324 | OK | 6 | 60 | 61 | 60 | 60 | 63 | 61 | |
| P-038 | 11/10/2011 | 6602 | OK | 6 | 63 | 63 | 60 | 61 | 61 | 62 | |
| P-039 | 11/10/2011 | 4034 | OK | 6 | 63 | 60 | 61 | 60 | 63 | 61 | |
| P-040 | 11/10/2011 | 1198 | OK | 6 | 62 | 60 | 61 | 63 | 62 | 62 | |
| P-041 | 11/10/2011 | 1161 | OK | 6 | 62 | 62 | 60 | 61 | 63 | 62 | |
| P-042 | 11/10/2011 | 243 | OK | 6 | 63 | 60 | 60 | 62 | 61 | 61 | |
| P-043 | 11/10/2011 | 243 | OK | 6 | 63 | 63 | 61 | 60 | 62 | 62 | |
| P-044 | 11/10/2011 | 4011 | OK | 6 | 61 | 61 | 63 | 62 | 60 | 61 | |
| P-045 | 11/10/2011 | 4008 | OK | 6 | 63 | 63 | 60 | 62 | 61 | 62 | |
| P-046 | 11/10/2011 | 1549 | OK | 6 | 60 | 61 | 63 | 60 | 62 | 61 | |
| P-047 | 11/10/2011 | 1549 | OK | 6 | 60 | 61 | 63 | 60 | 62 | 61 | |
| P-048 | 11/10/2011 | 1359 | OK | 6 | 63 | 63 | 60 | 62 | 60 | 62 | |
| P-049 | 11/10/2011 | 695 | OK | 6 | 60 | 61 | 60 | 61 | 61 | 61 | |
| P-050 | 11/10/2011 | 4447 | OK | 6 | 60 | 60 | 63 | 62 | 62 | 61 | |
| P-051 | 11/10/2011 | 4447 | OK | 6 | 63 | 63 | 61 | 60 | 61 | 62 | |
| P-052 | 11/10/2011 | 4355 | OK | 6 | 62 | 61 | 63 | 63 | 64 | 63 | |
| P-053 | 11/10/2011 | 4355 | OK | 6 | 64 | 61 | 61 | 63 | 60 | 62 | |
| P-054 | 11/10/2011 | 1492 | OK | 6 | 63 | 61 | 60 | 62 | 61 | 61 | |
| P-055 | 11/10/2011 | 1492 | OK | 6 | 63 | 61 | 60 | 62 | 61 | 61 | |
| P-056 | 11/10/2011 | 1060 | OK | 6 | 63 | 63 | 62 | 60 | 61 | 62 | |
| P-057 | 11/10/2011 | 4083 | OK | 6 | 64 | 64 | 62 | 60 | 61 | 62 | |
| P-058 | 11/10/2011 | 4070 | OK | 6 | 63 | 60 | 61 | 61 | 62 | 61 | |
| P-059 | 11/10/2011 | 4070 | OK | 6 | 60 | 61 | 63 | 62 | 61 | 61 | |
| P-060 | 11/10/2011 | 6021 | OK | 6 | 61 | 60 | 63 | 63 | 62 | 62 | |
| P-061 | 11/10/2011 | 6021 | OK | 6 | 63 | 63 | 62 | 60 | 61 | 62 | |
| P-062 | 11/10/2011 | 4534 | OK | 6 | 61 | 63 | 60 | 60 | 62 | 61 | |
| P-063 | 11/10/2011 | 4002 | OK | 6 | 64 | 62 | 60 | 61 | 63 | 62 | |
| P-064 | 11/10/2011 | 4075 | OK | 6 | 63 | 63 | 62 | 61 | 60 | 62 | |
| P-065 | 11/10/2011 | 1083 | OK | 6 | 61 | 60 | 60 | 61 | 63 | 61 | |
| P-066 | 11/10/2011 | 2212 | OK | 6 | 62 | 62 | 61 | 61 | 63 | 62 | |
| P-067 | 11/11/2011 | 1277 | OK | 6 | 63 | 60 | 60 | 62 | 61 | 61 | |
| P-068 | 11/11/2011 | 2212 | OK | 6 | 61 | 61 | 60 | 63 | 62 | 61 | |
| P-069 | 11/11/2011 | 2212 | OK | 6 | 63 | 63 | 60 | 61 | 60 | 61 | |
| P-070 | 11/11/2011 | 2212 | OK | 6 | 61 | 61 | 60 | 62 | 61 | 61 | |
| P-071 | 11/11/2011 | 4055 | OK | 6 | 63 | 60 | 61 | 60 | 61 | 61 | |
| P-072 | 11/11/2011 | 4055 | OK | 6 | 60 | 60 | 61 | 63 | 64 | 62 | |

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Panel Number | Date Deployed | Roll Number | Visual Panel Condition | Minimum Overlap (inches) | Sheet Thickness (mils) | | | | | Panel Edge Thickness (mil) Average Lead | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P-073 | 11/11/2011 | 4055 | OK | 6 | 64 | 64 | 63 | 62 | 61 | 63 | |
| P-074 | 11/11/2011 | 4055 | OK | 6 | 62 | 61 | 63 | 63 | 60 | 62 | |
| P-075 | 11/11/2011 | 4554 | OK | 6 | 60 | 63 | 63 | 61 | 62 | 62 | |
| P-076 | 11/11/2011 | 4554 | OK | 6 | 60 | 61 | 63 | 60 | 62 | 61 | |
| P-077 | 11/11/2011 | 4554 | OK | 6 | 62 | 60 | 61 | 61 | 63 | 61 | |
| P-078 | 11/11/2011 | 4142 | OK | 6 | 60 | 63 | 62 | 62 | 61 | 62 | |
| P-079 | 11/11/2011 | 4142 | OK | 6 | 63 | 65 | 62 | 60 | 62 | 62 | |
| P-080 | 11/11/2011 | 4142 | OK | 6 | 63 | 64 | 64 | 60 | 62 | 63 | |
| P-081 | 11/11/2011 | 4142 | OK | 6 | 65 | 63 | 61 | 60 | 66 | 63 | |
| P-082 | 11/11/2011 | 4142 | OK | 6 | 63 | 60 | 62 | 60 | 61 | 61 | |
| P-083 | 11/11/2011 | 4142 | OK | 6 | 60 | 62 | 61 | 60 | 63 | 61 | |
| P-084 | 11/11/2011 | 4142 | OK | 6 | 63 | 60 | 62 | 60 | 61 | 61 | |
| P-085 | 11/11/2011 | 1073 | OK | 6 | 63 | 60 | 61 | 62 | 62 | 62 | |
| P-086 | 11/11/2011 | 1073 | OK | 6 | 61 | 61 | 63 | 62 | 61 | 62 | |
| P-087 | 11/11/2011 | 1073 | OK | 6 | 64 | 64 | 63 | 60 | 61 | 62 | |
| P-088 | 11/11/2011 | 1073 | OK | 6 | 63 | 63 | 61 | 60 | 62 | 62 | |
| P-089 | 11/11/2011 | 1126 | OK | 6 | 63 | 60 | 61 | 60 | 62 | 61 | |
| P-090 | 11/12/2011 | 1126 | OK | 6 | 63 | 60 | 62 | 60 | 61 | 61 | |
| P-091 | 11/12/2011 | 1126 | OK | 6 | 64 | 63 | 62 | 60 | 61 | 62 | |
| P-092 | 11/12/2011 | 4053 | OK | 6 | 60 | 61 | 63 | 62 | 61 | 61 | |
| P-093 | 11/12/2011 | 4053 | OK | 6 | 60 | 61 | 63 | 62 | 61 | 61 | |
| P-094 | 11/12/2011 | 4053 | OK | 6 | 62 | 60 | 61 | 63 | 65 | 62 | |
| P-095 | 11/12/2011 | 4130 | OK | 6 | 62 | 60 | 61 | 63 | 65 | 62 | |
| P-096 | 11/12/2011 | 4130 | OK | 6 | 61 | 60 | 63 | 62 | 61 | 61 | |
| P-097 | 11/12/2011 | 4130 | OK | 6 | 64 | 63 | 60 | 61 | 60 | 62 | |
| P-098 | 11/12/2011 | 4152 | OK | 6 | 66 | 61 | 62 | 63 | 60 | 62 | |
| P-099 | 11/12/2011 | 1250 | OK | 6 | 61 | 63 | 62 | 60 | 64 | 62 | |
| P-100 | 11/12/2011 | 4152 | OK | 6 | 62 | 62 | 61 | 63 | 60 | 62 | |
| P-101 | 11/12/2011 | 1005 | OK | 6 | 63 | 60 | 61 | 62 | 60 | 61 | |
| P-102 | 11/12/2011 | 4152 | OK | 6 | 63 | 63 | 60 | 61 | 62 | 62 | |
| P-103 | 11/12/2011 | 1005 | OK | 6 | 61 | 63 | 60 | 62 | 61 | 61 | |
| P-104 | 11/12/2011 | 1005 | OK | 6 | 65 | 63 | 60 | 61 | 63 | 62 | |
| P-105 | 11/12/2011 | 1185 | OK | 6 | 63 | 63 | 60 | 62 | 61 | 62 | |
| P-106 | 11/12/2011 | 1185 | OK | 6 | 60 | 62 | 60 | 61 | 63 | 61 | |
| P-107 | 11/12/2011 | 1185 | OK | 6 | 63 | 60 | 62 | 61 | 60 | 61 | |
| P-108 | 11/12/2011 | 1185 | OK | 6 | 63 | 61 | 60 | 62 | 61 | 61 | |

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Panel Number | Date Deployed | Roll Number | Visual Panel Condition | Minimum Overlap (inches) | Sheet Thickness (mils) | | | | | Panel Edge Thickness (mil) Average Lead | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P-109 | 11/12/2011 | 1060 | OK | 6 | 63 | 63 | 60 | 61 | 62 | 62 | |
| P-110 | 11/14/2011 | 4568 | OK | 6 | 63 | 60 | 62 | 61 | 60 | 61 | |
| P-111 | 11/14/2011 | 4568 | OK | 6 | 60 | 63 | 61 | 60 | 62 | 61 | |
| P-112 | 11/14/2011 | 4065 | OK | 6 | 61 | 60 | 64 | 63 | 62 | 62 | |
| P-113 | 11/14/2011 | 4568 | OK | 6 | 64 | 64 | 63 | 60 | 61 | 62 | |
| P-114 | 11/14/2011 | 4553 | OK | 6 | 62 | 60 | 61 | 63 | 62 | 62 | |
| P-115 | 11/14/2011 | 4553 | OK | 6 | 62 | 61 | 60 | 63 | 62 | 62 | |
| P-116 | 11/14/2011 | 4553 | OK | 6 | 61 | 61 | 63 | 62 | 61 | 62 | |
| P-117 | 11/14/2011 | 1353 | OK | 6 | 61 | 61 | 63 | 60 | 62 | 61 | |
| P-118 | 11/14/2011 | 1349 | OK | 6 | 63 | 63 | 61 | 60 | 64 | 62 | |
| P-119 | 11/14/2011 | 4075 | OK | 6 | 60 | 62 | 61 | 60 | 63 | 61 | |
| P-120 | 11/14/2011 | 4075 | OK | 6 | 61 | 63 | 63 | 60 | 62 | 62 | |
| P-121 | 11/14/2011 | 4130 | OK | 6 | 64 | 62 | 62 | 63 | 60 | 62 | |
| P-122 | 11/14/2011 | 1112 | OK | 6 | 61 | 60 | 62 | 61 | 63 | 61 | |
| P-123 | 11/14/2011 | 4522 | OK | 6 | 65 | 65 | 60 | 61 | 63 | 63 | |
| P-124 | 11/14/2011 | 4522 | OK | 6 | 62 | 62 | 60 | 61 | 63 | 62 | |
| P-125 | 11/14/2011 | 1247 | OK | 6 | 64 | 61 | 63 | 60 | 62 | 62 | |
| P-126 | 11/14/2011 | 4522 | OK | 6 | 61 | 63 | 60 | 62 | 61 | 61 | |
| P-127 | 11/14/2011 | 957 | OK | 6 | 61 | 63 | 60 | 62 | 61 | 61 | |
| P-128 | 11/14/2011 | 957 | OK | 6 | 64 | 62 | 61 | 63 | 61 | 62 | |
| P-129 | 11/14/2011 | 957 | OK | 6 | 62 | 62 | 60 | 61 | 63 | 62 | |
| P-130 | 11/14/2011 | 957 | OK | 6 | 64 | 63 | 61 | 62 | 62 | 62 | |
| P-131 | 11/14/2011 | 957 | OK | 6 | 60 | 60 | 61 | 63 | 63 | 61 | |
| P-132 | 11/14/2011 | 6346 | OK | 6 | 62 | 62 | 60 | 61 | 63 | 62 | |
| P-133 | 11/14/2011 | 6346 | OK | 6 | 62 | 62 | 61 | 63 | 60 | 62 | |
| P-134 | 11/14/2011 | 6346 | OK | 6 | 64 | 63 | 63 | 61 | 60 | 62 | |
| P-135 | 11/14/2011 | 1597 | OK | 6 | 62 | 62 | 61 | 60 | 63 | 62 | |
| P-136 | 11/14/2011 | 6346 | OK | 6 | 62 | 60 | 61 | 63 | 64 | 62 | |
| P-137 | 11/14/2011 | 1597 | OK | 6 | 64 | 63 | 60 | 61 | 65 | 63 | |
| P-138 | 11/14/2011 | 1597 | OK | 6 | 65 | 61 | 63 | 61 | 60 | 62 | |
| P-139 | 11/14/2011 | 4061 | OK | 6 | 62 | 61 | 63 | 64 | 64 | 63 | |
| P-140 | 11/14/2011 | 4061 | OK | 6 | 65 | 61 | 66 | 66 | 61 | 64 | |
| P-141 | 11/14/2011 | 4061 | OK | 6 | 63 | 60 | 61 | 62 | 61 | 61 | |
| P-142 | 11/14/2011 | 4061 | OK | 6 | 63 | 60 | 61 | 62 | 60 | 61 | |
| P-143 | 11/14/2011 | 4061 | OK | 6 | 63 | 61 | 60 | 62 | 61 | 61 | |
| P-144 | 11/14/2011 | 4061 | OK | 6 | 63 | 63 | 61 | 60 | 62 | 62 | |

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Panel Number | Date Deployed | Roll Number | Visual Panel Condition | Minimum Overlap (inches) | Sheet Thickness (mils) | | | | | Panel Edge Thickness (mil) Average Lead | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P-145 | 11/14/2011 | 1657 | OK | 6 | 62 | 60 | 61 | 63 | 64 | 62 | |
| P-146 | 11/14/2011 | 1657 | OK | 6 | 61 | 61 | 62 | 63 | 63 | 62 | |
| P-147 | 11/14/2011 | 1597 | OK | 6 | 63 | 63 | 60 | 61 | 62 | 62 | |
| P-148 | 11/14/2011 | 1351 | OK | 6 | 61 | 60 | 62 | 61 | 63 | 61 | |
| P-149 | 11/14/2011 | 1351 | OK | 6 | 63 | 60 | 61 | 62 | 63 | 62 | |
| P-150 | 11/14/2011 | 1212 | OK | 6 | 63 | 60 | 61 | 63 | 62 | 62 | |
| P-151 | 11/15/2011 | 1212 | OK | 6 | 61 | 61 | 63 | 60 | 62 | 61 | |
| P-152 | 11/15/2011 | 4123 | OK | 6 | 61 | 63 | 60 | 62 | 61 | 61 | |
| P-153 | 11/15/2011 | 4123 | OK | 6 | 63 | 63 | 60 | 62 | 61 | 62 | |
| P-154 | 11/15/2011 | 4123 | OK | 6 | 60 | 62 | 63 | 63 | 61 | 62 | |
| P-155 | 11/15/2011 | 682 | OK | 6 | 63 | 60 | 61 | 60 | 62 | 61 | |
| P-156 | 11/15/2011 | 682 | OK | 6 | 61 | 61 | 63 | 62 | 62 | 62 | |
| P-157 | 11/15/2011 | 682 | OK | 6 | 63 | 61 | 60 | 61 | 63 | 62 | |
| P-158 | 11/15/2011 | 682 | OK | 6 | 62 | 61 | 61 | 60 | 63 | 61 | |
| P-159 | 11/15/2011 | 1273 | OK | 6 | 64 | 63 | 60 | 61 | 62 | 62 | |
| P-160 | 11/19/2011 | 682 | OK | 6 | 61 | 61 | 63 | 65 | 62 | 62 | |
| P-161 | 11/19/2011 | 682 | OK | 6 | 62 | 61 | 60 | 63 | 60 | 61 | |
| P-162 | 11/19/2011 | 4020 | OK | 6 | 61 | 65 | 63 | 63 | 62 | 63 | |
| P-163 | 11/19/2011 | 4020 | OK | 6 | 63 | 63 | 60 | 61 | 62 | 62 | |
| P-164 | 11/19/2011 | 4020 | OK | 6 | 62 | 61 | 63 | 60 | 64 | 62 | |
| P-165 | 11/19/2011 | 4009 | OK | 6 | 63 | 61 | 60 | 62 | 61 | 61 | |
| P-166 | 11/19/2011 | 4009 | OK | 6 | 63 | 61 | 60 | 61 | 63 | 62 | |
| P-167 | 11/19/2011 | 4042 | OK | 6 | 62 | 61 | 60 | 61 | 63 | 61 | |
| P-168 | 11/19/2011 | 4042 | OK | 6 | 63 | 63 | 61 | 60 | 62 | 62 | |
| P-169 | 11/19/2011 | 4042 | OK | 6 | 62 | 62 | 60 | 61 | 63 | 62 | |
| P-170 | 11/19/2011 | 4042 | OK | 6 | 62 | 62 | 60 | 61 | 63 | 62 | |
| P-171 | 11/19/2011 | 4142 | OK | 6 | 61 | 61 | 60 | 62 | 63 | 61 | |
| P-172 | 11/19/2011 | 4142 | OK | 6 | 62 | 62 | 60 | 61 | 63 | 62 | |
| P-173 | 11/19/2011 | 4142 | OK | 6 | 63 | 63 | 60 | 62 | 61 | 62 | |
| P-174 | 11/19/2011 | 4142 | OK | 6 | 64 | 64 | 63 | 61 | 60 | 62 | |
| P-175 | 11/19/2011 | 1087 | OK | 6 | 61 | 61 | 60 | 62 | 63 | 61 | |
| P-176 | 11/19/2011 | 1087 | OK | 6 | 61 | 63 | 60 | 62 | 61 | 61 | |
| P-177 | 11/19/2011 | 1087 | OK | 6 | 61 | 64 | 64 | 62 | 61 | 62 | |
| P-178 | 11/19/2011 | 1087 | OK | 6 | 60 | 62 | 61 | 63 | 63 | 62 | |
| P-179 | 11/19/2011 | 4371 | OK | 6 | 61 | 60 | 63 | 60 | 62 | 61 | |
| P-180 | 11/19/2011 | 4371 | OK | 6 | 62 | 61 | 63 | 60 | 65 | 62 | |

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Panel Number | Date Deployed | Roll Number | Visual Panel Condition | Minimum Overlap (inches) | Sheet Thickness (mils) | | | | | Panel Edge Thickness (mil) Average Lead | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P-181 | 11/19/2011 | 4371 | OK | 6 | 60 | 61 | 63 | 62 | 62 | 62 | |
| P-182 | 11/19/2011 | 4371 | OK | 6 | 61 | 61 | 63 | 62 | 61 | 62 | |
| P-183 | 11/19/2011 | 4371 | OK | 6 | 62 | 60 | 61 | 63 | 63 | 62 | |

# APPENDIX J
# GEOMEMBRANE TRIAL SEAM SUMMARIES

POLYWELD U.S.A., INC.

1620 EAST RICHEY ROAD
HOUSTON, TEXAS 77073

(281) 821-4156
FAX (281) 821-8901
1-888-325-3168
Email: info@polyweldusa.com
www.polyweldusa.com

# Calibration Certificate

| | |
|---|---|
| **Customer:** | **Texas Enviromental Plastics** |
| **Device Calibrated:** | *Meezan 500 Tensiometer* |
| **S/N:** | *10191996* |
| **Model #:** | |
| **Load Cell Type:** | *Button Type* |
| **Voltage:** | *120/v/* |
| **Date:** | *8-Feb-11* |
| **Calibration #** | *CAL1215* |

Calibration of the PolyWeld USA Meezan 500 Tensiometer was verified using a calibration load cell indicator on dead weights. **2/8/2011** The readings of the calibration set are recorded as "True Load." The readings of the instrument in question are recorded below as "Display Load."

| *True Load* | Display Load Trial #1 | Display Load Trial #2 | Display Load Trial #3 |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 50 | 49.8 | 49.8 | 50 |
| 100 | 99.6 | 99.7 | 99.9 |
| 150 | 149.7 | 149.8 | 150 |
| 200 | 199.5 | 199.9 | 199.5 |
| 250 | 249.6 | 249.9 | 249.9 |
| 300 | 299.5 | 299.8 | 300 |
| 350 | 349.5 | 349.1 | 350.1 |
| 400 | 399.8 | 399.9 | 400 |
| 450 | 449.7 | 449.8 | 450 |
| 500 | 499.7 | 499.9 | 500 |
| *Error % for each Trial* | 0.1309 | 0.0873 | 0.0218 |

*Average % Error* 0.0800

Wakeel Ahmad

2/8/2011
Date

**18 Years in the Plastic Welding Industry**

***• Extrusion Welding Machines • Wedge Welders • Spark Tester • Sample Cutter • Tensiometer Meezan 500***

# FUSION

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Sample Number | Weld Date | Weld Time | Welding Machine Number | Weld Technician | Ambient Air Temp. (F) | Machine Speed (feet per minute) | Wedge Temp. | Test Results (Note 1) | | | Pass/Fail | QA Mon. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Inside Peel Mode Strength | Outside Peel Mode Strength | Shear Mode Strength | | |
| TF-01 | 11/08/11 | 1425 | 23 | AG | 75 | 6 | 740 | SE1/SE1/SE1<br>116/115/105 | SE1/SE1/SE1<br>119/128/134 | BRK/BRK/BRK<br>168/164/163 | PASS | SAB |
| TF-02 | 11/08/11 | 1430 | 22 | SC | 75 | 4 | 740 | SE1/SE1/SE1<br>112/117/102 | SE1/SE1/SE1<br>124/111/109 | BRK/BRK/BRK<br>167/166/165 | PASS | SAB |
| TF-03 | 11/08/11 | 1435 | 26 | SP | 75 | 6 | 740 | SE1/SE1/SE1<br>106/122/124 | SE1/SE1/SE1<br>115/116/121 | BRK/BRK/BRK<br>162/166/165 | PASS | SAB |
| TF-04 | 11/08/11 | 1440 | 24 | RH | 75 | 6 | 740 | SE1/SE1/SE1<br>108/118/119 | SE1/SE1/SE1<br>120/102/107 | BRK/BRK/BRK<br>178/174/173 | PASS | SAB |
| TF-05 | 11/08/11 | 1535 | 23 | AG | 75 | 4 | 740 | SE1/SE1/SE1<br>108/101/100 | SE1/SE1/SE1<br>129/119/114 | BRK/BRK/BRK<br>156/152/151 | PASS | SAB |
| TF-06 | 11/08/11 | 1540 | 24 | RH | 75 | 4 | 740 | SE1/SE1/SE1<br>123/121/1105 | SE1/SE1/SE1<br>118/103/114 | BRK/BRK/BRK<br>150/154/150 | PASS | SAB |
| TF-01 | 11/09/11 | 1300 | 26 | SP | 65 | 5.5 | 740 | SE1/SE1/SE1<br>130/145/132 | SE1/SE1/SE1<br>125/130/135 | BRK/BRK/BRK<br>178/176/137 | PASS | SAB |
| TF-02 | 11/09/11 | 1305 | 22 | SC | 65 | 4 | 740 | SE1/SE1/SE1<br>124/141/123 | SE1/SE1/SE1<br>123/136/121 | BRK/BRK/BRK<br>210/197/196 | PASS | SAB |
| TF-03 | 11/09/11 | 1310 | 23 | AG | 65 | 5 | 740 | SE1/SE1/SE1<br>128/116/102 | SE1/SE1/SE1<br>105/117/101 | BRK/BRK/BRK<br>197/192/190 | PASS | SAB |
| TF-04 | 11/09/11 | 1315 | 23 | AG | 65 | 4.5 | 740 | SE1/SE1/SE1<br>127/101/101 | SE1/SE1/SE1<br>116/112/106 | BRK/BRK/BRK<br>148/146/141 | PASS | SAB |
| TF-05 | 11/09/11 | 1320 | 24 | RH | 65 | 5 | 740 | SE1/SE1/SE1<br>143/106/102 | SE1/SE1/SE1<br>106/117/104 | BRK/BRK/BRK<br>154/152/154 | PASS | SAB |
| TF-06 | 11/09/11 | 1325 | 24 | RH | 65 | 4 | 740 | SE1/SE1/SE1<br>118/124/119 | SE1/SE1/SE1<br>128/122/114 | BRK/BRK/BRK<br>154/160/157 | PASS | SAB |
| TF-01 | 11/10/11 | 0803 | 24 | RH | 65 | 5 | 740 | SE1/SE1/SE1<br>125/124/116 | SE1/SE1/SE1<br>127/120/121 | BRK/BRK/BRK<br>191/190/188 | PASS | SAB |
| TF-02 | 11/10/11 | 0803 | 24 | RH | 65 | 5 | 740 | SE1/SE1/SE1<br>138/135/130 | SE1/SE1/SE1<br>130/137/128 | BRK/BRK/BRK<br>180/196/182 | PASS | SAB |
| TF-03 | 11/10/11 | 0815 | 26 | SP | 65 | 5.5 | 740 | SE1/SE1/SE1<br>130/140/122 | SE1/SE1/SE1<br>141/121/125 | BRK/BRK/BRK<br>191/190/191 | PASS | SAB |

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Sample Number | Weld Date | Weld Time | Welding Machine Number | Weld Technician | Ambient Air Temp. (F) | Machine Speed (feet per minute) | Wedge Temp. | Test Results (Note 1) | | | Pass/Fail | QA Mon. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Inside Peel Mode Strength | Outside Peel Mode Strength | Shear Mode Strength | | |
| TF-04 | 11/10/11 | 0821 | 23 | AG | 65 | 5.5 | 740 | SE1/SE1/SE1<br>109/128/113 | SE1/SE1/SE1<br>120/106/125 | BRK/BRK/BRK<br>234/194/200 | PASS | SAB |
| TF-05 | 11/10/11 | 0834 | 22 | SC | 65 | 4 | 740 | SE1/SE1/SE1<br>109/128/113 | SE1/SE1/SE1<br>129/106/105 | BRK/BRK/BRK<br>217/206/210 | PASS | SAB |
| TF-06 | 11/10/11 | 1250 | 26 | SP | 65 | 6 | 740 | SE1/SE1/SE1<br>119/135/132 | SE1/SE1/SE1<br>131/200/131 | BRK/BRK/BRK<br>215/206/210 | PASS | SAB |
| TF-07 | 11/10/11 | 1257 | 22 | SC | 65 | 4 | 740 | SE1/SE1/SE1<br>109/118/120 | SE1/SE1/SE1<br>129/120/120 | BRK/BRK/BRK<br>198/190/200 | PASS | SAB |
| TF-08 | 11/10/11 | 1300 | 23 | AG | 65 | 4.5 | 740 | SE1/SE1/SE1<br>103/123/110 | SE1/SE1/SE1<br>122/192/102 | BRK/BRK/BRK<br>187/180/192 | PASS | SAB |
| TF-09 | 11/10/11 | 1310 | 23 | AG | 65 | 4 | 740 | SE1/SE1/SE1<br>114/116/108 | SE1/SE1/SE1<br>123/120/112 | BRK/BRK/BRK<br>194/182/190 | PASS | SAB |
| TF-10 | 11/10/11 | 1315 | 24 | RH | 65 | 4.5 | 740 | SE1/SE1/SE1<br>101/123/117 | SE1/SE1/SE1<br>118/127/104 | BRK/BRK/BRK<br>180/168/178 | PASS | SAB |
| TF-11 | 11/10/11 | 1318 | 24 | RH | 65 | 4 | 740 | SE1/SE1/SE1<br>112/122/108 | SE1/SE1/SE1<br>112/118/111 | BRK/BRK/BRK<br>156/154/158 | PASS | SAB |
| TF-01 | 11/11/11 | 0750 | 23 | AG | 60 | 5 | 730 | SE1/SE1/SE1<br>114/108/107 | SE1/SE1/SE1<br>123/123/120 | BRK/BRK/BRK<br>205/202/199 | PASS | SAB |
| TF-02 | 11/11/11 | 0755 | 23 | AG | 60 | 4.5 | 736 | SE1/SE1/SE1<br>127/129/130 | SE1/SE1/SE1<br>154/150/142 | BRK/BRK/BRK<br>210/200/202 | PASS | SAB |
| TF-03 | 11/11/11 | 0802 | 22 | SC | 60 | 4 | 736 | SE1/SE1/SE1<br>110/111/112 | SE1/SE1/SE1<br>115/112/114 | BRK/BRK/BRK<br>191/190/188 | PASS | SAB |
| TF-04 | 11/11/11 | 0810 | 24 | RH | 60 | 5 | 736 | SE1/SE1/SE1<br>104/120/100 | SE1/SE1/SE1<br>145/130/140 | BRK/BRK/BRK<br>197/190/194 | PASS | SAB |
| TF-05 | 11/11/11 | 0815 | 24 | RH | 60 | 4 | 736 | SE1/SE1/SE1<br>124/97/99 | SE1/SE1/SE1<br>120/124/120 | BRK/BRK/BRK<br>186/180/184 | PASS | SAB |
| TF-06 | 11/11/11 | 0820 | 26 | SR | 60 | 4 | 736 | SE1/SE1/SE1<br>126/111/135 | SE1/SE1/SE1<br>119/132/106 | BRK/BRK/BRK<br>196/162/154 | PASS | SAB |
| TF-07 | 11/11/11 | 0825 | 26 | SP | 60 | 5 | 736 | SE1/SE1/SE1<br>120/119/113 | SE1/SE1/SE1<br>112/105/110 | BRK/BRK/BRK<br>171/170/168 | PASS | SAB |

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Sample Number | Weld Date | Weld Time | Welding Machine Number | Weld Technician | Ambient Air Temp. (F) | Machine Speed (feet per minute) | Wedge Temp. | Test Results (Note 1) | | | Pass/Fail | QA Mon. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Inside Peel Mode Strength | Outside Peel Mode Strength | Shear Mode Strength | | |
| TF-01 | 11/12/11 | 1400 | 22 | SC | 60 | 4 | 740 | SE1/SE1/SE1<br>118/114/110 | SE1/SE1/SE1<br>107/110/116 | BRK/BRK/BRK<br>179/188/184 | PASS | SAB |
| TF-02 | 11/12/11 | 1405 | 26 | SP | 60 | 5 | 740 | SE1/SE1/SE1<br>127/120/116 | SE1/SE1/SE1<br>112/114/111 | BRK/BRK/BRK<br>174/170/172 | PASS | SAB |
| TF-03 | 11/12/11 | 1410 | 26 | SP | 65 | 4.5 | 740 | SE1/SE1/SE1<br>118/120/104 | SE1/SE1/SE1<br>110/112/100 | BRK/BRK/BRK<br>167/169/164 | PASS | SAB |
| TF-04 | 11/12/11 | 1415 | 23 | AG | 65 | 5.5 | 740 | SE1/SE1/SE1<br>102/106/108 | SE1/SE1/SE1<br>112/116/110 | BRK/BRK/BRK<br>156/152/153 | PASS | SAB |
| TF-05 | 11/12/11 | 1420 | 23 | AG | 65 | 4.5 | 740 | SE1/SE1/SE1<br>100/103/101 | SE1/SE1/SE1<br>110/114/109 | BRK/BRK/BRK<br>161/160/164 | PASS | SAB |
| TF-06 | 11/12/11 | 1425 | 24 | RH | 65 | 4 | 740 | SE1/SE1/SE1<br>120/121/125 | SE1/SE1/SE1<br>119/113/114 | BRK/BRK/BRK<br>158/162/164 | PASS | SAB |
| TF-07 | 11/12/11 | 1430 | 24 | RH | 65 | 5 | 740 | SE1/SE1/SE1<br>120/137/108 | SE1/SE1/SE1<br>108/124/116 | BRK/BRK/BRK<br>162/157/169 | PASS | SAB |
| TF-01 | 11/14/11 | 0800 | 26 | SP | 70 | 5 | 730 | SE1/SE1/SE1<br>97/121/103 | SE1/SE1/SE1<br>119/106/102 | BRK/BRK/BRK<br>168/160/162 | PASS | SAB |
| TF-02 | 11/14/11 | 0805 | 26 | SP | 70 | 4 | 730 | SE1/SE1/SE1<br>107/121/116 | SE1/SE1/SE1<br>124/118/120 | BRK/BRK/BRK<br>164/168/160 | PASS | SAB |
| TF-03 | 11/14/11 | 0810 | 22 | SC | 70 | 4.5 | 740 | SE1/SE1/SE1<br>140/131/146 | SE1/SE1/SE1<br>130/119/124 | BRK/BRK/BRK<br>192/190/189 | PASS | SAB |
| TF-04 | 11/14/11 | 0815 | 24 | RH | 70 | 6.5 | 740 | SE1/SE1/SE1<br>135/126/130 | SE1/SE1/SE1<br>104/111/109 | BRK/BRK/BRK<br>194/196/200 | PASS | SAB |
| TF-05 | 11/14/11 | 0820 | 23 | AG | 70 | 5.5 | 740 | SE1/SE1/SE1<br>129/127/126 | SE1/SE1/SE1<br>117/138/131 | BRK/BRK/BRK<br>205/201/205 | PASS | SAB |
| TF-06 | 11/14/11 | 0825 | 23 | AG | 70 | 4.5 | 740 | SE1/SE1/SE1<br>130/129/109 | SE1/SE1/SE1<br>131/131/117 | BRK/BRK/BRK<br>186/189/190 | PASS | SAB |
| TF-07 | 11/14/11 | 0830 | 24 | RH | 70 | 4 | 740 | SE1/SE1/SE1<br>148/109/124 | SE1/SE1/SE1<br>130/128/109 | BRK/BRK/BRK<br>176/179/177 | PASS | SAB |
| TF-08 | 11/14/11 | 1320 | 22 | SC | 78 | 4.5 | 740 | SE1/SE1/SE1<br>121/131/122 | SE1/SE1/SE1<br>124/116/114 | BRK/BRK/BRK<br>154/151/149 | PASS | SAB |

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Sample Number | Weld Date | Weld Time | Welding Machine Number | Weld Technician | Ambient Air Temp. (F) | Machine Speed (feet per minute) | Wedge Temp. | Test Results (Note 1) | | | Pass/Fail | QA Mon. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Inside Peel Mode Strength | Outside Peel Mode Strength | Shear Mode Strength | | |
| TF-09 | 11/14/11 | 1325 | 24 | RH | 78 | 6 | 740 | SE1/SE1/SE1<br>130/104/124 | SE1/SE1/SE1<br>120/109/119 | BRK/BRK/BRK<br>157/150/154 | PASS | SAB |
| TF-10 | 11/14/11 | 1330 | 23 | AG | 78 | 5.5 | 740 | SE1/SE1/SE1<br>116/119/107 | SE1/SE1/SE1<br>103/113/101 | BRK/BRK/BRK<br>169/172/168 | PASS | SAB |
| TF-11 | 11/14/11 | 1335 | 23 | AG | 78 | 4.5 | 740 | SE1/SE1/SE1<br>110/115/113 | SE1/SE1/SE1<br>101/114/116 | BRK/BRK/BRK<br>171/178/173 | PASS | SAB |
| TF-12 | 11/14/11 | 1340 | 26 | SP | 78 | 4 | 740 | SE1/SE1/SE1<br>106/114/104 | SE1/SE1/SE1<br>110/118/102 | BRK/BRK/BRK<br>158/152/160 | PASS | SAB |
| TF-13 | 11/14/11 | 1345 | 26 | SP | 78 | 4 | 740 | SE1/SE1/SE1<br>102/104/112 | SE1/SE1/SE1<br>100/109/114 | BRK/BRK/BRK<br>160/159/162 | PASS | SAB |
| TF-01 | 11/15/11 | 0800 | 22 | SC | 70 | 4.5 | 450 | SE1/SE1/SE1<br>121/118/132 | SE1/SE1/SE1<br>140/127/119 | BRK/BRK/BRK<br>195/192/194 | PASS | SAB |
| TF-02 | 11/15/11 | 0805 | 24 | RH | 70 | 6 | 600 | SE1/SE1/SE1<br>114/112/108 | SE1/SE1/SE1<br>124/122/113 | BRK/BRK/BRK<br>189/190/188 | PASS | SAB |
| TF-03 | 11/15/11 | 0810 | 26 | SP | 70 | 5 | 500 | SE1/SE1/SE1<br>118/101/112 | SE1/SE1/SE1<br>114/111/110 | BRK/BRK/BRK<br>194/190/191 | PASS | SAB |
| TF-04 | 11/15/11 | 0815 | 26 | SP | 70 | 6 | 600 | SE1/SE1/SE1<br>137/119/130 | SE1/SE1/SE1<br>130/133/119 | BRK/BRK/BRK<br>188/194/189 | PASS | SAB |
| TF-05 | 11/15/11 | 0820 | 23 | AG | 70 | 5.5 | 550 | SE1/SE1/SE1<br>139/118/134 | SE1/SE1/SE1<br>130/132/130 | BRK/BRK/BRK<br>194/190/192 | PASS | SAB |
| TF-06 | 11/15/11 | 0825 | 23 | AG | 71 | 4.5 | 450 | SE1/SE1/SE1<br>110/132/131 | SE1/SE1/SE1<br>130/136/135 | BRK/BRK/BRK<br>196/191/192 | PASS | SAB |
| TF-07 | 11/15/11 | 0830 | 24 | RH | 72 | 4 | 400 | SE1/SE1/SE1<br>103/111/106 | SE1/SE1/SE1<br>101/104/112 | BRK/BRK/BRK<br>166/162/165 | PASS | SAB |
| TF-01 | 11/19/11 | 0805 | 23 | AG | 70 | 5.5 | 740 | SE1/SE1/SE1<br>113/100/119 | SE1/SE1/SE1<br>103/110/125 | BRK/BRK/BRK<br>172/170/174 | PASS | SAB |
| TF-02 | 11/19/11 | 0810 | 23 | AG | 70 | 4.5 | 740 | SE1/SE1/SE1<br>145/123/104 | SE1/SE1/SE1<br>111/101/119 | BRK/BRK/BRK<br>176/176/179 | PASS | SAB |
| TF-03 | 11/19/11 | 0815 | 22 | SC | 70 | 4.5 | 740 | SE1/SE1/SE1<br>125/112/133 | SE1/SE1/SE1<br>108/120/131 | BRK/BRK/BRK<br>166/162/164 | PASS | SAB |

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Sample Number | Weld Date | Weld Time | Welding Machine Number | Weld Technician | Ambient Air Temp. (F) | Machine Speed (feet per minute) | Wedge Temp. | Test Results (Note 1) | | | Pass/Fail | QA Mon. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Inside Peel Mode Strength | Outside Peel Mode Strength | Shear Mode Strength | | |
| TF-04 | 11/19/11 | 0820 | 26 | SP | 70 | 5.5 | 740 | SE1/SE1/SE1<br>116/114/116 | SE1/SE1/SE1<br>100/112/118 | BRK/BRK/BRK<br>181/179/182 | PASS | SAB |
| TF-05 | 11/19/11 | 0825 | 26 | SP | 70 | 4.5 | 740 | SE1/SE1/SE1<br>112/110/120 | SE1/SE1/SE1<br>106/116/111 | BRK/BRK/BRK<br>170/169/174 | PASS | SAB |
| TF-06 | 11/19/11 | 0830 | 24 | RH | 70 | 5.5 | 740 | SE1/SE1/SE1<br>115/122/120 | SE1/SE1/SE1<br>120/109/111 | BRK/BRK/BRK<br>160/157/159 | PASS | SAB |
| TF-07 | 11/19/11 | 0831 | 24 | RH | 70 | 4.5 | 740 | SE1/SE1/SE1<br>117/124/117 | SE1/SE1/SE1<br>110/110/124 | BRK/BRK/BRK<br>155/158/160 | PASS | SAB |
| TF-08 | 11/19/11 | 1315 | 22 | SC | 70 | 4.5 | 740 | SE1/SE1/SE1<br>128/126/118 | SE1/SE1/SE1<br>117/117/120 | BRK/BRK/BRK<br>204/200/201 | PASS | SAB |
| TF-09 | 11/19/11 | 1320 | 24 | RH | 70 | 5.5 | 740 | SE1/SE1/SE1<br>112/101/114 | SE1/SE1/SE1<br>110/100/109 | BRK/BRK/BRK<br>164/162/167 | PASS | SAB |
| TF-10 | 11/19/11 | 1325 | 24 | RH | 70 | 4.5 | 740 | SE1/SE1/SE1<br>125/120/122 | SE1/SE1/SE1<br>110/108/104 | BRK/BRK/BRK<br>160/158/162 | PASS | SAB |
| TF-11 | 11/19/11 | 1325 | 26 | SP | 70 | 5 | 740 | SE1/SE1/SE1<br>118/132/114 | SE1/SE1/SE1<br>115/124/112 | BRK/BRK/BRK<br>168/166/164 | PASS | SAB |
| TF-12 | 11/19/11 | 1330 | 26 | SP | 70 | 4 | 740 | SE1/SE1/SE1<br>121/119/111 | SE1/SE1/SE1<br>120/110/109 | BRK/BRK/BRK<br>170/167/163 | PASS | SAB |
| TF-13 | 11/19/11 | 1335 | 23 | AG | 70 | 4 | 740 | SE1/SE1/SE1<br>112/104/112 | SE1/SE1/SE1<br>120/100/111 | BRK/BRK/BRK<br>156/157/150 | PASS | SAB |

NOTES: (1) Modes are illustrated on Figure 10, strengths are in pounds per inch.

# EXTRUSION

# GEOMEMBRANE EXTRUSION TRIAL SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Sample Number | Weld Date | Weld Time | Welding Machine Number | Weld Technician | Ambient Air Temp. (F) | Extruder Temp. or Preheat Setting | Nozzle Temperature | Test Results (Note 1) | | Pass/Fail | QA Mon. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Inside Peel Mode Strength | Shear Mode Strength | | |
| TX-01 | 11/09/11 | 0830 | 27 | AR | 55 | 300 | 310 | SE3/SE3/SE3 96/97/97 | BRK1/BRK1/BRK1 176/168/170 | PASS | SAB |
| TX-01 | 11/10/11 | 1040 | 27 | AR | 65 | 310 | 330 | SE3/SE3/SE3 92/101/95 | BRK1/BRK1/BRK1 157/160/158 | PASS | SAB |
| TX-01 | 11/11/11 | 0800 | 27 | AR | 60 | 310 | 330 | SE3/SE3/SE3 130/110/117 | BRK1/BRK1/BRK1 197/196/229 | PASS | SAB |
| TX-02 | 11/11/11 | 0805 | 28 | DP | 60 | 310 | 330 | SE3/SE3/SE3 90/96/110 | BRK1/BRK1/BRK1 201/190/198 | PASS | SAB |
| TX-03 | 11/11/11 | 1302 | 27 | AR | 65 | 310 | 330 | SE3/SE3/SE3 105/107/109 | BRK1/BRK1/BRK1 145/160/173 | PASS | SAB |
| TX-04 | 11/11/11 | 1304 | 28 | DP | 65 | 310 | 330 | SE3/SE3/SE3 89/90/80 | BRK1/BRK1/BRK1 160/158/172 | PASS | SAB |
| TX-01 | 11/15/11 | 1007 | 28 | RS | 75 | 310 | 330 | SE3/SE3/SE3 106/112/109 | BRK1/BRK1/BRK1 133/147/152 | PASS | SAB |
| TX-01 | 11/16/11 | 0825 | 27 | AR | 70 | 310 | 330 | SE3/SE3/SE3 99/102/88 | BRK1/BRK1/BRK1 182/186/180 | PASS | SAB |
| TX-02 | 11/16/11 | 0830 | 28 | DP | 70 | 310 | 330 | SE3/SE3/SE3 98/94/104 | BRK1/BRK1/BRK1 183/188/180 | PASS | SAB |
| TX-03 | 11/16/11 | 1310 | 27 | AR | 75 | 310 | 330 | SE3/SE3/SE3 100/102/98 | BRK1/BRK1/BRK1 154/152/154 | PASS | SAB |
| TX-04 | 11/16/11 | 1315 | 28 | DP | 75 | 310 | 330 | SE3/SE3/SE3 120/111/114 | BRK1/BRK1/BRK1 162/167/161 | PASS | SAB |
| TX-01 | 11/17/11 | 0745 | 28 | DP | 45 | 310 | 330 | SE3/SE3/SE3 105/102/109 | BRK1/BRK1/BRK1 143/140/141 | PASS | SAB |
| TX-02 | 11/17/11 | 0750 | 27 | AR | 45 | 310 | 330 | SE3/SE3/SE3 100/106/112 | BRK1/BRK1/BRK1 188/169/182 | PASS | SAB |
| TX-01 | 11/18/11 | 0750 | 28 | DP | 50 | 310 | 330 | SE3/SE3/SE3 141/135/120 | BRK1/BRK1/BRK1 170/165/162 | PASS | SAB |
| TX-02 | 11/18/11 | 0755 | 27 | AR | 50 | 310 | 330 | SE3/SE3/SE3 142/125/115 | BRK1/BRK1/BRK1 172/186/174 | PASS | SAB |

# GEOMEMBRANE EXTRUSION TRIAL SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Sample Number | Weld Date | Weld Time | Welding Machine Number | Weld Technician | Ambient Air Temp. (F) | Extruder Temp. or Preheat Setting | Nozzle Temperature | Test Results (Note 1) | | Pass/Fail | QA Mon. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Inside Peel Mode Strength | Shear Mode Strength | | |
| TX-01 | 11/19/11 | 1000 | 27 | AR | 65 | 310 | 330 | SE3/SE3/SE3 115/122/137 | BRK1/BRK1/BRK1 175/182/191 | PASS | SAB |
| TX-02 | 11/19/11 | 1002 | 28 | DP | 65 | 310 | 330 | SE3/SE3/SE3 125/122/131 | BRK1/BRK1/BRK1 171/173/176 | PASS | SAB |
| TX-03 | 11/19/11 | 1400 | 27 | AR | 65 | 310 | 330 | SE3/SE3/SE3 103/101/107 | BRK1/BRK1/BRK1 138/142/144 | PASS | SAB |
| TX-04 | 11/19/11 | 1415 | 28 | DP | 65 | 310 | 330 | SE3/SE3/SE3 102/108/98 | BRK1/BRK1/BRK1 142/140/144 | PASS | SAB |

NOTES: (1) Modes are illustrated on Figure 11, strengths are in pounds per inch.

# APPENDIX K
# GEOMEMBRANE SEAM AND NON-DESTRUCTIVE TEST SUMMARIES

# FUSION SEAMING SUMMARY

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P003 \ P004 | 11/08/11 | WEOS TO EEOS | 1450 | 75 | SC | SAB | 22 | 53 | P | 11/08/11 | SAB | DS-02 | |
| P008 \ P009 | 11/08/11 | WEOS TO EEOS | 1500 | 75 | SC | SAB | 22 | 57 | P | 11/08/11 | SAB | | |
| P014 \ P015 | 11/08/11 | SEOS TO NEOS | 1534 | 75 | SC | SAB | 22 | 53 | P | 11/08/11 | SAB | | |
| P018 \ P019 | 11/08/11 | EEOS TO WEOS | 1600 | 75 | SC | SAB | 22 | 49 | P | 11/08/11 | SAB | | |
| P021 \ P024 | 11/08/11 | EEOS TO WEOS | 1647 | 75 | SC | SAB | 22 | 73 | P | 11/09/11 | SAB | | |
| P022 \ P023 | 11/08/11 | WEOS TO EEOS | 1700 | 75 | SC | SAB | 22 | 24 | P | 11/09/11 | SAB | | |
| P022 \ P024 | 11/08/11 | WEOS TO EEOS | 1710 | 75 | SC | SAB | 22 | 24 | P | 11/09/11 | SAB | | |
| P024 \ P027 | 11/08/11 | EEOS TO WEOS | 1725 | 75 | SC | SAB | 22 | 12 | P | 11/09/11 | SAB | | |
| P001 \ P002 | 11/08/11 | WEOS TO EEOS | 1423 | 75 | AG | SAB | 23 | 53 | P | 11/08/11 | SAB | DS-01 | |
| P002 \ P003 | 11/08/11 | WEOS TO EEOS | 1444 | 75 | AG | SAB | 23 | 53 | P | 11/08/11 | SAB | | |
| P006 \ P007 | 11/08/11 | WEOS TO EEOS | 1501 | 75 | AG | SAB | 23 | 53 | P | 11/08/11 | SAB | | |
| P010 \ P011 | 11/08/11 | WEOS TO EEOS | 1514 | 75 | AG | SAB | 23 | 58 | P | 11/08/11 | SAB | | |
| P012 \ P014 | 11/08/11 | EEOS TO WEOS | 1519 | 75 | AG | SAB | 23 | 33 | P | 11/08/11 | SAB | | |
| P017 \ P018 | 11/08/11 | EEOS TO WEOS | 1601 | 75 | AG | SAB | 23 | 24 | P | 11/08/11 | SAB | | |
| P008 \ P023 | 11/08/11 | NEOS TO SEOS | 1630 | 75 | AG | SAB | 23 | 10 | P | 11/08/11 | SAB | | |
| P009 \ P019 | 11/08/11 | NEOS TO SEOS | 1632 | 75 | AG | SAB | 23 | 9 | P | 11/08/11 | SAB | | |
| P009 \ P020 | 11/08/11 | NEOS TO SEOS | 1635 | 75 | AG | SAB | 23 | 12 | P | 11/08/11 | SAB | | |
| P010 \ P020 | 11/08/11 | NEOS TO SEOS | 1640 | 75 | AG | SAB | 23 | 8 | P | 11/08/11 | SAB | | |
| P015 \ P020 | 11/08/11 | NEOS TO SEOS | 1645 | 75 | AG | SAB | 23 | 12 | P | 11/08/11 | SAB | | |
| P021 \ P022 | 11/08/11 | SEOS TO NEOS | 1647 | 75 | AG | SAB | 23 | 22 | P | 11/09/11 | SAB | | |
| P007 \ P022 | 11/08/11 | NEOS TO SEOS | 1704 | 75 | AG | SAB | 23 | 9 | P | 11/09/11 | SAB | | |
| P007 \ P023 | 11/08/11 | NEOS TO SEOS | 1708 | 75 | AG | SAB | 23 | 15 | P | 11/09/11 | SAB | | |
| P008 \ P023 | 11/08/11 | WEOS TO EEOS | 1712 | 75 | AG | SAB | 23 | 12 | P | 11/09/11 | SAB | | |
| P006 \ P027 | 11/08/11 | NEOS TO SEOS | 1725 | 75 | AG | SAB | 23 | 12 | P | 11/09/11 | SAB | | |
| P006 \ P022 | 11/08/11 | NEOS TO SEOS | 1728 | 75 | AG | SAB | 23 | 12 | P | 11/09/11 | SAB | | |
| P005 \ P025 | 11/08/11 | NEOS TO SEOS | 1730 | 75 | AG | SAB | 23 | 22 | P | 11/09/11 | SAB | | |
| P025 \ P026 | 11/08/11 | SEOS TO NEOS | 1739 | 75 | AG | SAB | 23 | 22 | P | 11/09/11 | SAB | | |
| P003 \ P026 | 11/08/11 | NEOS TO SEOS | 1740 | 75 | AG | SAB | 23 | 15 | P | 11/09/11 | SAB | | |
| P004 \ P026 | 11/08/11 | NEOS TO SEOS | 1750 | 75 | AG | SAB | 23 | 9 | P | 11/09/11 | SAB | | |
| P004 \ P024 | 11/08/11 | NEOS TO SEOS | 1752 | 75 | AG | SAB | 23 | 12 | P | 11/09/11 | SAB | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | | | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P005 | \ | P006 | 11/08/11 | WEOS TO EEOS | 1456 | 75 | RH | SAB | 24 | 52 | P | 11/08/11 | SAB | DS-04 | |
| P009 | \ | P010 | 11/08/11 | WEOS TO EEOS | 1516 | 75 | RH | SAB | 24 | 57 | P | 11/08/11 | SAB | | |
| P011 | \ | P015 | 11/08/11 | SEOS TO NEOS | 1520 | 75 | RH | SAB | 24 | 22 | P | 11/08/11 | SAB | | |
| P010 | \ | P015 | 11/08/11 | SEOS TO NEOS | 1540 | 75 | RH | SAB | 24 | 22 | P | 11/08/11 | SAB | | |
| P012 | \ | P013 | 11/08/11 | WEOS TO EEOS | 1612 | 75 | RH | SAB | 24 | 18 | P | 11/08/11 | SAB | | |
| P016 | \ | P019 | 11/08/11 | EEOS TO WEOS | 1622 | 75 | RH | SAB | 24 | 30 | P | 11/08/11 | SAB | | |
| P015 | \ | P019 | 11/08/11 | EEOS TO WEOS | 1631 | 75 | RH | SAB | 24 | 33 | P | 11/08/11 | SAB | | |
| P016 | \ | P017 | 11/08/11 | SEOS TO NEOS | 1645 | 75 | RH | SAB | 24 | 24 | P | 11/08/11 | SAB | | |
| P016 | \ | P018 | 11/08/11 | SEOS TO NEOS | 1652 | 75 | RH | SAB | 24 | 30 | P | 11/08/11 | SAB | | |
| P004 | \ | P005 | 11/08/11 | WEOS TO EEOS | 1454 | 78 | SP | SAB | 26 | 50 | P | 11/08/11 | SAB | DS-03 | |
| P007 | \ | P008 | 11/08/11 | WEOS TO EEOS | 1505 | 75 | SP | SAB | 26 | 53 | P | 11/08/11 | SAB | | |
| P011 | \ | P012 | 11/08/11 | WEOS TO EEOS | 1519 | 75 | SP | SAB | 26 | 58 | P | 11/08/11 | SAB | | |
| P013 | \ | P014 | 11/08/11 | SEOS TO NEOS | 1530 | 75 | SP | SAB | 26 | 17 | P | 11/08/11 | SAB | | |
| P015 | \ | P016 | 11/08/11 | SEOS TO NEOS | 1544 | 75 | SP | SAB | 26 | 103 | P | 11/08/11 | SAB | | |
| P019 | \ | P020 | 11/08/11 | WEOS TO EEOS | 1628 | 75 | SP | SAB | 26 | 15 | P | 11/09/11 | SAB | | |
| P019 | \ | P021 | 11/08/11 | EEOS TO WEOS | 1620 | 75 | SP | SAB | 26 | 73 | P | 11/09/11 | SAB | | |
| P019 | \ | P022 | 11/08/11 | EEOS TO WEOS | 1648 | 75 | SP | SAB | 26 | 51 | P | 11/09/11 | SAB | | |
| P024 | \ | P025 | 11/08/11 | EEOS TO WEOS | 1730 | 75 | SP | SAB | 26 | 164 | P | 11/09/11 | SAB | | |
| P024 | \ | P026 | 11/08/11 | EEOS TO WEOS | 1750 | 75 | SP | SAB | 26 | 30 | P | 11/09/11 | SAB | | |
| P029 | \ | P030 | 11/09/11 | EEOS TO WEOS | 1319 | 60 | SC | SAB | 22 | 154 | P | 11/09/11 | SAB | | |
| P033 | \ | P034 | 11/09/11 | EEOS TO WEOS | 1451 | 60 | SC | SAB | 22 | 283 | P | 11/09/11 | SAB | DS-06 | |
| P001 | \ | P028 | 11/09/11 | NEOS TO SEOS | 1350 | 60 | AG | SAB | 23 | 6 | P | 11/09/11 | SAB | | |
| P002 | \ | P028 | 11/09/11 | NEOS TO SEOS | 1354 | 60 | AG | SAB | 23 | 22 | P | 11/09/11 | SAB | | |
| P028 | \ | P029 | 11/09/11 | NEOS TO SEOS | 1359 | 60 | AG | SAB | 23 | 22 | P | 11/09/11 | SAB | DS-07 | |
| P031 | \ | P032 | 11/09/11 | EEOS TO WEOS | 1401 | 60 | AG | SAB | 23 | 265 | P | 11/09/11 | SAB | | |
| P030 | \ | P031 | 11/09/11 | EEOS TO WEOS | 1343 | 60 | RH | SAB | 24 | 235 | P | 11/09/11 | SAB | DS-08 | |
| P034 | \ | P035 | 11/09/11 | EEOS TO WEOS | 1455 | 60 | RH | SAB | 24 | 286 | P | 11/09/11 | SAB | | |
| P025 | \ | P029 | 11/09/11 | EEOS TO WEOS | 1305 | 60 | SP | SAB | 26 | 154 | P | 11/09/11 | SAB | DS-05 | |
| P032 | \ | P033 | 11/09/11 | EEOS TO WEOS | 1420 | 60 | SP | SAB | 26 | 265 | P | 11/09/11 | SAB | | |
| P037 | \ | P038 | 11/10/11 | EEOS TO WEOS | 0835 | 60 | SC | SAB | 22 | 358 | P | 11/11/11 | SAB | DS-11 | |



Golder Associates

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P038 \ P042 | 11/10/11 | EEOS TO WEOS | 0910 | 60 | SC | SAB | 22 | 110 | P | 11/11/11 | SAB | | |
| P044 \ P045 | 11/10/11 | EEOS TO WEOS | 1038 | 66 | SC | SAB | 22 | 302 | P | 11/11/11 | SAB | DS-16 | |
| P044 \ P046 | 11/10/11 | EEOS TO WEOS | 1112 | 66 | SC | SAB | 22 | 109 | P | 11/11/11 | SAB | | |
| P049 \ P051 | 11/10/11 | EEOS TO WEOS | 1358 | 66 | SC | SAB | 22 | 266 | P | 11/11/11 | SAB | DS-19 | |
| P049 \ P052 | 11/10/11 | EEOS TO WEOS | 1425 | 66 | SC | SAB | 22 | 46 | P | 11/11/11 | SAB | | |
| P050 \ P052 | 11/10/11 | EEOS TO WEOS | 1440 | 66 | SC | SAB | 22 | 90 | P | 11/11/11 | SAB | | |
| P057 \ P059 | 11/10/11 | EEOS TO WEOS | 1600 | 66 | SC | SAB | 22 | 302 | P | 11/11/11 | SAB | DS-22 | |
| P057 \ P060 | 11/10/11 | EEOS TO WEOS | 1720 | 66 | SC | SAB | 22 | 10 | P | 11/11/11 | SAB | | |
| P058 \ P060 | 11/10/11 | EEOS TO WEOS | 1735 | 66 | SC | SAB | 22 | 78 | P | 11/11/11 | SAB | | |
| P064 \ P066 | 11/10/11 | EEOS TO WEOS | 1744 | 66 | SC | SAB | 22 | 100 | P | 11/11/11 | SAB | | |
| P038 \ P039 | 11/10/11 | EEOS TO WEOS | 0843 | 60 | AG | SAB | 23 | 359 | P | 11/11/11 | SAB | DS-12 | |
| P041 \ P043 | 11/10/11 | SEOS TO NEOS | 1002 | 60 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P040 \ P041 | 11/10/11 | EEOS TO WEOS | 1027 | 66 | AG | SAB | 23 | 278 | P | 11/11/11 | SAB | | |
| P040 \ P043 | 11/10/11 | EEOS TO WEOS | 1115 | 66 | AG | SAB | 23 | 110 | P | 11/11/11 | SAB | DS-14 | |
| P049 \ P050 | 11/10/11 | NEOS TO SEOS | 1344 | 66 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P051 \ P052 | 11/10/11 | NEOS TO SEOS | 1345 | 66 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P053 \ P054 | 11/10/11 | NEOS TO SEOS | 1411 | 66 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P057 \ P058 | 11/10/11 | NEOS TO SEOS | 1608 | 66 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P059 \ P060 | 11/10/11 | NEOS TO SEOS | 1620 | 66 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P061 \ P062 | 11/10/11 | NEOS TO SEOS | 1622 | 66 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P063 \ P064 | 11/10/11 | EEOS TO WEOS | 1648 | 66 | AG | SAB | 23 | 391 | P | 11/11/11 | SAB | DS-24 | |
| P064 \ P065 | 11/10/11 | 6A TO WEOS | 1702 | 66 | AG | SAB | 23 | 75 | P | 11/11/11 | SAB | | |
| P035 \ P036 | 11/10/11 | EEOS TO WEOS | 0810 | 60 | RH | SAB | 24 | 295 | P | 11/11/11 | SAB | DS-09 | |
| P037 \ P042 | 11/10/11 | SEOS TO NEOS | 0926 | 60 | RH | SAB | 24 | 22 | P | 11/11/11 | SAB | | |
| P039 \ P040 | 11/10/11 | EEOS TO WEOS | 0945 | 60 | RH | SAB | 24 | 394 | P | 11/11/11 | SAB | DS-13 | |
| P047 \ P048 | 11/10/11 | EEOS TO WEOS | 1138 | 66 | RH | SAB | 24 | 88 | P | 11/11/11 | SAB | | |
| P045 \ P046 | 11/10/11 | SEOS TO NEOS | 1140 | 66 | RH | SAB | 24 | 22 | P | 11/11/11 | SAB | | |
| P047 \ P049 | 11/10/11 | EEOS TO WEOS | 1355 | 66 | RH | SAB | 24 | 165 | P | 11/11/11 | SAB | | |
| P048 \ P049 | 11/10/11 | EEOS TO WEOS | 1410 | 66 | RH | SAB | 24 | 155 | P | 11/11/11 | SAB | DS-18 | |
| P048 \ P050 | 11/10/11 | EEOS TO WEOS | 1425 | 66 | RH | SAB | 24 | 94 | P | 11/11/11 | SAB | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P055 \ P057 | 11/10/11 | EEOS TO WEOS | 1456 | 66 | RH | SAB | 24 | 121 | P | 11/11/11 | SAB | | |
| P055 \ P056 | 11/10/11 | NEOS TO SEOS | 1524 | 66 | RH | SAB | 24 | 22 | P | 11/11/11 | SAB | | |
| P056 \ P057 | 11/10/11 | EEOS TO WEOS | 1532 | 66 | RH | SAB | 24 | 200 | P | 11/11/11 | SAB | | |
| P056 \ P058 | 11/10/11 | EEOS TO WEOS | 1610 | 66 | RH | SAB | 24 | 79 | P | 11/11/11 | SAB | DS-21 | |
| P061 \ P063 | 11/10/11 | EEOS TO WEOS | 1649 | 66 | RH | SAB | 24 | 292 | P | 11/11/11 | SAB | | |
| P062 \ P063 | 11/10/11 | EEOS TO WEOS | 1750 | 66 | RH | SAB | 24 | 99 | P | 11/11/11 | SAB | | |
| P065 \ P066 | 11/10/11 | NEOS TO SEOS | 1803 | 66 | RH | SAB | 24 | 22 | P | 11/11/11 | SAB | | |
| P036 \ P037 | 11/10/11 | EEOS TO WEOS | 0835 | 60 | SP | SAB | 26 | 335 | P | 11/11/11 | SAB | DS-10 | |
| P036 \ P042 | 11/10/11 | EEOS TO WEOS | 0910 | 60 | SP | SAB | 26 | 61 | P | 11/11/11 | SAB | | |
| P041 \ P044 | 11/10/11 | WEOS TO EEOS | 1000 | 60 | SP | SAB | 26 | 278 | P | 11/11/11 | SAB | DS-15 | |
| P043 \ P044 | 11/10/11 | EEOS TO WEOS | 1050 | 66 | SP | SAB | 26 | 124 | P | 11/11/11 | SAB | | |
| P045 \ P047 | 11/10/11 | EEOS TO WEOS | 1300 | 66 | SP | SAB | 26 | 165 | P | 11/11/11 | SAB | | |
| P045 \ P048 | 11/10/11 | EEOS TO WEOS | 1400 | 66 | SP | SAB | 26 | 140 | P | 11/11/11 | SAB | DS-17 | |
| P046 \ P048 | 11/10/11 | EEOS TO WEOS | 1420 | 66 | SP | SAB | 26 | 109 | P | 11/11/11 | SAB | | |
| P053 \ P055 | 11/10/11 | EEOS TO WEOS | 1448 | 66 | SP | SAB | 26 | 124 | P | 11/11/11 | SAB | | |
| P053 \ P056 | 11/10/11 | EEOS TO WEOS | 1509 | 66 | SP | SAB | 26 | 101 | P | 11/11/11 | SAB | | |
| P054 \ P056 | 11/10/11 | EEOS TO WEOS | 1530 | 66 | SP | SAB | 26 | 171 | P | 11/11/11 | SAB | DS20 | |
| P059 \ P061 | 11/10/11 | EEOS TO WEOS | 1605 | 66 | SP | SAB | 26 | 292 | P | 11/11/11 | SAB | | |
| P059 \ P062 | 11/10/11 | EEOS TO WEOS | 1715 | 66 | SP | SAB | 26 | 8 | P | 11/11/11 | SAB | | |
| P060 \ P062 | 11/10/11 | EEOS TO WEOS | 1720 | 66 | SP | SAB | 26 | 91 | P | 11/11/11 | SAB | DS-23 | |
| P064 \ P065 | 11/10/11 | EEOS TO 6A | 1750 | 66 | SP | SAB | 26 | 217 | P | 11/11/11 | SAB | | |
| P001 \ P068 | 11/11/11 | WEOS TO EEOS | 1410 | 65 | SC | SAB | 22 | 45 | P | 11/11/11 | SAB | | |
| P069 \ P070 | 11/11/11 | WEOS TO EEOS | 1425 | 65 | SC | SAB | 22 | 45 | P | 11/11/11 | SAB | | |
| P073 \ P074 | 11/11/11 | SEOS TO NEOS | 1455 | 65 | SC | SAB | 22 | 99 | P | 11/11/11 | SAB | | |
| P075 \ P076 | 11/11/11 | SEOS TO NEOS | 1525 | 65 | SC | SAB | 22 | 96 | P | 11/11/11 | SAB | DS-26 | |
| P079 \ P080 | 11/11/11 | SEOS TO NEOS | 1559 | 65 | SC | SAB | 22 | 44 | P | 11/12/11 | SAB | | |
| P080 \ P081 | 11/11/11 | SEOS TO NEOS | 1615 | 65 | SC | SAB | 22 | 44 | P | 11/12/11 | SAB | | |
| P081 \ P082 | 11/11/11 | SEOS TO NEOS | 1619 | 65 | SC | SAB | 22 | 44 | P | 11/12/11 | SAB | | |
| P086 \ P088 | 11/11/11 | WEOS TO EEOS | 1658 | 65 | SC | SAB | 22 | 98 | P | 11/12/11 | SAB | | |
| P086 \ P089 | 11/11/11 | WEOS TO EEOS | 1719 | 65 | SC | SAB | 22 | 20 | P | 11/12/11 | SAB | | |



Golder Associates

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Non-Destructive | | | Destructive | |
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P078 \ P089 | 11/11/11 | NEOS TO SEOS | 1722 | 65 | SC | SAB | 22 | 22 | P | 11/12/11 | SAB | | |
| P036 \ P076 | 11/11/11 | WEOS TO EEOS | 1628 | 60 | AG | SAB | 23 | 9 | P | 11/11/11 | SAB | | |
| P036 \ P075 | 11/11/11 | WEOS TO EEOS | 1632 | 60 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P036 \ P074 | 11/11/11 | WEOS TO EEOS | 1634 | 60 | AG | SAB | 23 | 4 | P | 11/11/11 | SAB | | |
| P036 \ P076 | 11/11/11 | WEOS TO EEOS | 1645 | 60 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P042 \ P078 | 11/11/11 | WEOS TO EEOS | 1700 | 60 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P042 \ P076 | 11/11/11 | WEOS TO EEOS | 1702 | 60 | AG | SAB | 23 | 8 | P | 11/11/11 | SAB | | |
| P042 \ P077 | 11/11/11 | WEOS TO EEOS | 1705 | 60 | AG | SAB | 23 | 22 | P | 11/12/11 | SAB | | |
| P087 \ P089 | 11/11/11 | NEOS TO SEOS | 1714 | 60 | AG | SAB | 23 | 22 | P | 11/12/11 | SAB | | |
| P032 \ P070 | 11/11/11 | NEOS TO SEOS | 1450 | 65 | AG | SAB | 23 | 8 | P | 11/11/11 | SAB | | |
| P031 \ P070 | 11/11/11 | NEOS TO SEOS | 1453 | 65 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P032 \ P033 | 11/11/11 | WEOS TO 8J | 1426 | 65 | AG | SAB | 23 | 21 | P | 11/11/11 | SAB | | |
| P031 \ P069 | 11/11/11 | NEOS TO SEOS | 1459 | 65 | AG | SAB | 23 | 20 | P | 11/11/11 | SAB | | |
| P067 \ P069 | 11/11/11 | NEOS TO SEOS | 1502 | 65 | AG | SAB | 23 | 4 | P | 11/11/11 | SAB | | |
| P067 \ P068 | 11/11/11 | NEOS TO SEOS | 1507 | 65 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P001 \ P067 | 11/11/11 | NEOS TO SEOS | 1510 | 65 | AG | SAB | 23 | 5 | P | 11/11/11 | SAB | | |
| P030 \ P067 | 11/11/11 | NEOS TO SEOS | 1517 | 65 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P035 \ P073 | 11/11/11 | WEOS TO EEOS | 1532 | 65 | AG | SAB | 23 | 10 | P | 11/11/11 | SAB | | |
| P035 \ P072 | 11/11/11 | WEOS TO EEOS | 1533 | 65 | AG | SAB | 23 | 9 | P | 11/11/11 | SAB | | |
| P034 \ P072 | 11/11/11 | WEOS TO EEOS | 1535 | 65 | AG | SAB | 23 | 27 | P | 11/11/11 | SAB | DS-25 | |
| P033 \ P071 | 11/11/11 | NEOS TO SEOS | 1540 | 65 | AG | SAB | 23 | 22 | P | 11/11/11 | SAB | | |
| P032 \ P072 | 11/11/11 | NEOS TO SEOS | 1543 | 65 | AG | SAB | 23 | 21 | P | 11/11/11 | SAB | | |
| P036 \ P084 | 11/11/11 | WEOS TO EEOS | 1549 | 65 | AG | SAB | 23 | 24 | P | 11/11/11 | SAB | | |
| P035 \ P084 | 11/11/11 | NEOS TO SEOS | 1558 | 60 | AG | SAB | 23 | 15 | P | 11/11/11 | SAB | | |
| P074 \ P084 | 11/11/11 | NEOS TO SEOS | 1607 | 60 | AG | SAB | 23 | 18 | P | 11/11/11 | SAB | | |
| P073 \ P084 | 11/11/11 | NEOS TO SEOS | 1610 | 60 | AG | SAB | 23 | 10 | P | 11/11/11 | SAB | | |
| P071 \ P072 | 11/11/11 | SEOS TO NEOS | 1450 | 65 | RH | SAB | 24 | 25 | P | 11/11/11 | SAB | DS-27 | |
| P072 \ P073 | 11/11/11 | SEOS TO NEOS | 1459 | 65 | RH | SAB | 24 | 48 | P | 11/11/11 | SAB | | |
| P071 \ P073 | 11/11/11 | SEOS TO NEOS | 1517 | 65 | RH | SAB | 24 | 8 | P | 11/11/11 | SAB | | |
| P076 \ P077 | 11/11/11 | SEOS TO NEOS | 1539 | 65 | RH | SAB | 24 | 99 | P | 11/11/11 | SAB | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | | | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P076 | \ | P083 | 11/11/11 | SEOS TO NEOS | 1559 | 65 | RH | SAB | 24 | 5 | P | 11/11/11 | SAB | | |
| P077 | \ | P083 | 11/11/11 | EEOS TO WEOS | 1604 | 65 | RH | SAB | 24 | 22 | P | 11/11/11 | SAB | | |
| P082 | \ | P085 | 11/11/11 | NEOS TO SEOS | 1633 | 65 | RH | SAB | 24 | 42 | P | 11/12/11 | SAB | | |
| P085 | \ | P086 | 11/11/11 | WEOS TO EEOS | 1706 | 65 | RH | SAB | 24 | 22 | P | 11/12/11 | SAB | | |
| P085 | \ | P087 | 11/11/11 | SEOS TO NEOS | 1714 | 65 | RH | SAB | 24 | 20 | P | 11/12/11 | SAB | | |
| P068 | \ | P069 | 11/11/11 | WEOS TO EEOS | 1420 | 65 | SP | SAB | 26 | 45 | P | 11/12/11 | SAB | | |
| P070 | \ | P071 | 11/11/11 | WEOS TO EEOS | 1425 | 65 | SP | SAB | 26 | 45 | P | 11/12/11 | SAB | | |
| P031 | \ | P032 | 11/11/11 | 8K TO EEOS | 1453 | 65 | SP | SAB | 26 | 27 | P | 11/12/11 | SAB | | |
| P031 | \ | P067 | 11/11/11 | WEOS TO EEOS | 1508 | 65 | SP | SAB | 26 | 25 | P | 11/12/11 | SAB | | |
| P074 | \ | P075 | 11/11/11 | SEOS TO NEOS | 1520 | 65 | SP | SAB | 26 | 98 | P | 11/12/11 | SAB | DS-28 | |
| P077 | \ | P078 | 11/11/11 | SEOS TO NEOS | 1549 | 65 | SP | SAB | 26 | 96 | P | 11/12/11 | SAB | | |
| P078 | \ | P083 | 11/11/11 | SEOS TO NEOS | 1602 | 65 | SP | SAB | 26 | 92 | P | 11/12/11 | SAB | | |
| P078 | \ | P079 | 11/11/11 | SEOS TO NEOS | 1624 | 65 | SP | SAB | 26 | 44 | P | 11/12/11 | SAB | | |
| P078 | \ | P086 | 11/11/11 | NEOS TO SEOS | 1630 | 65 | SP | SAB | 26 | 22 | P | 11/12/11 | SAB | | |
| P079 | \ | P086 | 11/11/11 | EEOS TO WEOS | 1638 | 65 | SP | SAB | 26 | 22 | P | 11/12/11 | SAB | | |
| P080 | \ | P086 | 11/11/11 | EEOS TO WEOS | 1655 | 65 | SP | SAB | 26 | 22 | P | 11/12/11 | SAB | | |
| P082 | \ | P086 | 11/11/11 | EEOS TO WEOS | 1720 | 65 | SP | SAB | 26 | 22 | P | 11/12/11 | SAB | | |
| P081 | \ | P086 | 11/11/11 | WEOS TO EEOS | 1730 | 65 | SP | SAB | 26 | 22 | P | 11/12/11 | SAB | | |
| P090 | \ | P091 | 11/12/11 | WEOS TO EEOS | 0819 | 65 | AG | SAB | 23 | 140 | P | 11/12/11 | SAB | | |
| P092 | \ | P093 | 11/12/11 | WEOS TO EEOS | 0843 | 65 | AG | SAB | 23 | 143 | P | 11/12/11 | SAB | DS-32 | |
| P096 | \ | P097 | 11/12/11 | WEOS TO EEOS | 0923 | 65 | AG | SAB | 23 | 129 | P | 11/12/11 | SAB | | |
| P096 | \ | P099 | 11/12/11 | WEOS TO EEOS | 0942 | 65 | AG | SAB | 23 | 8 | P | 11/12/11 | SAB | | |
| P097 | \ | P099 | 11/12/11 | NEOS TO SEOS | 1000 | 65 | AG | SAB | 23 | 22 | P | 11/12/11 | SAB | | |
| P048 | \ | P098 | 11/12/11 | NEOS TO SEOS | 1016 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P046 | \ | P098 | 11/12/11 | NEOS TO SEOS | 1018 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P046 | \ | P099 | 11/12/11 | NEOS TO SEOS | 1025 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P044 | \ | P099 | 11/12/11 | NEOS TO SEOS | 1032 | 65 | AG | SAB | 23 | 12 | P | 11/12/11 | SAB | | |
| P048 | \ | P100 | 11/12/11 | NEOS TO SEOS | 1044 | 65 | AG | SAB | 23 | 12 | P | 11/12/11 | SAB | | |
| P052 | \ | P102 | 11/12/11 | NEOS TO SEOS | 1056 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P050 | \ | P102 | 11/12/11 | NEOS TO SEOS | 1058 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P050 \ P100 | 11/12/11 | NEOS TO SEOS | 1059 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P054 \ P103 | 11/12/11 | NEOS TO SEOS | 1100 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P052 \ P103 | 11/12/11 | NEOS TO SEOS | 1109 | 65 | AG | SAB | 23 | 12 | P | 11/12/11 | SAB | | |
| P054 \ P105 | 11/12/11 | NEOS TO SEOS | 1133 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P056 \ P105 | 11/12/11 | NEOS TO SEOS | 1143 | 65 | AG | SAB | 23 | 12 | P | 11/12/11 | SAB | | |
| P056 \ P106 | 11/12/11 | NEOS TO SEOS | 1142 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P060 \ P107 | 11/12/11 | NEOS TO SEOS | 1153 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P058 \ P107 | 11/12/11 | NEOS TO SEOS | 1157 | 65 | AG | SAB | 23 | 12 | P | 11/12/11 | SAB | | |
| P058 \ P106 | 11/12/11 | NEOS TO SEOS | 1202 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P062 \ P108 | 11/12/11 | NEOS TO SEOS | 1205 | 65 | AG | SAB | 23 | 10 | P | 11/12/11 | SAB | | |
| P060 \ P108 | 11/12/11 | NEOS TO SEOS | 1210 | 65 | AG | SAB | 23 | 12 | P | 11/12/11 | SAB | | |
| P108 \ P109 | 11/12/11 | SEOS TO NEOS | 1212 | 65 | AG | SAB | 23 | 22 | P | 11/12/11 | SAB | | |
| P091 \ P092 | 11/12/11 | WEOS TO EEOS | 0828 | 65 | RH | SAB | 24 | 142 | P | 11/12/11 | SAB | | |
| P094 \ P095 | 11/12/11 | WEOS TO EEOS | 0906 | 65 | RH | SAB | 24 | 133 | P | 11/12/11 | SAB | DS-30 | |
| P098 \ P100 | 11/12/11 | WEOS TO EEOS | 1000 | 65 | RH | SAB | 24 | 134 | P | 11/12/11 | SAB | | |
| P101 \ P103 | 11/12/11 | WEOS TO EEOS | 1050 | 65 | RH | SAB | 24 | 90 | P | 11/12/11 | SAB | | |
| P102 \ P103 | 11/12/11 | WEOS TO EEOS | 1111 | 65 | RH | SAB | 24 | 45 | P | 11/12/11 | SAB | | |
| P106 \ P107 | 11/12/11 | WEOS TO EEOS | 1140 | 65 | RH | SAB | 24 | 152 | P | 11/12/11 | SAB | | |
| P078 \ P091 | 11/12/11 | NEOS TO SEOS | 0800 | 65 | SP | SAB | 26 | 20 | P | 11/12/11 | SAB | | |
| P078 \ P090 | 11/12/11 | NEOS TO SEOS | 0805 | 65 | SP | SAB | 26 | 22 | P | 11/12/11 | SAB | | |
| P039 \ P093 | 11/12/11 | NEOS TO SEOS | 0848 | 65 | SP | SAB | 26 | 10 | P | 11/12/11 | SAB | | |
| P038 \ P093 | 11/12/11 | NEOS TO SEOS | 0850 | 65 | SP | SAB | 26 | 8 | P | 11/12/11 | SAB | | |
| P038 \ P092 | 11/12/11 | NEOS TO SEOS | 0855 | 65 | SP | SAB | 26 | 12 | P | 11/12/11 | SAB | | |
| P042 \ P092 | 11/12/11 | NEOS TO SEOS | 0859 | 65 | SP | SAB | 26 | 8 | P | 11/12/11 | SAB | | |
| P095 \ P096 | 11/12/11 | WEOS TO EEOS | 0923 | 65 | SP | SAB | 26 | 133 | P | 11/12/11 | SAB | DS-29 | |
| P044 \ P096 | 11/12/11 | NEOS TO SEOS | 0950 | 65 | SP | SAB | 26 | 15 | P | 11/12/11 | SAB | | |
| P043 \ P096 | 11/12/11 | NEOS TO SEOS | 0952 | 65 | SP | SAB | 26 | 10 | P | 11/12/11 | SAB | | |
| P043 \ P095 | 11/12/11 | NEOS TO SEOS | 0957 | 65 | SP | SAB | 26 | 8 | P | 11/12/11 | SAB | | |
| P040 \ P095 | 11/12/11 | NEOS TO SEOS | 1000 | 65 | SP | SAB | 26 | 10 | P | 11/12/11 | SAB | | |
| P040 \ P094 | 11/12/11 | NEOS TO SEOS | 1002 | 65 | SP | SAB | 26 | 20 | P | 11/12/11 | SAB | | |



Golder Associates

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Non-Destructive | | | Destructive | |
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P094 \ 9A | 11/12/11 | NEOS TO SEOS | 1004 | 65 | SP | SAB | 26 | 8 | P | 11/12/11 | SAB | | |
| P040 \ 9A | 11/12/11 | WEOS TO EEOS | 1005 | 65 | SP | SAB | 26 | 8 | P | 11/12/11 | SAB | | |
| P093 \ 9A | 11/12/11 | WEOS TO EEOS | 1010 | 65 | SP | SAB | 26 | 8 | P | 11/12/11 | SAB | | |
| P039 \ 9A | 11/12/11 | NEOS TO SEOS | 1012 | 65 | SP | SAB | 26 | 8 | P | 11/12/11 | SAB | | |
| P101 \ P102 | 11/12/11 | NEOS TO SEOS | 1055 | 65 | SP | SAB | 26 | 22 | P | 11/12/11 | SAB | | |
| P104 \ P105 | 11/12/11 | SEOS TO NEOS | 1056 | 65 | SP | SAB | 26 | 22 | P | 11/12/11 | SAB | | |
| P105 \ P106 | 11/12/11 | WEOS TO EEOS | 1130 | 65 | SP | SAB | 26 | 133 | P | 11/12/11 | SAB | | |
| P088 \ P090 | 11/12/11 | WEOS TO EEOS | 0812 | 65 | SC | SAB | 22 | 100 | P | 11/12/11 | SAB | | |
| P089 \ P090 | 11/12/11 | WEOS TO EEOS | 0832 | 65 | SC | SAB | 22 | 34 | P | 11/12/11 | SAB | DS-31 | |
| P093 \ P094 | 11/12/11 | WEOS TO EEOS | 0858 | 65 | SC | SAB | 22 | 146 | P | 11/12/11 | SAB | | |
| P097 \ P098 | 11/12/11 | WEOS TO EEOS | 0930 | 65 | SC | SAB | 22 | 129 | P | 11/12/11 | SAB | | |
| P098 \ P099 | 11/12/11 | WEOS TO EEOS | 0952 | 65 | SC | SAB | 22 | 8 | P | 11/12/11 | SAB | | |
| P100 \ P101 | 11/12/11 | WEOS TO EEOS | 1045 | 65 | SC | SAB | 22 | 99 | P | 11/12/11 | SAB | | |
| P100 \ P102 | 11/12/11 | WEOS TO EEOS | 1105 | 65 | SC | SAB | 22 | 35 | P | 11/12/11 | SAB | | |
| P103 \ P104 | 11/12/11 | WEOS TO EEOS | 1112 | 65 | SC | SAB | 22 | 48 | P | 11/12/11 | SAB | DS-33 | |
| P103 \ P105 | 11/12/11 | WEOS TO EEOS | 1124 | 65 | SC | SAB | 22 | 93 | P | 11/12/11 | SAB | | |
| P107 \ P106 | 11/12/11 | WEOS TO EEOS | 1149 | 65 | SC | SAB | 22 | 30 | P | 11/12/11 | SAB | | |
| P107 \ P108 | 11/12/11 | WEOS TO EEOS | 1159 | 65 | SC | SAB | 22 | 21 | P | 11/12/11 | SAB | | |
| P116 \ P117 | 11/14/11 | WEOS TO EEOS | 0916 | 78 | RH | SAB | 24 | 142 | P | 11/14/11 | SAB | DS-39 | |
| P122 \ P126 | 11/14/11 | WEOS TO EEOS | 1118 | 78 | RH | SAB | 24 | 254 | P | 11/14/11 | SAB | | |
| P127 \ P128 | 11/14/11 | NEOS TO SEOS | 1338 | 78 | RH | SAB | 24 | 100 | P | 11/14/11 | SAB | | |
| P129 \ P130 | 11/14/11 | NEOS TO SEOS | 1350 | 78 | RH | SAB | 24 | 70 | P | 11/14/11 | SAB | DS-42 | |
| P130 \ P131 | 11/14/11 | NEOS TO SEOS | 1419 | 78 | RH | SAB | 24 | 70 | P | 11/14/11 | SAB | | |
| P134 \ P136 | 11/14/11 | NEOS TO SEOS | 1450 | 78 | RH | SAB | 24 | 110 | P | 11/15/11 | SAB | | |
| P138 \ P139 | 11/14/11 | NEOS TO SEOS | 1516 | 78 | RH | SAB | 24 | 60 | P | 11/15/11 | SAB | | |
| P141 \ P142 | 11/14/11 | NEOS TO SEOS | 1540 | 78 | RH | SAB | 24 | 22 | P | 11/14/11 | SAB | | |
| P142 \ P143 | 11/14/11 | NEOS TO SEOS | 1546 | 78 | RH | SAB | 24 | 68 | P | 11/15/11 | SAB | | |
| P144 \ P146 | 11/14/11 | WEOS TO EEOS | 1613 | 78 | RH | SAB | 24 | 36 | P | 11/14/11 | SAB | | |
| P145 \ P146 | 11/14/11 | WEOS TO EEOS | 1620 | 78 | RH | SAB | 24 | 100 | P | 11/15/11 | SAB | DS-43 | |
| P145 \ P147 | 11/14/11 | WEOS TO EEOS | 1649 | 78 | RH | SAB | 24 | 37 | P | 11/15/11 | SAB | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P146 \ P147 | 11/14/11 | NEOS TO SEOS | 1703 | 78 | RH | SAB | 24 | 22 | P | 11/15/11 | SAB | | |
| P110 \ P111 | 11/14/11 | WEOS TO EEOS | 0819 | 70 | SC | SAB | 22 | 95 | P | 11/14/11 | SAB | | |
| P109 \ P111 | 11/14/11 | WEOS TO EEOS | 0831 | 70 | SC | SAB | 22 | 30 | P | 11/14/11 | SAB | | |
| P108 \ P111 | 11/14/11 | WEOS TO EEOS | 0837 | 70 | SC | SAB | 22 | 20 | P | 11/14/11 | SAB | | |
| P114 \ P115 | 11/14/11 | WEOS TO EEOS | 0859 | 70 | SC | SAB | 22 | 84 | P | 11/14/11 | SAB | | |
| P112 \ P115 | 11/14/11 | WEOS TO EEOS | 0920 | 70 | SC | SAB | 22 | 2 | P | 11/14/11 | SAB | | |
| P112 \ P113 | 11/14/11 | WEOS TO EEOS | 0922 | 73 | SC | SAB | 22 | 58 | P | 11/14/11 | SAB | | |
| P121 \ P122 | 11/14/11 | WEOS TO EEOS | 1015 | 73 | SC | SAB | 22 | 278 | P | 11/14/11 | SAB | DS-37 | |
| P121 \ P125 | 11/14/11 | WEOS TO EEOS | 1118 | 73 | SC | SAB | 22 | 63 | P | 11/14/11 | SAB | | |
| P121 \ P124 | 11/14/11 | WEOS TO EEOS | 1150 | 73 | SC | SAB | 22 | 40 | P | 11/14/11 | SAB | | |
| P123 \ P124 | 11/14/11 | WEOS TO EEOS | 1202 | 73 | SC | SAB | 22 | 155 | P | 11/14/11 | SAB | DS-38 | |
| P126 \ P127 | 11/14/11 | WEOS TO EEOS | 1335 | 78 | SC | SAB | 22 | 238 | P | 11/15/11 | SAB | | |
| P134 \ P135 | 11/14/11 | NEOS TO SEOS | 1435 | 78 | SC | SAB | 22 | 60 | P | 11/14/11 | SAB | | |
| P137 \ P138 | 11/14/11 | NEOS TO SEOS | 1515 | 78 | SC | SAB | 22 | 58 | P | 11/14/11 | SAB | | |
| P139 \ P140 | 11/14/11 | NEOS TO SEOS | 1525 | 78 | SC | SAB | 22 | 61 | P | 11/15/11 | SAB | | |
| P122 \ P144 | 11/14/11 | WEOS TO EEOS | 1539 | 78 | SC | SAB | 22 | 33 | P | 11/14/11 | SAB | DS-44 | |
| P122 \ P145 | 11/14/11 | WEOS TO EEOS | 1549 | 78 | SC | SAB | 22 | 9 | P | 11/14/11 | SAB | | |
| P125 \ P145 | 11/14/11 | WEOS TO EEOS | 1550 | 78 | SC | SAB | 22 | 68 | P | 11/14/11 | SAB | | |
| P148 \ P149 | 11/14/11 | WEOS TO EEOS | 1645 | 78 | SC | SAB | 22 | 36 | P | 11/15/11 | SAB | | |
| P148 \ P151 | 11/14/11 | WEOS TO EEOS | 1650 | 78 | SC | SAB | 22 | 217 | P | 11/15/11 | SAB | | |
| P107 \ P110 | 11/14/11 | WEOS TO EEOS | 0800 | 70 | SP | SAB | 26 | 95 | P | 11/14/11 | SAB | DS-34 | |
| P109 \ P110 | 11/14/11 | NEOS TO SEOS | 0825 | 70 | SP | SAB | 26 | 27 | P | 11/14/11 | SAB | | |
| P111 \ P114 | 11/14/11 | WEOS TO EEOS | 0837 | 70 | SP | SAB | 26 | 84 | P | 11/14/11 | SAB | | |
| P111 \ P112 | 11/14/11 | WEOS TO EEOS | 0800 | 70 | SP | SAB | 26 | 57 | P | 11/14/11 | SAB | | |
| P063 \ P111 | 11/14/11 | NEOS TO SEOS | 0910 | 70 | SP | SAB | 26 | 18 | P | 11/14/11 | SAB | | |
| P062 \ P111 | 11/14/11 | NEOS TO SEOS | 0912 | 70 | SP | SAB | 26 | 10 | P | 11/14/11 | SAB | | |
| P064 \ P112 | 11/14/11 | NEOS TO SEOS | 0918 | 70 | SP | SAB | 26 | 10 | P | 11/14/11 | SAB | | |
| P063 \ P112 | 11/14/11 | NEOS TO SEOS | 0920 | 70 | SP | SAB | 26 | 10 | P | 11/14/11 | SAB | | |
| P064 \ P113 | 11/14/11 | NEOS TO SEOS | 0935 | 70 | SP | SAB | 26 | 10 | P | 11/14/11 | SAB | | |
| P066 \ P113 | 11/14/11 | NEOS TO SEOS | 0940 | 70 | SP | SAB | 26 | 10 | P | 11/14/11 | SAB | | |



Golder Associates

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P066 \ P116 | 11/14/11 | NEOS TO SEOS | 0942 | 73 | SP | SAB | 26 | 10 | P | 11/14/11 | SAB | | |
| P118 \ P121 | 11/14/11 | WEOS TO EEOS | 0949 | 73 | SP | SAB | 26 | 219 | P | 11/14/11 | SAB | DS-35 | |
| P125 \ P118 | 11/14/11 | NEOS TO SEOS | 1102 | 73 | SP | SAB | 26 | 22 | P | 11/14/11 | SAB | | |
| P125 \ P120 | 11/14/11 | NEOS TO SEOS | 1105 | 73 | SP | SAB | 26 | 22 | P | 11/14/11 | SAB | | |
| P121 \ P123 | 11/14/11 | NEOS TO SEOS | 1125 | 73 | SP | SAB | 26 | 22 | P | 11/14/11 | SAB | | |
| P124 \ P125 | 11/14/11 | NEOS TO SEOS | 1155 | 73 | SP | SAB | 26 | 22 | P | 11/14/11 | SAB | | |
| P122 \ P125 | 11/14/11 | NEOS TO SEOS | 1205 | 73 | SP | SAB | 26 | 22 | P | 11/14/11 | SAB | | |
| P120 \ P121 | 11/14/11 | WEOS TO EEOS | 1206 | 78 | SP | SAB | 26 | 243 | P | 11/14/11 | SAB | | |
| P120 \ P123 | 11/14/11 | WEOS TO EEOS | 1250 | 78 | SP | SAB | 26 | 155 | P | 11/14/11 | SAB | | |
| P128 \ P132 | 11/14/11 | WEOS TO EEOS | 1410 | 78 | SP | SAB | 26 | 22 | P | 11/14/11 | SAB | | |
| P133 \ P134 | 11/14/11 | WEOS TO EEOS | 1435 | 78 | SP | SAB | 26 | 95 | P | 11/14/11 | SAB | | |
| P136 \ P137 | 11/14/11 | NEOS TO SEOS | 1500 | 78 | SP | SAB | 26 | 58 | P | 11/14/11 | SAB | | |
| P135 \ P136 | 11/14/11 | WEOS TO EEOS | 1525 | 78 | SP | SAB | 26 | 22 | P | 11/15/11 | SAB | | |
| P127 \ P148 | 11/14/11 | WEOS TO EEOS | 1624 | 78 | SP | SAB | 26 | 52 | P | 11/14/11 | SAB | | |
| P146 \ P148 | 11/14/11 | WEOS TO EEOS | 1640 | 78 | SP | SAB | 26 | 141 | P | 11/15/11 | SAB | | |
| P147 \ P148 | 11/14/11 | WEOS TO EEOS | 1659 | 78 | SP | SAB | 26 | 39 | P | 11/15/11 | SAB | | |
| P112 \ P114 | 11/14/11 | WEOS TO EEOS | 0828 | 70 | AG | SAB | 23 | 22 | P | 11/14/11 | SAB | | |
| P113 \ P115 | 11/14/11 | NEOS TO SEOS | 0837 | 70 | AG | SAB | 23 | 22 | P | 11/14/11 | SAB | | |
| P115 \ P116 | 11/14/11 | WEOS TO EEOS | 0847 | 70 | AG | SAB | 23 | 86 | P | 11/14/11 | SAB | DS-40 | |
| P113 \ P116 | 11/14/11 | WEOS TO EEOS | 0900 | 70 | AG | SAB | 23 | 57 | P | 11/14/11 | SAB | | |
| P117 \ P118 | 11/14/11 | WEOS TO EEOS | 0930 | 78 | AG | SAB | 23 | 289 | P | 11/14/11 | SAB | | |
| P117 \ P120 | 11/14/11 | WEOS TO EEOS | 1029 | 78 | AG | SAB | 23 | 100 | P | 11/14/11 | SAB | | |
| P119 \ P120 | 11/14/11 | WEOS TO EEOS | 1050 | 78 | AG | SAB | 23 | 153 | P | 11/14/11 | SAB | DS-41 | |
| 13P \ P133 | 11/14/11 | NEOS TO SEOS | 1445 | 78 | AG | SAB | 23 | 8 | P | 11/14/11 | SAB | | |
| 13P \ P128 | 11/14/11 | NEOS TO SEOS | 1447 | 78 | AG | SAB | 23 | 8 | P | 11/14/11 | SAB | | |
| 13P \ P127 | 11/14/11 | WEOS TO EEOS | 1449 | 78 | AG | SAB | 23 | 6 | P | 11/14/11 | SAB | | |
| P135 \ P149 | 11/14/11 | SEOS TO NEOS | 1450 | 78 | AG | SAB | 23 | 22 | P | 11/15/11 | SAB | | |
| P135 \ P148 | 11/14/11 | SEOS TO NEOS | 1452 | 78 | AG | SAB | 23 | 22 | P | 11/15/11 | SAB | | |
| P127 \ P133 | 11/14/11 | WEOS TO EEOS | 1457 | 78 | AG | SAB | 23 | 22 | P | 11/14/11 | SAB | | |
| P134 \ P146 | 11/14/11 | WEOS TO EEOS | 1505 | 78 | AG | SAB | 23 | 22 | P | 11/15/11 | SAB | | |



Golder Associates

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P135 \ P148 | 11/14/11 | WEOS TO EEOS | 1511 | 78 | AG | SAB | 23 | 22 | P | 11/15/11 | SAB | | |
| P140 \ P141 | 11/14/11 | NEOS TO SEOS | 1540 | 78 | AG | SAB | 23 | 22 | P | 11/15/11 | SAB | | |
| P140 \ P142 | 11/14/11 | NEOS TO SEOS | 1545 | 78 | AG | SAB | 23 | 35 | P | 11/15/11 | SAB | | |
| P128 \ P129 | 11/14/11 | NEOS TO SEOS | 1357 | 78 | AG | SAB | 23 | 70 | P | 11/14/11 | SAB | DS-48 | |
| P131 \ P132 | 11/14/11 | NEOS TO SEOS | 1412 | 78 | AG | SAB | 23 | 72 | P | 11/14/11 | SAB | | |
| P132 \ P133 | 11/14/11 | NEOS TO SEOS | 1428 | 78 | AG | SAB | 23 | 70 | P | 11/14/11 | SAB | | |
| P126 \ P144 | 11/14/11 | SEOS TO NEOS | 1602 | 78 | AG | SAB | 23 | 22 | P | 11/14/11 | SAB | | |
| P127 \ P146 | 11/14/11 | SEOS TO NEOS | 1610 | 78 | AG | SAB | 23 | 22 | P | 11/14/11 | SAB | | |
| P144 \ P145 | 11/14/11 | SEOS TO NEOS | 1621 | 78 | AG | SAB | 23 | 22 | P | 11/14/11 | SAB | | |
| P149 \ P150 | 11/14/11 | NEOS TO SEOS | 1700 | 78 | AG | SAB | 23 | 22 | P | 11/15/11 | SAB | | |
| P151 \ P154 | 11/15/11 | WEOS TO EEOS | 0821 | 60 | RH | SAB | 24 | 69 | P | 11/15/11 | SAB | | |
| P140 \ P155 | 11/15/11 | EEOS TO WEOS | 0851 | 60 | RH | SAB | 24 | 22 | P | 11/15/11 | SAB | | |
| P139 \ P155 | 11/15/11 | EEOS TO WEOS | 0856 | 60 | RH | SAB | 24 | 8 | P | 11/15/11 | SAB | | |
| P139 \ P154 | 11/15/11 | EEOS TO WEOS | 0901 | 60 | RH | SAB | 24 | 12 | P | 11/15/11 | SAB | | |
| P138 \ P154 | 11/15/11 | EEOS TO WEOS | 0905 | 60 | RH | SAB | 24 | 10 | P | 11/15/11 | SAB | | |
| P138 \ P151 | 11/15/11 | EEOS TO WEOS | 0910 | 60 | RH | SAB | 24 | 6 | P | 11/15/11 | SAB | | |
| P157 \ P158 | 11/15/11 | NEOS TO SEOS | 0918 | 60 | RH | SAB | 24 | 168 | P | 11/15/11 | SAB | | |
| P157 \ P159 | 11/15/11 | NEOS TO SEOS | 0935 | 60 | RH | SAB | 24 | 19 | P | 11/15/11 | SAB | | |
| P143 \ P152 | 11/15/11 | NEOS TO SEOS | 0818 | 60 | SC | SAB | 22 | 68 | P | 11/15/11 | SAB | DS-46 | |
| P152 \ P156 | 11/15/11 | NEOS TO SEOS | 0822 | 60 | SC | SAB | 22 | 5 | P | 11/15/11 | SAB | | |
| P154 \ P155 | 11/15/11 | WEOS TO EEOS | 0830 | 60 | SC | SAB | 22 | 49 | P | 11/15/11 | SAB | | |
| P152 \ P157 | 11/15/11 | NEOS TO SEOS | 0849 | 60 | SC | SAB | 22 | 168 | P | 11/15/11 | SAB | | |
| P152 \ P155 | 11/15/11 | NEOS TO SEOS | 0909 | 60 | SC | SAB | 22 | 22 | P | 11/15/11 | SAB | | |
| P152 \ P154 | 11/15/11 | NEOS TO SEOS | 0920 | 60 | SC | SAB | 22 | 22 | P | 11/15/11 | SAB | | |
| P149 \ P153 | 11/15/11 | WEOS TO EEOS | 0820 | 60 | SP | SAB | 26 | 39 | P | 11/15/11 | SAB | DS-47 | |
| P150 \ P153 | 11/15/11 | WEOS TO EEOS | 0828 | 60 | SP | SAB | 26 | 63 | P | 11/15/11 | SAB | | |
| P153 \ 19J | 11/15/11 | WEOS TO EEOS | 0840 | 60 | SP | SAB | 26 | 8 | P | 11/15/11 | SAB | | |
| P135 \ 19J | 11/15/11 | SEOS TO NEOS | 0844 | 60 | SP | SAB | 26 | 22 | P | 11/15/11 | SAB | | |
| P137 \ 19J | 11/15/11 | NEOS TO SEOS | 0900 | 60 | SP | SAB | 26 | 10 | P | 11/15/11 | SAB | | |
| P151 \ 19J | 11/15/11 | SEOS TO NEOS | 0905 | 60 | SP | SAB | 26 | 8 | P | 11/15/11 | SAB | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P150 \ P152 | 11/15/11 | WEOS TO EEOS | 0919 | 60 | SP | SAB | 26 | 22 | P | 11/15/11 | SAB | | |
| P150 \ P157 | 11/15/11 | WEOS TO EEOS | 0940 | 60 | SP | SAB | 26 | 22 | P | 11/15/11 | SAB | | |
| P150 \ P154 | 11/15/11 | WEOS TO EEOS | 0945 | 60 | SP | SAB | 26 | 22 | P | 11/15/11 | SAB | | |
| P152 \ P153 | 11/15/11 | SEOS TO NEOS | 0839 | 60 | AG | SAB | 23 | 23 | P | 11/15/11 | SAB | | |
| P151 \ P152 | 11/15/11 | SEOS TO NEOS | 0847 | 60 | AG | SAB | 23 | 22 | P | 11/15/11 | SAB | | |
| P155 \ P156 | 11/15/11 | EEOS TO WEOS | 0911 | 60 | AG | SAB | 23 | 20 | P | 11/15/11 | SAB | | |
| P143 \ P156 | 11/15/11 | SEOS TO NEOS | 0928 | 60 | AG | SAB | 23 | 20 | P | 11/15/11 | SAB | DS-48 | |
| P158 \ P159 | 11/15/11 | EEOS TO WEOS | 0947 | 60 | AG | SAB | 23 | 22 | P | 11/15/11 | SAB | | |
| P158 \ P160 | 11/19/11 | NEOS TO SEOS | 0849 | 65 | AG | SAB | 23 | 198 | P | 11/19/11 | SAB | | |
| P159 \ P160 | 11/19/11 | NEOS TO SEOS | 0910 | 65 | AG | SAB | 23 | 10 | P | 11/19/11 | SAB | | |
| P164 \ P166 | 11/19/11 | NEOS TO SEOS | 0955 | 65 | AG | SAB | 23 | 140 | P | 11/19/11 | SAB | | |
| P165 \ P166 | 11/19/11 | NEOS TO SEOS | 1002 | 65 | AG | SAB | 23 | 58 | P | 11/19/11 | SAB | | |
| P145 \ P168 | 11/19/11 | SEOS TO NEOS | 1036 | 65 | AG | SAB | 23 | 22 | P | 11/19/11 | SAB | | |
| P147 \ P169 | 11/19/11 | SEOS TO NEOS | 1040 | 65 | AG | SAB | 23 | 22 | P | 11/19/11 | SAB | | |
| P148 \ P171 | 11/19/11 | SEOS TO NEOS | 1045 | 65 | AG | SAB | 23 | 22 | P | 11/19/11 | SAB | DS-54 | |
| P169 \ P171 | 11/19/11 | WEOS TO EEOS | 1106 | 65 | AG | SAB | 23 | 69 | P | 11/19/11 | SAB | | |
| P170 \ P172 | 11/19/11 | WEOS TO EEOS | 1115 | 65 | AG | SAB | 23 | 56 | P | 11/19/11 | SAB | | |
| P170 \ P171 | 11/19/11 | SEOS TO NEOS | 0119 | 65 | AG | SAB | 23 | 22 | P | 11/19/11 | SAB | | |
| P167 \ P183 | 11/19/11 | SEOS TO NEOS | 1353 | 65 | AG | SAB | 23 | 48 | P | 11/19/11 | SAB | | |
| P181 \ P182 | 11/19/11 | SEOS TO NEOS | 1400 | 65 | AG | SAB | 23 | 8 | P | 11/19/11 | SAB | | |
| P182 \ P183 | 11/19/11 | SEOS TO NEOS | 1407 | 65 | AG | SAB | 23 | 30 | P | 11/19/11 | SAB | | |
| P161 \ P162 | 11/19/11 | EEOS TO WEOS | 0910 | 65 | SP | SAB | 26 | 22 | P | 11/19/11 | SAB | | |
| P164 \ P165 | 11/19/11 | EEOS TO WEOS | 0912 | 65 | SP | SAB | 26 | 22 | P | 11/19/11 | SAB | | |
| P150 \ P165 | 11/19/11 | EEOS TO WEOS | 1003 | 65 | SP | SAB | 26 | 22 | P | 11/19/11 | SAB | | |
| P150 \ P163 | 11/19/11 | EEOS TO WEOS | 1005 | 65 | SP | SAB | 26 | 22 | P | 11/19/11 | SAB | | |
| P150 \ P162 | 11/19/11 | EEOS TO WEOS | 1007 | 65 | SP | SAB | 26 | 22 | P | 11/19/11 | SAB | | |
| P150 \ P160 | 11/19/11 | EEOS TO WEOS | 1011 | 65 | SP | SAB | 26 | 22 | P | 11/19/11 | SAB | | |
| P124 \ P168 | 11/19/11 | WEOS TO EEOS | 1034 | 65 | SP | SAB | 26 | 119 | P | 11/19/11 | SAB | DS-51 | |
| P171 \ P172 | 11/19/11 | WEOS TO EEOS | 1100 | 65 | SP | SAB | 26 | 69 | P | 11/19/11 | SAB | | |
| P166 \ P172 | 11/19/11 | EEOS TO WEOS | 1135 | 65 | SP | SAB | 26 | 22 | P | 11/19/11 | SAB | | |



Golder Associates

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P165 \ P172 | 11/19/11 | EEOS TO WEOS | 1139 | 65 | SP | SAB | 26 | 3 | P | 11/19/11 | SAB | | |
| P174 \ P175 | 11/19/11 | WEOS TO EEOS | 1150 | 65 | SP | SAB | 26 | 82 | P | 11/19/11 | SAB | | |
| P177 \ P179 | 11/19/11 | WEOS TO EEOS | 1320 | 65 | SP | SAB | 26 | 42 | P | 11/19/11 | SAB | | |
| P177 \ P178 | 11/19/11 | WEOS TO EEOS | 1336 | 65 | SP | SAB | 26 | 40 | P | 11/19/11 | SAB | | |
| P160 \ P161 | 11/19/11 | NEOS TO SEOS | 0850 | 65 | SC | SAB | 22 | 75 | P | 11/19/11 | SAB | | |
| P160 \ P162 | 11/19/11 | NEOS TO SEOS | 0912 | 65 | SC | SAB | 22 | 105 | P | 11/19/11 | SAB | DS-49 | |
| P163 \ P164 | 11/19/11 | NEOS TO SEOS | 1010 | 65 | SC | SAB | 22 | 140 | P | 11/19/11 | SAB | | |
| P163 \ P165 | 11/19/11 | NEOS TO SEOS | 1033 | 65 | SC | SAB | 22 | 58 | P | 11/19/11 | SAB | | |
| P168 \ P169 | 11/19/11 | WEOS TO EEOS | 1040 | 65 | SC | SAB | 22 | 119 | P | 11/19/11 | SAB | | |
| P172 \ P173 | 11/19/11 | WEOS TO EEOS | 1119 | 65 | SC | SAB | 22 | 93 | P | 11/19/11 | SAB | DS-52 | |
| P175 \ P176 | 11/19/11 | WEOS TO EEOS | 1150 | 65 | SC | SAB | 22 | 82 | P | 11/19/11 | SAB | | |
| P176 \ P177 | 11/19/11 | WEOS TO EEOS | 1317 | 65 | SC | SAB | 22 | 66 | P | 11/19/11 | SAB | | |
| P177 \ P178 | 11/19/11 | WEOS TO EEOS | 1322 | 65 | SC | SAB | 22 | 22 | P | 11/19/11 | SAB | | |
| P178 \ P179 | 11/19/11 | WEOS TO EEOS | 1400 | 65 | SC | SAB | 22 | 40 | P | 11/19/11 | SAB | | |
| P158 \ P160 | 11/19/11 | NEOS TO SEOS | 0849 | 65 | AG | SAB | 23 | 198 | P | 11/19/11 | SAB | | |
| P159 \ P160 | 11/19/11 | NEOS TO SEOS | 0910 | 65 | AG | SAB | 23 | 10 | P | 11/19/11 | SAB | | |
| P164 \ P166 | 11/19/11 | NEOS TO SEOS | 0955 | 65 | AG | SAB | 23 | 140 | P | 11/19/11 | SAB | | |
| P165 \ P166 | 11/19/11 | NEOS TO SEOS | 1002 | 65 | AG | SAB | 23 | 58 | P | 11/19/11 | SAB | | |
| P145 \ P168 | 11/19/11 | SEOS TO NEOS | 1036 | 65 | AG | SAB | 23 | 22 | P | 11/19/11 | SAB | | |
| P147 \ P169 | 11/19/11 | SEOS TO NEOS | 1040 | 65 | AG | SAB | 23 | 22 | P | 11/19/11 | SAB | | |
| P148 \ P171 | 11/19/11 | SEOS TO NEOS | 1045 | 65 | AG | SAB | 23 | 22 | P | 11/19/11 | SAB | DS-54 | |
| P169 \ P171 | 11/19/11 | WEOS TO EEOS | 1106 | 65 | AG | SAB | 23 | 69 | P | 11/19/11 | SAB | | |
| P170 \ P172 | 11/19/11 | WEOS TO EEOS | 1115 | 65 | AG | SAB | 23 | 58 | P | 11/19/11 | SAB | | |
| P170 \ P171 | 11/19/11 | SEOS TO NEOS | 1119 | 65 | AG | SAB | 23 | 22 | P | 11/19/11 | SAB | | |
| P167 \ P183 | 11/19/11 | SEOS TO NEOS | 1353 | 65 | AG | SAB | 23 | 48 | P | 11/19/11 | SAB | | |
| P181 \ P182 | 11/19/11 | SEOS TO NEOS | 1400 | 65 | AG | SAB | 23 | 8 | P | 11/19/11 | SAB | | |
| P182 \ P183 | 11/19/11 | SEOS TO NEOS | 1407 | 65 | AG | SAB | 23 | 30 | P | 11/19/11 | SAB | | |
| P161 \ P163 | 11/19/11 | NEOS TO SEOS | 0919 | 65 | RH | SAB | 24 | 74 | P | 11/19/11 | SAB | | |
| P162 \ P163 | 11/19/11 | NEOS TO SEOS | 0932 | 65 | RH | SAB | 24 | 105 | P | 11/19/11 | SAB | DS-50 | |
| P166 \ P167 | 11/19/11 | NEOS TO SEOS | 1015 | 65 | RH | SAB | 24 | 155 | P | 11/19/11 | SAB | | |



Golder Associates

# GEOMEMBRANE FUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | Non-Destructive | | | Destructive | |
| | | | | | | | | | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P173 \ P174 | 11/19/11 | WEOS TO EEOS | 1128 | 65 | RH | SAB | 24 | 95 | P | 11/19/11 | SAB | DS-53 | |
| P180 \ P181 | 11/19/11 | EEOS TO WEOS | 1424 | 65 | RH | SAB | 24 | 20 | P | 11/19/11 | SAB | | |
| P180 \ P182 | 11/19/11 | EEOS TO WEOS | 1426 | 65 | RH | SAB | 24 | 23 | P | 11/19/11 | SAB | | |
| P180 \ P183 | 11/19/11 | EEOS TO WEOS | 1440 | 65 | RH | SAB | 24 | 23 | P | 11/19/11 | SAB | | |
| P167 \ P174 | 11/19/11 | WEOS TO EEOS | 1443 | 65 | RH | SAB | 24 | 22 | P | 11/19/11 | SAB | | |
| P167 \ P175 | 11/19/11 | SEOS TO NEOS | 1448 | 65 | RH | SAB | 24 | 22 | P | 11/19/11 | SAB | | |
| P167 \ P176 | 11/19/11 | SEOS TO NEOS | 1452 | 65 | RH | SAB | 24 | 22 | P | 11/19/11 | SAB | | |
| P167 \ P177 | 11/19/11 | SEOS TO NEOS | 1458 | 65 | RH | SAB | 24 | 22 | P | 11/19/11 | SAB | | |
| P167 \ P179 | 11/19/11 | SEOS TO NEOS | 1501 | 65 | RH | SAB | 24 | 8 | P | 11/19/11 | SAB | | |
| P167 \ P180 | 11/19/11 | SEOS TO NEOS | 1503 | 65 | RH | SAB | 24 | 8 | P | 11/19/11 | SAB | | |
| P166 \ P173 | 11/19/11 | SEOS TO NEOS | 1157 | 65 | RH | SAB | 24 | 22 | P | 11/19/11 | SAB | | |
| P166 \ P174 | 11/19/11 | SEOS TO NEOS | 1202 | 65 | RH | SAB | 24 | 22 | P | 11/19/11 | SAB | | |

NOTES: (1) "V" denotes vacuum testing; individual test data in Appendix K.
(2) Welding machines #s 22, 23, 24, and 26 are fusion welders.



Golder Associates

# EXTRUSION SEAM SUMMARY

# GEOMEMBRANE EXTRUSION SEAM SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAMING PROCESS | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Non-Destructive | | | Destructive | |
| Seam Number | Date | Location | Start Time | Ambient Temp (F) | Welding Tech. | QA Mon. | Welding Machine Number | Length Welded (ft) | P/V (Note 1) | Date Complete | QA Monitor | Test Number | Remarks |
| P019 \ P023 | 11/09/11 | WEOS TO EEOS | 0925 | 58 | AR | SAB | 27 | 6 | V | 11/09/11 | SAB | | |
| P161 \ P163 | 11/19/11 | NEOS TO SEOS | 1730 | 65 | AR | SAB | 27 | 74 | V | 11/19/11 | SAB | | |

NOTES: (1) "V" denotes vacuum testing; individual test data in Appendix K.
(2) Welding machine #27 is an extrusion welder.

# PRESSURE TEST SUMMARY

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P004 \ P005 | 11/08/11 | EEOS TO WEOS | IS | 1504 | 1509 | 30 | 30 | PASS | SAB | |
| P003 \ P004 | 11/08/11 | EEOS TO WEOS | IS | 1502 | 1507 | 30 | 30 | PASS | SAB | |
| P002 \ P003 | 11/08/11 | EEOS TO WEOS | IS | 1501 | 1506 | 30 | 30 | PASS | SAB | |
| P001 \ P002 | 11/08/11 | EEOS TO WEOS | IS | 1500 | 1505 | 30 | 30 | PASS | SAB | |
| P007 \ P008 | 11/08/11 | EEOS TO 1E | IS | 1523 | 1528 | 30 | 30 | PASS | SAB | |
| P007 \ P008 | 11/08/11 | 1E TO WEOS | IS | 1555 | 1600 | 30 | 30 | PASS | SAB | |
| P006 \ P007 | 11/08/11 | EEOS TO WEOS | IS | 1520 | 1525 | 30 | 30 | PASS | SAB | |
| P005 \ P006 | 11/08/11 | EEOS TO WEOS | IS | 1520 | 1525 | 30 | 30 | PASS | SAB | |
| P008 \ P009 | 11/08/11 | EEOS TO WEOS | IS | 1642 | 1647 | 30 | 30 | PASS | SAB | |
| P009 \ P010 | 11/08/11 | EEOS TO WEOS | IS | 1700 | 1705 | 30 | 30 | PASS | SAB | |
| P010 \ P011 | 11/08/11 | EEOS TO WEOS | IS | 1715 | 1720 | 30 | 30 | PASS | SAB | |
| P011 \ P012 | 11/08/11 | EEOS TO WEOS | IS | 1718 | 1723 | 30 | 30 | PASS | SAB | |
| P012 \ P014 | 11/08/11 | NEOS TO SEOS | IS | 1717 | 1722 | 30 | 30 | PASS | SAB | |
| P014 \ P015 | 11/08/11 | NEOS TO 1F | IS | 1723 | 1728 | 30 | 30 | PASS | SAB | |
| P014 \ P015 | 11/08/11 | 1F TO SEOS | IS | 1722 | 1727 | 30 | 30 | PASS | SAB | |
| P013 \ P014 | 11/08/11 | NEOS TO SEOS | IS | 1726 | 1731 | 30 | 30 | PASS | SAB | |
| P012 \ P013 | 11/08/11 | EEOS TO WEOS | IS | 1725 | 1730 | 30 | 30 | PASS | SAB | |
| P011 \ P015 | 11/08/11 | SEOS TO NEOS | IS | 1716 | 1721 | 30 | 30 | PASS | SAB | |
| P010 \ P015 | 11/08/11 | NEOS TO SEOS | IS | 1708 | 1713 | 30 | 30 | PASS | SAB | |
| P010 \ P020 | 11/08/11 | NEOS TO SEOS | IS | 1701 | 1706 | 30 | 30 | PASS | SAB | |
| P015 \ P019 | 11/08/11 | SEOS TO NEOS | IS | 1707 | 1712 | 30 | 30 | PASS | SAB | |
| P015 \ P020 | 11/08/11 | SEOS TO NEOS | IS | 1655 | 1700 | 30 | 30 | PASS | SAB | |
| P009 \ P020 | 11/08/11 | NEOS TO SEOS | IS | 1656 | 1707 | 30 | 30 | PASS | SAB | |
| P009 \ P019 | 11/08/11 | NEOS TO SEOS | IS | 1641 | 1646 | 30 | 30 | PASS | SAB | |
| P008 \ P019 | 11/08/11 | NEOS TO SEOS | IS | 1640 | 1645 | 30 | 30 | PASS | SAB | |
| P016 \ P019 | 11/08/11 | WEOS TO EEOS | IS | 1736 | 1741 | 30 | 30 | PASS | SAB | |
| P015 \ P016 | 11/08/11 | NEOS TO SEOS | IS | 1735 | 1740 | 30 | 30 | PASS | SAB | |
| P016 \ P017 | 11/08/11 | NEOS TO SEOS | IS | 1754 | 1759 | 30 | 30 | PASS | SAB | |
| P017 \ P018 | 11/08/11 | WEOS TO EEOS | IS | 1755 | 1800 | 30 | 30 | PASS | SAB | |
| P016 \ P018 | 11/08/11 | NEOS TO SEOS | IS | 1754 | 1759 | 30 | 30 | PASS | SAB | |
| P018 \ P019 | 11/08/11 | WEOS TO EEOS | IS | 1738 | 1743 | 30 | 30 | PASS | SAB | |
| P031 \ P030 | 11/09/11 | 3R TO EEOS | IS | 1441 | 1446 | 30 | 30 | PASS | SAB | |
| P031 \ P030 | 11/09/11 | 3R TO WEOS | IS | 1440 | 1445 | 30 | 30 | PASS | SAB | |
| P025 \ P029 | 11/09/11 | WEOS TO EEOS | IS | 1351 | 1356 | 30 | 30 | PASS | SAB | |



Golder Associates

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P028 \ P029 | 11/09/11 | SEOS TO NEOS | IS | 1350 | 1355 | 30 | 30 | PASS | SAB | |
| P029 \ P030 | 11/09/11 | WEOS TO EEOS | IS | 1400 | 1405 | 30 | 30 | PASS | SAB | |
| P028 \ P030 | 11/09/11 | EEOS TO 3W | IS | 1425 | 1430 | 30 | 30 | PASS | SAB | |
| P028 \ P030 | 11/09/11 | 3W TO WEOS | IS | 1430 | 1435 | 30 | 30 | PASS | SAB | |
| P002 \ P028 | 11/09/11 | SEOS TO NEOS | IS | 1411 | 1416 | 30 | 30 | PASS | SAB | |
| P001 \ P028 | 11/09/11 | SEOS TO NEOS | IS | 1410 | 1415 | 30 | 30 | PASS | SAB | |
| P031 \ P032 | 11/09/11 | WEOS TO EEOS | IS | 1500 | 1505 | 30 | 30 | PASS | SAB | |
| P032 \ P033 | 11/09/11 | WEOS TO EEOS | IS | 1515 | 1520 | 30 | 30 | PASS | SAB | |
| P033 \ P034 | 11/09/11 | WEOS TO EEOS | IS | 1545 | 1550 | 30 | 30 | PASS | SAB | |
| P034 \ P035 | 11/09/11 | WEOS TO EEOS | IS | 1555 | 1600 | 30 | 30 | PASS | SAB | |
| P019 \ P020 | 11/09/11 | WEOS TO EEOS | IS | 1802 | 1807 | 30 | 30 | PASS | SAB | |
| P003 \ P026 | 11/09/11 | SEOS TO NEOS | IS | 0811 | 0816 | 30 | 30 | PASS | SAB | |
| P004 \ P026 | 11/09/11 | NEOS TO SEOS | IS | 0810 | 0815 | 30 | 30 | PASS | SAB | |
| P024 \ P026 | 11/09/11 | WEOS TO EEOS | IS | 0812 | 0817 | 30 | 30 | PASS | SAB | |
| P004 \ P024 | 11/09/11 | SEOS TO NEOS | IS | 0814 | 0819 | 30 | 30 | PASS | SAB | |
| P005 \ P026 | 11/09/11 | NEOS TO SEOS | IS | 0817 | 0822 | 30 | 30 | PASS | SAB | |
| P006 \ P027 | 11/09/11 | NEOS TO SEOS | IS | 0821 | 0826 | 30 | 30 | PASS | SAB | |
| P024 \ P027 | 11/09/11 | WEOS TO EEOS | IS | 0820 | 0825 | 30 | 30 | PASS | SAB | |
| P022 \ P027 | 11/09/11 | NEOS TO SEOS | IS | 0822 | 0827 | 30 | 30 | PASS | SAB | |
| P022 \ P024 | 11/09/11 | WEOS TO EEOS | IS | 0833 | 0838 | 30 | 30 | PASS | SAB | |
| P024 \ P025 | 11/09/11 | WEOS TO EEOS | IS | 0831 | 0836 | 30 | 30 | PASS | SAB | |
| P025 \ P026 | 11/09/11 | SEOS TO NEOS | IS | 0830 | 0835 | 30 | 30 | PASS | SAB | |
| P006 \ P022 | 11/09/11 | NEOS TO SEOS | IS | 0834 | 0839 | 30 | 30 | PASS | SAB | |
| P007 \ P022 | 11/09/11 | NEOS TO SEOS | IS | 0835 | 0840 | 30 | 30 | PASS | SAB | |
| P022 \ P023 | 11/09/11 | WEOS TO EEOS | IS | 0841 | 0846 | 30 | 30 | PASS | SAB | |
| P007 \ P023 | 11/09/11 | NEOS TO SEOS | IS | 0843 | 0848 | 30 | 30 | PASS | SAB | |
| P008 \ P023 | 11/09/11 | NEOS TO SEOS | IS | 0845 | 0850 | 30 | 30 | PASS | SAB | |
| P019 \ P022 | 11/09/11 | WEOS TO EEOS | IS | 0846 | 0851 | 30 | 30 | PASS | SAB | |
| P019 \ P021 | 11/09/11 | WEOS TO EEOS | IS | 0855 | 0900 | 30 | 30 | PASS | SAB | |
| P021 \ P022 | 11/09/11 | SEOS TO NEOS | IS | 0856 | 0901 | 30 | 30 | PASS | SAB | |
| P021 \ P024 | 11/09/11 | WEOS TO EEOS | IS | 0858 | 0903 | 30 | 30 | PASS | SAB | |
| P031 \ P069 | 11/11/11 | NEOS TO SEOS | IS | 1509 | 1514 | 30 | 30 | PASS | SAB | |
| P067 \ P069 | 11/11/11 | NEOS TO SEOS | IS | 1521 | 1526 | 30 | 30 | PASS | SAB | |
| P067 \ P068 | 11/11/11 | NEOS TO SEOS | IS | 1522 | 1527 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P001 \ P067 | 11/11/11 | NEOS TO SEOS | IS | 1524 | 1529 | 30 | 30 | PASS | SAB | |
| P030 \ P067 | 11/11/11 | SEOS TO NEOS | IS | 1525 | 1530 | 30 | 30 | PASS | SAB | |
| P031 \ P067 | 11/11/11 | WEOS TO EEOS | IS | 1520 | 1525 | 30 | 30 | PASS | SAB | |
| P068 \ P069 | 11/11/11 | EEOS TO WEOS | IS | 1441 | 1446 | 30 | 30 | PASS | SAB | |
| P069 \ P070 | 11/11/11 | EEOS TO WEOS | IS | 1442 | 1447 | 30 | 30 | PASS | SAB | |
| P070 \ P071 | 11/11/11 | EEOS TO WEOS | IS | 1550 | 1555 | 30 | 30 | PASS | SAB | |
| P035 \ P084 | 11/11/11 | SEOS TO NEOS | IS | 1616 | 1621 | 30 | 30 | PASS | SAB | |
| P035 \ P073 | 11/11/11 | WEOS TO EEOS | IS | 1610 | 1615 | 30 | 30 | PASS | SAB | |
| P035 \ P072 | 11/11/11 | EEOS TO WEOS | IS | 1604 | 1609 | 30 | 30 | PASS | SAB | |
| P034 \ P072 | 11/11/11 | EEOS TO WEOS | IS | 1603 | 1608 | 30 | 30 | PASS | SAB | |
| P033 \ P071 | 11/11/11 | NEOS TO 8N | IS | 1535 | 1540 | 30 | 30 | PASS | SAB | |
| P033 \ P071 | 11/11/11 | 8N TO SEOS | IS | 1536 | 1541 | 30 | 30 | PASS | SAB | |
| P032 \ P072 | 11/11/11 | NEOS TO SEOS | IS | 1500 | 1505 | 30 | 30 | PASS | SAB | |
| P036 \ P084 | 11/11/11 | WEOS TO EEOS | IS | 1620 | 1625 | 30 | 30 | PASS | SAB | |
| P073 \ P084 | 11/11/11 | SEOS TO NEOS | IS | 1615 | 1620 | 30 | 30 | PASS | SAB | |
| P074 \ P084 | 11/11/11 | SEOS TO NEOS | IS | 1618 | 1623 | 30 | 30 | PASS | SAB | |
| P036 \ P075 | 11/11/11 | EEOS TO WEOS | IS | 1645 | 1650 | 30 | 30 | PASS | SAB | |
| P059 \ P062 | 11/11/11 | WEOS TO EEOS | IS | 0932 | 0937 | 30 | 30 | PASS | SAB | |
| P060 \ P062 | 11/11/11 | EEOS TO WEOS | IS | 0931 | 0936 | 30 | 30 | PASS | SAB | |
| P059 \ P061 | 11/11/11 | WEOS TO EEOS | IS | 0934 | 0939 | 30 | 30 | PASS | SAB | |
| P061 \ P062 | 11/11/11 | SEOS TO NEOS | IS | 0933 | 0938 | 30 | 30 | PASS | SAB | |
| P062 \ P063 | 11/11/11 | EEOS TO WEOS | IS | 0936 | 0941 | 30 | 30 | PASS | SAB | |
| P061 \ P063 | 11/11/11 | WEOS TO EEOS | IS | 0935 | 0940 | 30 | 30 | PASS | SAB | |
| P064 \ P066 | 11/11/11 | EEOS TO WEOS | IS | 0947 | 0952 | 30 | 30 | PASS | SAB | |
| P064 \ P065 | 11/11/11 | WEOS TO 6A | IS | 0948 | 0953 | 30 | 30 | PASS | SAB | |
| P065 \ P066 | 11/11/11 | SEOS TO NEOS | IS | 0949 | 0954 | 30 | 30 | PASS | SAB | |
| P064 \ P065 | 11/11/11 | 6A TO EEOS | IS | 0955 | 1000 | 30 | 30 | PASS | SAB | |
| P055 \ P056 | 11/11/11 | NEOS TO SEOS | IS | 0907 | 0912 | 30 | 30 | PASS | SAB | |
| P056 \ P057 | 11/11/11 | EEOS TO WEOS | IS | 0909 | 0914 | 30 | 30 | PASS | SAB | |
| P055 \ P057 | 11/11/11 | WEOS TO EEOS | IS | 0910 | 0915 | 30 | 30 | PASS | SAB | |
| P053 \ P056 | 11/11/11 | EEOS TO WEOS | IS | 0905 | 0910 | 30 | 30 | PASS | SAB | |
| P053 \ P055 | 11/11/11 | WEOS TO EEOS | IS | 0906 | 0911 | 30 | 30 | PASS | SAB | |
| P001 \ P068 | 11/11/11 | EEOS TO WEOS | IS | 1440 | 1445 | 30 | 30 | PASS | SAB | |
| P032 \ P070 | 11/11/11 | NEOS TO SEOS | IS | 1505 | 1510 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P031 \ P070 | 11/11/11 | NEOS TO SEOS | IS | 1506 | 1511 | 30 | 30 | PASS | SAB | |
| P032 \ P033 | 11/11/11 | WEOS TO 8J | IS | 1501 | 1506 | 30 | 30 | PASS | SAB | |
| P031 \ P032 | 11/11/11 | WEOS TO 8K | IS | 1507 | 1512 | 30 | 30 | PASS | SAB | |
| P071 \ P072 | 11/11/11 | SEOS TO NEOS | IS | 1556 | 1601 | 30 | 30 | PASS | SAB | |
| P071 \ P073 | 11/11/11 | NEOS TO SEOS | IS | 1554 | 1559 | 30 | 30 | PASS | SAB | |
| P072 \ P073 | 11/11/11 | SEOS TO NEOS | IS | 1555 | 1600 | 30 | 30 | PASS | SAB | |
| P073 \ P074 | 11/11/11 | NEOS TO SEOS | IS | 1617 | 1622 | 30 | 30 | PASS | SAB | |
| P036 \ P074 | 11/11/11 | EEOS TO WEOS | IS | 1646 | 1651 | 30 | 30 | PASS | SAB | |
| P074 \ P075 | 11/11/11 | NEOS TO SEOS | IS | 1647 | 1652 | 30 | 30 | PASS | SAB | |
| P075 \ P076 | 11/11/11 | NEOS TO SEOS | IS | 1700 | 1705 | 30 | 30 | PASS | SAB | |
| P036 \ P076 | 11/11/11 | EEOS TO WEOS | IS | 1701 | 1706 | 30 | 30 | PASS | SAB | |
| P036 \ P076 | 11/11/11 | SEOS TO NEOS | IS | 1702 | 1707 | 30 | 30 | PASS | SAB | |
| P042 \ P076 | 11/11/11 | EEOS TO WEOS | IS | 1705 | 1710 | 30 | 30 | PASS | SAB | |
| P076 \ P083 | 11/11/11 | SEOS TO NEOS | IS | 1704 | 1709 | 30 | 30 | PASS | SAB | |
| P076 \ P077 | 11/11/11 | NEOS TO SEOS | IS | 1703 | 1708 | 30 | 30 | PASS | SAB | |
| P077 \ P083 | 11/11/11 | WEOS TO EEOS | IS | 1716 | 1721 | 30 | 30 | PASS | SAB | |
| P078 \ P083 | 11/11/11 | SEOS TO NEOS | IS | 1715 | 1720 | 30 | 30 | PASS | SAB | |
| P042 \ P083 | 11/11/11 | SEOS TO NEOS | IS | 1719 | 1724 | 30 | 30 | PASS | SAB | |
| P042 \ P078 | 11/11/11 | EEOS TO WEOS | IS | 1718 | 1723 | 30 | 30 | PASS | SAB | |
| P077 \ P078 | 11/11/11 | NEOS TO SEOS | IS | 1717 | 1722 | 30 | 30 | PASS | SAB | |
| P063 \ P064 | 11/11/11 | WEOS TO EEOS | IS | 1720 | 1725 | 30 | 30 | PASS | SAB | |
| P035 \ P036 | 11/11/11 | WEOS TO EEOS | IS | 0750 | 0755 | 30 | 30 | PASS | SAB | |
| P036 \ P042 | 11/11/11 | EEOS TO WEOS | IS | 0753 | 0758 | 30 | 30 | PASS | SAB | |
| P036 \ P037 | 11/11/11 | WEOS TO EEOS | IS | 0755 | 0800 | 30 | 30 | PASS | SAB | |
| P037 \ P038 | 11/11/11 | WEOS TO EEOS | IS | 0801 | 0806 | 30 | 30 | PASS | SAB | |
| P038 \ P042 | 11/11/11 | EEOS TO WEOS | IS | 0800 | 0805 | 30 | 30 | PASS | SAB | |
| P038 \ P039 | 11/11/11 | WEOS TO EEOS | IS | 0803 | 0808 | 30 | 30 | PASS | SAB | |
| P039 \ P040 | 11/11/11 | WEOS TO EEOS | IS | 0805 | 0810 | 30 | 30 | PASS | SAB | |
| P040 \ P043 | 11/11/11 | EEOS TO WEOS | IS | 0809 | 0814 | 30 | 30 | PASS | SAB | |
| P040 \ P041 | 11/11/11 | WEOS TO EEOS | IS | 0808 | 0813 | 30 | 30 | PASS | SAB | |
| P037 \ P042 | 11/11/11 | SEOS TO NEOS | IS | 0754 | 0759 | 30 | 30 | PASS | SAB | |
| P041 \ P044 | 11/11/11 | WEOS TO EEOS | IS | 0811 | 0816 | 30 | 30 | PASS | SAB | |
| P043 \ P044 | 11/11/11 | EEOS TO WEOS | IS | 0810 | 0815 | 30 | 30 | PASS | SAB | |
| P041 \ P043 | 11/11/11 | SEOS TO NEOS | IS | 0806 | 0811 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P044 \ P045 | 11/11/11 | WEOS TO 6M | IS | 0815 | 0820 | 30 | 30 | PASS | SAB | |
| P044 \ P046 | 11/11/11 | EEOS TO WEOS | IS | 0817 | 0822 | 30 | 30 | PASS | SAB | |
| P045 \ P046 | 11/11/11 | SEOS TO NEOS | IS | 0816 | 0821 | 30 | 30 | PASS | SAB | |
| P045 \ P048 | 11/11/11 | WEOS TO EEOS | IS | 0819 | 0824 | 30 | 30 | PASS | SAB | |
| P046 \ P048 | 11/11/11 | EEOS TO WEOS | IS | 0820 | 0825 | 30 | 30 | PASS | SAB | |
| P044 \ P045 | 11/11/11 | 6M TO EEOS | IS | 0822 | 0827 | 30 | 30 | PASS | SAB | |
| P045 \ P047 | 11/11/11 | WEOS TO EEOS | IS | 0824 | 0829 | 30 | 30 | PASS | SAB | |
| P047 \ P048 | 11/11/11 | SEOS TO NEOS | IS | 0825 | 0830 | 30 | 30 | PASS | SAB | |
| P047 \ P049 | 11/11/11 | WEOS TO EEOS | IS | 0828 | 0833 | 30 | 30 | PASS | SAB | |
| P048 \ P049 | 11/11/11 | EEOS TO WEOS | IS | 0826 | 0831 | 30 | 30 | PASS | SAB | |
| P048 \ P050 | 11/11/11 | EEOS TO WEOS | IS | 0840 | 0845 | 30 | 30 | PASS | SAB | |
| P049 \ P050 | 11/11/11 | SEOS TO NEOS | IS | 0841 | 0846 | 30 | 30 | PASS | SAB | |
| P049 \ P052 | 11/11/11 | WEOS TO EEOS | IS | 0844 | 0849 | 30 | 30 | PASS | SAB | |
| P050 \ P052 | 11/11/11 | EEOS TO WEOS | IS | 0843 | 0848 | 30 | 30 | PASS | SAB | |
| P049 \ P051 | 11/11/11 | WEOS TO EEOS | IS | 0851 | 0856 | 30 | 30 | PASS | SAB | |
| P051 \ P052 | 11/11/11 | SEOS TO NEOS | IS | 0850 | 0855 | 30 | 30 | PASS | SAB | |
| P051 \ P054 | 11/11/11 | WEOS TO EEOS | IS | 0833 | 0838 | 30 | 30 | PASS | SAB | |
| P052 \ P054 | 11/11/11 | EEOS TO WEOS | IS | 0854 | 0859 | 30 | 30 | PASS | SAB | |
| P051 \ P053 | 11/11/11 | WEOS TO EEOS | IS | 0856 | 0901 | 30 | 30 | PASS | SAB | |
| P053 \ P054 | 11/11/11 | SEOS TO NEOS | IS | 0855 | 0900 | 30 | 30 | PASS | SAB | |
| P054 \ P056 | 11/11/11 | EEOS TO WEOS | IS | 0916 | 0921 | 30 | 30 | PASS | SAB | |
| P057 \ P058 | 11/11/11 | SEOS TO NEOS | IS | 0921 | 0926 | 30 | 30 | PASS | SAB | |
| P056 \ P058 | 11/11/11 | EEOS TO WEOS | IS | 0920 | 0925 | 30 | 30 | PASS | SAB | |
| P057 \ P060 | 11/11/11 | WEOS TO EEOS | IS | 0924 | 0929 | 30 | 30 | PASS | SAB | |
| P058 \ P060 | 11/11/11 | EEOS TO WEOS | IS | 0925 | 0930 | 30 | 30 | PASS | SAB | |
| P057 \ P059 | 11/11/11 | WEOS TO EEOS | IS | 0925 | 0930 | 30 | 30 | PASS | SAB | |
| P059 \ P060 | 11/11/11 | NEOS TO SEOS | IS | 0930 | 0935 | 30 | 30 | PASS | SAB | |
| P091 \ P093 | 11/12/11 | EEOS TO WEOS | IS | 0905 | 0910 | 30 | 30 | PASS | SAB | |
| P042 \ P092 | 11/12/11 | NEOS TO SEOS | IS | 0910 | 0915 | 30 | 30 | PASS | SAB | |
| P038 \ P092 | 11/12/11 | NEOS TO SEOS | IS | 0911 | 0916 | 30 | 30 | PASS | SAB | |
| P038 \ P093 | 11/12/11 | SEOS TO NEOS | IS | 0916 | 0921 | 30 | 30 | PASS | SAB | |
| P092 \ P093 | 11/12/11 | EEOS TO WEOS | IS | 0915 | 0920 | 30 | 30 | PASS | SAB | |
| P039 \ P093 | 11/12/11 | SEOS TO NEOS | IS | 0917 | 0922 | 30 | 30 | PASS | SAB | |
| P039 \ 9A | 11/12/11 | SEOS TO NEOS | IS | 1151 | 1156 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| 9A \ P093 | 11/12/11 | EEOS TO WEOS | IS | 1150 | 1155 | 30 | 30 | PASS | SAB | |
| P093 \ P094 | 11/12/11 | EEOS TO WEOS | IS | 0930 | 0935 | 30 | 30 | PASS | SAB | |
| 9A \ P094 | 11/12/11 | NEOS TO SEOS | IS | 1153 | 1158 | 30 | 30 | PASS | SAB | |
| 9A \ P040 | 11/12/11 | WEOS TO EEOS | IS | 1152 | 1157 | 30 | 30 | PASS | SAB | |
| P040 \ P094 | 11/12/11 | NEOS TO SEOS | IS | 1025 | 1030 | 30 | 30 | PASS | SAB | |
| P040 \ P095 | 11/12/11 | NEOS TO SEOS | IS | 1015 | 1020 | 30 | 30 | PASS | SAB | |
| P094 \ P095 | 11/12/11 | EEOS TO WEOS | IS | 0933 | 0938 | 30 | 30 | PASS | SAB | |
| P043 \ P095 | 11/12/11 | SEOS TO NEOS | IS | 1016 | 1021 | 30 | 30 | PASS | SAB | |
| P095 \ P096 | 11/12/11 | EEOS TO WEOS | IS | 0955 | 1000 | 30 | 30 | PASS | SAB | |
| P043 \ P096 | 11/12/11 | NEOS TO SEOS | IS | 1017 | 1022 | 30 | 30 | PASS | SAB | |
| P044 \ P096 | 11/12/11 | SEOS TO NEOS | IS | 1018 | 1023 | 30 | 30 | PASS | SAB | |
| P096 \ P099 | 11/12/11 | EEOS TO WEOS | IS | 1042 | 1047 | 30 | 30 | PASS | SAB | |
| P103 \ P104 | 11/12/11 | EEOS TO WEOS | IS | 1337 | 1342 | 30 | 30 | PASS | SAB | |
| P103 \ P105 | 11/12/11 | WEOS TO EEOS | IS | 1335 | 1340 | 30 | 30 | PASS | SAB | |
| P104 \ P105 | 11/12/11 | SEOS TO NEOS | IS | 1336 | 1341 | 30 | 30 | PASS | SAB | |
| P105 \ P106 | 11/12/11 | WEOS TO EEOS | IS | 1345 | 1350 | 30 | 30 | PASS | SAB | |
| P104 \ P106 | 11/12/11 | EEOS TO WEOS | IS | 1346 | 1351 | 30 | 30 | PASS | SAB | |
| P106 \ P107 | 11/12/11 | EEOS TO WEOS | IS | 1355 | 1400 | 30 | 30 | PASS | SAB | |
| P107 \ P109 | 11/12/11 | EEOS TO WEOS | IS | 1432 | 1437 | 30 | 30 | PASS | SAB | |
| P107 \ P108 | 11/12/11 | WEOS TO EEOS | IS | 1430 | 1435 | 30 | 30 | PASS | SAB | |
| P108 \ P109 | 11/12/11 | SEOS TO NEOS | IS | 1431 | 1436 | 30 | 30 | PASS | SAB | |
| P054 \ P105 | 11/12/11 | NEOS TO SEOS | IS | 1402 | 1407 | 30 | 30 | PASS | SAB | |
| P056 \ P105 | 11/12/11 | NEOS TO SEOS | IS | 1400 | 1405 | 30 | 30 | PASS | SAB | |
| P056 \ P106 | 11/12/11 | NEOS TO SEOS | IS | 1359 | 1404 | 30 | 30 | PASS | SAB | |
| P058 \ P106 | 11/12/11 | SEOS TO NEOS | IS | 1358 | 1403 | 30 | 30 | PASS | SAB | |
| P058 \ P107 | 11/12/11 | NEOS TO SEOS | IS | 1420 | 1425 | 30 | 30 | PASS | SAB | |
| P060 \ P107 | 11/12/11 | NEOS TO SEOS | IS | 1421 | 1426 | 30 | 30 | PASS | SAB | |
| P060 \ P108 | 11/12/11 | NEOS TO SEOS | IS | 1425 | 1430 | 30 | 30 | PASS | SAB | |
| P062 \ P108 | 11/12/11 | SEOS TO NEOS | IS | 1424 | 1429 | 30 | 30 | PASS | SAB | |
| P042 \ P077 | 11/12/11 | WEOS TO EEOS | IS | 1722 | 1727 | 30 | 30 | PASS | SAB | |
| P087 \ P089 | 11/12/11 | NEOS TO SEOS | IS | 1721 | 1726 | 30 | 30 | PASS | SAB | |
| P082 \ P085 | 11/12/11 | NEOS TO SEOS | IS | 1727 | 1732 | 30 | 30 | PASS | SAB | |
| P078 \ P089 | 11/12/11 | SEOS TO NEOS | IS | 0743 | 0748 | 30 | 30 | PASS | SAB | |
| P078 \ P086 | 11/12/11 | NEOS TO SEOS | IS | 0740 | 0745 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P086 \ P089 | 11/12/11 | EEOS TO WEOS | IS | 0741 | 0746 | 30 | 30 | PASS | SAB | |
| P088 \ P089 | 11/12/11 | SEOS TO NEOS | IS | 0753 | 0758 | 30 | 30 | PASS | SAB | |
| P086 \ P088 | 11/12/11 | EEOS TO WEOS | IS | 0750 | 0755 | 30 | 30 | PASS | SAB | |
| P078 \ P079 | 11/12/11 | NEOS TO SEOS | IS | 0745 | 0750 | 30 | 30 | PASS | SAB | |
| P079 \ P086 | 11/12/11 | EEOS TO WEOS | IS | 0746 | 0751 | 30 | 30 | PASS | SAB | |
| P079 \ P080 | 11/12/11 | NEOS TO SEOS | IS | 0755 | 0800 | 30 | 30 | PASS | SAB | |
| P080 \ P086 | 11/12/11 | EEOS TO WEOS | IS | 0756 | 0801 | 30 | 30 | PASS | SAB | |
| P080 \ P081 | 11/12/11 | NEOS TO SEOS | IS | 0804 | 0809 | 30 | 30 | PASS | SAB | |
| P081 \ P086 | 11/12/11 | EEOS TO WEOS | IS | 0803 | 0808 | 30 | 30 | PASS | SAB | |
| P081 \ P082 | 11/12/11 | NEOS TO SEOS | IS | 0808 | 0813 | 30 | 30 | PASS | SAB | |
| P082 \ P086 | 11/12/11 | EEOS TO WEOS | IS | 0805 | 0810 | 30 | 30 | PASS | SAB | |
| P085 \ P087 | 11/12/11 | NEOS TO SEOS | IS | 0810 | 0815 | 30 | 30 | PASS | SAB | |
| P085 \ P086 | 11/12/11 | WEOS TO EEOS | IS | 0811 | 0816 | 30 | 30 | PASS | SAB | |
| P088 \ P090 | 11/12/11 | EEOS TO WEOS | IS | 0840 | 0845 | 30 | 30 | PASS | SAB | |
| P089 \ P090 | 11/12/11 | WEOS TO EEOS | IS | 0850 | 0855 | 30 | 30 | PASS | SAB | |
| P078 \ P090 | 11/12/11 | NEOS TO SEOS | IS | 0855 | 0900 | 30 | 30 | PASS | SAB | |
| P090 \ P091 | 11/12/11 | EEOS TO WEOS | IS | 0856 | 0901 | 30 | 30 | PASS | SAB | |
| P078 \ P091 | 11/12/11 | SEOS TO NEOS | IS | 0950 | 0955 | 30 | 30 | PASS | SAB | |
| P096 \ P097 | 11/12/11 | EEOS TO WEOS | IS | 1040 | 1045 | 30 | 30 | PASS | SAB | |
| P044 \ P099 | 11/12/11 | SEOS TO NEOS | IS | 1043 | 1048 | 30 | 30 | PASS | SAB | |
| P097 \ P099 | 11/12/11 | SEOS TO NEOS | IS | 1041 | 1046 | 30 | 30 | PASS | SAB | |
| P046 \ P099 | 11/12/11 | SEOS TO NEOS | IS | 1044 | 1049 | 30 | 30 | PASS | SAB | |
| P098 \ P099 | 11/12/11 | WEOS TO EEOS | IS | 1050 | 1055 | 30 | 30 | PASS | SAB | |
| P097 \ P098 | 11/12/11 | EEOS TO WEOS | IS | 1051 | 1056 | 30 | 30 | PASS | SAB | |
| P046 \ P098 | 11/12/11 | SEOS TO NEOS | IS | 1053 | 1058 | 30 | 30 | PASS | SAB | |
| P048 \ P098 | 11/12/11 | NEOS TO SEOS | IS | 1054 | 1059 | 30 | 30 | PASS | SAB | |
| P098 \ P100 | 11/12/11 | EEOS TO WEOS | IS | 1055 | 1100 | 30 | 30 | PASS | SAB | |
| P048 \ P100 | 11/12/11 | NEOS TO SEOS | IS | 1106 | 1111 | 30 | 30 | PASS | SAB | |
| P050 \ P100 | 11/12/11 | SEOS TO NEOS | IS | 1105 | 1110 | 30 | 30 | PASS | SAB | |
| P050 \ P102 | 11/12/11 | SEOS TO NEOS | IS | 1110 | 1115 | 30 | 30 | PASS | SAB | |
| P052 \ P102 | 11/12/11 | SEOS TO NEOS | IS | 1305 | 1310 | 30 | 30 | PASS | SAB | |
| P100 \ P102 | 11/12/11 | WEOS TO EEOS | IS | 1316 | 1321 | 30 | 30 | PASS | SAB | |
| P100 \ P101 | 11/12/11 | EEOS TO WEOS | IS | 1315 | 1320 | 30 | 30 | PASS | SAB | |
| P101 \ P102 | 11/12/11 | NEOS TO SEOS | IS | 1317 | 1322 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
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## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P101 \ P103 | 11/12/11 | EEOS TO WEOS | IS | 1318 | 1323 | 30 | 30 | PASS | SAB | |
| P102 \ P103 | 11/12/11 | WEOS TO EEOS | IS | 1320 | 1325 | 30 | 30 | PASS | SAB | |
| P052 \ P103 | 11/12/11 | SEOS TO NEOS | IS | 1406 | 1411 | 30 | 30 | PASS | SAB | |
| P054 \ P103 | 11/12/11 | SEOS TO NEOS | IS | 1405 | 1410 | 30 | 30 | PASS | SAB | |
| P109 \ P110 | 11/14/11 | SEOS TO NEOS | IS | 0841 | 0846 | 30 | 30 | PASS | SAB | |
| P107 \ P110 | 11/14/11 | EEOS TO WEOS | IS | 0840 | 0845 | 30 | 30 | PASS | SAB | |
| P110 \ P111 | 11/14/11 | EEOS TO WEOS | IS | 0845 | 0850 | 30 | 30 | PASS | SAB | |
| P109 \ P111 | 11/14/11 | WEOS TO EEOS | IS | 0846 | 0851 | 30 | 30 | PASS | SAB | |
| P108 \ P111 | 11/14/11 | WEOS TO EEOS | IS | 0847 | 0852 | 30 | 30 | PASS | SAB | |
| P062 \ P011 | 11/14/11 | NEOS TO SEOS | IS | 0935 | 0940 | 30 | 30 | PASS | SAB | |
| P063 \ P011 | 11/14/11 | NEOS TO SEOS | IS | 0936 | 0941 | 30 | 30 | PASS | SAB | |
| P063 \ P112 | 11/14/11 | NEOS TO SEOS | IS | 0937 | 0942 | 30 | 30 | PASS | SAB | |
| P064 \ P112 | 11/14/11 | NEOS TO SEOS | IS | 0938 | 0943 | 30 | 30 | PASS | SAB | |
| P064 \ P113 | 11/14/11 | NEOS TO SEOS | IS | 0950 | 0955 | 30 | 30 | PASS | SAB | |
| P066 \ P113 | 11/14/11 | NEOS TO SEOS | IS | 0951 | 0956 | 30 | 30 | PASS | SAB | |
| P066 \ P116 | 11/14/11 | SEOS TO NEOS | IS | 0953 | 0958 | 30 | 30 | PASS | SAB | |
| P112 \ P114 | 11/14/11 | SEOS TO NEOS | IS | 0911 | 0916 | 30 | 30 | PASS | SAB | |
| P111 \ P114 | 11/14/11 | EEOS TO WEOS | IS | 0910 | 0915 | 30 | 30 | PASS | SAB | |
| P111 \ P112 | 11/14/11 | WEOS TO EEOS | IS | 0912 | 0917 | 30 | 30 | PASS | SAB | |
| P112 \ P115 | 11/14/11 | WEOS TO EEOS | IS | 0913 | 0918 | 30 | 30 | PASS | SAB | |
| P114 \ P115 | 11/14/11 | EEOS TO WEOS | IS | 0914 | 0919 | 30 | 30 | PASS | SAB | |
| P112 \ P113 | 11/14/11 | WEOS TO EEOS | IS | 0916 | 0921 | 30 | 30 | PASS | SAB | |
| P113 \ P115 | 11/14/11 | SEOS TO NEOS | IS | 0915 | 0920 | 30 | 30 | PASS | SAB | |
| P118 \ P116 | 11/14/11 | WEOS TO EEOS | IS | 0920 | 0925 | 30 | 30 | PASS | SAB | |
| P124 \ P145 | 11/14/11 | WEOS TO EEOS | IS | 1645 | 1650 | 30 | 30 | PASS | SAB | |
| P124 \ P145 | 11/14/11 | SEOS TO NEOS | IS | 1305 | 1310 | 30 | 30 | PASS | SAB | |
| P121 \ P125 | 11/14/11 | EEOS TO WEOS | IS | 1147 | 1152 | 30 | 30 | PASS | SAB | |
| P117 \ P118 | 11/14/11 | EEOS TO WEOS | IS | 1030 | 1035 | 30 | 30 | PASS | SAB | |
| P118 \ P125 | 11/14/11 | NEOS TO SEOS | IS | 1130 | 1135 | 30 | 30 | PASS | SAB | |
| P120 \ P125 | 11/14/11 | NEOS TO SEOS | IS | 1111 | 1116 | 30 | 30 | PASS | SAB | |
| P118 \ P121 | 11/14/11 | EEOS TO WEOS | IS | 1112 | 1117 | 30 | 30 | PASS | SAB | |
| P122 \ P124 | 11/14/11 | EEOS TO WEOS | IS | 1145 | 1150 | 30 | 30 | PASS | SAB | |
| P123 \ P124 | 11/14/11 | WEOS TO EEOS | IS | 1406 | 1411 | 30 | 30 | PASS | SAB | |
| P122 \ P123 | 11/14/11 | SEOS TO NEOS | IS | 1136 | 1141 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P120 \ P122 | 11/14/11 | EEOS TO WEOS | IS | 1135 | 1140 | 30 | 30 | PASS | SAB | |
| P120 \ P123 | 11/14/11 | WEOS TO EEOS | IS | 1200 | 1205 | 30 | 30 | PASS | SAB | |
| P065 \ P119 | 11/14/11 | WEOS TO EEOS | IS | 1100 | 1105 | 30 | 30 | PASS | SAB | |
| P065 \ P117 | 11/14/11 | EEOS TO WEOS | IS | 1035 | 1040 | 30 | 30 | PASS | SAB | |
| P117 \ P119 | 11/14/11 | NEOS TO SEOS | IS | 1051 | 1056 | 30 | 30 | PASS | SAB | |
| P119 \ P120 | 11/14/11 | WEOS TO EEOS | IS | 1140 | 1145 | 30 | 30 | PASS | SAB | |
| P117 \ P120 | 11/14/11 | EEOS TO WEOS | IS | 1050 | 1055 | 30 | 30 | PASS | SAB | |
| P121 \ P124 | 11/14/11 | WEOS TO EEOS | IS | 1302 | 1307 | 30 | 30 | PASS | SAB | |
| P137 \ P138 | 11/14/11 | SEOS TO NEOS | IS | 1522 | 1527 | 30 | 30 | PASS | SAB | |
| P125 \ P123 | 11/14/11 | NEOS TO SEOS | IS | 1202 | 1207 | 30 | 30 | PASS | SAB | |
| P115 \ P116 | 11/14/11 | EEOS TO WEOS | IS | 0921 | 0926 | 30 | 30 | PASS | SAB | |
| P116 \ P117 | 11/14/11 | EEOS TO WEOS | IS | 1000 | 1005 | 30 | 30 | PASS | SAB | |
| P066 \ P117 | 11/14/11 | 12R TO WEOS | IS | 1010 | 1015 | 30 | 30 | PASS | SAB | |
| P065 \ P117 | 11/14/11 | EEOS TO 12R | IS | 1035 | 1040 | 30 | 30 | PASS | SAB | |
| P117 \ P118 | 11/14/11 | EEOS TO WEOS | IS | 1030 | 1035 | 30 | 30 | PASS | SAB | |
| P118 \ P125 | 11/14/11 | NEOS TO SEOS | IS | 1130 | 1135 | 30 | 30 | PASS | SAB | |
| P120 \ P125 | 11/14/11 | NEOS TO SEOS | IS | 1111 | 1116 | 30 | 30 | PASS | SAB | |
| P065 \ P119 | 11/14/11 | WEOS TO EEOS | IS | 1100 | 1105 | 30 | 30 | PASS | SAB | |
| P117 \ P119 | 11/14/11 | NEOS TO SEOS | IS | 1051 | 1056 | 30 | 30 | PASS | SAB | |
| P119 \ P120 | 11/14/11 | WEOS TO EEOS | IS | 1140 | 1145 | 30 | 30 | PASS | SAB | |
| P117 \ P120 | 11/14/11 | NEOS TO SEOS | IS | 1050 | 1055 | 30 | 30 | PASS | SAB | |
| P122 \ P126 | 11/14/11 | WEOS TO EEOS | IS | 1405 | 1410 | 30 | 30 | PASS | SAB | |
| P122 \ P126 | 11/14/11 | EEOS TO WEOS | IS | 1415 | 1420 | 30 | 30 | PASS | SAB | |
| P126 \ P144 | 11/14/11 | 15K TO EEOS | IS | 1420 | 1425 | 30 | 30 | PASS | SAB | |
| P122 \ P144 | 11/14/11 | 15K TO WEOS | IS | 1421 | 1426 | 30 | 30 | PASS | SAB | |
| P144 \ P145 | 11/14/11 | SEOS TO NEOS | IS | 1630 | 1635 | 30 | 30 | PASS | SAB | |
| P122 \ P145 | 11/14/11 | WEOS TO EEOS | IS | 1632 | 1637 | 30 | 30 | PASS | SAB | |
| P122 \ P125 | 11/14/11 | SEOS TO NEOS | IS | 1121 | 1126 | 30 | 30 | PASS | SAB | |
| P121 \ P122 | 11/14/11 | EEOS TO WEOS | IS | 1120 | 1125 | 30 | 30 | PASS | SAB | |
| P125 \ P145 | 11/14/11 | EEOS TO WEOS | IS | 1646 | 1651 | 30 | 30 | PASS | SAB | |
| P128 \ P129 | 11/14/11 | EEOS TO WEOS | IS | 1425 | 1430 | 30 | 30 | PASS | SAB | |
| P129 \ P130 | 11/14/11 | EEOS TO WEOS | IS | 1426 | 1431 | 30 | 30 | PASS | SAB | |
| P130 \ P131 | 11/14/11 | EEOS TO WEOS | IS | 1442 | 1447 | 30 | 30 | PASS | SAB | |
| P131 \ P132 | 11/14/11 | SEOS TO NEOS | IS | 1436 | 1441 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P128 \ P132 | 11/14/11 | WEOS TO EEOS | IS | 1435 | 1440 | 30 | 30 | PASS | SAB | |
| P132 \ P133 | 11/14/11 | SEOS TO NEOS | IS | 1446 | 1451 | 30 | 30 | PASS | SAB | |
| P128 \ P133 | 11/14/11 | NEOS TO SEOS | IS | 1445 | 1450 | 30 | 30 | PASS | SAB | |
| 13P \ P133 | 11/14/11 | NEOS TO SEOS | IS | 1450 | 1455 | 30 | 30 | PASS | SAB | |
| P128 \ 13P | 11/14/11 | NEOS TO SEOS | IS | 1452 | 1457 | 30 | 30 | PASS | SAB | |
| P127 \ P128 | 11/14/11 | EEOS TO WEOS | IS | 1420 | 1425 | 30 | 30 | PASS | SAB | |
| 13P \ P127 | 11/14/11 | WEOS TO EEOS | IS | 1517 | 1522 | 30 | 30 | PASS | SAB | |
| P127 \ P133 | 11/14/11 | WEOS TO EEOS | IS | 1515 | 1520 | 30 | 30 | PASS | SAB | |
| P133 \ P134 | 11/14/11 | SEOS TO NEOS | IS | 1518 | 1523 | 30 | 30 | PASS | SAB | |
| P126 \ P127 | 11/14/11 | EEOS TO WEOS | IS | 1455 | 1460 | 30 | 30 | PASS | SAB | |
| P144 \ P146 | 11/14/11 | WEOS TO EEOS | IS | 1625 | 1630 | 30 | 30 | PASS | SAB | |
| P127 \ P146 | 11/14/11 | SEOS TO NEOS | IS | 1626 | 1631 | 30 | 30 | PASS | SAB | |
| P127 \ P148 | 11/14/11 | SEOS TO NEOS | IS | 1640 | 1645 | 30 | 30 | PASS | SAB | |
| P141 \ P142 | 11/14/11 | NEOS TO SEOS | IS | 1622 | 1627 | 30 | 30 | PASS | SAB | |
| P120 \ P121 | 11/14/11 | WEOS TO EEOS | IS | 1302 | 1307 | 30 | 30 | PASS | SAB | |
| P136 \ P137 | 11/14/11 | SEOS TO NEOS | IS | 1521 | 1526 | 30 | 30 | PASS | SAB | |
| P152 \ P153 | 11/15/11 | NEOS TO SEOS | IS | 0944 | 0949 | 30 | 30 | PASS | SAB | |
| P151 \ P152 | 11/15/11 | NEOS TO SEOS | IS | 0941 | 0946 | 30 | 30 | PASS | SAB | |
| P152 \ P154 | 11/15/11 | SEOS TO NEOS | IS | 0940 | 0945 | 30 | 30 | PASS | SAB | |
| P152 \ P155 | 11/15/11 | NEOS TO SEOS | IS | 0925 | 0930 | 30 | 30 | PASS | SAB | |
| P152 \ P156 | 11/15/11 | NEOS TO SEOS | IS | 0926 | 0931 | 30 | 30 | PASS | SAB | |
| P143 \ P152 | 11/15/11 | SEOS TO NEOS | IS | 0930 | 0935 | 30 | 30 | PASS | SAB | |
| P143 \ P156 | 11/15/11 | EEOS TO WEOS | IS | 0931 | 0936 | 30 | 30 | PASS | SAB | |
| P155 \ P156 | 11/15/11 | EEOS TO WEOS | IS | 0927 | 0932 | 30 | 30 | PASS | SAB | |
| P142 \ P143 | 11/15/11 | SEOS TO NEOS | IS | 1605 | 1610 | 30 | 30 | PASS | SAB | |
| P140 \ P142 | 11/15/11 | NEOS TO SEOS | IS | 1555 | 1600 | 30 | 30 | PASS | SAB | |
| P140 \ P155 | 11/15/11 | WEOS TO EEOS | IS | 0915 | 0920 | 30 | 30 | PASS | SAB | |
| P139 \ P140 | 11/15/11 | SEOS TO NEOS | IS | 1550 | 1555 | 30 | 30 | PASS | SAB | |
| P139 \ P155 | 11/15/11 | WEOS TO EEOS | IS | 0914 | 0919 | 30 | 30 | PASS | SAB | |
| P154 \ P155 | 11/15/11 | WEOS TO EEOS | IS | 0913 | 0918 | 30 | 30 | PASS | SAB | |
| P139 \ P154 | 11/15/11 | WEOS TO EEOS | IS | 0911 | 0916 | 30 | 30 | PASS | SAB | |
| P138 \ P139 | 11/15/11 | EEOS TO WEOS | IS | 1500 | 1505 | 30 | 30 | PASS | SAB | |
| P138 \ P154 | 11/15/11 | EEOS TO WEOS | IS | 1602 | 1607 | 30 | 30 | PASS | SAB | |
| P150 \ P152 | 11/15/11 | EEOS TO WEOS | IS | 0953 | 0958 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P150 \ P157 | 11/15/11 | WEOS TO EEOS | IS | 0952 | 0957 | 30 | 30 | PASS | SAB | |
| P152 \ P157 | 11/15/11 | SEOS TO NEOS | IS | 0950 | 0955 | 30 | 30 | PASS | SAB | |
| P150 \ P159 | 11/15/11 | WEOS TO EEOS | IS | 0958 | 0963 | 30 | 30 | PASS | SAB | |
| P157 \ P159 | 11/15/11 | NEOS TO SEOS | IS | 1000 | 1005 | 30 | 30 | PASS | SAB | |
| P158 \ P159 | 11/15/11 | WEOS TO EEOS | IS | 1003 | 1008 | 30 | 30 | PASS | SAB | |
| P148 \ P150 | 11/15/11 | 21I TO WEOS | IS | 0801 | 0806 | 30 | 30 | PASS | SAB | |
| P148 \ P150 | 11/15/11 | 21I TO EEOS | IS | 0800 | 0805 | 30 | 30 | PASS | SAB | |
| P134 \ P146 | 11/15/11 | WEOS TO EEOS | IS | 1529 | 1534 | 30 | 30 | PASS | SAB | |
| P135 \ P146 | 11/15/11 | EEOS TO WEOS | IS | 1531 | 1536 | 30 | 30 | PASS | SAB | |
| P140 \ P141 | 11/15/11 | SEOS TO NEOS | IS | 1539 | 1544 | 30 | 30 | PASS | SAB | |
| P151 \ P154 | 11/15/11 | EEOS TO WEOS | IS | 0837 | 0842 | 30 | 30 | PASS | SAB | |
| P157 \ P158 | 11/15/11 | SEOS TO NEOS | IS | 1025 | 1030 | 30 | 30 | PASS | SAB | |
| P135 \ P148 | 11/15/11 | NEOS TO SEOS | IS | 0740 | 0745 | 30 | 30 | PASS | SAB | |
| P135 \ P149 | 11/15/11 | SEOS TO NEOS | IS | 0741 | 0746 | 30 | 30 | PASS | SAB | |
| P135 \ P153 | 11/15/11 | NEOS TO SEOS | IS | 0845 | 0850 | 30 | 30 | PASS | SAB | |
| P135 \ P136 | 11/15/11 | EEOS TO WEOS | IS | 1525 | 1530 | 30 | 30 | PASS | SAB | |
| P135 \ 19J | 11/15/11 | NEOS TO SEOS | IS | 0845 | 0850 | 30 | 30 | PASS | SAB | |
| P153 \ 19J | 11/15/11 | WEOS TO EEOS | IS | 0846 | 0851 | 30 | 30 | PASS | SAB | |
| P134 \ P136 | 11/15/11 | WEOS TO EEOS | IS | 1510 | 1515 | 30 | 30 | PASS | SAB | |
| P134 \ P135 | 11/15/11 | NEOS TO SEOS | IS | 1511 | 1516 | 30 | 30 | PASS | SAB | |
| P137 \ 19J | 11/15/11 | EEOS TO WEOS | IS | 0901 | 0906 | 30 | 30 | PASS | SAB | |
| P151 \ 19J | 11/15/11 | SEOS TO NEOS | IS | 0902 | 0907 | 30 | 30 | PASS | SAB | |
| P138 \ P151 | 11/15/11 | SEOS TO NEOS | IS | 0900 | 0905 | 30 | 30 | PASS | SAB | |
| P148 \ P149 | 11/15/11 | EEOS TO WEOS | IS | 0748 | 0753 | 30 | 30 | PASS | SAB | |
| P149 \ P150 | 11/15/11 | SEOS TO NEOS | IS | 0745 | 0750 | 30 | 30 | PASS | SAB | |
| P150 \ P153 | 11/15/11 | WEOS TO EEOS | IS | 0835 | 0840 | 30 | 30 | PASS | SAB | |
| P149 \ P153 | 11/15/11 | EEOS TO WEOS | IS | 0825 | 0830 | 30 | 30 | PASS | SAB | |
| P145 \ P146 | 11/15/11 | EEOS TO WEOS | IS | 1652 | 1657 | 30 | 30 | PASS | SAB | |
| P145 \ P147 | 11/15/11 | WEOS TO EEOS | IS | 1650 | 1655 | 30 | 30 | PASS | SAB | |
| P146 \ P147 | 11/15/11 | NEOS TO SEOS | IS | 1713 | 1718 | 30 | 30 | PASS | SAB | |
| P146 \ P148 | 11/15/11 | EEOS TO WEOS | IS | 1711 | 1716 | 30 | 30 | PASS | SAB | |
| P147 \ P148 | 11/15/11 | WEOS TO EEOS | IS | 1710 | 1715 | 30 | 30 | PASS | SAB | |
| P175 \ P176 | 11/19/11 | WEOS TO EEOS | IS | 1246 | 1251 | 30 | 30 | PASS | SAB | |
| P167 \ P175 | 11/19/11 | NEOS TO SEOS | IS | 1355 | 1400 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P174 \ P175 | 11/19/11 | WEOS TO EEOS | IS | 1245 | 1250 | 30 | 30 | PASS | SAB | |
| P167 \ P174 | 11/19/11 | WEOS TO EEOS | IS | 1415 | 1420 | 30 | 30 | PASS | SAB | |
| P166 \ P167 | 11/19/11 | SEOS TO NEOS | IS | 1045 | 1050 | 30 | 30 | PASS | SAB | |
| P166 \ P174 | 11/19/11 | SEOS TO NEOS | IS | 1205 | 1210 | 30 | 30 | PASS | SAB | |
| P173 \ P174 | 11/19/11 | WEOS TO EEOS | IS | 1155 | 1200 | 30 | 30 | PASS | SAB | |
| P166 \ P173 | 11/19/11 | NEOS TO SEOS | IS | 1202 | 1207 | 30 | 30 | PASS | SAB | |
| P166 \ P172 | 11/19/11 | EEOS TO WEOS | IS | 1145 | 1150 | 30 | 30 | PASS | SAB | |
| P165 \ P172 | 11/19/11 | EEOS TO WEOS | IS | 1200 | 1205 | 30 | 30 | PASS | SAB | |
| P171 \ P172 | 11/19/11 | EEOS TO WEOS | IS | 1126 | 1131 | 30 | 30 | PASS | SAB | |
| P170 \ P172 | 11/19/11 | WEOS TO EEOS | IS | 1125 | 1130 | 30 | 30 | PASS | SAB | |
| P170 \ P171 | 11/19/11 | SEOS TO NEOS | IS | 1116 | 1121 | 30 | 30 | PASS | SAB | |
| P169 \ P171 | 11/19/11 | EEOS TO WEOS | IS | 1120 | 1125 | 30 | 30 | PASS | SAB | |
| P169 \ P170 | 11/19/11 | WEOS TO EEOS | IS | 1115 | 1120 | 30 | 30 | PASS | SAB | |
| P150 \ P165 | 11/19/11 | EEOS TO WEOS | IS | 1000 | 1005 | 30 | 30 | PASS | SAB | |
| P150 \ P163 | 11/19/11 | WEOS TO EEOS | IS | 0945 | 0950 | 30 | 30 | PASS | SAB | |
| P162 \ P163 | 11/19/11 | SEOS TO NEOS | IS | 0955 | 1000 | 30 | 30 | PASS | SAB | |
| P150 \ P162 | 11/19/11 | EEOS TO WEOS | IS | 0946 | 0951 | 30 | 30 | PASS | SAB | |
| P159 \ P160 | 11/19/11 | NEOS TO SEOS | IS | 0926 | 0931 | 30 | 30 | PASS | SAB | |
| P180 \ P181 | 11/19/11 | WEOS TO EEOS | IS | 1435 | 1440 | 30 | 30 | PASS | SAB | |
| P181 \ P182 | 11/19/11 | SEOS TO NEOS | IS | 1436 | 1441 | 30 | 30 | PASS | SAB | |
| P180 \ P182 | 11/19/11 | WEOS TO EEOS | IS | 1440 | 1445 | 30 | 30 | PASS | SAB | |
| P182 \ P183 | 11/19/11 | SEOS TO NEOS | IS | 1442 | 1447 | 30 | 30 | PASS | SAB | |
| P167 \ P183 | 11/19/11 | SEOS TO NEOS | IS | 1430 | 1435 | 30 | 30 | PASS | SAB | |
| P161 \ P162 | 11/19/11 | WEOS TO EEOS | IS | 0911 | 0916 | 30 | 30 | PASS | SAB | |
| P160 \ P161 | 11/19/11 | SEOS TO NEOS | IS | 0910 | 0915 | 30 | 30 | PASS | SAB | |
| P160 \ P162 | 11/19/11 | NEOS TO SEOS | IS | 0940 | 0945 | 30 | 30 | PASS | SAB | |
| P163 \ P164 | 11/19/11 | SEOS TO NEOS | IS | 1027 | 1032 | 30 | 30 | PASS | SAB | |
| P163 \ P165 | 11/19/11 | NEOS TO SEOS | IS | 1038 | 1043 | 30 | 30 | PASS | SAB | |
| P164 \ P165 | 11/19/11 | EEOS TO WEOS | IS | 1020 | 1025 | 30 | 30 | PASS | SAB | |
| P164 \ P166 | 11/19/11 | SEOS TO NEOS | IS | 1025 | 1030 | 30 | 30 | PASS | SAB | |
| P165 \ P166 | 11/19/11 | NEOS TO SEOS | IS | 1040 | 1045 | 30 | 30 | PASS | SAB | |
| P167 \ P179 | 11/19/11 | SEOS TO NEOS | IS | 1415 | 1420 | 30 | 30 | PASS | SAB | |
| P167 \ P180 | 11/19/11 | SEOS TO NEOS | IS | 1410 | 1415 | 30 | 30 | PASS | SAB | |
| P179 \ P180 | 11/19/11 | SEOS TO NEOS | IS | 1420 | 1425 | 30 | 30 | PASS | SAB | |

# PRESSURE TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P177 \ P179 | 11/19/11 | WEOS TO EEOS | IS | 1411 | 1416 | 30 | 30 | PASS | SAB | |
| P176 \ P177 | 11/19/11 | WEOS TO EEOS | IS | 1412 | 1417 | 30 | 30 | PASS | SAB | |
| P177 \ P178 | 11/19/11 | WEOS TO EEOS | IS | 1421 | 1426 | 30 | 30 | PASS | SAB | |
| P178 \ P179 | 11/19/11 | WEOS TO EEOS | IS | 1422 | 1427 | 30 | 30 | PASS | SAB | |
| P158 \ P160 | 11/19/11 | SEOS TO NEOS | IS | 0931 | 0936 | 30 | 30 | PASS | SAB | |
| P124 \ P168 | 11/19/11 | WEOS TO EEOS | IS | 1100 | 1105 | 30 | 30 | PASS | SAB | |
| P147 \ P169 | 11/19/11 | NEOS TO SEOS | IS | 1200 | 1205 | 30 | 30 | PASS | SAB | |
| P145 \ P168 | 11/19/11 | NEOS TO SEOS | IS | 1340 | 1345 | 30 | 30 | PASS | SAB | |
| P148 \ P171 | 11/19/11 | NEOS TO SEOS | IS | 1023 | 1028 | 30 | 30 | PASS | SAB | |
| P150 \ P160 | 11/19/11 | EEOS TO WEOS | IS | 1025 | 1030 | 30 | 30 | PASS | SAB | |
| P168 \ P169 | 11/19/11 | EEOS TO WEOS | IS | 1232 | 1237 | 30 | 30 | PASS | SAB | |
| P172 \ P173 | 11/19/11 | WEOS TO EEOS | IS | 1125 | 1130 | 30 | 30 | PASS | SAB | |
| P180 \ P183 | 11/19/11 | WEOS TO EEOS | IS | 1522 | 1527 | 30 | 30 | PASS | SAB | |
| P161 \ P176 | 11/19/11 | SEOS TO NEOS | IS | 1523 | 1528 | 30 | 30 | PASS | SAB | |
| P167 \ P177 | 11/19/11 | NEOS TO SEOS | IS | 1525 | 1530 | 30 | 30 | PASS | SAB | |

# VACUUM TEST SUMMARY

# VACUUM TEST SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| Seam Number | Date | Location | Tech | Mon | Remarks |
|---|---|---|---|---|---|
| P019 \ P023 | 11/09/12 | EEOS TO WEOS | SC | SAB | |
| P161 \ P163 | 11/09/12 | NEOS TO SEOS | SC | SAB | |

# APPENDIX L
# GEOMEMBRANE SEAM STRENGTH DESTRUCTIVE TEST SUMMARIES

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

## DESTRUCTIVE SAMPLE LOG

LUMINANT

11-9-11

| DS Number | Seam Number | Date Welded | Machine Number | Tech | Date Pulled | Date Tested | Tested By | Peel Values | Shear Values | Pass/ Fail |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 1.2 | 11.8.11 | 23 | AG | 11.9.11 | 11.9.11 | R | 120. 133, 125<br>124. 143. 136 | 212 198. 210 | P |
| 2. | 3.4 | | 22 | SC | | | | 137 126 132<br>146. 136. 144. | 210. 208. 200 | P |
| 3. | 4.5 | | 26 | SP | | | | 123. 122 126<br>130. 130. 126. | 208. 210. 200 | P. |
| 4 | 5.6 | | 24 | RH | | | | 151 129 139<br>142. 142 117 | 202. 210. 198 | P |
| 1 | 24/21 | | G#27 | AR | | | | 111 122 122 | 159 154 158 | P |
| 5. | 29/25 | | | | 11.10.11 | 11.10.11 | P. | 130 140 136<br>132 138 134 | 158. 160 156 | P. |
| 6. | 18/33 | | | SC | | | | 125 117 128<br>116. 121. 125 | 162. 170. 168 | P. |
| 7 | | | | | | | | 117 132 118<br>111 121. 120 | 170. 172. 168 | P. |
| 8 | | | | | | | | 138 140 138<br>126 142 126 | 206. 200 204 | P |
| 9. | 36/35 | 11.10.11 | 24 | RH | 11.11.11 | 11.11.11 | R | 118 126 130<br>120 122 120 | 160. 168. 162 | P. |
| 10 | 37/36 | | 26 | SP | | | | 116 122 130<br>118 120 128 | 143. 160. 142 | P |
| 1 | 38/37 | | 22 | SC | | | | 136 122 107<br>130 119. 118 | 189. 190. 188 | P |
| 12 | 39/38 | | 23 | AG | | | | 107 120 108<br>112 122 116 | 192. 188 190 | P |
| 13 | 40/39 | | 24 | RH | | | | 126 119 117<br>120 124 122 | 194 200 191 | P |
| 14 | 43/40 | | 23 | AG | | | | 130 120 104<br>118 105 121 | 190 188 190 | P |
| 15 | 41/41 | | 26 | SP | | | | 101 103 130<br>135 124 141 | 159 156 157 | P |
| 16 | 45/41 | | 22 | SC | | | | 138 116 133<br>126 128 113 | 197 194 197 | P |
| 17 | | | | | | | | 110 111 118<br>145 146 152 | 195 191 195 | P |
| 18 | 47/49 | | 24 | RH | | | | 144 128 124<br>130 131 130 | 177 171 172 | P |
| 19 | 51/49 | | 22 | SC | | | | 123 120 123<br>113 133 109 | 171 168 174 | P |
| 20 | | | | | | | | 103 100 108<br>126 137 134 | 163 160 162 | P |
| 2 | | | G#28 | | | | | 101 104 100 | 147 144 146 | P |
| 21 | | | | | | | | 123 121 111<br>106 150 145 | 177 172 169 | P |
| 22 | | | | | | | | 100 134 139<br>125 121 119 | 167 170 168 | P |
| 23 | | | | | | | | 133 103 113<br>116 130 128 | 169 164 160 | P |
| 24 | | | | | | | | 110 100 104<br>126 102 101 | 154 158 155 | P |

# Texas Environmental Plastics, Ltd.

*Installers, Fabricators & Distributors of Environmental Lining Systems*

11-16-11

## DESTRUCTIVE SAMPLE LOG

Lunnant

| DS Number | Seam Number | Date Welded | Machine Number | Tech | Date Pulled | Date Tested | Tested By | Peel Values | Shear Values | Pass/ Fail |
|---|---|---|---|---|---|---|---|---|---|---|
| 29 | | | | | | | | 127 124 124<br>117 121 129 | 187 184 187 | P |
| 30 | 94/95 | | 24 | RH | | | | 104 130 132<br>108 119 120 | 202, 200, 198 | P |
| 31 | 89/90 | | 22 | SC | | | | 110 108 119<br>119 133 142 | 164 167 165 | P |
| 32 | 92/93 | | 23 | AG | | | | 102 111 104<br>121 106 120 | 152 149, 150 | P |
| 33 | 103/104 | | 22 | SC | | | | 110 137 111<br>106 129 129 | 191 190 186 | P |
| 34 | 107/110 | | 26 | SP | 11.16.11 | 11.16.11 | P. | 98 99 104<br>124 102 120 | 188<br>198 200 | P |
| 35 | 118/121 | | 26 | SP | | | | 110 114 112<br>138 121 135 | 184 187 184 | P |
| 36 | 123/120 | 11-14-11 | 26 | SP | | | | 120 123 127<br>116 129 113 | 168 164 169 | P |
| 37 | 121 122 | 11-14 | 22 | SC | 11.16.11 | 11.16.11 | P. | 130 126 132<br>128 124 136 | 190, 198, 204 | P |
| 38 | 123/124 | | 24 | RH | | | | 144 138 142<br>138 147 139 | 201 198 204 | P |
| 39 | 116/117 | | 24 | RH | | | | 120, 118 124<br>117 116 132 | 198, 190 196 | P |
| 40 | 115/116 | | 23 | AG | | | | 114 104 101<br>106 115 115 | 145 144 144 | P |
| 41 | 119/120 | | 23 | AG | | | | 103 113 100<br>122 103 123 | 184 187 182 | P |
| 42 | 129/130 | | 23 | AG | | | | 140 130 128<br>124 105 136 | 176 178, 184 | P |
| 43 | 145/146 | | 24 | RH | | | | 136 134 132<br>146 129 139 | 192 196 196 | P |
| 44 | 122/144 | | 22 | SC | | | | 119 134 111<br>133 128 132 | 186 182 189 | P |
| | | | | | | | | | | |
| 25 | 72/34 | | 23 | AG | | | | 126 120 124<br>114 119 116 | 142 147 140 | P |
| 26 | 75/76 | | 22 | SC | | | | 122 130 123<br>119 125 105 | 148 150 146 | P |
| 27 | 71/72 | | 24 | RH | | | | 104 106 102<br>101 100 104 | 144 145 140 | P |
| 28 | 74/76 | | 26 | SP | | | | 108 122 109<br>121 104 119 | 152 155 149 | P |
| 3 | 121/122 | 11.16.11 | S#28 | DP | | | | 105 116 105 | 153 150 148 | P |
| 6N2 | | | | | | | | 131 133 147 126 144 127 | 164 161 167 | P |
| 4 | | | G#27 | AR | | | | 136 126 110 | 146 140 144 | P |
| 3.1 | | | | | 11-18-11 | 11-18-11 | | 95 97 92 | 144 141 142 | P |
| 3.2 | | | | | 11-18-11 | 11-18-11 | | 96 94 97 | 145 143 146 | P |

LUMINANT

# DESTRUCTIVE SAMPLE LOG

| DS Number | Seam Number | Date Welded | Machine Number | Tech | Date Pulled | Date Tested | Tested By | Peel Values | | | Shear Values | | | Pass/ Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | | 11.19.11 | | | 11.19.11 | 11.19 | P | 165/100 | 98/119 | 109/100 | 180 | 178 | 176 | P. |
| 46 | | | | | | | – | 115/114 | 145/110 | 116/115 | 177 | 170 | 178 | P |
| 47 | | | | | | | – | 118/117 | 115/113 | 109/110 | 182 | 178 | 176 | P. |
| 48 | | | | | | | | 99/100 | 98/116 | 99/112 | | | | |
| 49 | | | | | | | | 132/118 | 111/108 | 124/107 | 168 | 164 | 160 | P. |
| 50 | | | | | | | | | | | | | | |
| 51 | | | | | 11.19.11 | 11.19.11 | P. | 130/137 | 128/120 | 118/122 | 182 | 180 | 178 | P |
| 52 | | | | | | | | 132/116 | 126/141 | 123/130 | 180 | 178 | 182 | P |
| 53 | | | | | | | | 117/108 | 112/112 | 111/110 | 185 | 180 | 184 | P |
| 54 | | | | | | | | 99/121 | 99/100 | 102/98 | 182 | 165 | 168 | P |
| DS45 | | | | | | | | 80 | 82 | 92 | 170 | 145 | 148 | P |
| DS46 | | | | | | | | 92/79 | 92 | 100 | 180 | 168 | 170 | P |
| | | | | | | | | | | | | | | |
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2500 Farrell Road • Houston, Texas 77073 U.S.A. • Tel: 281-821-7320 • Fax: 281-821-7138

# FUSION

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**LUMINANT**
**OAK GROVE FGB-B POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | SHEAR BREAK STRAIN (%) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|---|
| DS-01 | 196.8 | BRK | >50 | 151.6 | SE 1 | 143.1 | SE 1 | PASS |
| | 197.0 | BRK | >50 | 150.1 | SE 1 | 137.5 | SE 1 | |
| | 196.4 | BRK | >50 | 152.1 | SE 1 | 139.2 | SE 1 | |
| | 197.2 | BRK | >50 | 150.7 | SE 1 | 145.5 | SE 1 | |
| | 197.3 | BRK | >50 | 145.9 | SE 1 | 146.1 | SE 1 | |
| DS-02 | 193.0 | BRK | >50 | 134.4 | SE 1 | 156.4 | SE 1 | PASS |
| | 193.2 | BRK | >50 | 143.2 | SE 1 | 158.0 | SE 1 | |
| | 192.3 | BRK | >50 | 149.0 | SE 1 | 154.8 | SE 1 | |
| | 193.6 | BRK | >50 | 140.7 | SE 1 | 155.4 | SE 1 | |
| | 193.6 | BRK | >50 | 129.3 | SE 1 | 146.6 | SE 1 | |
| DS-03 | 198.1 | BRK | >50 | 151.7 | SE 1 | 146.1 | SE 1 | PASS |
| | 198.4 | BRK | >50 | 152.2 | SE 1 | 149.4 | SE 1 | |
| | 198.5 | BRK | >50 | 150.2 | SE 1 | 150.5 | SE 1 | |
| | 198.5 | BRK | >50 | 147.5 | SE 1 | 145.9 | SE 1 | |
| | 197.0 | BRK | >50 | 145.6 | SE 1 | 143.7 | SE 1 | |
| DS-04 | 194.0 | BRK | >50 | 151.4 | SE 1 | 133.3 | SE 1 | PASS |
| | 193.2 | BRK | >50 | 149.7 | SE 1 | 136.3 | SE 1 | |
| | 191.9 | BRK | >50 | 149.2 | SE 1 | 103.9 | SE 1 | |
| | 192.1 | BRK | >50 | 146.8 | SE 1 | 127.2 | SE 1 | |
| | 191.8 | BRK | >50 | 140.1 | SE 1 | 119.5 | SE 1 | |
| DS-05 | 201.6 | BRK | >50 | 157.8 | SE 1 | 142.1 | SE 1 | PASS |
| | 199.4 | BRK | >50 | 159.8 | SE 1 | 144.6 | SE 1 | |
| | 199.5 | BRK | >50 | 158.7 | SE 1 | 147.1 | SE 1 | |
| | 200.0 | BRK | >50 | 159.4 | SE 1 | 149.8 | SE 1 | |
| | 191.3 | BRK | >50 | 154.2 | SE 1 | 147.0 | SE 1 | |
| DS-06 | 179.0 | BRK | 22 | 172.6 | SE 1 | 168.6 | SE 1 | FAIL |
| | 183.9 | BRK | 22 | 171.8 | SE 1 | 164.2 | SE 1 | |
| | 181.5 | BRK | 22 | 172.4 | SE 1 | 171.7 | SE 1 | |
| | 179.9 | BRK | 22 | 175.4 | SE 1 | 168.9 | SE 1 | |
| | 178.6 | BRK | 22 | 171.0 | SE 1 | 166.2 | SE 1 | |
| DS-06N1 | 233.9 | BRK | >50 | 172.3 | SE 1 | 168.8 | SE 1 | FAIL |
| | 213.4 | BRK | 10 | 172.6 | SE 1 | 171.6 | SE 1 | |
| | 232.8 | BRK | 15 | 174.3 | SE 1 | 173.6 | SE 1 | |
| | 236.6 | BRK | 15 | 170.6 | SE 1 | 176.6 | SE 1 | |
| | 235.5 | BRK | >50 | 175.5 | SE 1 | 173.8 | SE 1 | |
| DS-06N2 | 230.0 | BRK | >50 | 148.1 | SE 1 | 160.3 | SE 1 | PASS |
| | 231.5 | BRK | >50 | 146.4 | SE 1 | 162.8 | SE 1 | |
| | 231.3 | BRK | >50 | 149.9 | SE 1 | 155.2 | SE 1 | |
| | 211.0 | BRK | 24 | 149.2 | SE 1 | 162.8 | SE 1 | |
| | 222.6 | BRK | >50 | 155.3 | SE 1 | 157.3 | SE 1 | |
| DS-06P1 | 230.6 | BRK | >50 | 178.8 | SE 1 | 166.5 | SE 1 | PASS |
| | 233.3 | BRK | >50 | 167.7 | SE 1 | 169.8 | SE 1 | |
| | 226.4 | BRK | >50 | 170.3 | SE 1 | 170.4 | SE 1 | |
| | 231.8 | BRK | >50 | 167.5 | SE 1 | 170.2 | SE 1 | |
| | 226.6 | BRK | >50 | 171.4 | SE 1 | 166.7 | SE 1 | |
| DS-07 | 172.5 | BRK | >50 | 151.7 | SE 1 | 150.0 | SE 1 | PASS |
| | 177.2 | BRK | >50 | 163.1 | SE 1 | 147.8 | SE 1 | |
| | 170.0 | BRK | >50 | 167.4 | SE 1 | 143.6 | SE 1 | |
| | 179.6 | BRK | >50 | 163.4 | SE 1 | 140.6 | SE 1 | |
| | 167.9 | BRK | >50 | 162.4 | SE 1 | 140.2 | SE 1 | |

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**LUMINANT**
**OAK GROVE FGB-B POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | SHEAR BREAK STRAIN (%) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|---|
| DS-08 | 207.0 | BRK | >50 | 153.9 | SE 1 | 162.4 | SE 1 | PASS |
| | 208.7 | BRK | >50 | 154.1 | SE 1 | 155.1 | SE 1 | |
| | 208.9 | BRK | >50 | 158.0 | SE 1 | 160.8 | SE 1 | |
| | 210.5 | BRK | >50 | 160.6 | SE 1 | 153.4 | SE 1 | |
| | 206.0 | BRK | >50 | 158.6 | SE 1 | 151.8 | SE 1 | |
| DS-09 | 168.9 | BRK | >50 | 146.6 | SE 1 | 159.8 | SE 1 | FAIL |
| | 171.9 | BRK | 21 | 149.8 | SE 1 | 165.3 | SE 1 | |
| | 174.8 | BRK | 50 | 151.7 | SE 1 | 159.7 | SE 1 | |
| | 175.2 | BRK | 21 | 145.1 | SE 1 | 134.0 | SE 1 | |
| | 173.4 | BRK | 21 | 140.1 | SE 1 | 135.4 | SE 1 | |
| DS-09N1 | 171.3 | BRK | 30 | 143.6 | SE 1 | 165.3 | SE 1 | PASS |
| | 182.5 | BRK | >50 | 143.0 | SE 1 | 170.9 | SE 1 | |
| | 181.4 | BRK | >50 | 154.7 | SE 1 | 157.7 | SE 1 | |
| | 186.7 | BRK | >50 | 157.8 | SE 1 | 170.9 | SE 1 | |
| | 187.7 | BRK | >50 | 142.0 | SE 1 | 163.2 | SE 1 | |
| DS-09P1 | 205.1 | BRK | >50 | 146.5 | SE 1 | 162.5 | SE 1 | PASS |
| | 205.7 | BRK | >50 | 145.3 | SE 1 | 153.6 | SE 1 | |
| | 206.4 | BRK | >50 | 149.3 | SE 1 | 156.5 | SE 1 | |
| | 207.7 | BRK | >50 | 147.6 | SE 1 | 165.2 | SE 1 | |
| | 206.0 | BRK | >50 | 138.7 | SE 1 | 158.4 | SE 1 | |
| DS-10 | 177.9 | BRK | >50 | 145.4 | SE 1 | 121.3 | SE 1 | PASS |
| | 180.2 | BRK | >50 | 145.0 | SE 1 | 121.1 | SE 1 | |
| | 179.5 | BRK | >50 | 146.7 | SE 1 | 120.0 | SE 1 | |
| | 176.3 | BRK | >50 | 151.9 | SE 1 | 123.5 | SE 1 | |
| | 169.7 | BRK | >50 | 149.5 | SE 1 | 124.8 | SE 1 | |
| DS-11 | 206.4 | BRK | >50 | 142.9 | SE 1 | 160.1 | SE 1 | PASS |
| | 206.8 | BRK | >50 | 136.2 | SE 1 | 157.8 | SE 1 | |
| | 208.5 | BRK | >50 | 148.7 | SE 1 | 156.5 | SE 1 | |
| | 209.1 | BRK | >50 | 141.4 | SE 1 | 159.5 | SE 1 | |
| | 208.3 | BRK | >50 | 140.6 | SE 1 | 160.3 | SE 1 | |
| DS-12 | 207.8 | BRK | >50 | 153.3 | SE 1 | 153.8 | SE 1 | PASS |
| | 208.4 | BRK | >50 | 133.8 | SE 1 | 130.6 | SE 1 | |
| | 208.3 | BRK | >50 | 161.9 | SE 1 | 134.9 | SE 1 | |
| | 206.6 | BRK | >50 | 148.4 | SE 1 | 134.7 | SE 1 | |
| | 197.8 | BRK | >50 | 150.6 | SE 1 | 131.3 | SE 1 | |
| DS-13 | 213.1 | BRK | >50 | 156.9 | SE 1 | 153.7 | SE 1 | PASS |
| | 212.5 | BRK | >50 | 143.7 | SE 1 | 166.7 | SE 1 | |
| | 213.2 | BRK | >50 | 155.3 | SE 1 | 149.7 | SE 1 | |
| | 213.1 | BRK | >50 | 158.8 | SE 1 | 161.9 | SE 1 | |
| | 210.8 | BRK | >50 | 144.3 | SE 1 | 155.3 | SE 1 | |
| DS-14 | 203.3 | BRK | >50 | 141.0 | SE 1 | 137.4 | SE 1 | PASS |
| | 204.8 | BRK | >50 | 132.5 | SE 1 | 127.6 | SE 1 | |
| | 204.9 | BRK | >50 | 133.4 | SE 1 | 137.0 | SE 1 | |
| | 206.5 | BRK | >50 | 136.4 | SE 1 | 137.1 | SE 1 | |
| | 203.6 | BRK | >50 | 137.1 | SE 1 | 119.5 | SE 1 | |
| DS-15 | 191.7 | BRK | >50 | 134.4 | SE 1 | 128.3 | SE 1 | PASS |
| | 193.0 | BRK | >50 | 135.5 | SE 1 | 125.0 | SE 1 | |
| | 192.7 | BRK | >50 | 135.1 | SE 1 | 125.8 | SE 1 | |
| | 191.2 | BRK | >50 | 136.2 | SE 1 | 116.9 | SE 1 | |
| | 183.2 | BRK | >50 | 148.7 | SE 1 | 114.8 | SE 1 | |

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**LUMINANT**
**OAK GROVE FGB-B POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | SHEAR BREAK STRAIN (%) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|---|
| DS-16 | 213.3 | BRK | >50 | 150.3 | SE 1 | 143.4 | SE 1 | PASS |
| | 213.0 | BRK | >50 | 159.8 | SE 1 | 138.3 | SE 1 | |
| | 212.2 | BRK | >50 | 140.2 | SE 1 | 144.9 | SE 1 | |
| | 211.5 | BRK | >50 | 137.8 | SE 1 | 143.5 | SE 1 | |
| | 207.5 | BRK | >50 | 132.7 | SE 1 | 152.7 | SE 1 | |
| DS-17 | 210.3 | BRK | >50 | 157.8 | SE 1 | 125.2 | SE 1 | PASS |
| | 213.1 | BRK | >50 | 157.6 | SE 1 | 130.3 | SE 1 | |
| | 215.8 | BRK | >50 | 166.7 | SE 1 | 129.2 | SE 1 | |
| | 211.9 | BRK | >50 | 164.8 | SE 1 | 128.7 | SE 1 | |
| | 214.9 | BRK | >50 | 164.0 | SE 1 | 129.6 | SE 1 | |
| DS-18 | 212.3 | BRK | >50 | 126.1 | SE 1 | 138.2 | SE 1 | PASS |
| | 213.2 | BRK | >50 | 128.7 | SE 1 | 139.9 | SE 1 | |
| | 213.1 | BRK | >50 | 129.0 | SE 1 | 124.1 | SE 1 | |
| | 212.3 | BRK | >50 | 124.7 | SE 1 | 147.2 | SE 1 | |
| | 210.9 | BRK | >50 | 124.9 | SE 1 | 137.4 | SE 1 | |
| DS-19 | 206.2 | BRK | >50 | 159.4 | SE 1 | 145.1 | SE 1 | PASS |
| | 206.6 | BRK | >50 | 140.8 | SE 1 | 148.3 | SE 1 | |
| | 204.7 | BRK | >50 | 162.1 | SE 1 | 145.3 | SE 1 | |
| | 200.6 | BRK | >50 | 155.8 | SE 1 | 135.3 | SE 1 | |
| | 203.3 | BRK | >50 | 146.0 | SE 1 | 142.9 | SE 1 | |
| DS-20 | 203.7 | BRK | >50 | 139.7 | SE 1 | 134.4 | SE 1 | PASS |
| | 204.1 | BRK | >50 | 141.5 | SE 1 | 135.9 | SE 1 | |
| | 204.1 | BRK | >50 | 137.3 | SE 1 | 139.7 | SE 1 | |
| | 202.6 | BRK | >50 | 139.0 | SE 1 | 136.0 | SE 1 | |
| | 204.0 | BRK | >50 | 140.0 | SE 1 | 142.4 | SE 1 | |
| DS-21 | 203.2 | BRK | >50 | 161.7 | SE 1 | 126.4 | SE 1 | PASS |
| | 204.8 | BRK | >50 | 169.2 | SE 1 | 125.6 | SE 1 | |
| | 203.5 | BRK | >50 | 148.0 | SE 1 | 125.8 | SE 1 | |
| | 205.3 | BRK | >50 | 148.3 | SE 1 | 126.1 | SE 1 | |
| | 202.6 | BRK | >50 | 156.5 | SE 1 | 130.1 | SE 1 | |
| DS-22 | 189.7 | BRK | >50 | 133.1 | SE 1 | 131.6 | SE 1 | PASS |
| | 191.5 | BRK | >50 | 128.2 | SE 1 | 131.6 | SE 1 | |
| | 192.0 | BRK | >50 | 130.2 | SE 1 | 132.3 | SE 1 | |
| | 192.3 | BRK | >50 | 123.1 | SE 1 | 131.2 | SE 1 | |
| | 186.2 | BRK | >50 | 127.0 | SE 1 | 132.3 | SE 1 | |
| DS-23 | 181.4 | BRK | >50 | 131.7 | SE 1 | 141.5 | SE 1 | PASS |
| | 181.9 | BRK | >50 | 129.2 | SE 1 | 110.3 | AD BRK(53%) | |
| | 183.5 | BRK | >50 | 127.9 | SE 1 | 144.2 | SE 1 | |
| | 184.3 | BRK | >50 | 130.7 | SE 1 | 145.9 | SE 1 | |
| | 181.4 | BRK | >50 | 128.5 | SE 1 | 135.3 | SE 1 | |
| DS-24 | 179.8 | BRK | >50 | 141.4 | SE 1 | 110.8 | SE 1 | PASS |
| | 180.7 | BRK | >50 | 145.6 | SE 1 | 107.2 | SE 1 | |
| | 179.8 | BRK | >50 | 144.8 | SE 1 | 109.4 | SE 1 | |
| | 179.4 | BRK | >50 | 147.1 | SE 1 | 111.5 | SE 1 | |
| | 177.0 | BRK | >50 | 144.2 | SE 1 | 110.0 | SE 1 | |
| DS-25 | 174.3 | BRK | >50 | 142.7 | SE 1 | 118.8 | SE 1 | PASS |
| | 169.2 | BRK | >50 | 144.2 | SE 1 | 133.8 | SE 1 | |
| | 172.5 | BRK | >50 | 133.4 | SE 1 | 122.2 | SE 1 | |
| | 167.1 | BRK | >50 | 155.9 | SE 1 | 133.4 | SE 1 | |
| | 164.9 | BRK | >50 | 136.4 | SE 1 | 121.1 | SE 1 | |

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**LUMINANT**
**OAK GROVE FGB-B POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | SHEAR BREAK STRAIN (%) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|---|
| DS-26 | 198.7 | BRK | >50 | 144.7 | SE 1 | 137.6 | SE 1 | PASS |
| | 198.4 | BRK | >50 | 144.4 | SE 1 | 133.8 | SE 1 | |
| | 199.1 | BRK | >50 | 144.4 | SE 1 | 134.1 | SE 1 | |
| | 198.4 | BRK | >50 | 145.2 | SE 1 | 139.7 | SE 1 | |
| | 194.1 | BRK | >50 | 145.0 | SE 1 | 135.5 | SE 1 | |
| DS-27 | 173.1 | BRK | >50 | 109.9 | SE 1 | 104.0 | SE 1 | PASS |
| | 176.4 | BRK | >50 | 114.7 | SE 1 | 105.6 | SE 1 | |
| | 176.7 | BRK | >50 | 114.1 | SE 1 | 105.0 | SE 1 | |
| | 174.7 | BRK | >50 | 117.4 | SE 1 | 110.6 | SE 1 | |
| | 169.4 | BRK | >50 | 116.8 | SE 1 | 108.2 | SE 1 | |
| DS-28 | 186.0 | BRK | >50 | 128.5 | SE 1 | 128.2 | SE 1 | PASS |
| | 190.1 | BRK | >50 | 135.1 | SE 1 | 125.5 | SE 1 | |
| | 191.0 | BRK | >50 | 134.8 | SE 1 | 132.8 | SE 1 | |
| | 192.6 | BRK | >50 | 134.8 | SE 1 | 123.2 | SE 1 | |
| | 191.0 | BRK | >50 | 139.2 | SE 1 | 122.3 | SE 1 | |
| DS-29 | 211.5 | BRK | >50 | 153.2 | SE 1 | 148.0 | SE 1 | PASS |
| | 210.9 | BRK | >50 | 150.2 | SE 1 | 152.0 | SE 1 | |
| | 211.1 | BRK | >50 | 152.2 | SE 1 | 147.2 | SE 1 | |
| | 211.4 | BRK | >50 | 147.3 | SE 1 | 147.5 | SE 1 | |
| | 205.5 | BRK | >50 | 143.9 | SE 1 | 139.6 | SE 1 | |
| DS-30 | 209.9 | BRK | >50 | 133.7 | SE 1 | 124.4 | SE 1 | PASS |
| | 210.6 | BRK | >50 | 135.5 | SE 1 | 161.1 | SE 1 | |
| | 210.0 | BRK | >50 | 136.9 | SE 1 | 123.0 | SE 1 | |
| | 208.7 | BRK | >50 | 136.4 | SE 1 | 132.4 | SE 1 | |
| | 203.5 | BRK | >50 | 135.9 | SE 1 | 133.9 | SE 1 | |
| DS-31 | 212.3 | BRK | >50 | 116.2 | SE 1 | 153.7 | SE 1 | PASS |
| | 215.7 | BRK | >50 | 111.8 | SE 1 | 145.5 | SE 1 | |
| | 216.0 | BRK | >50 | 121.2 | SE 1 | 147.8 | SE 1 | |
| | 215.2 | BRK | >50 | 114.3 | SE 1 | 149.1 | SE 1 | |
| | 209.4 | BRK | >50 | 128.7 | SE 1 | 148.8 | SE 1 | |
| DS-32 | 208.0 | BRK | >50 | 135.5 | SE 1 | 122.5 | SE 1 | PASS |
| | 209.0 | BRK | >50 | 133.1 | SE 1 | 144.0 | SE 1 | |
| | 208.7 | BRK | >50 | 135.3 | SE 1 | 124.6 | SE 1 | |
| | 208.6 | BRK | >50 | 133.2 | SE 1 | 121.8 | SE 1 | |
| | 201.7 | BRK | >50 | 131.7 | SE 1 | 115.5 | SE 1 | |
| DS-33 | 211.4 | BRK | >50 | 164.0 | SE 1 | 154.5 | SE 1 | PASS |
| | 213.0 | BRK | >50 | 147.0 | SE 1 | 156.4 | SE 1 | |
| | 212.8 | BRK | >50 | 136.7 | SE 1 | 162.3 | SE 1 | |
| | 212.7 | BRK | >50 | 127.4 | SE 1 | 153.6 | SE 1 | |
| | 207.6 | BRK | >50 | 135.0 | SE 1 | 148.9 | SE 1 | |
| DS-34 | 184.4 | BRK | >50 | 155.0 | SE 1 | 118.0 | SE 1 | PASS |
| | 184.8 | BRK | >50 | 155.9 | SE 1 | 117.2 | SE 1 | |
| | 185.5 | BRK | >50 | 154.6 | SE 1 | 118.1 | SE 1 | |
| | 185.5 | BRK | >50 | 152.7 | SE 1 | 117.7 | SE 1 | |
| | 179.0 | BRK | >50 | 149.4 | SE 1 | 119.5 | SE 1 | |
| DS-35 | 204.0 | BRK | >50 | 152.0 | SE 1 | 145.9 | SE 1 | PASS |
| | 204.2 | BRK | >50 | 151.0 | SE 1 | 144.0 | SE 1 | |
| | 204.8 | BRK | >50 | 148.2 | SE 1 | 151.6 | SE 1 | |
| | 202.4 | BRK | >50 | 137.6 | SE 1 | 144.6 | SE 1 | |
| | 196.3 | BRK | >50 | 147.9 | SE 1 | 149.0 | SE 1 | |

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**LUMINANT**
**OAK GROVE FGB-B POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | SHEAR BREAK STRAIN (%) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|---|
| DS-36 | 215.9 | BRK | >50 | 149.8 | SE 1 | 141.6 | SE 1 | PASS |
| | 217.3 | BRK | >50 | 162.1 | SE 1 | 139.4 | SE 1 | |
| | 217.8 | BRK | >50 | 138.2 | SE 1 | 152.6 | SE 1 | |
| | 216.5 | BRK | >50 | 135.6 | SE 1 | 147.1 | SE 1 | |
| | 214.4 | BRK | >50 | 135.0 | SE 1 | 167.5 | SE 1 | |
| DS-37 | 230.1 | BRK | >50 | 152.6 | SE 1 | 158.1 | SE 1 | PASS |
| | 232.0 | BRK | >50 | 163.5 | SE 1 | 167.5 | SE 1 | |
| | 218.0 | BRK | >50 | 162.8 | SE 1 | 170.4 | SE 1 | |
| | 231.5 | BRK | >50 | 163.2 | SE 1 | 174.4 | SE 1 | |
| | 228.9 | BRK | >50 | 154.2 | SE 1 | 172.5 | SE 1 | |
| DS-38 | 251.5 | BRK | >50 | 195.5 | SE 1 | 162.6 | SE 1 | PASS |
| | 249.5 | BRK | >50 | 171.9 | SE 1 | 168.8 | SE 1 | |
| | 251.7 | BRK | >50 | 171.4 | SE 1 | 170.3 | SE 1 | |
| | 251.2 | BRK | >50 | 169.1 | SE 1 | 169.4 | SE 1 | |
| | 245.2 | BRK | >50 | 160.7 | SE 1 | 170.8 | SE 1 | |
| DS-39 | 185.6 | BRK | >50 | 153.2 | SE 1 | 140.7 | SE 1 | PASS |
| | 184.0 | BRK | >50 | 159.0 | SE 1 | 146.2 | SE 1 | |
| | 187.4 | BRK | >50 | 148.1 | SE 1 | 133.4 | SE 1 | |
| | 184.6 | BRK | >50 | 149.3 | SE 1 | 149.3 | SE 1 | |
| | 188.5 | BRK | >50 | 168.0 | SE 1 | 135.3 | SE 1 | |
| DS-40 | 187.5 | BRK | >50 | 143.7 | SE 1 | 124.6 | SE 1 | PASS |
| | 189.1 | BRK | >50 | 137.5 | SE 1 | 124.4 | SE 1 | |
| | 188.6 | BRK | >50 | 130.3 | SE 1 | 120.3 | SE 1 | |
| | 187.4 | BRK | >50 | 139.1 | SE 1 | 119.2 | SE 1 | |
| | 183.7 | BRK | >50 | 135.0 | SE 1 | 119.1 | SE 1 | |
| DS-41 | 204.5 | BRK | >50 | 134.0 | SE 1 | 121.6 | SE 1 | PASS |
| | 205.3 | BRK | >50 | 142.0 | SE 1 | 122.8 | SE 1 | |
| | 205.0 | BRK | >50 | 139.4 | SE 1 | 124.2 | SE 1 | |
| | 205.2 | BRK | >50 | 142.8 | SE 1 | 115.6 | SE 1 | |
| | 197.9 | BRK | >50 | 152.3 | SE 1 | 136.9 | SE 1 | |
| DS-42 | 189.6 | BRK | >50 | 130.8 | SE 1 | 148.6 | SE 1 | PASS |
| | 190.0 | BRK | >50 | 132.7 | SE 1 | 152.9 | SE 1 | |
| | 189.0 | BRK | >50 | 128.7 | SE 1 | 147.8 | SE 1 | |
| | 185.0 | BRK | >50 | 146.4 | SE 1 | 151.3 | SE 1 | |
| | 188.0 | BRK | >50 | 130.7 | SE 1 | 151.5 | SE 1 | |
| DS-43 | 241.1 | BRK | >50 | 157.2 | SE 1 | 171.1 | SE 1 | PASS |
| | 242.3 | BRK | >50 | 164.6 | SE 1 | 167.2 | SE 1 | |
| | 241.9 | BRK | >50 | 166.0 | SE 1 | 166.3 | SE 1 | |
| | 242.1 | BRK | >50 | 161.1 | SE 1 | 159.2 | SE 1 | |
| | 239.9 | BRK | >50 | 172.4 | SE 1 | 154.2 | SE 1 | |
| DS-44 | 238.2 | BRK | >50 | 158.8 | SE 1 | 155.6 | SE 1 | PASS |
| | 237.8 | BRK | >50 | 181.2 | SE 1 | 153.2 | SE 1 | |
| | 238.0 | BRK | >50 | 159.1 | SE 1 | 151.3 | SE 1 | |
| | 237.3 | BRK | >50 | 164.3 | SE 1 | 159.1 | SE 1 | |
| | 236.2 | BRK | >50 | 155.1 | SE 1 | 157.2 | SE 1 | |
| DS-45 | 175.4 | BRK | >50 | 155.1 | SE 1 | 143.1 | SE 1 | PASS |
| | 173.4 | BRK | >50 | 138.9 | SE 1 | 145.9 | SE 1 | |
| | 178.3 | BRK | >50 | 138.9 | SE 1 | 138.8 | SE 1 | |
| | 175.4 | BRK | >50 | 139.2 | SE 1 | 129.5 | SE 1 | |
| | 170.9 | BRK | >50 | 141.0 | SE 1 | 117.9 | SE 1 | |

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**LUMINANT**
**OAK GROVE FGB-B POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | SHEAR BREAK STRAIN (%) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|---|
| DS-46 | 204.7 | BRK | >50 | 169.8 | SE 1 | 161.8 | SE 1 | PASS |
| | 204.7 | BRK | >50 | 156.8 | SE 1 | 164.9 | SE 1 | |
| | 204.7 | BRK | >50 | 166.8 | SE 1 | 162.0 | SE 1 | |
| | 208.7 | BRK | >50 | 164.6 | SE 1 | 165.7 | SE 1 | |
| | 208.8 | BRK | >50 | 174.2 | SE 1 | 163.6 | SE 1 | |
| DS-47 | 205.6 | BRK | >50 | 147.4 | SE 1 | 155.9 | SE 1 | PASS |
| | 206.0 | BRK | >50 | 147.7 | SE 1 | 151.9 | SE 1 | |
| | 207.2 | BRK | >50 | 140.8 | SE 1 | 154.0 | SE 1 | |
| | 206.0 | BRK | >50 | 146.5 | SE 1 | 142.7 | SE 1 | |
| | 205.2 | BRK | >50 | 147.1 | SE 1 | 152.5 | SE 1 | |
| DS-48 | 181.1 | BRK | >50 | 152.6 | SE 1 | 111.8 | SE 1 | PASS |
| | 179.1 | BRK | >50 | 151.7 | SE 1 | 113.3 | SE 1 | |
| | 188.5 | BRK | >50 | 156.3 | SE 1 | 111.9 | SE 1 | |
| | 175.2 | BRK | >50 | 149.2 | SE 1 | 112.2 | SE 1 | |
| | 181.0 | BRK | >50 | 155.1 | SE 1 | 117.3 | SE 1 | |
| DS-49 | 195.6 | BRK | >50 | 154.3 | SE 1 | 153.7 | SE 1 | PASS |
| | 198.1 | BRK | >50 | 135.4 | SE 1 | 161.7 | SE 1 | |
| | 196.2 | BRK | >50 | 147.9 | SE 1 | 163.4 | SE 1 | |
| | 194.7 | BRK | >50 | 149.4 | ADBRK(80.0%) | 165.3 | SE 1 | |
| | 194.1 | BRK | >50 | 122.8 | SE 1 | 162.6 | SE 1 | |
| DS-50 | 203.3 | BRK | >50 | 150.7 | ADBRK(77.8%) | 159.9 | SE 1 | FAIL |
| | 202.2 | BRK | >50 | 154.1 | SE 1 | 142.8 | SE 1 | |
| | 201.3 | BRK | >50 | 114.4 | ADBRK(64.3%) | 160.9 | SE 1 | |
| | 199.8 | BRK | >50 | 137.1 | ADBRK(83.3%) | 151.5 | SE 1 | |
| | 198.0 | BRK | >50 | 136.4 | ADBRK(72.2%) | 159.2 | SE 1 | |
| DS-50N1 | 206.3 | BRK | >50 | 139.0 | SE 1 | 159.1 | SE 1 | PASS |
| | 202.4 | BRK | >50 | 152.4 | SE 1 | 160.8 | SE 1 | |
| | 203.2 | BRK | >50 | 150.2 | SE 1 | 163.6 | SE 1 | |
| | 205.1 | BRK | >50 | 149.9 | SE 1 | 156.8 | SE 1 | |
| | 205.1 | BRK | >50 | 146.0 | SE 1 | 153.2 | SE 1 | |
| DS-50P1 | 185.3 | BRK | >50 | 133.7 | SE 1 | 139.0 | SE 1 | PASS |
| | 183.2 | BRK | >50 | 130.1 | SE 1 | 142.1 | SE 1 | |
| | 186.8 | BRK | >50 | 135.0 | SE 1 | 145.4 | SE 1 | |
| | 185.8 | BRK | >50 | 125.3 | SE 1 | 140.5 | SE 1 | |
| | 184.8 | BRK | >50 | 140.7 | SE 1 | 138.3 | SE 1 | |
| DS-51 | 218.0 | BRK | >50 | 148.3 | SE 1 | 196.8 | SE 1 | PASS |
| | 218.8 | BRK | >50 | 158.1 | SE 1 | 190.9 | SE 1 | |
| | 219.5 | BRK | >50 | 161.0 | SE 1 | 194.4 | SE 1 | |
| | 217.7 | BRK | >50 | 156.5 | SE 1 | 196.1 | SE 1 | |
| | 217.2 | BRK | >50 | 156.0 | SE 1 | 196.5 | SE 1 | |
| DS-52 | 214.3 | BRK | >50 | 172.1 | SE 1 | 161.9 | SE 1 | PASS |
| | 215.1 | BRK | >50 | 163.5 | SE 1 | 159.9 | SE 1 | |
| | 213.7 | BRK | >50 | 154.7 | SE 1 | 162.6 | SE 1 | |
| | 211.3 | BRK | >50 | 169.3 | SE 1 | 158.1 | SE 1 | |
| | 210.0 | BRK | >50 | 157.3 | SE 1 | 160.6 | SE 1 | |
| DS-53 | 212.0 | BRK | >50 | 138.3 | SE 1 | 164.2 | SE 1 | PASS |
| | 214.0 | BRK | >50 | 125.9 | ADBRK(20%) | 167.8 | SE 1 | |
| | 214.0 | BRK | >50 | 144.0 | SE 1 | 166.3 | SE 1 | |
| | 215.3 | BRK | >50 | 128.9 | ADBRK(20%) | 167.2 | SE 1 | |
| | 215.2 | BRK | >50 | 149.0 | SE 1 | 163.5 | SE 1 | |

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**LUMINANT**
**OAK GROVE FGB-B POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | SHEAR BREAK STRAIN (%) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|---|
| DS-54 | 178.3 | BRK | >50 | 148.6 | SE 1 | 139.8 | SE 1 | PASS |
| | 167.8 | BRK | >50 | 156.6 | SE 1 | 129.7 | SE 1 | |
| | 175.1 | BRK | >50 | 151.5 | SE 1 | 127.4 | SE 1 | |
| | 167.7 | BRK | >50 | 151.2 | SE 1 | 136.5 | SE 1 | |
| | 168.6 | BRK | >50 | 153.2 | SE 1 | 139.1 | SE 1 | |

(1) PEEL (1) Represents outer track or top flap.
(2) PEEL (2) represents inner track or bottom flap.
(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE 10.

DFSUM

# EXTRUSION

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**EXTRUSION METHOD**
**LUMINANT**
**OAK GROVE FGB-B POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (1) | SHEAR BREAK STRAIN (%) | PEEL STRENGTH (ppi) | PEEL BREAK CODE (1) | REMARKS |
|---|---|---|---|---|---|---|
| DSE-01 | 171.0 | BRK 1 | >50 | 134.7 | SE 3 | PASS |
| | 168.1 | BRK 2 | >50 | 165.2 | SE 3 | |
| | 169.1 | BRK 2 | >50 | 140.6 | SE 3 | |
| | 167.4 | BRK 2 | >50 | 155.8 | SE 3 | |
| | 170.6 | BRK 1 | >50 | 157.5 | SE 3 | |
| DSE-02 | 180.8 | SE 2 | 48 | 111.5 | SE 3 | FAIL |
| | 177.4 | BRK 2 | >50 | 134.1 | SE 3 | |
| | 180.8 | BRK 2 | >50 | 132.6 | SE 3 | |
| | 177.0 | BRK 2 | >50 | 91.6 | AD 1 | |
| | 172.9 | SE 2 | 24 | 88.9 | AD BRK | |
| DSE-02N1 | 164.7 | BRK 1 | >50 | 97.4 | SE 3 | PASS |
| | 164.4 | BRK 1 | >50 | 118.7 | SE 3 | |
| | 169.0 | BRK 1 | >50 | 134.4 | SE 3 | |
| | 169.7 | BRK 2 | >50 | 135.5 | SE 3 | |
| | 164.7 | BRK 1 | >50 | 89.1 | SE 3 | |
| DSE-02P1 | 159.0 | BRK 1 | >50 | 109.7 | SE 3 | PASS |
| | 159.6 | BRK 1 | >50 | 130.8 | SE 3 | |
| | 160.0 | BRK 1 | >50 | 131.5 | SE 3 | |
| | 161.6 | BRK 1 | >50 | 135.9 | SE 3 | |
| | 161.3 | BRK 1 | >50 | 127.2 | SE 3 | |
| DSE-03 | 182.7 | BRK 2 | >50 | 115.8 | SE 3 | FAIL |
| | 184.5 | BRK 2 | >50 | 143.8 | SE 3 | |
| | 185.9 | BRK 2 | >50 | 126.8 | SE 3 | |
| | 183.8 | SE 2 | 24 | 134.3 | SE 3 | |
| | 180.4 | BRK 2 | >50 | 22.4 | AD 1 | |
| DSE-03N1 | 179.2 | BRK 1 | >50 | 96.8 | SE 3 | PASS |
| | 176.0 | BRK 1 | >50 | 121.6 | SE 3 | |
| | 177.3 | BRK 1 | >50 | 105.1 | SE 3 | |
| | 175.0 | BRK 1 | >50 | 110.8 | SE 3 | |
| | 174.3 | BRK 1 | >50 | 115.6 | SE 3 | |
| DSE-03P1 | 179.9 | BRK 1 | >50 | 155.5 | SE 3 | PASS |
| | 182.5 | BRK 1 | >50 | 131.9 | SE 3 | |
| | 181.7 | BRK 1 | >50 | 120.2 | SE 3 | |
| | 186.6 | BRK 1 | >50 | 118.4 | SE 3 | |
| | 183.9 | BRK 1 | >50 | 125.8 | SE 3 | |
| DSE-04 | 179.8 | BRK 2 | >50 | 121.6 | SE 3 | PASS |
| | 178.4 | SE 1 | 43 | 127.2 | SE 3 | |
| | 183.2 | BRK 2 | >50 | 120.5 | SE 3 | |
| | 178.6 | BRK 1 | >50 | 120.5 | SE 3 | |
| | 175.6 | BRK 2 | >50 | 111.9 | SE 3 | |

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**EXTRUSION METHOD**
**LUMINANT**
**OAK GROVE FGB-B POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (1) | SHEAR BREAK STRAIN (%) | PEEL STRENGTH (ppi) | PEEL BREAK CODE (1) | REMARKS |
|---|---|---|---|---|---|---|
| DSE-05 | 177.8 | BRK 1 | >50 | 121.2 | SE 3 | PASS |
| | 177.6 | BRK 1 | >50 | 127.5 | SE 3 | |
| | 175.2 | BRK 1 | >50 | 124.3 | SE 3 | |
| | 174.8 | BRK 1 | >50 | 119.2 | SE 3 | |
| | 174.4 | BRK 1 | >50 | 118.2 | SE 3 | |
| DSE-06 | 186.6 | BRK 1 | >50 | 98.5 | SE 3 | PASS |
| | 193.3 | BRK 1 | >50 | 106.4 | SE 3 | |
| | 183.7 | BRK 1 | >50 | 139.4 | SE 3 | |
| | 180.8 | BRK 1 | >50 | 149.4 | SE 3 | |
| | 158.7 | BRK 2 | 25 | 124.8 | SE 3 | |

(1) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE 11. DESUM

# APPENDIX M
# GEOMEMBRANE REPAIR SUMMARY

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | WELDER I.D. TECH. | WELDER I.D. MACH. | WELDER I.D. QA MON. | DATE | QA MON. |
| 1 | A | P001 / P002 | 30' E OF WEOS | DS-01 | 11/09/11 | 0805 | P | 2 X 4 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | B | P003 / P004 | 20' E OF WEOS | DS-02 | 11/09/11 | 0830 | P | 2 X 4 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | C | P004 / P005 | 30' E OF WEOS | DS-03 | 11/09/11 | 0839 | P | 2 X 4 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | D | P005 / P006 | 10' E OF WEOS | DS-04 | 11/09/11 | 0849 | P | 2 X 4 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | E | P007 / P008 | 20' W OF EEOS | PT | 11/09/11 | 0920 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | F | P014 / P015 | 3' S OF NEOS | PT | 11/09/11 | 0940 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | G | P012 / P014 | @ P015 | T | 11/09/11 | 0939 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | H | P012 / P013 | @ P014 | T | 11/09/11 | 0941 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | I | P010 / P011 | @ P015 | T | 11/09/11 | 0938 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | J | P010 / P015 | @ P020 | T | 11/09/11 | 0936 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | K | P015 / P019 | @ P020 | T | 11/09/11 | 0933 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | M | P009 / P010 | @ P020 | T | 11/09/11 | 0931 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | N | P009 / P019 | @ P020 | T | 11/09/11 | 0929 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | P | P008 / P009 | @ P019 | T | 11/09/11 | 0928 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | Q | P019 / P023 | ENTIRE SEAM | IO | 11/09/11 | 0923 | P | 2 X 7 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | R | P001 / P002 | @ ANCHOR TRENCH | D | 11/09/11 | 0820 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | S | P002 / P003 | @ ANCHOR TRENCH | D | 11/09/11 | 0825 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | T | P003 / P004 | @ ANCHOR TRENCH | D | 11/09/11 | 0835 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | W | P004 / P005 | @ ANCHOR TRENCH | D | 11/09/11 | 0842 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 1 | X | P005 / P006 | @ ANCHOR TRENCH | D | 11/09/11 | 0845 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | A | P003 / P004 | @ P026 | T | 11/09/11 | 0850 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | B | P004 / P024 | @ p026 | T | 11/09/11 | 0852 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | C | P004 / P005 | @ P024 | T | 11/09/11 | 0856 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | D | P005 / P006 | @ P027 | T | 11/09/11 | 0859 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | E | P022 / P024 | @ P027 | T | 11/09/11 | 0901 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | F | P006 / P022 | @ P027 | T | 11/09/11 | 0903 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 2 | G | P006 / P007 | @ P022 | T | 11/09/11 | 0905 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | H | P007 / P022 | @ P023 | T | 11/09/11 | 0908 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | I | P007 / P008 | @ P023 | T | 11/09/11 | 0910 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | J | P006 / P007 | @ ANCHOR TRENCH | D | 11/09/11 | 0915 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | K | P007 / P008 | @ ANCHOR TRENCH | D | 11/09/11 | 0918 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | M | P008 / P009 | @ ANCHOR TRENCH | D | 11/09/11 | 0922 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | N | P019 / P022 | @ P023 | T | 11/09/11 | 0926 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | P | P015 / P016 | @ P019 | T | 11/09/11 | 0942 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | Q | P019 / P021 | @ P022 | T | 11/09/11 | 0943 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | R | P021 / P022 | @ P024 | T | 11/09/11 | 0944 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | S | P016 / P018 | @ P019 | T | 11/09/11 | 0946 | P | 2 X 3 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | T | P016 / P017 | @ P018 | T | 11/09/11 | 0948 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | W | P021 / P024 | @ ANCHOR TRENCH | D | 11/09/11 | 1010 | P | 2 X 4 | AR | 27 | SAB | 11/09/11 | SAB |
| 2 | X | 2W / P021 | 6' W OF EEOP | DSE-01 | 11/09/11 | 1059 | P | 2 X 4 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | A | P019 / P021 | @ ANCHOR TRENCH | D | 11/09/11 | 1011 | P | 2 X 4 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | B | P018 / P019 | @ ANCHOR TRENCH | D | 11/09/11 | 1013 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | C | P017 / P018 | @ ANCHOR TRENCH | D | 11/09/11 | 1015 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | D | P016 / P017 | @ ANCHOR TRENCH | D | 11/09/11 | 1017 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | E | P015 / P016 | @ ANCHOR TRENCH | D | 11/09/11 | 1019 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | F | P014 / P015 | @ ANCHOR TRENCH | D | 11/09/11 | 1020 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | G | P013 / P014 | @ ANCHOR TRENCH | D | 11/09/11 | 1022 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | H | P012 / P013 | @ ANCHOR TRENCH | D | 11/09/11 | 1024 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | I | P011 / P012 | @ ANCHOR TRENCH | D | 11/09/11 | 1025 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | J | P010 / P011 | @ ANCHOR TRENCH | D | 11/09/11 | 1028 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | K | P009 / P010 | @ ANCHOR TRENCH | D | 11/09/11 | 1053 | P | 2 X 2 | AR | 27 | SAB | 11/09/11 | SAB |
| 3 | M | P025 / P029 | 10' W OF EEOS | DS-05 | 11/10/11 | 1130 | P | 2 X 10 | AR | 27 | SAB | 11/12/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 3 | N | P033 / P034 | 20' W OF EEOS | DS-06 | 11/11/11 | 0830 | P | 2 X 12 | AR | 27 | SAB | 11/12/11 | SAB |
| 3 | P | P028 / P029 | 10' N OF SEOS | DS-07 | 11/10/11 | 1109 | P | 2 X 4 | AR | 27 | SAB | 11/12/11 | SAB |
| 3 | Q | P030 / P031 | 200' W OF EEOS | DS-08 | 11/10/11 | 1100 | P | 2 X 4 | AR | 27 | SAB | 11/12/11 | SAB |
| 3 | R | P030 / P031 | 30' W OF EEOS | PT | 11/10/11 | 1120 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 3 | S | P024 / P025 | @ P026 | T | 11/10/11 | 1045 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 3 | T | P028 / P029 | @ P030 | T | 11/10/11 | 1047 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 3 | W | P028 / P030 | 25' E OF WEOS | PT | 11/10/11 | 1056 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 3 | X | P002 / P026 | @ P028 | T | 11/10/11 | 1115 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | A | P001 / P002 | @ P028 | T | 11/16/11 | 1410 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 4 | B | P029 / P030 | @ ANCHOR TRENCH | D | 11/11/11 | 0810 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | C | P030 / P031 | @ ANCHOR TRENCH | D | 11/11/11 | 0815 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | D | P031 / P032 | @ ANCHOR TRENCH | D | 11/11/11 | 0820 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | E | P032 / P033 | @ ANCHOR TRENCH | D | 11/11/11 | 0823 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | F | P033 / P034 | @ ANCHOR TRENCH | D | --- | --- | | COVERED BY 13C | | --- | --- | --- | --- |
| 4 | G | P034 / P035 | @ ANCHOR TRENCH | D | 11/11/11 | 0842 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | H | P035 / P036 | @ ANCHOR TRENCH | D | 11/11/11 | 0847 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | I | P036 / P037 | @ ANCHOR TRENCH | D | 11/11/11 | 0852 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | J | P037 | 10' W, 10' N | D | 11/11/11 | 0855 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | K | P037 / P038 | @ ANCHOR TRENCH | D | 11/11/11 | 0857 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | M | P038 / P039 | @ ANCHOR TRENCH | D | 11/11/11 | 0910 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | N | P039 | 15' W, 10' N | D | 11/11/11 | 0915 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | P | P039 | 20' W, 10' N | D | 11/11/11 | 0929 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | Q | P039 | 25' W, 10' N | D | 11/11/11 | 0931 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | R | P039 | 30' W, 10' N | D | 11/11/11 | 0938 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | S | P039 / P040 | @ ANCHOR TRENCH | D | 11/11/11 | 0938 | P | 2 X 4 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 | T | P034 | 5' W, 10' N | D | 11/11/11 | 0837 | G&W | 1 X 1 | AR | 27 | SAB | 11/12/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | WELDER I.D. | | | | |
| | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 4 W | P035 | 4' W, 10' N | D | 11/11/11 | 0853 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 4 X | P035 / P036 | 100' W OF EEOS | DS-09 | --- | --- | | COVERED BY 13A | | --- | --- | --- | --- |
| 5 A | P036 / P037 | 150' W OF EEOS | DS-10 | 11/11/11 | 0815 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 B | P037 / P038 | 200' W OF EEOS | DS-11 | 11/11/11 | 0820 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 C | P038 / P039 | 200' W OF EEOS | DS-12 | 11/11/11 | 0825 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 D | P039 / P040 | 200' W OF EEOS | DS-13 | 11/11/11 | 0935 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 E | P040 / P043 | 10' W OF EEOS | DS-14 | 11/11/11 | 0925 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 F | P040 / P041 | @ ANCHOR TRENCH | D | 11/11/11 | 0941 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 5 G | P041 / P044 | @ ANCHOR TRENCH | D | 11/11/11 | 0945 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 5 H | P041 / P044 | 100' W OF EEOS | DS-15 | 11/11/11 | 0942 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 I | P044 / P045 | 100' W OF EEOS | DS-16 | 11/11/11 | 0950 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 J | P044 / P045 | @ ANCHOR TRENCH | D | 11/11/11 | 0958 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 5 K | P045 / P048 | 20' W OF EEOS | DS-17 | 11/11/11 | 1000 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 M | P048 / P049 | 97' W OF EEOS | DS-18 | 11/11/11 | 1014 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 N | P025 / P026 | @ P028/P029 | T | 11/10/11 | 1119 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 5 P | P032 | 8' S, 25' E | D | 11/11/11 | 1342 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 5 Q | P049 / P051 | 150' W OF EEOS | DS-19 | 11/11/11 | 1009 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 R | P054 / P056 | 46' W OF EEOS | DS-20 | 11/11/11 | 1100 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 S | P056 / P058 | 5' W OF EEOS | DS-21 | 11/11/11 | 1115 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 T | P057 / P059 | 200' W OF EEOS | DS-22 | 11/11/11 | 1328 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 W | P060 / P062 | 75' W OF EEOS | DS-23 | 11/11/11 | 1147 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 5 X | P063 / P064 | 100' W OF EEOS | DS-24 | 11/11/11 | 1335 | P | 2 X 4 | AR | 27 | SAB | 11/12/11 | SAB |
| 6 A | P064 / P065 | 217' W OF EEOS | WS | 11/11/11 | 1324 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 B | P036 / P037 | @ P042 | T | 11/11/11 | 0830 | P | 2 X 3 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 C | P037 / P038 | @ P042 | T | 11/11/11 | 0833 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 D | P040 / P041 | @ P043 | T | 11/11/11 | 0837 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |

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## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 6 | E | P041 / P043 | @ P044 | T | 11/11/11 | 0840 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | F | P044 / P045 | @ P046 | T | 11/11/11 | 0852 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | G | P045 / P046 | @ P048 | T | 11/11/11 | 0918 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | H | P046 | 5' W, 8' N | D | 11/11/11 | 0900 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | I | P046 | 5' W, 12' N | D | 11/11/11 | 0905 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | J | P046 | 10' W, 8' N | D | 11/11/11 | 0910 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | K | P046 | 10' W, 12' N | D | 11/11/11 | 0915 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | M | P044 / P045 | 61' E OF WEOS | D | 11/11/11 | 0938 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | N | P045 / P047 | @ P048 | T | 11/11/11 | 0955 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | P | P047 / P048 | @ P049 | T | 11/11/11 | 1005 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | Q | 5M / P048 | 6' W OF EEOP | DSE-02 | 11/11/11 | 1057 | P | 2 X 4 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | R | P048 / P049 | @ P050 | T | 11/11/11 | 1016 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | S | P049 / P050 | @ P052 | T | 11/11/11 | 1018 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | T | P049 / P051 | @ P052 | T | 11/11/11 | 1028 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | W | P051 / P052 | @ P054 | T | 11/11/11 | 1022 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 6 | X | P054 | 6' W, 6' S | D | 11/11/11 | 1034 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 7 | A | P054 | 7' W, 8' S | D | 11/11/11 | 1038 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 7 | B | P054 | 6' W, 8' E | D | 11/11/11 | 1053 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 7 | C | P054 | 6' W, 8' E | D | 11/11/11 | 1036 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 7 | D | P051 / P053 | @ P054 | T | 11/11/11 | 1040 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 7 | E | P053 / P054 | @ P056 | T | 11/11/11 | 1045 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 7 | F | P045 / P047 | @ ANCHOR TRENCH | D | 11/11/11 | 1003 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | G | P047 / P049 | @ ANCHOR TRENCH | D | 11/11/11 | 1007 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | H | P049 / P051 | @ ANCHOR TRENCH | D | 11/11/11 | 1011 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | I | P051 / P053 | @ ANCHOR TRENCH | D | 11/11/11 | 1025 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | J | P053 / P055 | @ ANCHOR TRENCH | D | 11/11/11 | 1027 | P | 2 X 4 | AR | 27 | SAB | 11/12/11 | SAB |

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| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 7 | K | P055 / P057 | @ ANCHOR TRENCH | D | 11/11/11 | 1037 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | M | P057 / P059 | @ ANCHOR TRENCH | D | 11/11/11 | 1042 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | N | P059 / P061 | @ ANCHOR TRENCH | D | 11/11/11 | 1048 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | P | P061 / P063 | @ ANCHOR TRENCH | D | 11/11/11 | 1100 | P | 2 X 3 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | Q | P063 / P064 | @ ANCHOR TRENCH | D | 11/11/11 | 1300 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | R | P064 | 10' S, 6' W | D | 11/11/11 | 1310 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | S | P064 / P065 | @ ANCHOR TRENCH | D | 11/11/11 | 1315 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | T | P064 | 8' S, 6' W | D | 11/11/11 | 1320 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | W | P064 | 10' W, 8' S | D | 11/11/11 | 1325 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 7 | X | P064 | 15' W, 8' S | D | 11/11/11 | 1328 | P | 2 X 2 | AR | 27 | SAB | 11/12/11 | SAB |
| 8 | A | P056 / P057 | @ P058 | T | 11/11/11 | 1103 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 8 | B | P057 / P058 | @ P060 | T | 11/11/11 | 1123 | P | 2 X 3 | DP | 28 | SAB | 11/12/11 | SAB |
| 8 | C | P057 / P059 | @ P060 | T | 11/11/11 | 1126 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 8 | D | P059 / P060 | @ P062 | T | 11/11/11 | 1140 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 8 | E | P059 / P061 | @ P062 | T | 11/11/11 | 1131 | P | 2 X 3 | DP | 28 | SAB | 11/12/11 | SAB |
| 8 | F | P061 / P062 | @ P063 | T | 11/11/11 | 1149 | P | 2 X 3 | DP | 28 | SAB | 11/12/11 | SAB |
| 8 | G | P064 / P065 | @ P066 | T | 11/11/11 | 1308 | P | 2 X 3 | DP | 28 | SAB | 11/12/11 | SAB |
| 8 | H | P055 / P056 | @ P057 | T | 11/11/11 | 1337 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 8 | I | P053 / P055 | @ P056 | T | 11/11/11 | 1340 | P | 2 X 2 | DP | 28 | SAB | 11/12/11 | SAB |
| 8 | J | P032 / P033 | 21' E OF WEOS | WS | 11/12/11 | 1437 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 8 | K | P031 / P032 | 27' E OF WEOS | WS | 11/12/11 | 1429 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 8 | M | P034 / P072 | 20' E OF WEOS | DS-25 | 11/12/11 | 1510 | P | 2 X 4 | AR | 28 | SAB | 11/12/11 | SAB |
| 8 | N | P033 / P071 | 10' S OF NEOS | PT | 11/12/11 | 1450 | P | 2 X 4 | AR | 28 | SAB | 11/12/11 | SAB |
| 8 | P | P075 / P076 | 10' N OF SEOS | DS-26 | 11/12/11 | 1445 | P | 2 X 4 | PR | 27 | SAB | 11/12/11 | SAB |
| 8 | Q | P071 / P072 | 10' N OF SEOS | DS-27 | 11/12/11 | 1505 | P | 2 X 4 | AR | 28 | SAB | 11/12/11 | SAB |
| 8 | R | P074 / P075 | 25' N OF SEOS | DS-28 | 11/12/11 | 1443 | P | 2 X 4 | PR | 27 | SAB | 11/12/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
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| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 8 | S | P095 / P096 | 7' E OF WEOS | DS-29 | 11/16/11 | 1014 | P | 2 X 8 | AR | 27 | SAB | 11/16/11 | SAB |
| 8 | T | P094 / P095 | 50' E OF WEOS | DS-30 | 11/16/11 | 1055 | P | 2 X 4 | AR | 27 | SAB | 11/16/11 | SAB |
| 8 | W | P089 / P090 | 10' E OF WEOS | DS-31 | 11/15/11 | 1159 | P | 2 X 4 | RS | 28 | SAB | 11/16/11 | SAB |
| 8 | X | P092 / P093 | 100' E OF WEOS | DS-32 | 11/12/11 | 1626 | P | 2 X 4 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | A | P094 / | @ EEOP | EXT | 11/12/11 | 1440 | P | 8 X 8 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | B | P103 / P104 | 10' E OF WEOS | DS-33 | 11/16/11 | 0853 | P | 2 X 4 | DP | 28 | SAB | 11/16/11 | SAB |
| 9 | C | P001 / P068 | 10' E OF WEOS | D | 11/12/11 | 1341 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | D | P068 / P069 | 10' E OF WEOS | D | 11/12/11 | 1353 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | E | P069 / P070 | 10' E OF WEOS | D | 11/12/11 | 1400 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | F | P070 / P071 | 10' E OF WEOS | D | 11/12/11 | 1405 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | G | P071 / P073 | @ P074 | T | 11/12/11 | 1410 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | H | P075 | 4' W, 12' N | D | 11/12/11 | 1415 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | I | P075 | 4' W, 16' N | D | 11/12/11 | 1423 | P | 1 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | J | P075 | 4' W, 18' N | D | 11/12/11 | 1430 | P | 1 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | K | P075 / P076 | 10' N OF SEOS | D | 11/12/11 | 1440 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | M | P076 / P077 | 10' N OF SEOS | D | 11/12/11 | 1450 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | N | P077 / P078 | 10' N OF SEOS | D | 11/12/11 | 1456 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | P | P078 / P079 | 10' N OF SEOS | D | 11/12/11 | 1459 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | Q | P079 / P080 | 10' N OF SEOS | D | 11/12/11 | 1502 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | R | P080 / P081 | 10' N OF SEOS | D | 11/12/11 | 1506 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | S | P081 / P082 | 10' N OF SEOS | D | 11/12/11 | 1509 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | T | P082 | 8' N, 12' E | D | 11/12/11 | 1513 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 9 | W | P082 / P085 | 12' N OF SEOS | D | --- | --- | | COVERED BY 14A | | --- | --- | --- | --- |
| 9 | X | P085 / P087 | @ ANCHOR TRENCH | D | 11/12/11 | 1525 | P | 2 X 5 | PR | 27 | SAB | 11/12/11 | SAB |
| 10 | A | P086 / P087 | ENTIRE SEAM | PT | 11/12/11 | 1320 | P | 2 X 4 | AR | 28 | SAB | 11/12/11 | SAB |
| 10 | B | P082 / P085 | @ P086 | T | --- | --- | | COVERED BY 14A | | --- | --- | --- | --- |

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## Luminant Power
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## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 10 | C | P081 / P082 | @ P086 | T | 11/12/11 | 1629 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 10 | D | P080 / P081 | @ P086 | T | 11/12/11 | 1625 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 10 | E | P086 / P088 | @ P089 | T | 11/12/11 | 1623 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 10 | F | P086 / P089 | @ P090 | T | 11/12/11 | 1635 | P | 2 X 3 | PR | 27 | SAB | 11/12/11 | SAB |
| 10 | G | P096 / P097 | @ P099 | T | 11/12/11 | 1628 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 10 | H | P044 / P096 | @ P099 | T | 11/12/11 | 1632 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 10 | I | P044 / P046 | @ P099 | T | 11/12/11 | 1636 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 10 | J | P046 / P098 | @ P099 | T | 11/12/11 | 1639 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 10 | K | P097 / P098 | @ P099 | T | 11/12/11 | 1642 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 10 | M | P046 / P048 | @ P098 | T | 11/12/11 | 1648 | P | 2 X 2 | PR | 27 | SAB | 11/12/11 | SAB |
| 10 | N | P001 / P067 | @ P068 | T | 11/12/11 | 1330 | P | 2 X 10 | AR | 28 | SAB | 11/12/11 | SAB |
| 10 | P | P028 / P030 | @ P067 | T | 11/12/11 | 1340 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 10 | Q | P030 / P031 | @ P067 | T | 11/12/11 | 1400 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 10 | R | P067 / P068 | @ P069 | T | 11/12/11 | 1420 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 10 | S | P031 / P067 | @ P069 | T | 11/12/11 | 1424 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 10 | T | P031 / P069 | @ P070 | T | 11/12/11 | 1426 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 10 | W | P032 / P070 | @ P071 | T | 11/12/11 | 1433 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 10 | X | P031 / P032 | @ P070 | T | 11/12/11 | 1430 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | A | P032 / P033 | @ P071 | T | 11/12/11 | 1435 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | B | P033 / P034 | @ P071 | T | 11/12/11 | 1455 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | C | P071 / P072 | @ P034 | T | 11/12/11 | 1500 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | D | P071 / P072 | @ P073 | T | 11/12/11 | 1508 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | E | P034 / P035 | @ P072 | T | 11/12/11 | 1512 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | F | P035 / P072 | @ P073 | T | 11/12/11 | 1514 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | G | P035 / P073 | @ P084 | T | 11/12/11 | 1515 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | H | P035 / P036 | @ P084 | T | 11/12/11 | 1517 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 11 | I | P073 / P074 | @ P084 | T | 11/12/11 | 1518 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | J | P036 / P074 | @ P084 | T | 11/12/11 | 1519 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | K | P036 / P074 | @ P075 | T | 11/12/11 | 1520 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | M | P036 / P075 | @ P076 | T | 11/12/11 | 1521 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | N | P036 / P076 | @ WEOP | T | 11/12/11 | 1522 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | P | P076 / P077 | @ P083 | T | 11/12/11 | 1523 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | Q | P036 / P042 | @ P076 | T | 11/12/11 | 1530 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | R | P042 / P076 | @ P083 | T | 11/12/11 | 1531 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | S | P042 / P078 | @ P083 | T | 11/12/11 | 1532 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | T | P077 / P078 | @ P083 | T | 11/12/11 | 1535 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | W | P042 / P091 | ENTIRE SEAM | IO | 11/12/11 | 1600 | P | 3 X 12 | AR | 28 | SAB | 11/12/11 | SAB |
| 11 | X | P078 / P090 | @ P091 | T | 11/12/11 | 1605 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | A | P078 / P089 | @ P090 | T | 11/12/11 | 1610 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | B | P078 / P086 | @ P089 | T | 11/12/11 | 1612 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | C | P078 / P079 | @ P086 | T | 11/12/11 | 1615 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | D | P079 / P080 | @ P086 | T | 11/12/11 | 1620 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | E | P038 / P042 | @ P092 | T | 11/12/11 | 1630 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | F | P038 / P092 | @ P093 | T | 11/12/11 | 1632 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | G | P038 / P039 | @ P093 | T | 11/12/11 | 1634 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | H | P039 / P093 | @ EXTENSION (9A) | T | 11/12/11 | 1635 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | I | P093 / P094 | @ EXTENSION (9A) | T | 11/12/11 | 1636 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | J | P040 / P094 | @ EXTENSION (9A) | T | 11/12/11 | 1638 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | K | P039 / P040 | @ EXTENSION (9A) | T | 11/12/11 | 1637 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | M | P040 / P094 | @ P095 | T | 11/12/11 | 1640 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | N | P040 / P043 | @ P095 | T | 11/12/11 | 1641 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | P | P043 / P095 | @ P096 | T | 11/12/11 | 1645 | P | 2 X 2 | AR | 28 | SAB | 11/12/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
## Luminant Power
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## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 12 | Q | P043 / P044 | @ P096 | T | 11/12/11 | 1646 | P | 2 X 3 | AR | 28 | SAB | 11/12/11 | SAB |
| 12 | R | P065 / P066 | @ P117 | T | 11/16/11 | 1622 | P | 2 X 2 | AR | 27 | SAB | 11/16/11 | SAB |
| 12 | S | P118 | @ EEOP | EXT | --- | --- | SEE FUSION SEAMING 11/14/2011 | | --- | --- | --- | --- | --- |
| 12 | T | P048 / P049 | 10' W OF 5M | FS | 11/16/11 | 1605 | P | 2 X 6 | AR | 27 | SAB | 11/16/11 | SAB |
| 12 | W | P049 / P051 | 10' E OF WEOS | FS | 11/16/11 | 1625 | P | 2 X 2 | AR | 27 | SAB | 11/16/11 | SAB |
| 12 | X | P035 / P036 | 110' E OF WEOS | DS-09N1 | 11/16/11 | 1625 | P | 2 X 2 | AR | 27 | SAB | 11/16/11 | SAB |
| 13 | A | P035 / P036 | 90' W OF EEOS | DS-09P1 | 11/16/11 | 1459 | P | 2 X 20 | AR | 27 | SAB | 11/17/11 | SAB |
| 13 | B | P033 / P034 | 30' W OF EEOS | DS-06N1 | --- | --- | | CAPPED BY 16A | | --- | --- | --- | --- |
| 13 | C | P033 / P034 | 10' W OF EEOS | DS-06P1 | --- | --- | | CAPPED BY 16A | | --- | --- | --- | --- |
| 13 | D | P107 / P110 | 50' E OF WEOS | DS-34 | 11/17/11 | 1118 | P | 2 X 4 | AR | 27 | SAB | 11/17/11 | SAB |
| 13 | E | P118 / P121 | 200' E OF WEOS | DS-35 | 11/16/11 | 1418 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 13 | F | P120 / P123 | 100' E OF WEOS | DS-36 | 11/16/11 | 1611 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 13 | G | P121 / P122 | 20' E OF WEOS | DS-37 | 11/16/11 | 1018 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 13 | H | P123 / P124 | 100' E OF WEOS | DS-38 | 11/16/11 | 1605 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 13 | I | P116 / P117 | 10' E OF WEOS | DS-39 | 11/16/11 | 0947 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 13 | J | P115 / P116 | 40' E OF WEOS | DS-40 | 11/16/11 | 1019 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 13 | K | P119 / P120 | 8' E OF WEOS | DS-41 | 11/16/11 | 1600 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 13 | M | P054 / 5R | 2' E OF WEO PATCH (5R) | DSE-02N1 | 11/16/11 | 1610 | P | 2 X 5 | AR | 27 | SAB | 11/17/11 | SAB |
| 13 | N | P048 / 5K | 2' E OF WEO PATCH (5K) | DSE-02P1 | 11/16/11 | 1602 | P | 2 X 4 | AR | 27 | SAB | 11/17/11 | SAB |
| 13 | P | P128 / P128 | @ EEOP | EXT | --- | --- | SEE FUSION SEAMING 11/14/2011 | | --- | --- | --- | --- | --- |
| 13 | Q | P129 / P130 | 10' S OF NEOS | DS-42 | 11/16/11 | 1059 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 13 | R | P145 / P146 | 50' E OF WEOS | DS-43 | 11/16/11 | 1502 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 13 | S | P122 / P144 | 10' E OF WEOS | DS-44 | 11/16/11 | 1433 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 13 | T | P128 / P129 | 67' E OF WEOS | DS-45 | 11/19/11 | 1420 | P | 2 X 4 | DP | 28 | SAB | 11/19/11 | SAB |
| 13 | W | P018 | 5' W, 10' N | D | 11/15/11 | 1137 | P | 2 X 2 | RS | 28 | SAB | 11/16/11 | SAB |
| 13 | X | P018 | 10' W, 10' N | D | 11/15/11 | 1142 | P | 2 X 2 | RS | 28 | SAB | 11/16/11 | SAB |

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## FGD-B Pond Construction
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| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | WELDER I.D. TECH. | WELDER I.D. MACH. | WELDER I.D. QA MON. | DATE | QA MON. |
| 14 | A | P082 / P085 | 9' N TO NEOS | FS | 11/16/11 | 0900 | P | 2 X 35 | AR | 27 | SAB | 11/17/11 | SAB |
| 14 | B | P086 / P088 | @ ANCHOR TRENCH | D | 11/16/11 | 0906 | P | 2 X 3 | AR | 27 | SAB | 11/17/11 | SAB |
| 14 | C | P088 / P090 | @ ANCHOR TRENCH | D | 11/16/11 | 0925 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 14 | D | P090 / P091 | @ ANCHOR TRENCH | D | 11/16/11 | 0935 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 14 | E | P091 / P092 | @ ANCHOR TRENCH | D | 11/16/11 | 0940 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 14 | F | P092 / P093 | @ ANCHOR TRENCH | D | 11/16/11 | 0950 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 14 | G | P093 / P094 | @ ANCHOR TRENCH | D | 11/16/11 | 0955 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 14 | H | P094 / P095 | @ ANCHOR TRENCH | D | 11/16/11 | 1002 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 14 | I | P100 / P101 | @ ANCHOR TRENCH | D | 11/16/11 | 0835 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | J | P101 / P103 | @ ANCHOR TRENCH | D | 11/16/11 | 0847 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | K | P103 / P104 | @ ANCHOR TRENCH | D | 11/16/11 | 0850 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | M | P104 / P106 | @ ANCHOR TRENCH | D | 11/16/11 | 0859 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | N | P106 / P107 | @ ANCHOR TRENCH | D | 11/16/11 | 0908 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | P | P107 / P110 | @ ANCHOR TRENCH | D | 11/16/11 | 0912 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | Q | P110 / P111 | @ ANCHOR TRENCH | D | 11/16/11 | 0920 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | R | P111 / P114 | @ ANCHOR TRENCH | D | 11/16/11 | 0923 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | S | P114 / P115 | @ ANCHOR TRENCH | D | 11/16/11 | 0938 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | T | P115 / P116 | @ ANCHOR TRENCH | D | 11/16/11 | 0940 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | W | P116 / P117 | @ ANCHOR TRENCH | D | 11/16/11 | 0945 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 14 | X | P117 / P118 | @ ANCHOR TRENCH | D | --- | --- | | CAPPED BY 20C | | --- | --- | --- | --- |
| 15 | A | P118 / P121 | @ ANCHOR TRENCH | D | --- | --- | | CAPPED BY 20B | | --- | --- | --- | --- |
| 15 | B | P121 / P122 | @ ANCHOR TRENCH | D | --- | --- | | CAPPED BY 20A | | --- | --- | --- | --- |
| 15 | C | P121 / 13G | 2' E OF WEO PATCH (13G) | DSE-03 | 11/16/11 | 1635 | P | 2 X 4 | AR | 27 | SAB | 11/17/11 | SAB |
| 15 | D | P096 / 8S | 5' E OF WEO PATCH (8S) | DSE-04 | 11/16/11 | 1642 | P | 2 X 4 | AR | 27 | SAB | 11/17/11 | SAB |
| 15 | E | P093 / P094 | 50' E OF WEOS | D | 11/16/11 | 1105 | P | 2 X 4 | AR | 27 | SAB | 11/17/11 | SAB |
| 15 | F | P048 / P098 | @ P100 | T | 11/16/11 | 1120 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
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| DEFECT CODE | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | WELDER I.D. | | | | |
| | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 15 G | P048 / P050 | @ P100 | T | 11/16/11 | 1122 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 15 H | P050 / P100 | @ P102 | T | 11/16/11 | 1146 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 15 I | P050 / P052 | @ P102 | T | 11/16/11 | 1149 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 15 J | P122 / P126 | 51' E OF WEOS | T | 11/16/11 | 1028 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 15 K | P122 / P126 | @ ANCHOR TRENCH | D | 11/16/11 | 1031 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 15 M | P126 / P127 | @ ANCHOR TRENCH | D | 11/16/11 | 1037 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 15 N | P127 / P128 | @ ANCHOR TRENCH | D | 11/16/11 | 1039 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 15 P | P128 / P129 | @ ANCHOR TRENCH | D | 11/16/11 | 1050 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 15 Q | P130 / P131 | @ ANCHOR TRENCH | D | 11/16/11 | 1101 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 15 R | P131 / P132 | @ ANCHOR TRENCH | D | 11/16/11 | 1105 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 15 S | P132 / P133 | @ ANCHOR TRENCH | D | 11/16/11 | 1109 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 15 T | P133 / P134 | @ ANCHOR TRENCH | D | 11/16/11 | 1117 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 15 W | P134 / P136 | @ P137 | T | 11/16/11 | 1121 | P | 5 X 5 | DP | 28 | SAB | 11/17/11 | SAB |
| 15 X | P137 / P138 | @ ANCHOR TRENCH | D | 11/16/11 | 1134 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 A | P033 / P034 | 40' W OF EEOS | DS-06N2 | 11/16/11 | 1540 | P | 2 X 30 | AR | 27 | SAB | 11/17/11 | SAB |
| 16 B | P052 / P102 | @ P103 | T | 11/16/11 | 1308 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 16 C | P104 / P105 | @ P106 | T | 11/16/11 | 1350 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 16 D | P104 / P105 | @ P103 | T | 11/16/11 | 1357 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 16 E | P138 / P139 | @ ANCHOR TRENCH | D | 11/16/11 | 1134 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 F | P139 / P140 | @ ANCHOR TRENCH | D | 11/16/11 | 1140 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 G | P140 / P141 | @ ANCHOR TRENCH | D | 11/16/11 | 1258 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 H | P141 / P142 | @ ANCHOR TRENCH | D | 11/16/11 | 1304 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 I | P140 / P141 | @ P142 | T | 11/16/11 | 1302 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 J | P142 / P143 | @ ANCHOR TRENCH | D | 11/16/11 | 1318 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 K | P143 / P152 | @ ANCHOR TRENCH | D | 11/16/11 | 1321 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 M | P152 / P157 | @ ANCHOR TRENCH | D | 11/16/11 | 1342 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |

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| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 16 | N | P157 / P158 | @ ANCHOR TRENCH | D | 11/16/11 | 1351 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 | P | P122 / P126 | @ P144 | T | 11/16/11 | 1429 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 | Q | P122 / P144 | @ P145 | T | 11/16/11 | 1446 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 | R | P122 / P125 | @ P145 | T | 11/16/11 | 1451 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 | S | P121 / P122 | @ P125 | T | 11/16/11 | 1457 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 | T | P124 / P125 | @ P145 | T | 11/16/11 | 1513 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 | W | P121 / P124 | @ P125 | T | 11/16/11 | 1518 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 16 | X | P118 / P120 | @ P121 | T | 11/16/11 | 1521 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | A | P117 / P118 | @ P120 | T | 11/16/11 | 1541 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | B | P121 / P123 | @ P124 | T | 11/16/11 | 1546 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | C | P120 / P121 | @ P123 | T | 11/16/11 | 1550 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | D | P117 / P119 | @ P120 | T | 11/16/11 | 1551 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | E | P065 / P117 | @ P119 | T | 11/16/11 | 1559 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | F | P123 / P124 | @ ANCHOR TRENCH | D | 11/16/11 | 1614 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | G | P120 / P123 | @ ANCHOR TRENCH | D | 11/16/11 | 1620 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | H | P119 / P120 | @ ANCHOR TRENCH | D | 11/16/11 | 1625 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | I | P065 / P119 | @ ANCHOR TRENCH | D | 11/16/11 | 1630 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | J | P066 / P116 | @ P117 | T | 11/17/11 | 0753 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | K | P066 / P113 | @ P116 | T | 11/17/11 | 0759 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | M | P066 / P113 | 5' S OF NEOS | D | 11/17/11 | 0810 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | N | P064 / P066 | @ P113 | T | 11/17/11 | 0815 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | P | P064 / P112 | @ P113 | T | 11/17/11 | 0844 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | Q | P063 / P064 | @ P112 | T | 11/17/11 | 0853 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | R | P063 / P111 | @ P112 | T | 11/17/11 | 0849 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | S | P056 / P058 | @ P106 | T | 11/17/11 | 0941 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 | T | P058 / P106 | @ P107 | T | 11/17/11 | 0938 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | WELDER I.D. | | | | |
| | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 17 W | P058 / P060 | @ P107 | T | 11/17/11 | 0933 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 17 X | P060 / P107 | @ P108 | T | 11/17/11 | 0908 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 18 A | P052 / P054 | @ P103 | T | 11/17/11 | 1650 | P | 2 X 3 | AR | 27 | SAB | 11/17/11 | SAB |
| 18 B | P054 / P103 | @ P105 | T | 11/17/11 | 0810 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 18 C | P054 / P056 | @ P104 | T | 11/17/11 | 0825 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 18 D | P056 / P105 | @ P106 | T | 11/17/11 | 0832 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 18 E | P101 / P102 | @ P103 | T | 11/17/11 | 0847 | P | 2 X 3 | AR | 27 | SAB | 11/17/11 | SAB |
| 18 F | P100 / P101 | @ P102 | T | 11/17/11 | 0900 | P | 2 X 3 | AR | 27 | SAB | 11/17/11 | SAB |
| 18 G | P060 / P062 | @ P108 | T | 11/17/11 | 0942 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 18 H | P062 / P108 | @ P111 | T | 11/17/11 | 0943 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 18 I | P062 / P063 | @ P111 | T | 11/17/11 | 0944 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 18 J | P107 / P108 | @ P109 | T | 11/17/11 | 0945 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 18 K | P108 / P109 | @ P111 | T | 11/17/11 | 0950 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 18 M | P107 / P109 | @ P110 | T | 11/17/11 | 0944 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 18 N | P109 / P110 | @ P111 | T | 11/17/11 | 0943 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 18 P | P111 / P112 | @ P114 | T | 11/17/11 | 1015 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 18 Q | P112 / P114 | @ P115 | T | 11/17/11 | 1017 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 18 R | P112 / P113 | @ P115 | T | 11/17/11 | 1007 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 18 S | P113 / P115 | @ P116 | T | 11/17/11 | 1010 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 18 T | P128 / P129 | @ P130/P131/P132 | T | 11/17/11 | 1017 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 18 W | P128 / P132 | @ P133 | T | 11/17/11 | 1022 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 18 X | P128 / P133 | @ PATCH (13P) | T | 11/17/11 | 1030 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 19 A | P122 / 15K | 1' E OF WEO PATCH (15K) | DSE-03N1 | 11/18/11 | 0915 | P | 2 X 5 | DP | 28 | SAB | 11/18/11 | SAB |
| 19 B | P117 / 13I | 2' W OF EEO PATCH (13I) | DSE-03P1 | 11/18/11 | 0920 | P | 2 X 5 | DP | 28 | SAB | 11/18/11 | SAB |
| 19 C | P127 / P133 | @ PATCH (13P) | T | 11/17/11 | 1127 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |
| 19 D | P127 / P128 | @ PATCH (13P) | T | 11/17/11 | 1040 | P | 2 X 3 | DP | 28 | SAB | 11/17/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | WELDER I.D. TECH. | WELDER I.D. MACH. | WELDER I.D. QA MON. | DATE | QA MON. |
| 19 | E | P133 / P134 | @ P127 | T | 11/17/11 | 1140 | P | 2 X 4 | DP | 28 | SAB | 11/17/11 | SAB |
| 19 | F | P144 / P145 | @ P146 | T | 11/17/11 | 1050 | P | 2 X 2 | AR | 27 | SAB | 11/17/11 | SAB |
| 19 | G | P126 / P127 | @ P144/P146 | T | 11/17/11 | 1114 | P | 2 X 3 | AR | 27 | SAB | 11/17/11 | SAB |
| 19 | H | P127 / P146 | @ P148 | T | 11/17/11 | 1115 | P | 2 X 3 | AR | 27 | SAB | 11/17/11 | SAB |
| 19 | I | P127 / P135 | @ P148 | T | 11/17/11 | 1142 | P | 2 X 2 | DP | 28 | SAB | 11/17/11 | SAB |
| 19 | J | P137 / P151 | @ WEOP | EXT | --- | --- | SEE FUSION SEAMING 11/14/2011 | | --- | --- | --- | --- | --- |
| 19 | K | P143 / P152 | 6' S OF NEOS | DS-46 | 11/19/11 | 1425 | P | 2 X 4 | DP | 28 | SAB | 11/19/11 | SAB |
| 19 | M | P149 / P153 | 10' E OF WEOS | DS-47 | 11/19/11 | 1440 | P | 2 X 4 | DP | 28 | SAB | 11/19/11 | SAB |
| 19 | N | P143 / P156 | 3' W OF EEOS | DS-48 | 11/19/11 | 1452 | P | 2 X 4 | DP | 28 | SAB | 11/19/11 | SAB |
| 19 | P | P127 / P134 | @ P135 | T | 11/18/11 | 0750 | P | 2 X 2 | DP | 28 | SAB | 11/18/11 | SAB |
| 19 | Q | P135 / P148 | @ P149 | T | 11/18/11 | 0753 | P | 2 X 2 | DP | 28 | SAB | 11/18/11 | SAB |
| 19 | R | P135 / P136 | @ P137 | T | 11/18/11 | 0830 | P | 2 X 2 | DP | 28 | SAB | 11/18/11 | SAB |
| 19 | S | P134 / P135 | @ P136 | T | 11/18/11 | 0840 | P | 2 X 2 | DP | 28 | SAB | 11/18/11 | SAB |
| 19 | T | P151 / P153 | @ PATCH (19J) | T | 11/18/11 | 0845 | P | 2 X 2 | DP | 28 | SAB | 11/18/11 | SAB |
| 19 | W | P137 / P138 | @ PATCH (19J) | T | 11/18/11 | 0910 | P | 2 X 2 | DP | 28 | SAB | 11/18/11 | SAB |
| 19 | X | P135 / P149 | @ P153 | T | 11/18/11 | 0912 | P | 2 X 2 | DP | 28 | SAB | 11/18/11 | SAB |
| 20 | A | P121 / P122 | ENTIRE PATCH (15C) | FS | 11/18/11 | 0925 | P | 3 X 3 | DP | 28 | SAB | 11/18/11 | SAB |
| 20 | B | P118 / P121 | ENTIRE PATCH (15A) | FS | 11/18/11 | 0940 | P | 3 X 3 | DP | 28 | SAB | 11/18/11 | SAB |
| 20 | C | P117 / P118 | ENTIRE PATCH (14X) | FS | 11/18/11 | 0942 | P | 3 X 3 | DP | 28 | SAB | 11/18/11 | SAB |
| 20 | D | P160 / P162 | 10' S OF NEOS | DS-49 | 11/19/11 | 1515 | P | 2 X 4 | AR | 27 | SAB | 11/19/11 | SAB |
| 20 | E | P138 / P151 | @ P154 | T | 11/18/11 | 1018 | P | 2 X 3 | DP | 28 | SAB | 11/18/11 | SAB |
| 20 | F | P148 / P149 | @ P150 | T | 11/18/11 | 1021 | P | 2 X 2 | DP | 28 | SAB | 11/18/11 | SAB |
| 20 | G | P149 / P150 | @ P153 | T | 11/18/11 | 1032 | P | 2 X 2 | DP | 28 | SAB | 11/18/11 | SAB |
| 20 | H | P145 / P146 | @ P147 | T | 11/18/11 | 1083 | P | 2 X 2 | DP | 28 | SAB | 11/18/11 | SAB |
| 20 | I | P146 / P147 | @ P148 | T | 11/18/11 | 0950 | P | 3 X 3 | DP | 28 | SAB | 11/18/11 | SAB |
| 20 | J | P162 / P163 | 3' S OF NEOS | DS-50 | --- | --- | CAPPED BY 21K | | | --- | --- | --- | --- |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | WELDER I.D. | | | | |
| | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 20 K | P124 / P168 | 36' E OF WEOS | DS-51 | 11/19/11 | 1621 | P | 2 X 4 | AR | 27 | SAB | 11/19/11 | SAB |
| 20 M | P172 / P173 | 10' E OF WEOS | DS-52 | 11/19/11 | 1445 | P | 2 X 4 | AR | 27 | SAB | 11/19/11 | SAB |
| 20 N | P173 / P174 | 10' E OF WEOS | DS-53 | 11/19/11 | 1450 | P | 2 X 4 | AR | 27 | SAB | 11/19/11 | SAB |
| 20 P | P148 / P171 | 10' N OF SEOS | DS-54 | 11/19/11 | 1545 | P | 2 X 4 | DP | 28 | SAB | 11/19/11 | SAB |
| 20 Q | 23H / | 2' W OF EEO PATCH (23H) | DSE-05 | 11/19/11 | 1458 | P | 2 X 4 | DP | 28 | SAB | 11/19/11 | SAB |
| 20 R | 23J / | 2' N OF SEO PATCH (23J) | DSE-06 | 11/19/11 | 1503 | P | 2 X 4 | DP | 28 | SAB | 11/19/11 | SAB |
| 20 S | P150 / P152 | @ P153 | T | 11/18/11 | 0820 | P | 3 X 3 | AR | 27 | SAB | 11/18/11 | SAB |
| 20 T | P151 / P152 | @ P153 | T | 11/18/11 | 0823 | P | 3 X 3 | AR | 27 | SAB | 11/18/11 | SAB |
| 20 W | P151 / P152 | @ P154 | T | 11/18/11 | 0830 | P | 2 X 2 | AR | 27 | SAB | 11/18/11 | SAB |
| 20 X | P152 / P154 | @ P155 | T | 11/18/11 | 0838 | P | 2 X 2 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 A | P152 / P155 | @ P156 | T | 11/18/11 | 0845 | P | 2 X 3 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 B | P143 / P152 | @ P156 | T | 11/18/11 | 0902 | P | 3 X 3 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 C | P142 / P143 | @ P155/P156 | T | 11/18/11 | 0930 | P | 3 X 3 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 D | P139 / P140 | @ P155 | T | 11/18/11 | 0945 | P | 2 X 2 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 E | P139 / P154 | @ P155 | T | 11/18/11 | 0950 | P | 2 X 2 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 F | P138 / P139 | @ P154 | T | 11/18/11 | 1000 | P | 2 X 4 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 G | P150 / P152 | @ P157 | T | 11/18/11 | 1018 | P | 2 X 2 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 H | P150 / P157 | @ P159 | T | 11/18/11 | 1020 | P | 2 X 2 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 I | P148 / P150 | 162' W OF EEOS | D | 11/18/11 | 1030 | P | 2 X 2 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 J | P157 / P158 | @ P159 | T | 11/18/11 | 1035 | P | 2 X 2 | AR | 27 | SAB | 11/18/11 | SAB |
| 21 K | P162 / P163 | 20' S OF PATCH (20J) | DS-50N1 | 11/19/11 | 1710 | P | 2 X 20 | AR | 27 | SAB | 11/19/11 | SAB |
| 21 M | P157 / P159 | 10' N OF SEOS | DS-50P1 | 11/29/11 | 1425 | P | 2 X 10 | RS | 28 | SAB | 11/29/11 | SAB |
| 21 N | P124 / P168 | @ ANCHOR TRENCH | D | 11/19/11 | 1615 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 21 P | P168 / P169 | @ ANCHOR TRENCH | D | 11/19/11 | 1620 | P | 2 X 3 | DP | 28 | SAB | 11/19/11 | SAB |
| 21 Q | P169 / P170 | @ ANCHOR TRENCH | D | 11/19/11 | 1626 | P | 2 X 3 | DP | 28 | SAB | 11/19/11 | SAB |
| 21 R | P170 / P172 | @ ANCHOR TRENCH | D | 11/19/11 | 1630 | P | 2 X 3 | DP | 28 | SAB | 11/19/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
## Luminant Power
## Oak Grove SES Power Station
## FGD-B Pond Construction
## Robertson County, Texas

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 21 | S | P172 / P173 | @ ANCHOR TRENCH | D | 11/19/11 | 1635 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 21 | T | P173 / P174 | @ ANCHOR TRENCH | D | 11/19/11 | 1640 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 21 | W | P174 / P175 | @ ANCHOR TRENCH | D | 11/19/11 | 1648 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 21 | X | P175 / P176 | @ ANCHOR TRENCH | D | 11/19/11 | 1655 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 22 | A | P176 / P177 | @ ANCHOR TRENCH | D | 11/19/11 | 1650 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 22 | B | P177 / P178 | @ ANCHOR TRENCH | D | 11/19/11 | 1600 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | C | P178 / P179 | @ ANCHOR TRENCH | D | 11/19/11 | 1610 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | D | P179 / P180 | @ ANCHOR TRENCH | D | 11/19/11 | 1615 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | E | P180 / P181 | @ ANCHOR TRENCH | D | 11/19/11 | 1619 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | F | P181 / P182 | @ ANCHOR TRENCH | D | 11/19/11 | 1620 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | G | P182 / P183 | @ ANCHOR TRENCH | D | 11/19/11 | 1536 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | H | P180 / P182 | @ ANCHOR TRENCH | D | 11/19/11 | 1533 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | I | P179 / P180 | @ ANCHOR TRENCH | T | 11/19/11 | 1530 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | J | P177 / P178 | @ P179 | T | 11/19/11 | 1545 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | K | P167 / P176 | @ P177/P179 | T | 11/19/11 | 1527 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | M | P167 / P175 | @ P176 | T | 11/19/11 | 1520 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | N | P167 / P174 | @ P175 | T | 11/19/11 | 1510 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | P | P166 / P167 | @ P174 | T | 11/19/11 | 1507 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | Q | P166 / P173 | @ P174 | T | 11/19/11 | 1500 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | R | P166 / P172 | @ P173 | T | 11/19/11 | 1440 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 22 | S | P170 / P171 | @ P172 | T | 11/19/11 | 1610 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 22 | T | P169 / P170 | @ P171 | T | 11/19/11 | 1605 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 22 | W | P124 / P145 | @ P168 | T | 11/19/11 | 1601 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 22 | X | P145 / P147 | @ P168/P169 | T | 11/19/11 | 1555 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 23 | A | P147 / P148 | @ P169/P171 | T | 11/19/11 | 1553 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 23 | B | P170 | 1' S, 10' W | D | 11/19/11 | 1550 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |

# PRIMARY GEOMEMBRANE REPAIR SUMMARY
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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | WELDER I.D. | | | | |
| | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 23 C | P148 / P150 | @ P171/P172 | T | 11/19/11 | 1540 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 23 D | P150 / P165 | @ P172 | T | 11/19/11 | 1426 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 E | P165 / P166 | @ P172 | T | 11/19/11 | 1430 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 F | P150 / P163 | @ P165 | T | 11/19/11 | 1420 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 G | P150 / P162 | @ P163 | T | 11/19/11 | 1415 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 H | P150 / P160 | @ P162 | T | 11/19/11 | 1000 | P | 2 X 4 | DP | 28 | SAB | 11/19/11 | SAB |
| 23 I | P150 / P159 | @ P160 | T | 11/19/11 | 1752 | P | 2 X 2 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 J | P158 / P159 | @ P160 | T | 11/19/11 | 1010 | P | 2 X 4 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 K | P163 / P164 | @ P165 | T | 11/19/11 | 1525 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 23 M | P164 / P165 | @ P166 | T | 11/19/11 | 1538 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 23 N | P160 / P161 | @ P162 | T | 11/19/11 | 1510 | P | 2 X 2 | DP | 28 | SAB | 11/19/11 | SAB |
| 23 P | P158 / P160 | @ ANCHOR TRENCH | D | 11/19/11 | 1659 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 Q | P160 / P161 | @ ANCHOR TRENCH | D | 11/19/11 | 1655 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 R | P161 / P163 | @ ANCHOR TRENCH | D | 11/19/11 | 1650 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 S | P163 / P164 | @ ANCHOR TRENCH | D | 11/19/11 | 1645 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 T | P164 / P166 | @ ANCHOR TRENCH | D | 11/19/11 | 1640 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |
| 23 W | P166 / P167 | @ ANCHOR TRENCH | D | 11/19/11 | 1625 | P | 2 X 3 | AR | 27 | SAB | 11/19/11 | SAB |

# APPENDIX N
# PHOTOGRAPH LOG

| Project Title: Oak Grove SES / FGD Pond / Robertson County, Texas | |
|---|---|
| **PHOTO 1**<br>Structural fill placement north west corner | |
| **PHOTO 2**<br>Overflow pipe Pond A to Pond B anti seep collar | |

**Project Title: Oak Grove SES / FGD Pond / Robertson County, Texas**

| | |
|---|---|
| **PHOTO 3**<br>Backfill overflow pipe | |
| **PHOTO 4**<br>Gate valve FGD A/B pond road | |

| Project Title: Oak Grove SES / FGD Pond / Robertson County, Texas | |
|---|---|
| **PHOTO 5**<br>Outlet pad FGD A pond | |
| **PHOTO 6**<br>Clay placement SE looking SW | |

| Project Title: Oak Grove SES / FGD Pond / Robertson County, Texas | |
|---|---|
| **PHOTO 7**<br>Berm crest clay placement | |
| **PHOTO 8**<br>Clay process | |

**Project Title: Oak Grove SES / FGD Pond / Robertson County, Texas**

**PHOTO 9**

HDPE extrusion repair intersection VTOK, fusion seam air test OK

**PHOTO 10**

Protective cover placement, HDPE placement SE looking NW

| Project Title: Oak Grove SES / FGD Pond / Robertson County, Texas | |
|---|---|
| **PHOTO 11**<br>Protective cover placement | |

REPORT

# LINER EVALUATION REPORT

## Oak Grove SES
## FGD-C Pond
## Robertson County, Texas

**Submitted To:** Luminant Power
1601 Bryan Street
Dallas, TX 75201

**Submitted By:** Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

**Distribution:** 4 Hard Copies - Luminant Power
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**October 2016** **1525714**

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# 1.0 INTRODUCTION

## 1.1 Purpose and Scope

The Oak Grove SES Power Station is located in Robertson County, Texas. The FGD-C Pond is the subject of this Liner Evaluation Report (LER). The location of the Oak Grove SES Power Station is presented on Figure 2. The FGD-C Pond is located on the northern portion of the facility, west of FGD-A and FGD-B Ponds as shown on Figure 3. The total footprint of the FGD-C Pond is approximately 22 acres with a lined footprint of approximately 16 acres.

Golder Associates Inc. (Golder) was retained by Luminant Power (Luminant) to provide third party Construction Quality Assurance (CQA) monitoring and testing services during the construction of the embankment and composite liner for the FGD-C Pond.

This report summarizes the CQA monitoring activities, observations and the results of the tests conducted by Golder during the preparation of the subgrade, placement of the embankment fill, and installation of the composite compacted clay/geomembrane liner. It is Golder's opinion that the FGD-C Pond was constructed in compliance with the project plans, specifications and Quality Control Plans.

## 1.2 Project Team

Golder prepared the construction drawings for the FGD-C Pond. Mine Service Inc. (MSI) of Rockdale, Texas performed the construction of the embankment and clay liner. The installation of the geomembrane liner was performed by Lone Star Lining Company (LSL) of Houston, Texas. The protective cover was placed by Headwaters Resources Inc. of Bremond, Texas. Record surveying services for lines and grades, including clay liner and protective cover thickness verification, were provided by Survey and Mapping, Inc. (SAM) of Austin, Texas.

Golder monitored embankment fill placement, compacted clay placement, geomembrane liner installation activities and protective cover placement. Golder's field personnel consisted of a resident CQA manager who was on-site full time during construction. Mr. Jamie Kendall fulfilled the resident CQA manager duties during the FGD-C Pond earthwork activities. He was assisted by Mr. Mark Day during portions of the project.

Geomembrane installation CQA was provided by Mr. Varenya Kumar, Ms. Alexandra Morales and Mr. Mamoudou Sylla.

Mr. Daniel Williams monitored placement of ash as a final cover material over the geomembrane liner.

Resumes detailing the Golder staff's experience is provided in Appendix A. In addition to the presence of a CQA monitor, the professional of record made regular site visits during the course of the project.

The professional of record for the construction of the FGD-C Pond clay liner was Mr. Charles F. Rickert, PE. Mr. Rickert is a registered professional engineer in the State of Texas (PE 62392). He has over 30 years of civil engineering and extensive earthwork construction experience, having been directly involved with numerous CQA earthwork projects. The professional of record for the construction of the geomembrane liner and protective cover was Mr. William E. Gordon, PE. Mr. Gordon is a registered professional engineer in the State of Texas (PE 78933). He has over 29 years of civil engineering experience focusing on soils and geosynthetic lining for waste containment facilities. Resumes detailing Mr. Rickert's and Mr. Gordon's experience are presented in Appendix A. The lines of communication between Mr. Rickert, Mr. Gordon and Golder's field personnel were maintained regularly by telephone. Mr. Rickert visited the Oak Grove SES Power Station site frequently during clay liner construction and was in attendance at progress meetings held on site. Mr. Rickert made visits to the site on June 17, July 21, August 4, August 18, and September 17, 2015. Mr. Gordon visited the Oak Grove SES Power Station frequently during geomembrane and protective cover construction. Mr. Gordon was also in attendance at progress meetings held on site. Mr. Gordon made site visits on September 17, 29, October 13, 27, November 10, December 8, 2015 and January 5, February 2, March 1, April 5, May 3, June 7 and July 12, 2016.

Construction of the FGD-C Pond embankment began on July 12, 2015 and was completed on August 20, 2015. The clay liner was placed between August 21 and September 17, 2015 and the geomembrane was placed between September 21 and October 4, 2015. The protective cover was placed between April 5 and June 24, 2016. Prior to construction, CQA monitoring activities included preconstruction sampling and testing, and CQA activities associated with monitoring of the subgrade preparation. MSI personnel typically worked 10 to 12 hours per day, 6 to 7 days per week.

# 2.0 PROJECT DOCUMENTS AND DESCRIPTION

## 2.1 Project Description

FGD-C Pond was constructed above and below grade using fill obtained from on-site borrow sources. The pond embankments have 3H:1V interior and exterior slopes and rise from approximately 5 to 30 feet above the surround ground surface. The composite liner system on the floor and interior slopes consists of the following (from top to bottom):

- 2-foot thick layer of protective cover;
- 60-mil thick textured HDPE geomembrane; and
- 2-foot thick compacted clay.

The composite liner area in plan view is approximately 701,665 square feet or 16 acres. The protective cover consists of a fly ash and bottom ash mixture.

The certification drawing provided by SAM is included as Figure 12. CQA soil testing was performed according to the project plans, specifications and QCP.

## 2.2 Project Specifications and Drawings

Golder monitored the embankment fill, the composite clay and geomembrane liner construction and the protective cover placement for FGD-C Pond at the Oak Grove SES Power Station utilizing construction drawings and quality assurance documents prepared by Golder.

- Specification No.: A2YF00-0-SP-SI-04, Earthwork, Fluor, December 2006
- Soil Liner Quality Control Plan, Oak Grove Steam Electric Station, Roberson County, Texas, Golder Associates Inc. June 2015
- Geomembrane Liner Quality Control Plan, Oak Grove Steam Electric Station, Roberson County, Texas, Golder Associates Inc. June 2015

## 3.0 EARTHWORKS CONSTRUCTION QUALITY ASSURANCE ACTIVITIES

The CQA monitoring and testing performed by Golder for the embankment fill and clay liner construction consisted of the following activities:

- Participation in the preconstruction and progress meetings between Luminant, MSI, and Golder;
- Collection of preconstruction samples of potential material for use as embankment fill and clay liner;
- Observation and documentation of procedures during construction of the embankment fill and clay liner;
- Performance of field moisture/density tests on the embankment fill and clay liner;
- Acquisition of thin wall tube samples and performance of hydraulic conductivity tests on each lift during clay liner construction;
- Determination of Atterberg limits and particle size distribution (sieve analysis) of clay liner material; and
- Review of survey data for grade control and clay liner thickness verification.

A description of each of the above activities with a summary of the observations is presented in the following sections. A photograph log showing various construction activities is included in Appendix N. The actual number of quality assurance tests performed for this project met or exceeded the minimum number required for compliance with the QCP.

### 3.1 Preconstruction and Construction Sampling and Laboratory Testing

Prior to the use of site soils for the construction of the FGD-C Pond embankment and clay liner, samples were obtained from on-site borrow areas. The soil tests were performed in Golder's geotechnical laboratory in Houston, Texas.

Testing included moisture content (ASTM D2216), particle size analyses (ASTM D422) and Atterberg limits (ASTM D4318). Moisture/density relationships (ASTM D698) were developed for use during construction to document that the percent compaction and moisture content achieved in the field met the requirements of the project specifications and QCP. Hydraulic conductivity tests ASTM D5084 - Method F were performed on remolded specimens as required by the QCP. The test results showed the proposed material was suitable for clay liner construction. The laboratory preconstruction test results are provided in Appendix B.

## 3.2 Embankment Fill

Construction of the FGD-C Pond embankment generally progressed in the following manner:

- Embankment fill material was excavated from the on-site clay borrow source using John Deere tractors pulling scrapers. Material was spread in loose lifts of approximately 8-inches thick. Loose lift thickness was monitored by Golder.
- A water wagon was used to moisture condition the soil when it was necessary to add water following placement in the impoundment.
- The embankment fill was compacted using a tamping-foot roller.

The above procedures were followed for each lift of the FGD-C Pond embankment. The final surface of the uppermost lift was smoothed using a steel drum roller after the required density had been achieved. A survey was performed of the prepared embankment fill surface.

### *3.2.1 Field Moisture/Density Tests*

Field moisture/density tests were performed on the embankment fill using a nuclear density gauge (ASTM D6938) to determine whether the project specifications for compaction had been achieved. The minimum number of density tests required for compliance with the project specifications was one test per 5,000 cubic yards of fill material. Approximately 163,000 cubic yards of fill was placed in the embankment construction requiring a minimum of 33 tests. A total of 182 field moisture/density tests were performed on the embankment fill exceeding the minimum requirement.

The degree of compaction achieved in the field was computed on the basis of the dry density of the soil tested in the fill and the appropriate density standard developed in the laboratory for the material. The embankment fill lifts were placed at a minimum of 95 percent of the maximum density and +3 to -3 percent of the optimum moisture content as determined by ASTM D698 standard Proctor. Holes in the subgrade formed by the mandrel used for the nuclear density test were backfilled with bentonite powder. A summary of the embankment fill density test data is included in Appendix C.

## 3.3 Subgrade Preparation

Project specifications for the FGD-C Pond subgrade required that the material be a minimum of 95 percent of the maximum dry density as determined by the standard Proctor moisture/density test (ASTM D 698). The field moisture/density tests were performed using a nuclear density gauge (ASTM D 2922 and ASTM D 3017) to determine whether the project specifications for compaction had been achieved. The minimum number of density tests required for compliance with the SLQCP was 15 via the nuclear gauge method and 2 via the drive cylinder method (ASTM D 1556). A total of 15 field moisture/density tests via the nuclear gauge method and 2 field moisture/density tests via the drive cylinder method were performed on the subgrade.

The degree of compaction achieved in the field was computed on the basis of the dry density of the soil tested in the fill and the appropriate density standard developed in the laboratory for the subgrade material. Holes in the subgrade formed by the mandrel used for the nuclear density test were backfilled with bentonite powder, and holes formed by the drive cylinders were backfilled and compacted with a bentonite/clay mixture. A summary of the subgrade density test data is included in Appendix D.

## 3.4 Clay Liner Construction Procedures

Construction of the FGD-C Pond clay liner generally progressed in the following manner.

- Clay liner material was excavated from the on-site clay borrow source using John Deere tractors pulling scrapers. Material was spread in loose lifts of approximately 8-inches thick. Loose lift thickness was monitored by Golder.
- Soil clods were broken down by the blade and tracks of the bulldozer as the lift was struck to the proper thickness. A water wagon was used to moisture condition the soil when it was necessary to add water following placement in the impoundment.
- The clay was compacted using a tamping-foot roller.
- Prior to placement of subsequent lifts, the soil surface was watered as needed and then roughened by the cleats of the compactor to facilitate good interlift bonding.
- Throughout construction of the clay liner, water was added as necessary to the surface of previous lifts to prevent excessive drying under the elements of weather.

The above procedures were followed for each lift of the FGD-C Pond clay liner. Four complete lifts were placed across the impoundment for the compacted clay liner with each compacted lift being approximately 6-inches thick. The final surface of the uppermost lift was smoothed using a steel drum roller after the required density had been achieved. A final survey was performed of the prepared clay liner surface for the purpose of thickness verification (Figure 13).

### *3.4.1 Field Moisture/Density Tests*

The field moisture/density tests were performed using a nuclear density gauge (ASTM D6938) to determine whether the project specifications for compaction and moisture content had been achieved. Additional field moisture/density checks were performed using a drive cylinder (ASTM D2937) method on the undisturbed shelby tube samples. The drive cylinder tests were periodically performed in conjunction with the nuclear density gauge to verify the results. The degree of compaction achieved in the field was computed on the basis of the dry density of the soil tested in the fill and the appropriate density standard developed in the laboratory for the clay material (ASTM D698). Holes in the clay liner formed by the mandrel used for the nuclear density test were backfilled with bentonite powder, and holes formed by the shelby tubes were backfilled and compacted with a bentonite/clay mixture.

The Soil Liner Quality Control Plan (SLQCP) for the construction of the FGD-C Pond clay liner required that the material be placed between 2 to 6 percent above the optimum moisture content and compacted

to a minimum of 95 percent of the maximum dry density as determined by the standard Proctor moisture/density test (ASTM D698). The minimum number of density tests required for compliance with the QCP was 88 tests per lift via the nuclear gauge method and a total of 5 via the drive cylinder method. A minimum of 98 field moisture/density tests per lift were performed via the nuclear gauge method. A total of 23 moisture/density tests via the drive cylinder method were performed.

A summary of the clay liner density test data is included in Appendix D. The moisture/density reference curves (standard Proctor) are presented in Appendix B. The locations of each clay liner field moisture/density test are presented on Figures 4 through 7 for Lifts 1 through 4, respectively.

The field moisture/density measurements made with the nuclear density gauge and with drive cylinders are summarized in Appendix E.

### 3.4.2 Hydraulic Conductivity Sampling and Testing

To comply with the SLQCP, one hydraulic conductivity test was required for every 40,000 square feet of compacted clay liner, for each 6-inch (compacted) lift. This equates to 18 tests per lift. A minimum of 19 hydraulic conductivity tests were performed on samples collected from each of Lifts 1 through 4. The samples were obtained by pushing a thin-walled shelby tube (ASTM D1587) into the clay liner. The sample was sent to and tested at Golder's Houston, Texas geotechnical laboratory. The coefficient of hydraulic conductivity was determined according to ASTM D5084 -Method F. The holes formed in the clay liner by the thin-walled tubes were backfilled with a bentonite/clay mixture and compacted. The SLQCP for the construction of the FGD-C Pond clay liner required in-place material to have a hydraulic conductivity of no greater than $1.0 \times 10^{-7}$ centimeters per second (cm/sec). All of the samples tested met this requirement.

The laboratory data for the clay liner hydraulic conductivity for the FGD-C Pond are provided in Appendix B.

### 3.4.3 Atterberg Limits/Sieve Analysis Sampling and Testing

To comply with the SLQCP, one Atterberg limits (ASTM D4318) and sieve analysis (ASTM D422) were required for every 50,000 square feet of compacted clay liner, for each 6-inch (compacted) lift. This equates to 15 tests per lift. A minimum of 19 Atterberg limits and sieve analysis were performed on samples collected from each of Lifts 1 through 4. The SLQCP for the clay liner required that the material used exhibit a liquid limit of no less than 30 percent, a plasticity index of no less than 15 percent, and that the soil fraction passing the No. 200 sieve be no less than 30 percent. All of the samples tested met this requirement.

The clay liner Atterberg limits and percentage of fines (soil fraction smaller than 0.074 mm, which corresponds to the No. 200 sieve) laboratory test results are provided in Appendix B.

### 3.4.4 Thickness Verification

Clay liner thickness was verified by means of an engineering survey, performed by SAM, at points located on a 50-foot grid. Additional data was collected at break lines in the grade of the impoundment floor and at other points which would have otherwise fallen between the points on the grid. These points were compared to the bottom of liner points surveyed on the surface of the subgrade prior to clay liner construction. The SAM thickness verification survey drawing for the FGD-C Pond clay liner is presented as Figure 13.

## 4.0 GEOMEMBRANE QUALITY ASSURANCE ACTIVITIES

The quality assurance monitoring and testing performed by Golder Associates Inc. for geomembrane installation consisted of the following activities:

- Participating in the progress meetings prior to and during installation of the geomembrane;
- Reviewing manufacturer's raw materials and geomembrane roll quality control documents;
- Performing quality assurance testing on samples of the geomembrane material;
- Observing the clay liner to verify that the surface was generally free of irregularities, protrusions and loose soil;
- Observing the anchor trench excavation to verify that the surface was free of loose soil;
- Observing and documenting geomembrane panel placement and verifying thickness during panel deployment;
- Observing and documenting trial seam procedures and evaluating test results;
- Observing and documenting field seams and seaming operations;
- Observing and documenting non-destructive seam continuity testing;
- Locating and documenting seam strength destructive test locations;
- Performing destructive tests on geomembrane seams and evaluation of the test results;
- Locating geomembrane panel and seam defects, and observing and documenting repairs;
- Observing and documenting non-destructive continuity testing of repairs;
- Observing backfill placed in the anchor trenches; and
- Observing protective soil cover placement to ensure that no damage was done to the underlying geomembrane.

A description of the CQA activities and a summary of the observations are presented in the following sections.

### 4.1 Geomembrane Material

The geomembrane liner material installed at this site consisted of a nominal 60-mil textured high density polyethylene (HDPE) geomembrane manufactured in approximately 23 foot wide rolls by GSE Environmental (GSE). A total area of approximately 701,665 square feet of this geomembrane was deployed. Golder personnel inventoried all of the geomembrane material, and a complete inventory list is presented in Appendix F. Copies of the geomembrane resin and roll quality control documents from GSE are included in Appendix G. All test values reported by GSE for the geomembrane met the project specifications.

Quality assurance testing of the geomembrane material was performed by Golder to confirm the material met the project requirements. Testing was performed at a frequency of one per each 100,000 square feet

of material. The quality assurance test results are also included in Appendix G. All test values met the project specifications.

## 4.2 Soil Liner Surface

Prior to deployment of the geomembrane, MSI, who had constructed the clay liner, maintained the soil liner surface. The surface of the soil liner was rolled smooth with a steel drum roller and maintained in a moist condition by a water truck to prevent desiccation. Prior to deployment of the geomembrane the surface was examined by Golder and LSL personnel for any objects that could potentially damage the geomembrane, and any such objects found were removed. Subgrade acceptance certificates are presented in Appendix H.

## 4.3 Geomembrane Deployment

Geomembrane panels were deployed using a rubber tired front end loader with a spreader bar to unroll the geomembrane, and the panels were placed into final position by use of man power. Panels were aligned with a minimum 6-inch overlap. Free edges of the geomembrane were temporarily secured with sand bags.

Each geomembrane panel was marked with a field identification number by Golder CQA personnel. These numbers indicate the order of panel deployment and can be correlated to the manufacturer's roll number using the panel deployment summary in Appendix I. A plan view of the geomembrane panel layout is shown on Figures 8 and 9.

Each panel was visually examined for manufacturing defects and installation damage. Defects were marked, recorded and subsequently repaired.

## 4.4 Geomembrane Trial Seams

The seaming methods used on this project were the dual track fusion welding process and the extrusion welding process. Geomembrane trial seams were made by LSL technicians to test the seaming apparatus (welding machines) and operator's performance under daily site conditions. Trial seams were made each day prior to the start of field seaming in the morning and following the mid-day break.

Specimens from each trial seam were quantitatively and qualitatively field tested by LSL: 3 for peel adhesion (peel) and 3 for bonded seam strength (shear), using a portable field tensile testing machine. The separation mode for each test specimen was classified and documented according to the codes shown on Figures 10 and 11, for dual track fusion and extrusion welds respectively. A summary of the trial seam test results is presented in Appendix J. In the event of a failing test, a second trial seam was made and tested prior to implementation of the welding machine. If the second trial seam failed, two consecutive passing trial seams were required prior to the start of field production seaming.

Golder personnel observed trial seaming procedures and the testing of all specimens from the trial seams.

## 4.5 Geomembrane Seaming

The principal seaming method used on this project was the dual track fusion welding process. The extrusion welding process was used for making repairs, and capping inadequate fusion welds.

Golder personnel observed seaming operations on a routine basis. The observations consisted of checking for proper sheet overlap and periodically checking the seam area to verify that the surface was prepared properly and that the surface area was kept free of moisture, dust, dirt, and debris. All seams were examined for visual quality and seam completion. Visually detected imperfections were marked and subsequently repaired. A summary of the geomembrane seaming data collected by Golder CQA personnel is presented in Appendix K.

## 4.6 Seam Strength Destructive Testing

Geomembrane seam strength destructive test samples were taken at a frequency of at least one per 500 lineal feet of seam. Test locations were selected by Golder CQA personnel based on the progress of each welding machine and observations of the welding operations. After the sample was obtained in the field, one of the three segments of the sample was tested by LSL in the field. If the preliminary field test met the project requirements, one of the remaining samples was sent to. Golder Associates' laboratory in Atlanta, GA for testing. If the preliminary field tests failed to meet the project requirements, additional locations were identified for destructive test samples as part of the procedure for tracking a below specification seam. The remaining segment of each destructive sample was retained on site as an archive. For each of the destructive samples, 10 specimens were removed for testing. Five specimens were tested for peel adhesion (peel) and 5 specimens were tested for bonded seam strength (shear).

The acceptance criteria for both bonded shear strength and peel adhesion were that 4 out of the 5 specimens tested under each condition had to meet the minimum specified strength value and that the average strength values of each set of 5 specimens must meet the specifications. The 5$^{th}$ specimen tested must meet at least 80% of the specified strength. The strength criterion for an acceptable shear test was that the specimen had to exhibit a strength greater than 120 pounds per inch. Additionally, the specimen had to exhibit an acceptable break code as defined by the Geosynthetic Institute guidance document GRI-GM19 for seam strength and related properties of thermally bonded Polyolefin Geomembranes. The criterion for an acceptable peel test was that the specimen had to exhibit a strength greater than 78 pounds per inch for an extrusion weld and a strength greater than 91 pounds per inch for a fusion weld, and also exhibit an acceptable break code. Both tracks of dual track fusion welded seams were tested in peel. Separation modes for the test specimens were reported according to the modes shown on Figures 11 and 12.

The total length of fusion welded seams (not including repairs) was approximately 25,017 feet, which corresponds to a minimum number of destructive seam strength tests of 51 at a frequency of one per 500 linear feet of seam. Initially Golder monitors located 85 areas for destructive seam strength testing. A total of 1,058 feet of extrusion welding was performed in the repairs of defects (greater than 10 feet in length) requiring an additional 3 destructive tests of extrusion welds at a frequency of one per 500 feet. A total of 3 extrusion weld destructives were tested.

In the case of a passing destructive test, a patch was welded over the area from which the sample was taken. In the case of a failing test, additional samples were to be taken from seams or repairs completed by the same seamer and/or seaming apparatus which were seamed before and after the failed area. This process is repeated until failing area is bound on both sides with seams meeting the project requirements. There were no failing destructive seams tests during geomembrane installation in FGD-C. All destructive seam strength samples were tested by Golder Associates in Golder's Atlanta, Georgia laboratory. A summary of the destructive test results for geomembrane seam samples is included in Appendix L, and the locations are shown on Figure 8. Non-Destructive Seam Continuity Testing

Geomembrane seams and seam repairs were tested for continuity by LSL. The air pressure method was used for dual track fusion welds, and the vacuum box method was used for extrusion welds.

Golder CQA personnel observed and documented non-destructive testing of seams and seam repairs on a full-time basis. A summary of non-destructive testing of seams is included in the geomembrane seam summary presented in Appendix K. All tested seam lengths and repairs passed the project non-destructive testing requirements.

## 4.7 Geomembrane Defects and Repairs

Each geomembrane panel and seam was visually observed for defects. The term "defect" refers to manufacturing blemishes, installation damage including burns and creases, incomplete seaming, wrinkles and fish mouths. Defect identification codes were also assigned to multiple panel intersection points, as the project documents required patches at these locations. These observations were made on an on-going basis throughout the installation process.

Defects were logged by Golder Associates' personnel, who also observed repair operations performed by LSL. These observations were made to verify that all noted defects were repaired and documented. A summary of defects and repairs is contained in Appendix M, and the locations of repairs are shown on Figure 9.

LSL welded patches at destructive seam strength sample locations, at holes created during installation, in areas of insufficient overlap for seaming, and at intersecting fusion-welded seams ("T's"). Spot welds

were made by the installer to small isolated manufacturing blemishes, creases and minor scratches on the geomembrane panels. Minor defects in extruded seams were repaired by lightly grinding and rewelding these areas.

## 4.8 Non-Destructive Testing of Repairs

LSL non-destructively tested geomembrane defects, patches and panel repairs for continuity. The vacuum box method was used for all such testing.

Golder Associates' CQA personnel observed and documented non-destructive testing of defects and repairs on a full time basis. A summary of non-destructive testing of defects and repairs is presented in the Repair Summary in Appendix M.

## 5.0 ANCHOR TRENCHES

The geosynthetics were anchored in a trench above the slopes. The anchor trench was approximately 2 feet wide by 2 feet deep. The anchor trench detail is shown on Figure 10. The soil removed from the anchor trench was used as backfill. Soil was placed in loose lifts and compacted using the rubber tires of a backhoe. Care was taken to verify that no damage was inflicted to the geosynthetics in the anchor trenches as a result of the backfilling operations, which was verified by Golder personnel.

## 6.0 PROTECTIVE SOIL COVER

A protective cover, consisting of a minimum two feet of fly-ash/bottom ash mixture, was placed over the geomembrane. Placement of the protective cover and construction were observed by Golder Associates' personnel to verify that the geosynthetics were not damaged by construction equipment. The SAM thickness verification survey drawing for the FGD-C Pond protective cover is presented as Figure 13.

## 7.0 SUMMARY

Golder Associates Inc. (Golder) was retained by Luminant to provide third party Construction Quality Assurance (CQA) monitoring and testing services during the construction of the composite liner for the FGD-C Pond at the Oak Grove SES Power Plant. The CQA monitoring and testing services consisted of the following activities:

- Participating in and documenting the preconstruction and weekly construction progress meetings;
- Preconstruction sampling and testing of clay materials;
- Monitoring and documenting clay liner subgrade preparation;
- Monitoring and documenting clay liner construction procedures;
- Performing field moisture/density tests (including dive cylinder tests) on the prepared subgrade;
- Performing field moisture/density tests (including drive cylinder tests) on the compacted clay liner;
- Collecting and testing clay liner samples for hydraulic conductivity for the compacted clay liner;
- Collecting and testing sets of Atterberg limits and sieve analyses for the compacted clay liner;
- Reviewing survey data for thickness verification;
- Reviewing quality control submittals for the geomembrane liner materials. Performing quality assurance testing of the geomembrane liner material;
- Monitoring and documenting soil liner surface preparation;
- Monitoring and documenting geomembrane deployment;
- Monitoring and documenting trial and field seaming;
- Monitoring and documenting non-destructive seam continuity testing;
- Monitoring and documenting geomembrane repair procedures; and
- Monitoring and documenting installation of the protective cover.

Based on the observations and testing performed by Golder during the monitoring of the FGD-C Pond subgrade preparation and clay liner construction, it is in Golder's opinion that the liner was constructed in compliance with the project plans, specifications and Contractors Quality Assurance/Quality Control Plan (QCP).

Sincerely,
**GOLDER ASSOCIATES INC.**

William E. Gordon, PE
Senior Engineer

Charles F. Rickert, PE
Associate

GOLDER ASSOCIATES, INC
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

CONSULTANT

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| YYYY-MM-DD | 2016-04-07 |
| DESIGNED | TNB |
| PREPARED | |
| REVIEWED | KR |
| APPROVED | WEG |

TITLE
**MAP OF TEXAS COUNTIES**

| PROJECT NO | SCALE | REV. | FIGURE |
|---|---|---|---|
| 1525714 | N.T.S. | A | 1 |



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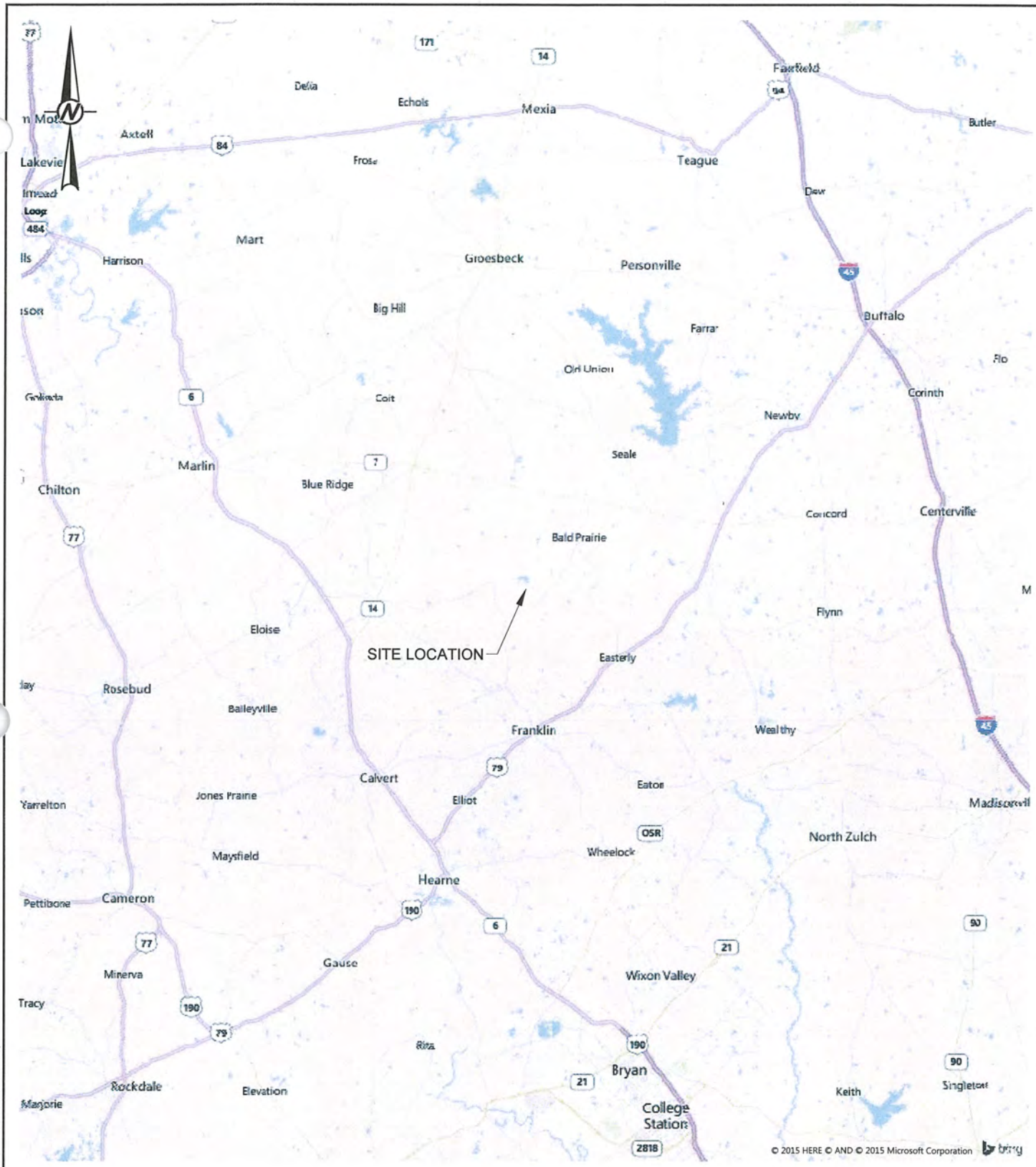
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




GOLDER ASSOCIATES, INC
TEXAS REGISTRATION F-2578

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CONSULTANT

| | | |
|---|---|---|
| YYYY-MM-DD | 2016-04-07 | |
| DESIGNED | TNB | |
| PREPARED | | |
| REVIEWED | KR | |
| APPROVED | WEG WEC | |

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

TITLE
**SITE LOCATION**

PROJECT NO. 1525714 | REV. ---- | FIGURE 2

APPENDIX E-Revision 1 November 21, 2022

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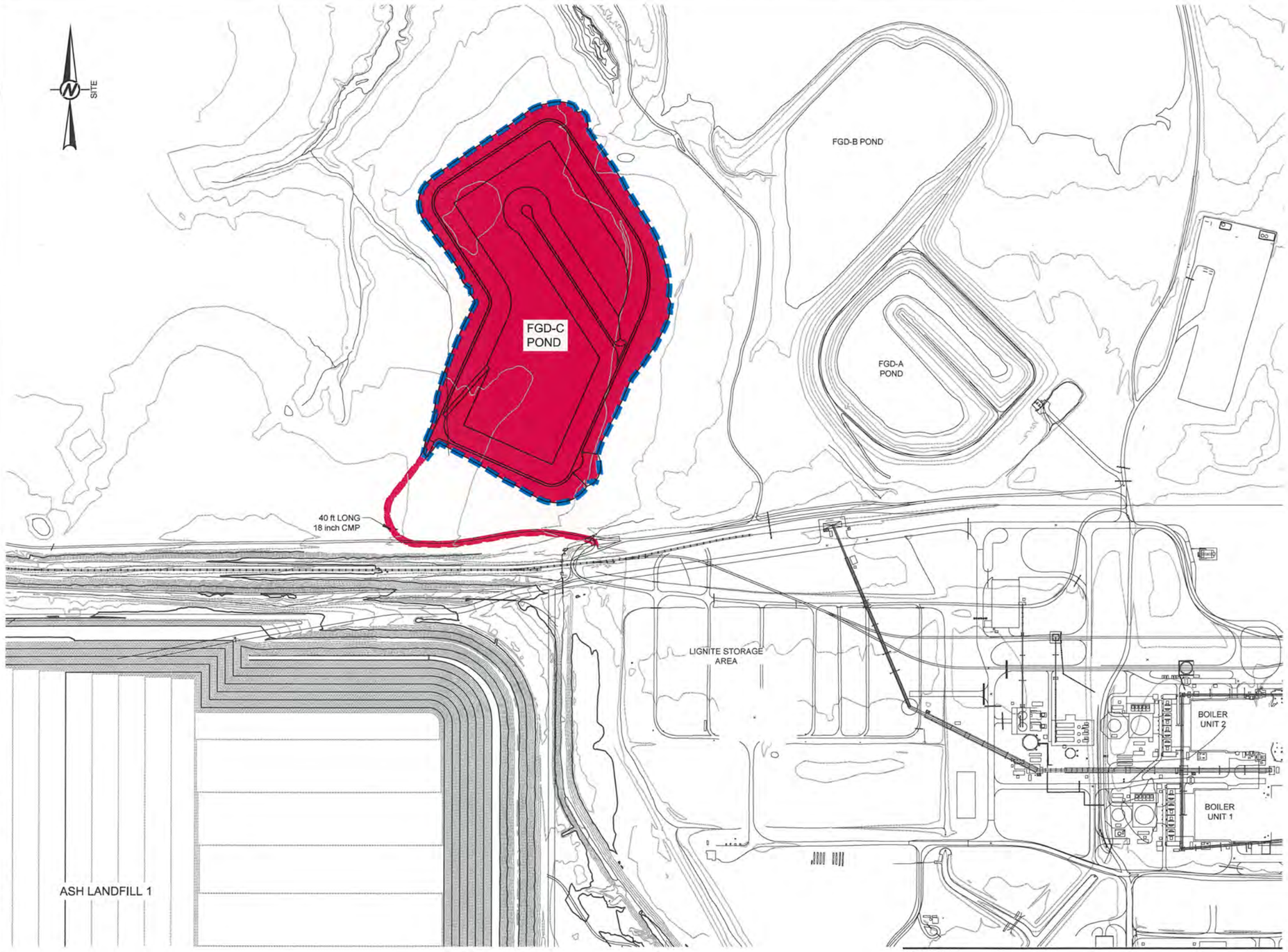
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0




LEGEND

- 25 ft EXISTING CONTOUR
- 5 ft EXISTING CONTOUR
- CURRENT POND CONSTRUCTION AREA

**NOTES**

1. EXISTING GROUND TOPOGRAPHY IS FROM AN AERIAL SURVEY PERFORMED BY GEODETIX, INC. ON MAY 27, 2010 AND GROUND SURVEY PERFORMED BY SAM INC. ON OCTOBER 23, 2014. EXISTING GROUND TOPOGRAPHY ELSEWHERE IS FROM FLOUR ENTERPRISE, INC. DRAWING A2YF00-0-CV-0-SW.PL.-01, AS PROVIDED BY LUMINANT.
2. COORDINATES ARE BASED ON OAK GROVE STEAM ELECTRIC STATION PLANT GRID SYSTEM.
3. ELEVATIONS ARE BASED ON MEAN SEA LEVEL DATUM.
4. CLAY MATERIAL AND STRUCTURAL FILL STOCKPILE AREAS NEED TO BE CLEARED AND GRUBBED PRIOR TO STOCKPILING ACTIVITIES.

0 200 400
SCALE FEET

0 200 400
SCALE FEET

CLIENT
LUMINANT

CONSULTANT
Golder Associates

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

| | |
|---|---|
| YYYY-MM-DD | 2016-04-07 |
| DESIGNED | |
| PREPARED | TNB |
| REVIEWED | KR |
| APPROVED | WEG |

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

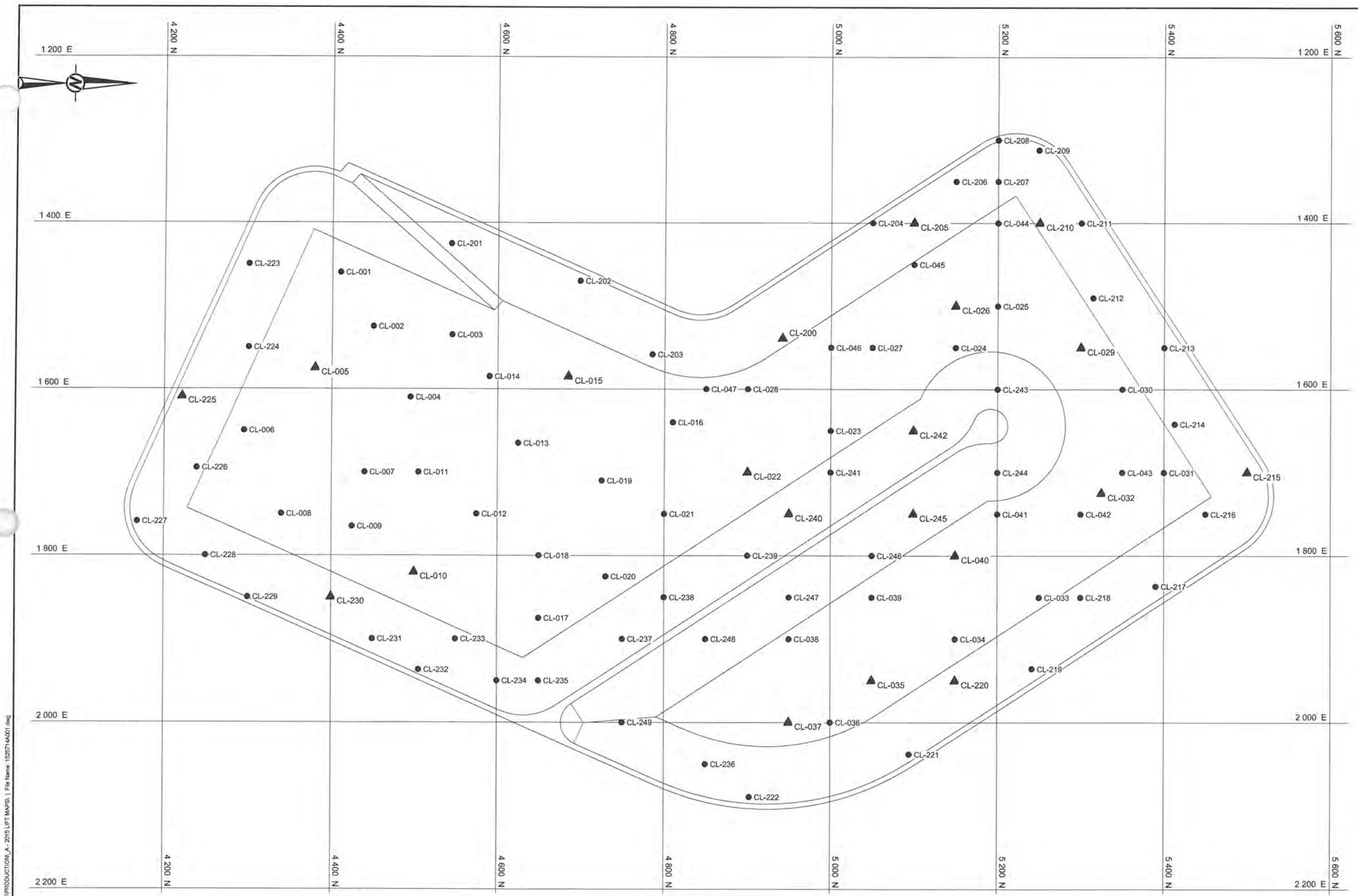
TITLE
**SITE LAYOUT**

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 1525714 | ---- | 3 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in

Path: \\houston\drafting_2015\15 ...mmant fgd-c\production_b - 2015.gle\1 | File Name: 1525714B003.dwg




LEGEND

- ● CL-# MOISTURE/DENSITY TEST LOCATION
- ▲ CL-# MOISTURE/DENSITY TEST AND HYDRAULIC CONDUCTIVITY SAMPLE LOCATION

STATE OF TEXAS
CHARLES FRED RICKERT
62392
REGISTERED
PROFESSIONAL ENGINEER

0 60 120
SCALE FEET

| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-11-05 | APPENDIX E Revision 1 November 21, 2022 | TNB | | WEG | WEG |

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
Luminant

CONSULTANT
Golder Associates

HOUSTON
500 CENTURY PLAZA DRIVE, SUITE 190
HOUSTON, TEXAS
USA
(281) 821-6868
www.golder.com

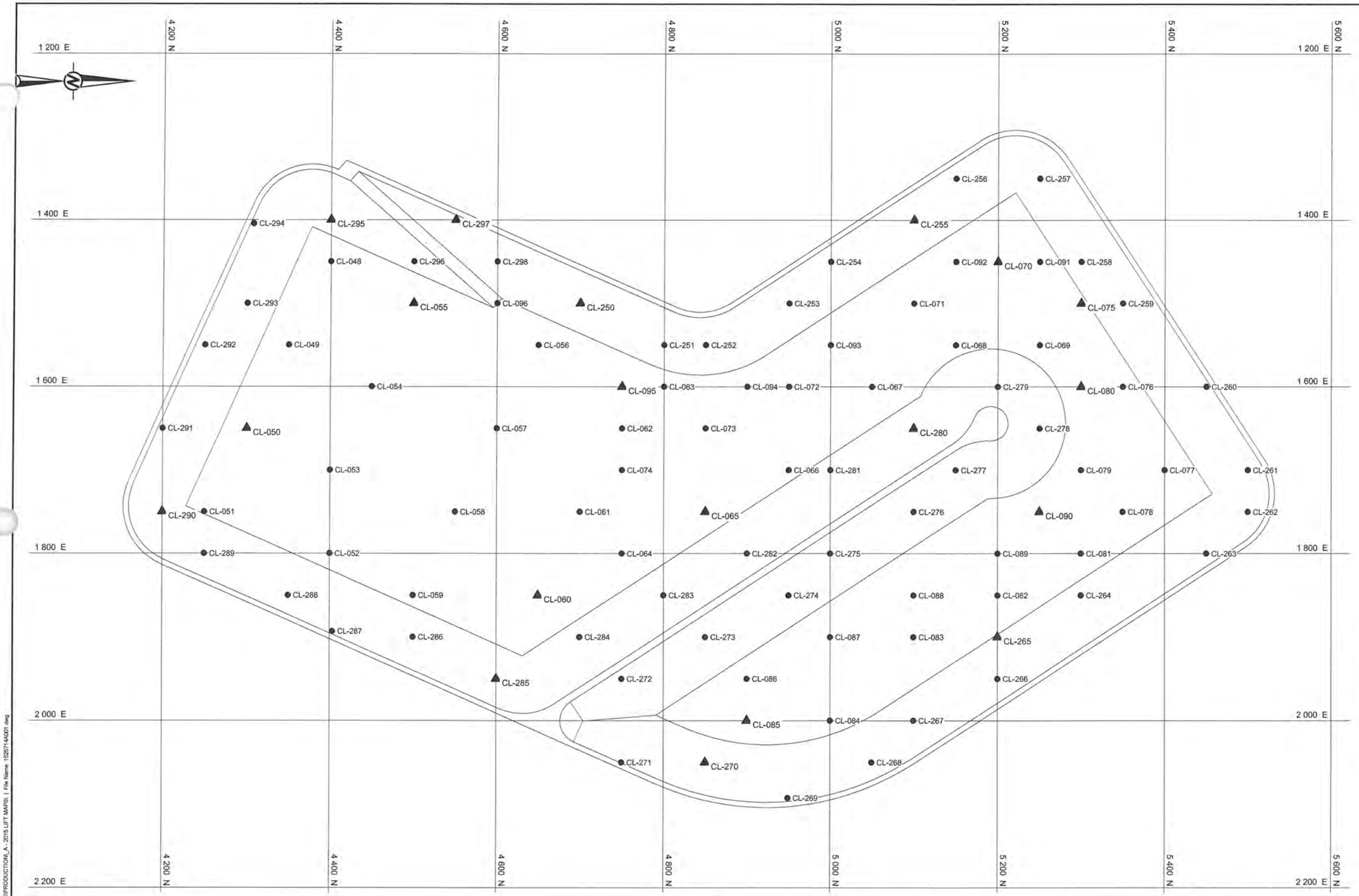
PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

TITLE
**FDG-C POND LIFT MAP 1**

PROJECT No. 1525714 | Rev. 0 | 1 of 4 | FIGURE 4

Path: C:\Users\crstark\Desktop\Luminant FGD-C\PRODUCTION_A - 2015 LIFT MAPS\ | File Name: 1525714A001.dwg

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B




LEGEND

- ● CL-# MOISTURE/DENSITY TEST LOCATION
- ▲ CL-# MOISTURE/DENSITY TEST AND HYDRAULIC CONDUCTIVITY SAMPLE LOCATION

STATE OF TEXAS
CHARLES FRED RICKERT
82392
REGISTERED
PROFESSIONAL ENGINEER

0 60 120
SCALE FEET

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-11-05 | | TNB | | WEG | WEG |

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USA
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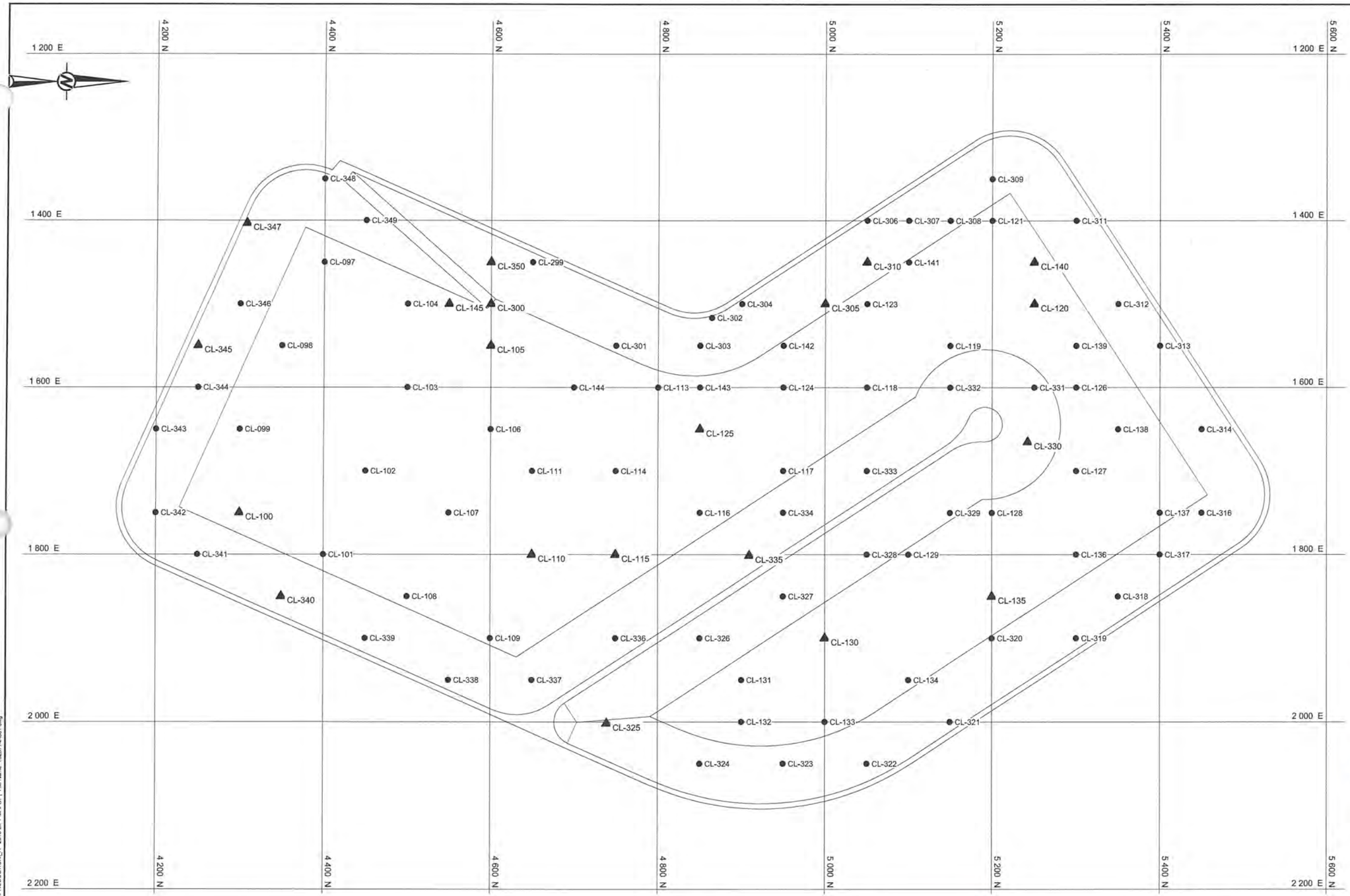
PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

TITLE
**FDG-C POND LIFT MAP 2**

PROJECT No. 1525714 | Rev. 0 | 2 of 4 | FIGURE 5




LEGEND

- ● CL-# MOISTURE/DENSITY TEST LOCATION
- ▲ CL-# MOISTURE/DENSITY TEST AND HYDRAULIC CONDUCTIVITY SAMPLE LOCATION

STATE OF TEXAS
CHARLES FRED RICKERT
10/31/16
62392
REGISTERED PROFESSIONAL ENGINEER

0 60 120
SCALE FEET

| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-11-05 | | TNB | | WEG | WEG |

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HOUSTION, TEXAS
USA
(281) 821-6868
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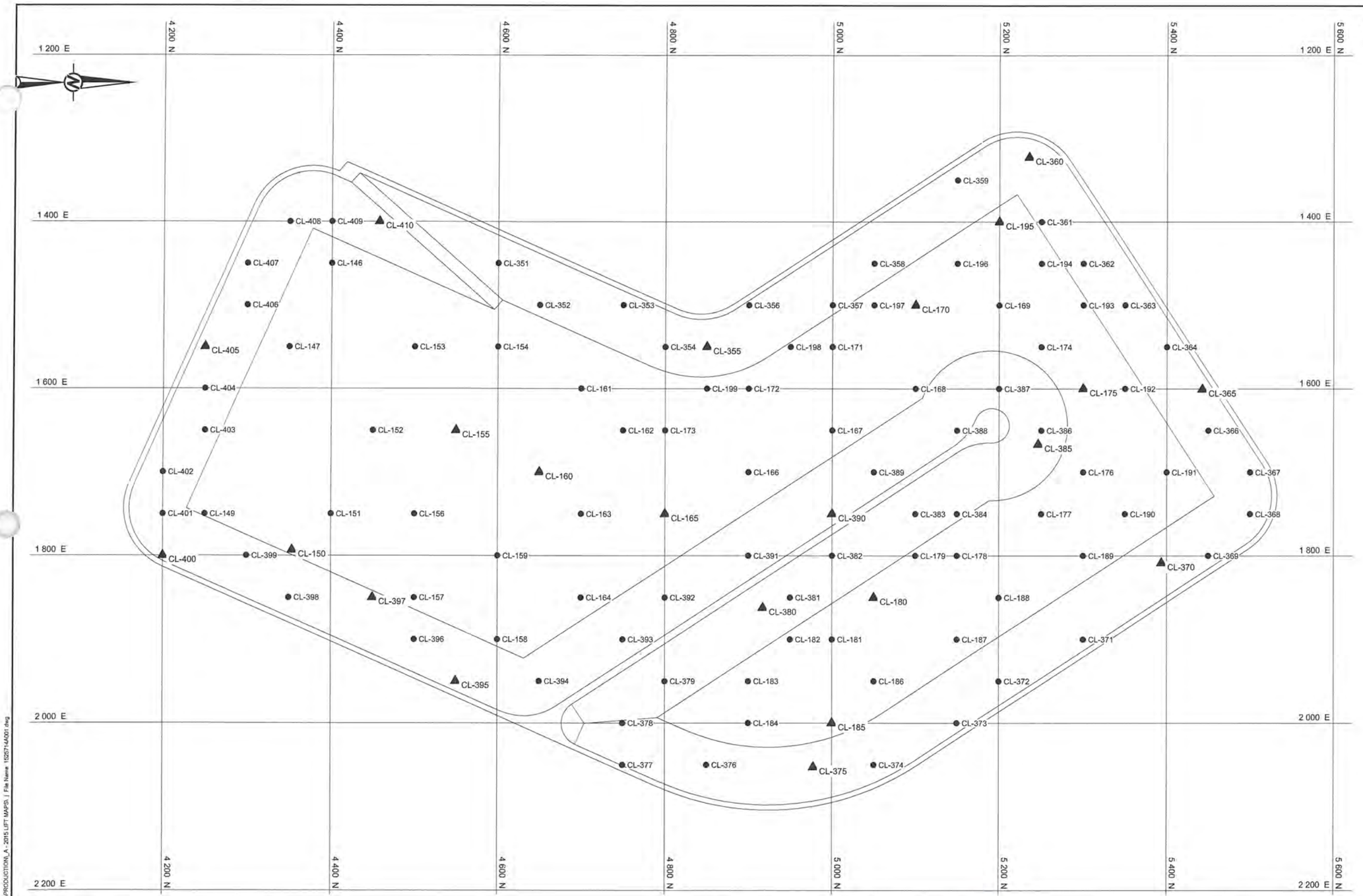
PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

TITLE
**FDG-C POND LIFT MAP 3**

| PROJECT No. | Rev. | 3 of 4 | FIGURE |
|---|---|---|---|
| 1525714 | 0 | | 6 |

Path: C:\Users\cleland\Desktop\Luminant FGD-C\PRODUCTION_A - 2015 LIFT MAPS\ | File Name: 1525714A001.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B




STATE OF TEXAS
CHARLES FRED RICKERT
10/31/22
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SEAL

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| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-11-05 | | TNB | | WEG | WEG |

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

TITLE
**FDG-C POND LIFT MAP 4**

PROJECT No. 1525714 | Rev. 0 | 4 of 4 | FIGURE 7

APPENDIX E-Revision 1 November 21, 2022

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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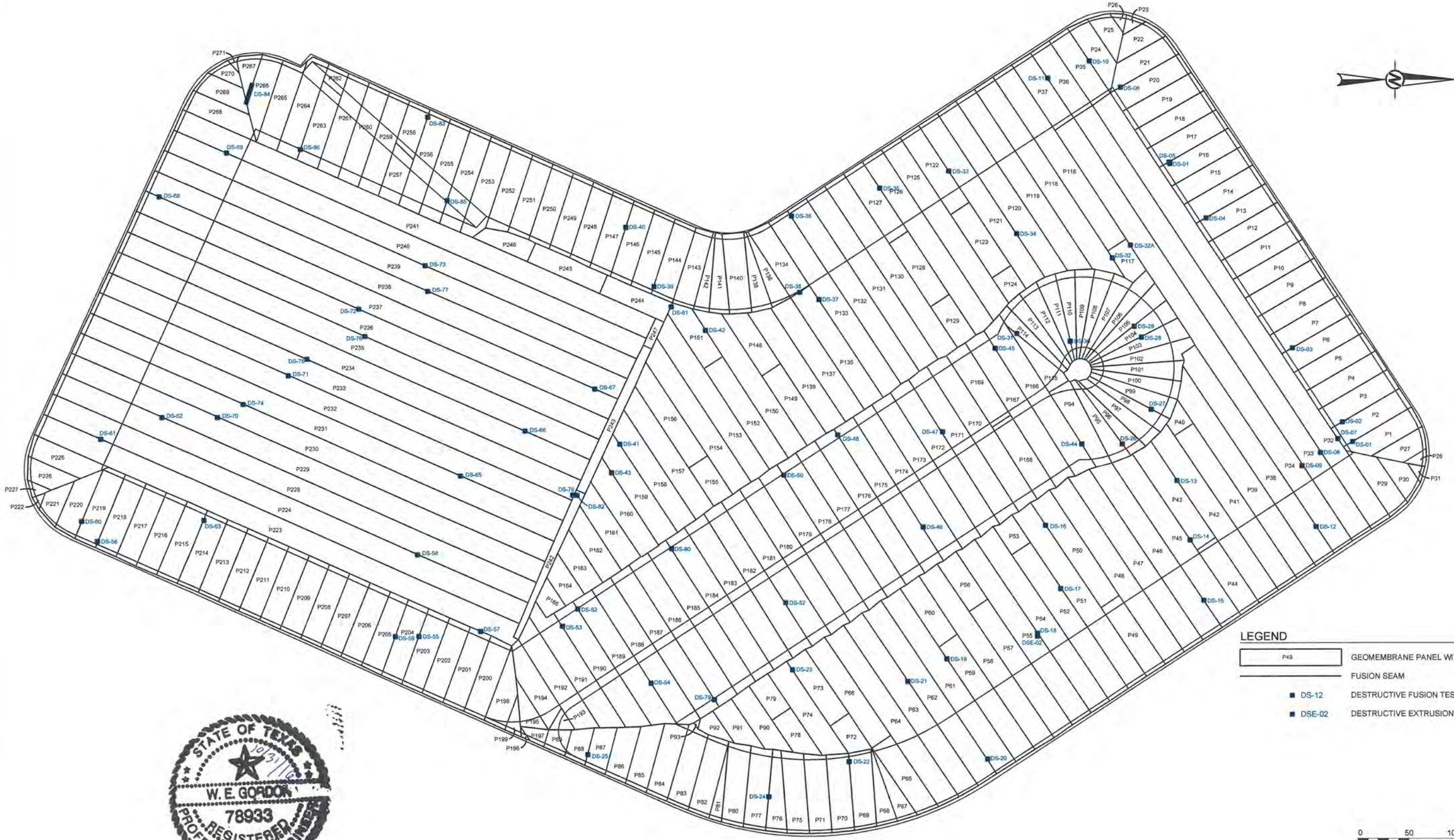


LEGEND

| | |
|---|---|
| P49 | GEOMEMBRANE PANEL WITH NUMBER |
| | FUSION SEAM |
| DS-12 | DESTRUCTIVE FUSION TEST LOCATION |
| DSE-02 | DESTRUCTIVE EXTRUSION TEST LOCATION |

0 50 100
1" = 100' FEET

STATE OF TEXAS
W. E. GORDON
78933
REGISTERED
PROFESSIONAL ENGINEER
10/31/16

CLIENT
LUMINANT

CONSULTANT
Golder Associates

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

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| PREPARED | TNB |
| REVIEWED | KR |
| APPROVED | WEG |

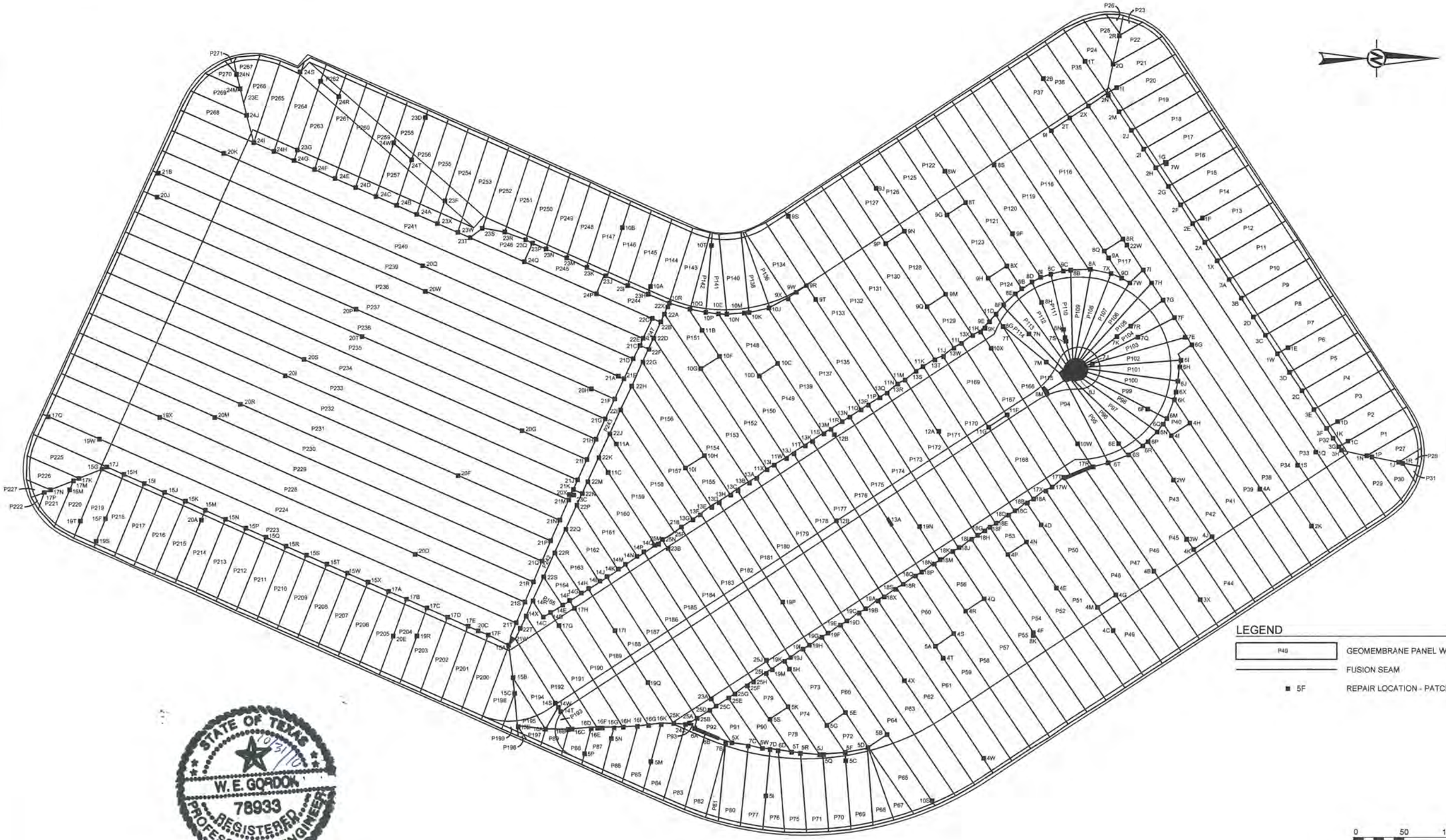
PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

TITLE
**DESTRUCTIVE LOCATIONS**

PROJECT NO. 1525714 | REV. ---- | FIGURE 8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Path: \\houston\data_2016 Projec...\049499 Pfizer Austin Ph II\0004 Excavation\Work Plans\Figures\ | File Name: 1525714d0004.dwg




STATE OF TEXAS
10/31/10
W. E. GORDON
78933
REGISTERED
PROFESSIONAL ENGINEER

**REPAIR COVERS**

| COVERING REPAIR | COVERED REPAIR |
|---|---|
| 1D | 1B |
| 2N | 2P |
| 2R | 2S |
| 6B | 6A, 7A |
| 7N | 7P |
| 8G | 11E |
| 11H | 14A |
| 11D | 14B |
| 17T | 6W, 20B, 20N |
| 18T | 18T |
| 18X | 18W |
| 23E | 24K |

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

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LUMINANT

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| PREPARED | TNB |
| REVIEWED | KR |
| APPROVED | WEG |

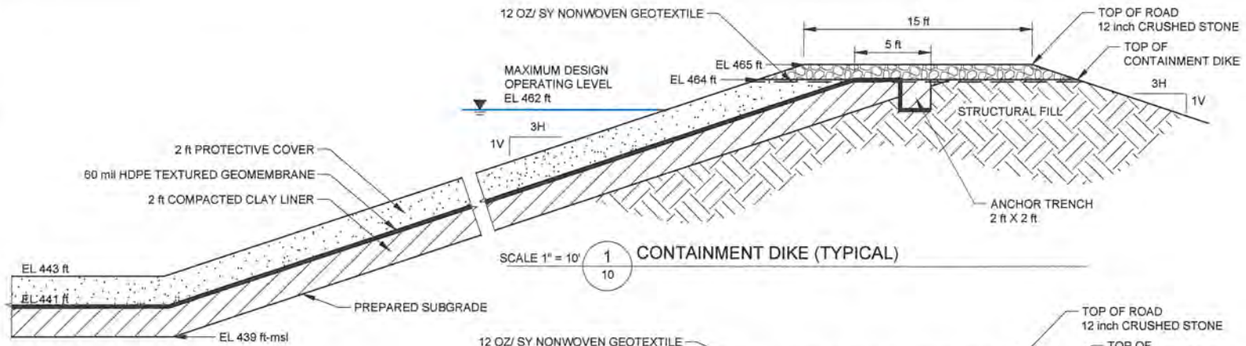
PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

TITLE
**REPAIR LOCATIONS**

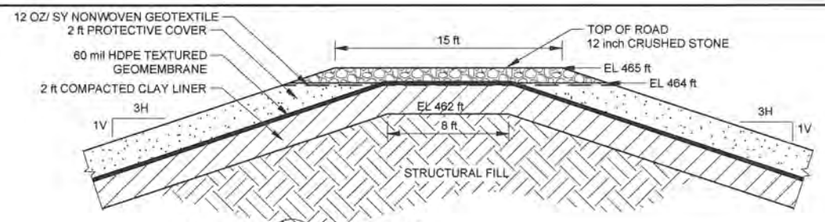
PROJECT NO. 1525714 | REV. ---- | FIGURE 9

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

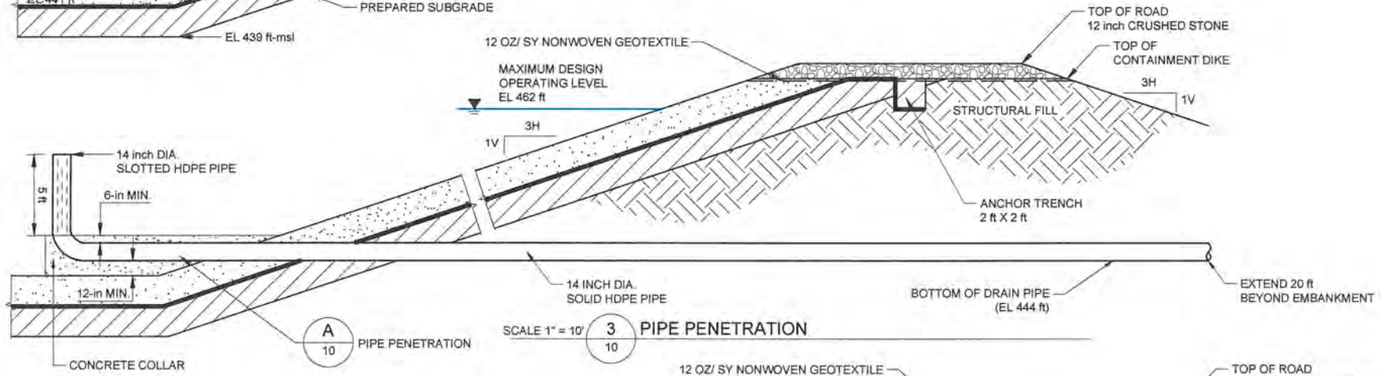
Path: \\houston\data_2016 Projects\549499 Pfizer Aubin Ph II\0004 Excavation\Work Plan\Figures\ | File Name: 1525714i0004.dwg




SCALE 1" = 10' 1/10 CONTAINMENT DIKE (TYPICAL)

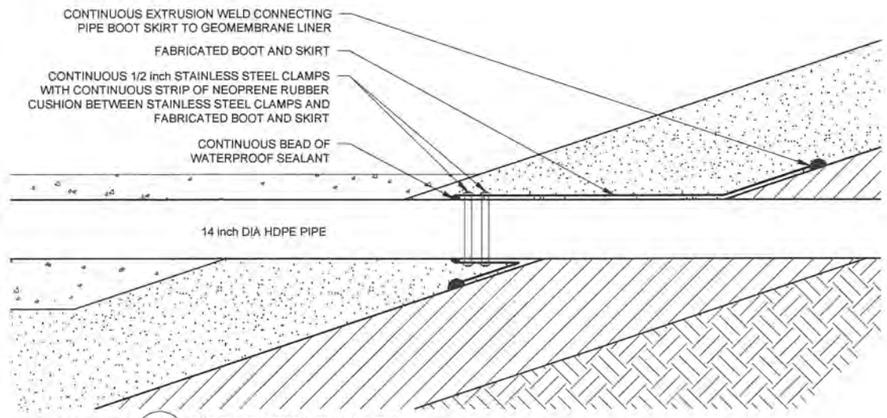



SCALE 1" = 10' 2/10 INTERBERM

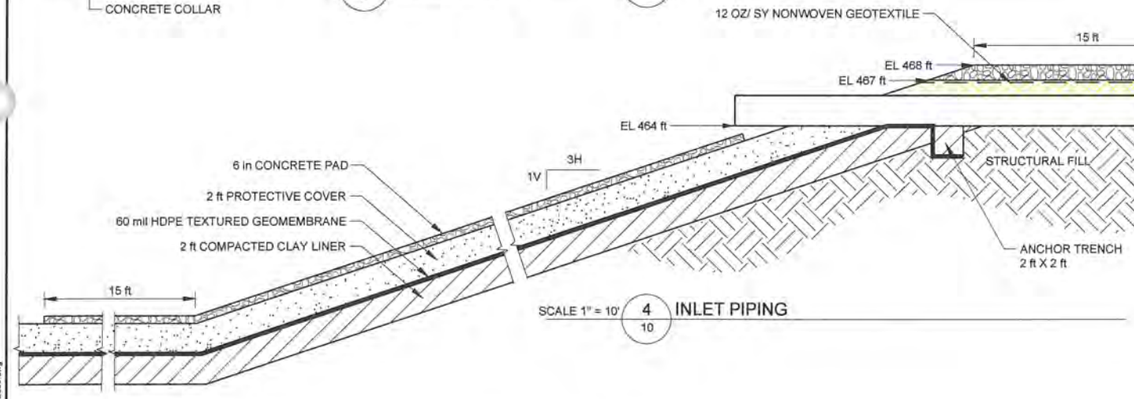



A/10 PIPE PENETRATION

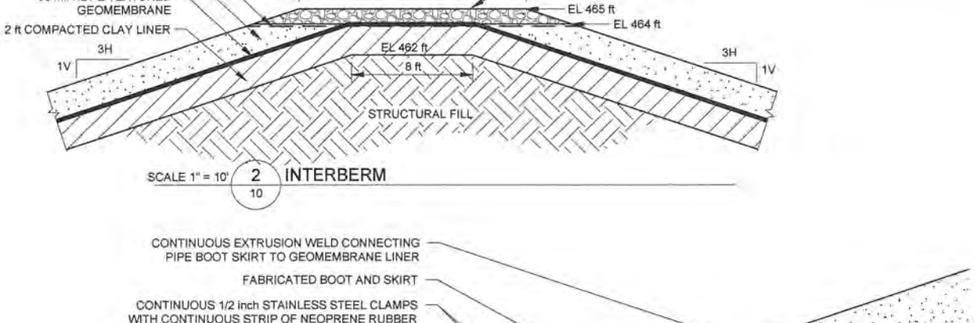
SCALE 1" = 10' 3/10 PIPE PENETRATION



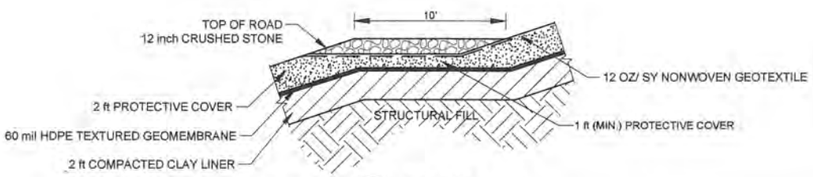

SCALE 1" = 3' A/10 PIPE PENETRATION DETAIL




SCALE 1" = 10' 4/10 INLET PIPING




SCALE 1" = 10' B/10 INLET PIPING DETAIL




SCALE 1" = 10' 5/10 ACCESS RAMP

0 1.5 3
SCALE FEET

0 5 10
SCALE FEET

STATE OF TEXAS
W. E. GORDON
78933
REGISTERED
PROFESSIONAL ENGINEER
10/31/16

APPENDIX E-Revision 1 November 21, 2022

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

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| DESIGNED | |
| PREPARED | TNB |
| REVIEWED | KR |
| APPROVED | WEG |

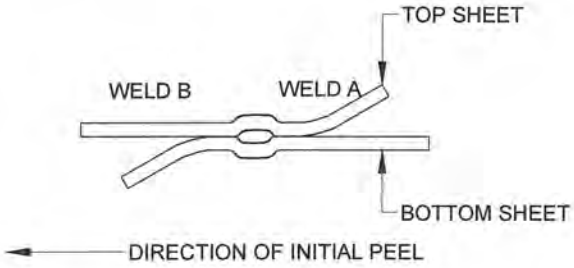
PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

TITLE
**TYPICAL DETAILS**

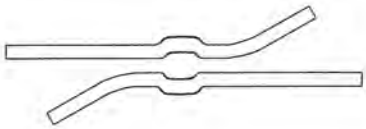
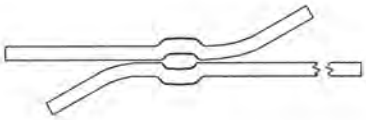
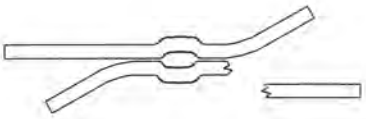
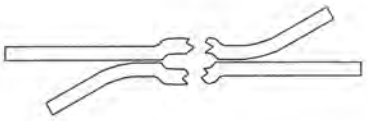
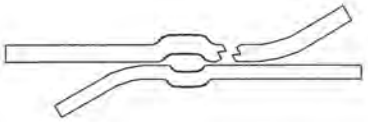
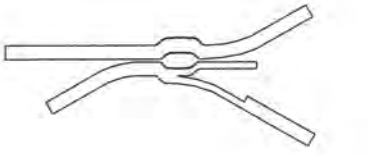
| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 1525714 | — | 10 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Path: \\houston\data_2016 Proje...\645499 Pfizer Austin Ph II\0004 Excavation\Work Plan\Figures\ | File Name: 1525714f0006.dwg




## SCHEMATIC OF UNTESTED SPECIMEN

| TYPES OF FAILURE | LOCUS-OF-BREAK CODE | BREAK |
|---|---|---|
|  | AD | ADHESION FAILURE. |
|  | BRK | BREAK IN SHEETING. BREAK CAN BE IN EITHER TOP OR BOTTOM SHEET. |
|  | SE1 | BREAK AT OUTER EDGE OF SEAM. BREAK CAN BE IN EITHER TOP OR BOTTOM SHEET. |
|  | SE2 | BREAK AT INNER EDGE OF SEAM THROUGH BOTH SHEETS. |
|  | AD-BRK | BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. BREAK CAN BE IN EITHER THE TOP OR BOTTOM SHEET. |
|  | SIP | SEPARATION IN THE PLANE OF THE SHEET. BREAK CAN BE IN EITHER TOP OR BOTTOM SHEET. |

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

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PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

CONSULTANT

| | |
|---|---|
| YYYY-MM-DD | 2016-04-07 |
| DESIGNED | |
| PREPARED | TNB |
| REVIEWED | KR |
| APPROVED | WEG |

TITLE
**FUSION CODES**

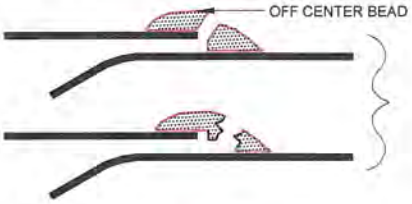
PROJECT NO. 1525714 | REV. ---- | FIGURE 11

APPENDIX E-Revision 1 November 21, 2022

Path: \\houston\data_2016 Proj\...\149498 PEner Austin Ph II\0004 Excavation\Work Plan\Figures\ | File Name: 1525714B006.dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0

# UNTESTED SPECIMEN
# EXTRUSION WELD WITH LEISTER HEAT SEAM

## LOCUS-OF-BREAK

| TYPES OF BREAK | CODE | BREAK DESCRIPTION |
|---|---|---|
| | AD1 | FAILURE IN ADHESION. SPECIMANS MAY ALSO DELAMINATE UNDER THE BEAD AND BREAK THROUGH THE THIN EXTRUDED MATERIAL IN THE OUTER AREA. |
| | AD2 | FAILURE IN ADHESION. |
|   | AD-WLD | BREAKS THROUGH THE FILLET. BREAKS THROUGH THE FILLET RANGE FROM BREAKS STARTING AT THE EDGE OF THE THE TOP SHEET TO BREAKS THROUGH THE FILLET AFTER SOME ADHESION FAILURE BETWEEN THE FILLET AND THE BOTTOM SHEET. |
| | SE1 | BREAK AT SEAM EDGE IN THE BOTTOM SHEET. SPECIMENS MAY BREAK ANYWHERE FROM THE BEAD/OUTER AREA EDGE TO THE OUTER AREA/ BUFFED AREA. (APPLICABLE TO SHEER ONLY). |
| | SE2 | BREAK AT SEAM EDGE IN THE TOP SHEET. SPECIMENS MAY BREAK ANYWHERE FROM THE BEAD/ OUTER AREA EDGE TO THE OUTER AREA/BUFFED AREA. (APPLICABLE TO SHEER ONLY). |
| | SE3 | BREAK AT SEAM EDGE IN THE BOTTOM SHEET. (APPLICABLE TO PEEL ONLY). |
| | BRK1 | BREAK IN THE BOTTOM SHEETING. A "B" IN PARENTHESIS FOLLOWING THE CODE MEANS THE SPECIMEN BROKE IN THE BUFFED AREA. (APPLICABLE TO SHEER ONLY). |
| | BRK2 | BREAK IN THE TOP SHEETING. A "B" IN PARENTHESIS FOLLOWING THE CODE MEANS THE SPECIMAN BROKE IN THE BUFFED AREA. |
| | AD-BRK | BREAK IN THE BOTTOM SHEETING AFTER SOME ADHESION FAILURE BETWEEN THE FILLET AND THE BOTTOM SHEET. (APPLICABLE TO PEEL ONLY). |
| | HT | BREAK AT THE EDGE OF THE HOT TACK FOR SPECIMENS WHICH COULD NOT BE DELAMINATED IN THE HOT TACK. |
| | SIP | SEPARATION IN THE PLANE OF THE SHEET. |

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FDG-C POND CQA
ROBERTSON COUNTY, TEXAS

CONSULTANT

| | |
|---|---|
| YYYY-MM-DD | 2016-04-07 |
| DESIGNED | |
| PREPARED | TNB |
| REVIEWED | KR |
| APPROVED | WEG |

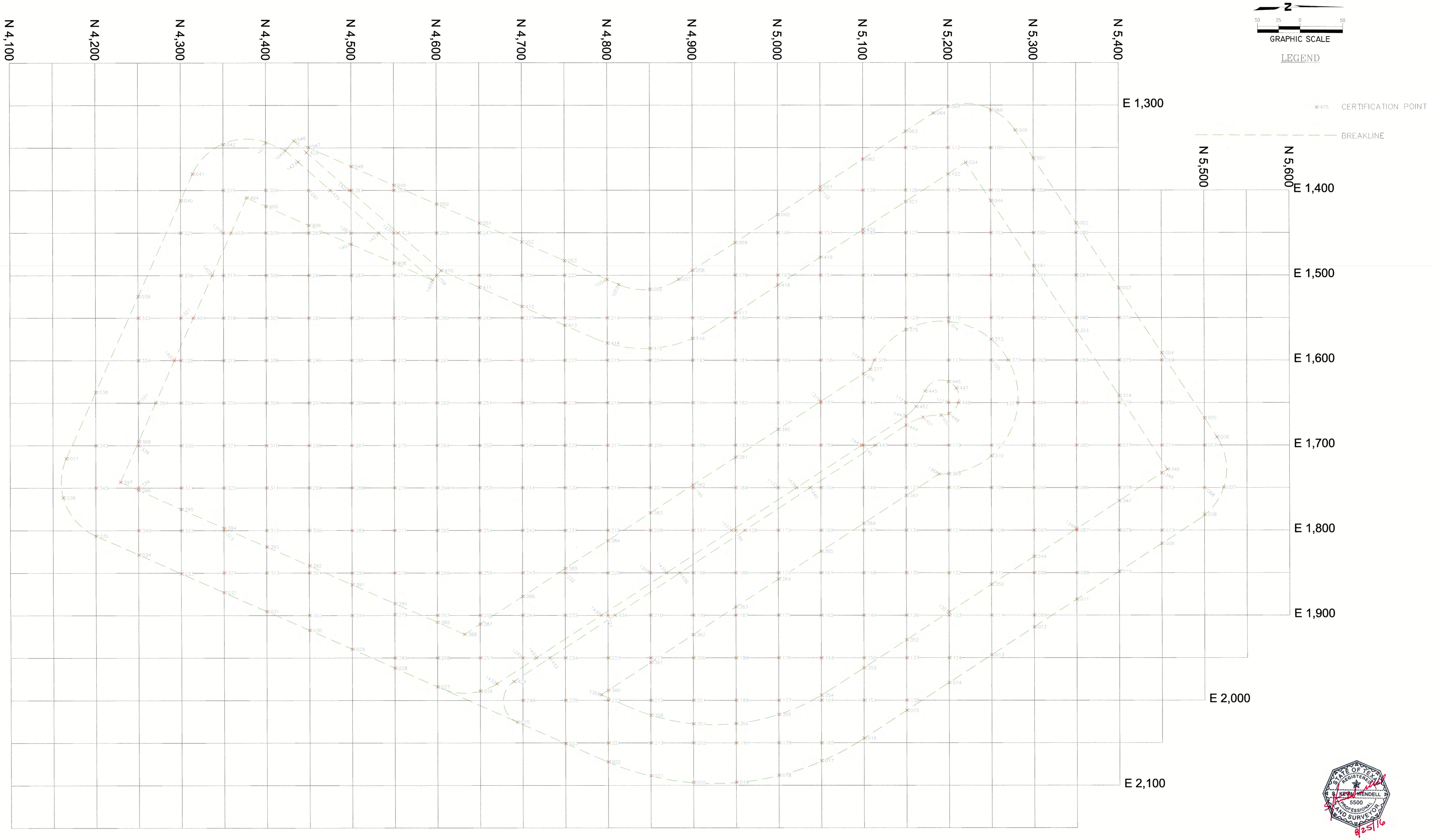
TITLE
**EXTRUSION CODES**

PROJECT NO. 1525714 | REV. ---- | FIGURE 12

APPENDIX E-Revision 1 November 21, 2022

Path: \\wcsalonfiles\...\49456 Pfizer Austin Ph II\0004 Excavation\Work Plan\Figures\ | File Name: 1525714B007.dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

APPENDIX E Revision 1 November 21, 2022




STATE OF TEXAS
REGISTERED
KEVIN WENDELL
5500
PROFESSIONAL
LAND SURVEYOR
9/25/16

| NO. | REVISIONS | BY | DATE |
|---|---|---|---|

PROJECT: GOLDER ASSOCIATES
OAK GROVE FGD POND C
JOB NUMBER: 35813-09
DATE: AUGUST 25, 2016
SCALE: 1"=50'
SURVEYOR: S.K.W.
TECHNICIAN: W.C.H.
DRAWING: 35813 FGD POND C.DWG
FIELDNOTES: N/A
PARTYCHIEF: J.SANDOVAL
FIELDBOOKS: 9999


SAM
SURVEYING•AERIAL MAPPING•ENGINEERING
7101 ENVOY COURT
DALLAS, TEXAS 75247
(214) 631-7888
Fax: (214) 631-7103
EMAIL: SAM@SAM.BIZ


# SUBGRADE AND CLAY LINER ELEVATIONS AS OF JULY 29, 2015 FGD POND C OAK GROVE POWER PLANT ROBERTSON COUNTY, TEXAS

SHEET 1 OF 2

DWG. NO.:35813-09

| POINT No. | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | CERT THICK |
|---|---|---|---|---|---|---|---|
| 1000 | 5278.62 | 1329.42 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1001 | 5300.00 | 1362.10 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1002 | 5350.00 | 1438.54 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1003 | 5400.00 | 1514.99 | 461.7 | 464.0 | 2.4 | 464.1 | 0.1 |
| 1004 | 5450.00 | 1591.43 | 461.7 | 464.0 | 2.4 | 464.1 | 0.1 |
| 1005 | 5500.00 | 1667.88 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1006 | 5514.74 | 1690.41 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1007 | 5522.71 | 1749.59 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1008 | 5500.00 | 1781.41 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1009 | 5450.00 | 1815.59 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1010 | 5400.00 | 1848.29 | 461.9 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1011 | 5350.00 | 1880.99 | 461.7 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1012 | 5300.00 | 1913.70 | 461.7 | 464.1 | 2.3 | 464.1 | 0.1 |
| 1013 | 5250.00 | 1946.40 | 461.8 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1014 | 5200.00 | 1979.11 | 461.8 | 464.1 | 2.3 | 464.1 | 0.1 |
| 1015 | 5150.00 | 2011.81 | 461.8 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1016 | 5100.00 | 2044.51 | 461.9 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1017 | 5050.00 | 2071.01 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1018 | 5000.00 | 2088.08 | 461.8 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1019 | 4950.00 | 2096.34 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1020 | 4900.00 | 2096.53 | 461.7 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1021 | 4850.00 | 2088.74 | 461.8 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1022 | 4800.00 | 2072.44 | 461.7 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1023 | 4750.00 | 2050.70 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1024 | 5220.61 | 1367.36 | 439.0 | 441.1 | 2.1 | 444.8 | 3.7 |
| 1025 | 4693.29 | 2025.51 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1026 | 4650.00 | 1989.13 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1027 | 4600.00 | 1984.07 | 461.9 | 464.1 | 2.1 | 464.1 | 0.1 |
| 1028 | 4550.00 | 1961.86 | 462.0 | 464.2 | 2.2 | 464.2 | 0.0 |
| 1029 | 4500.00 | 1939.65 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1030 | 4450.00 | 1917.44 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1031 | 4400.00 | 1895.23 | 461.7 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1032 | 4350.00 | 1873.02 | 461.7 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1033 | 4300.00 | 1850.81 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1034 | 4250.00 | 1828.60 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1035 | 4200.00 | 1806.31 | 461.9 | 464.3 | 2.4 | 464.3 | 0.0 |
| 1036 | 4161.78 | 1761.27 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1037 | 4165.38 | 1715.16 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1038 | 4200.00 | 1637.23 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1039 | 4250.00 | 1524.67 | 461.9 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1040 | 4300.00 | 1412.11 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1041 | 4313.95 | 1380.70 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1042 | 4350.00 | 1346.19 | 462.0 | 464.0 | 2.1 | 466.4 | 2.4 |
| 1043 | 4400.00 | 1344.10 | 462.0 | 464.0 | 2.1 | 466.1 | 2.1 |
| 1044 | 5250.00 | 1412.30 | 439.0 | 441.1 | 2.1 | 444.7 | 3.7 |
| 1045 | 4422.89 | 1353.23 | 462.0 | 464.1 | 2.2 | 466.2 | 2.0 |
| 1046 | 4432.81 | 1341.98 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1047 | 4450.00 | 1349.62 | 461.8 | 464.2 | 2.3 | 464.2 | 0.0 |
| 1048 | 4500.00 | 1371.83 | 461.8 | 464.1 | 2.2 | 464.1 | 0.1 |
| 1049 | 4550.00 | 1394.04 | 461.8 | 464.2 | 2.4 | 464.2 | 0.0 |
| 1050 | 4600.00 | 1416.25 | 461.7 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1051 | 4650.00 | 1438.46 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1052 | 4700.00 | 1460.67 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1053 | 4750.00 | 1482.88 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1054 | 4800.00 | 1505.09 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1055 | 4813.47 | 1511.06 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1056 | 4850.00 | 1516.68 | 461.7 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1057 | 4883.85 | 1504.79 | 461.7 | 464.0 | 2.4 | 464.1 | 0.1 |
| 1058 | 4900.00 | 1494.23 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1059 | 4950.00 | 1461.52 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1060 | 5000.00 | 1428.82 | 461.7 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1061 | 5050.00 | 1396.12 | 461.8 | 464.1 | 2.3 | 464.1 | 0.1 |
| 1062 | 5100.00 | 1363.41 | 461.7 | 464.2 | 2.5 | 464.2 | 0.0 |
| 1063 | 5150.00 | 1330.71 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1064 | 5182.66 | 1309.35 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1065 | 5200.00 | 1301.82 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1066 | 5250.00 | 1305.63 | 461.7 | 464.2 | 2.5 | 464.2 | 0.0 |
| 1067 | 5500.00 | 1700.00 | 456.1 | 458.3 | 2.2 | 460.6 | 2.3 |
| 1068 | 5500.00 | 1750.00 | 455.2 | 457.3 | 2.2 | 459.6 | 2.3 |
| 1069 | 5450.00 | 1600.00 | 460.2 | 462.5 | 2.3 | 464.7 | 2.2 |
| 1070 | 5450.00 | 1650.00 | 451.3 | 453.5 | 2.1 | 456.1 | 2.7 |
| 1071 | 5450.00 | 1700.00 | 442.2 | 444.3 | 2.1 | 447.7 | 3.4 |
| 1072 | 5450.00 | 1750.00 | 443.2 | 445.4 | 2.2 | 448.8 | 3.5 |
| 1073 | 5450.00 | 1800.00 | 457.6 | 459.7 | 2.1 | 461.7 | 2.0 |
| 1074 | 5400.00 | 1550.00 | 455.6 | 457.8 | 2.2 | 460.1 | 2.4 |
| 1075 | 5400.00 | 1600.00 | 446.5 | 448.6 | 2.1 | 451.9 | 3.3 |
| 1076 | 5400.00 | 1650.00 | 439.0 | 441.1 | 2.1 | 443.7 | 2.6 |
| 1077 | 5400.00 | 1700.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1078 | 5400.00 | 1750.00 | 438.9 | 441.0 | 2.1 | 443.0 | 2.0 |
| 1079 | 5400.00 | 1800.00 | 448.5 | 450.7 | 2.2 | 453.2 | 2.5 |
| 1080 | 5350.00 | 1450.00 | 459.9 | 462.0 | 2.1 | 464.3 | 2.3 |
| 1081 | 5350.00 | 1500.00 | 450.8 | 453.0 | 2.2 | 455.8 | 2.8 |
| 1082 | 5350.00 | 1550.00 | 441.7 | 443.8 | 2.1 | 447.4 | 3.6 |
| 1083 | 5350.00 | 1600.00 | 438.9 | 441.0 | 2.1 | 443.3 | 2.3 |
| 1084 | 5350.00 | 1650.00 | 439.0 | 441.2 | 2.3 | 443.4 | 2.2 |
| 1085 | 5350.00 | 1700.00 | 438.9 | 441.2 | 2.2 | 443.2 | 2.1 |
| 1086 | 5350.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.1 |
| 1087 | 5350.00 | 1800.00 | 439.4 | 441.6 | 2.2 | 444.9 | 3.3 |
| 1088 | 5350.00 | 1850.00 | 453.4 | 455.5 | 2.1 | 458.1 | 2.6 |
| 1089 | 5300.00 | 1400.00 | 455.1 | 457.1 | 2.0 | 459.9 | 2.7 |
| 1090 | 5300.00 | 1450.00 | 446.0 | 448.2 | 2.2 | 451.4 | 3.3 |
| 1091 | 5300.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 443.4 | 2.2 |
| 1092 | 5300.00 | 1550.00 | 439.0 | 441.0 | 2.1 | 443.7 | 2.7 |
| 1093 | 5300.00 | 1600.00 | 439.0 | 441.1 | 2.2 | 444.3 | 3.2 |
| 1094 | 5300.00 | 1650.00 | 439.0 | 441.1 | 2.1 | 443.6 | 2.5 |
| 1095 | 5300.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 444.0 | 2.8 |
| 1096 | 5300.00 | 1750.00 | 438.9 | 441.1 | 2.2 | 443.8 | 2.8 |
| 1097 | 5300.00 | 1800.00 | 438.9 | 441.0 | 2.2 | 443.3 | 2.3 |
| 1098 | 5300.00 | 1850.00 | 444.2 | 446.4 | 2.1 | 449.7 | 3.3 |
| 1099 | 5300.00 | 1900.00 | 458.2 | 460.4 | 2.2 | 462.7 | 2.3 |
| 1100 | 5250.00 | 1350.00 | 450.3 | 452.4 | 2.1 | 455.0 | 2.6 |
| 1101 | 5250.00 | 1400.00 | 441.2 | 443.5 | 2.3 | 446.7 | 3.3 |
| 1102 | 5250.00 | 1450.00 | 439.0 | 441.2 | 2.3 | 443.4 | 2.2 |
| 1103 | 5250.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 443.6 | 2.4 |
| 1104 | 5250.00 | 1550.00 | 438.9 | 441.1 | 2.2 | 443.9 | 2.8 |
| 1105 | 5250.00 | 1600.00 | 444.4 | 446.8 | 2.4 | 450.7 | 3.9 |
| 1107 | 5250.00 | 1700.00 | 441.8 | 444.0 | 2.2 | 447.3 | 3.3 |
| 1108 | 5250.00 | 1750.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1109 | 5250.00 | 1800.00 | 439.0 | 441.1 | 2.1 | 444.1 | 3.0 |
| 1110 | 5250.00 | 1850.00 | 438.9 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1111 | 5250.00 | 1900.00 | 449.1 | 451.2 | 2.1 | 454.3 | 3.0 |
| 1112 | 5200.00 | 1350.00 | 447.5 | 449.7 | 2.2 | 452.9 | 3.2 |
| 1113 | 5200.00 | 1400.00 | 439.0 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1114 | 5200.00 | 1450.00 | 438.9 | 441.0 | 2.1 | 443.5 | 2.5 |
| 1115 | 5200.00 | 1500.00 | 439.0 | 441.0 | 2.1 | 443.8 | 2.8 |
| 1116 | 5200.00 | 1550.00 | 439.0 | 441.2 | 2.2 | 443.6 | 2.5 |
| 1117 | 5200.00 | 1600.00 | 453.7 | 456.0 | 2.3 | 458.0 | 2.0 |
| 1118 | 5200.00 | 1650.00 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1119 | 5200.00 | 1700.00 | 449.9 | 452.1 | 2.2 | 455.2 | 3.1 |
| 1120 | 5200.00 | 1750.00 | 438.9 | 441.1 | 2.1 | 443.2 | 2.2 |
| 1121 | 5200.00 | 1800.00 | 439.0 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1122 | 5200.00 | 1850.00 | 438.9 | 441.1 | 2.2 | 443.6 | 2.5 |

| POINT No. | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | CERT THICK |
|---|---|---|---|---|---|---|---|
| 1123 | 5200.00 | 1900.00 | 439.9 | 442.0 | 2.1 | 445.7 | 3.7 |
| 1124 | 5200.00 | 1950.00 | 453.9 | 456.1 | 2.2 | 459.0 | 2.9 |
| 1125 | 5150.00 | 1350.00 | 456.6 | 458.9 | 2.3 | 461.4 | 2.5 |
| 1126 | 5150.00 | 1400.00 | 442.7 | 444.9 | 2.2 | 448.1 | 3.2 |
| 1127 | 5150.00 | 1450.00 | 438.9 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1128 | 5150.00 | 1500.00 | 439.0 | 441.0 | 2.1 | 443.6 | 2.6 |
| 1129 | 5150.00 | 1550.00 | 439.0 | 441.1 | 2.1 | 443.6 | 2.5 |
| 1131 | 5150.00 | 1650.00 | 458.3 | 460.5 | 2.2 | 463.5 | 3.0 |
| 1132 | 5150.00 | 1700.00 | 455.5 | 457.6 | 2.1 | 460.5 | 2.9 |
| 1133 | 5150.00 | 1750.00 | 441.5 | 443.6 | 2.1 | 447.4 | 3.8 |
| 1134 | 5150.00 | 1800.00 | 438.9 | 441.2 | 2.2 | 443.4 | 2.3 |
| 1135 | 5150.00 | 1850.00 | 438.9 | 441.1 | 2.2 | 443.9 | 2.8 |
| 1136 | 5150.00 | 1900.00 | 438.9 | 441.0 | 2.1 | 443.3 | 2.3 |
| 1137 | 5150.00 | 1950.00 | 444.8 | 447.0 | 2.2 | 450.4 | 3.4 |
| 1138 | 5150.00 | 2000.00 | 458.7 | 460.7 | 2.0 | 463.5 | 2.7 |
| 1139 | 5100.00 | 1400.00 | 451.8 | 454.0 | 2.1 | 456.7 | 2.8 |
| 1140 | 5100.00 | 1450.00 | 439.0 | 441.2 | 2.2 | 443.8 | 2.7 |
| 1141 | 5100.00 | 1500.00 | 438.9 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1142 | 5100.00 | 1550.00 | 439.0 | 441.1 | 2.1 | 444.1 | 3.0 |
| 1143 | 5100.00 | 1600.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1144 | 5100.00 | 1650.00 | 448.4 | 450.7 | 2.3 | 454.6 | 3.9 |
| 1145 | 5100.00 | 1700.00 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1146 | 5100.00 | 1750.00 | 450.6 | 452.8 | 2.1 | 456.2 | 3.4 |
| 1147 | 5100.00 | 1800.00 | 439.0 | 441.2 | 2.2 | 443.4 | 2.2 |
| 1148 | 5100.00 | 1850.00 | 438.9 | 441.1 | 2.1 | 443.1 | 2.1 |
| 1149 | 5100.00 | 1900.00 | 439.0 | 441.1 | 2.1 | 444.1 | 3.1 |
| 1150 | 5100.00 | 1950.00 | 438.9 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1151 | 5100.00 | 2000.00 | 449.6 | 451.9 | 2.2 | 455.2 | 3.3 |
| 1152 | 5050.00 | 1400.00 | 460.9 | 463.0 | 2.1 | 464.1 | 1.1 |
| 1153 | 5050.00 | 1450.00 | 447.0 | 449.2 | 2.2 | 452.0 | 2.9 |
| 1154 | 5050.00 | 1500.00 | 439.0 | 441.2 | 2.3 | 443.4 | 2.2 |
| 1155 | 5050.00 | 1550.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1156 | 5050.00 | 1600.00 | 439.0 | 441.1 | 2.1 | 444.0 | 2.9 |
| 1157 | 5050.00 | 1650.00 | 439.3 | 441.6 | 2.3 | 446.2 | 4.5 |
| 1158 | 5050.00 | 1700.00 | 453.2 | 455.4 | 2.2 | 459.1 | 3.6 |
| 1159 | 5050.00 | 1750.00 | 459.7 | 461.8 | 2.1 | 464.0 | 2.2 |
| 1160 | 5050.00 | 1800.00 | 445.8 | 448.0 | 2.2 | 451.8 | 3.8 |
| 1161 | 5050.00 | 1850.00 | 439.0 | 441.0 | 2.1 | 443.2 | 2.2 |
| 1162 | 5050.00 | 1900.00 | 439.0 | 441.1 | 2.1 | 443.5 | 2.4 |
| 1163 | 5050.00 | 1950.00 | 439.0 | 441.1 | 2.1 | 443.6 | 2.6 |
| 1164 | 5050.00 | 2000.00 | 440.7 | 442.8 | 2.1 | 447.0 | 4.2 |
| 1165 | 5050.00 | 2050.00 | 455.6 | 457.7 | 2.1 | 460.6 | 3.0 |
| 1166 | 5000.00 | 1450.00 | 456.1 | 458.3 | 2.2 | 460.5 | 2.3 |
| 1167 | 5000.00 | 1500.00 | 442.2 | 444.3 | 2.2 | 447.4 | 3.0 |
| 1168 | 5000.00 | 1550.00 | 439.0 | 441.1 | 2.1 | 443.5 | 2.3 |
| 1169 | 5000.00 | 1600.00 | 438.9 | 441.2 | 2.3 | 443.7 | 2.5 |
| 1170 | 5000.00 | 1650.00 | 438.9 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1171 | 5000.00 | 1700.00 | 444.1 | 446.3 | 2.2 | 450.8 | 4.5 |
| 1172 | 5000.00 | 1750.00 | 457.9 | 460.4 | 2.4 | 462.5 | 2.2 |
| 1173 | 5000.00 | 1800.00 | 454.9 | 457.1 | 2.2 | 460.0 | 2.9 |
| 1174 | 5000.00 | 1850.00 | 441.0 | 443.2 | 2.2 | 447.1 | 4.0 |
| 1175 | 5000.00 | 1900.00 | 439.0 | 441.1 | 2.2 | 443.4 | 2.3 |
| 1176 | 5000.00 | 1950.00 | 439.0 | 441.0 | 2.0 | 444.0 | 3.0 |
| 1177 | 5000.00 | 2000.00 | 438.9 | 441.0 | 2.1 | 443.3 | 2.3 |
| 1178 | 5000.00 | 2050.00 | 449.6 | 451.8 | 2.2 | 455.3 | 3.4 |
| 1179 | 4950.00 | 1500.00 | 451.3 | 453.6 | 2.3 | 455.9 | 2.3 |
| 1180 | 4950.00 | 1550.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.1 |
| 1181 | 4950.00 | 1600.00 | 439.0 | 441.1 | 2.1 | 443.1 | 2.0 |
| 1182 | 4950.00 | 1650.00 | 438.9 | 441.1 | 2.2 | 444.0 | 2.8 |
| 1183 | 4950.00 | 1700.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1184 | 4950.00 | 1750.00 | 448.9 | 451.1 | 2.2 | 455.1 | 3.9 |
| 1185 | 4950.00 | 1800.00 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1186 | 4950.00 | 1850.00 | 450.1 | 452.2 | 2.1 | 455.5 | 3.3 |
| 1187 | 4950.00 | 1900.00 | 439.0 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1188 | 4950.00 | 1950.00 | 438.9 | 441.1 | 2.1 | 444.2 | 3.1 |
| 1189 | 4950.00 | 2000.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1190 | 4950.00 | 2050.00 | 446.5 | 448.7 | 2.2 | 452.1 | 3.4 |
| 1191 | 5300.00 | 1488.75 | 439.0 | 441.1 | 2.2 | 445.0 | 3.9 |
| 1192 | 4900.00 | 1550.00 | 446.1 | 448.5 | 2.5 | 450.9 | 2.4 |
| 1193 | 4900.00 | 1600.00 | 438.9 | 441.2 | 2.2 | 443.2 | 2.0 |
| 1194 | 4900.00 | 1650.00 | 439.0 | 441.2 | 2.2 | 443.4 | 2.2 |
| 1195 | 4900.00 | 1700.00 | 438.9 | 441.1 | 2.2 | 443.1 | 2.0 |
| 1196 | 4900.00 | 1750.00 | 439.9 | 442.1 | 2.2 | 446.4 | 4.3 |
| 1197 | 4900.00 | 1800.00 | 453.7 | 455.9 | 2.2 | 459.5 | 3.5 |
| 1198 | 4900.00 | 1850.00 | 459.2 | 461.3 | 2.1 | 463.9 | 2.5 |
| 1199 | 4900.00 | 1900.00 | 445.3 | 447.5 | 2.2 | 451.0 | 3.6 |
| 1200 | 4900.00 | 1950.00 | 438.9 | 441.0 | 2.1 | 443.5 | 2.5 |
| 1201 | 4900.00 | 2000.00 | 439.0 | 441.2 | 2.2 | 443.8 | 2.6 |
| 1202 | 4900.00 | 2050.00 | 446.5 | 448.6 | 2.1 | 452.0 | 3.4 |
| 1203 | 4850.00 | 1550.00 | 450.7 | 453.1 | 2.3 | 455.5 | 2.4 |
| 1204 | 4850.00 | 1600.00 | 439.0 | 441.2 | 2.2 | 443.4 | 2.1 |
| 1205 | 4850.00 | 1650.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1206 | 4850.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 443.9 | 2.8 |
| 1207 | 4850.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 443.4 | 2.3 |
| 1208 | 4850.00 | 1800.00 | 444.6 | 446.9 | 2.3 | 450.8 | 4.0 |
| 1209 | 4850.00 | 1850.00 | 458.6 | 460.8 | 2.3 | 463.9 | 3.1 |
| 1210 | 4850.00 | 1900.00 | 454.3 | 456.6 | 2.3 | 459.6 | 3.0 |
| 1211 | 4850.00 | 1950.00 | 440.4 | 442.7 | 2.3 | 446.4 | 3.7 |
| 1212 | 4850.00 | 2000.00 | 439.0 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1213 | 4850.00 | 2050.00 | 449.5 | 451.6 | 2.2 | 454.3 | 2.7 |
| 1214 | 4800.00 | 1550.00 | 448.3 | 450.5 | 2.2 | 453.3 | 2.8 |
| 1215 | 4800.00 | 1600.00 | 438.9 | 441.2 | 2.3 | 443.3 | 2.1 |
| 1216 | 4800.00 | 1650.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1217 | 4800.00 | 1700.00 | 438.9 | 441.2 | 2.3 | 443.9 | 2.7 |
| 1218 | 4800.00 | 1750.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.1 |
| 1219 | 4800.00 | 1800.00 | 438.9 | 441.2 | 2.3 | 443.3 | 2.1 |
| 1220 | 4800.00 | 1850.00 | 449.4 | 451.6 | 2.2 | 455.3 | 3.7 |
| 1221 | 4800.00 | 1900.00 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1222 | 4800.00 | 1950.00 | 449.4 | 451.8 | 2.3 | 454.7 | 2.9 |
| 1223 | 4800.00 | 2000.00 | 439.9 | 442.0 | 2.1 | 446.0 | 4.0 |
| 1224 | 4800.00 | 2050.00 | 455.1 | 457.3 | 2.2 | 459.5 | 2.3 |
| 1225 | 4750.00 | 1500.00 | 456.8 | 458.9 | 2.1 | 461.0 | 2.0 |
| 1226 | 4750.00 | 1550.00 | 441.6 | 443.9 | 2.2 | 446.8 | 2.9 |
| 1227 | 4750.00 | 1600.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1228 | 4750.00 | 1650.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1229 | 4750.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 443.9 | 2.6 |
| 1230 | 4750.00 | 1750.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1231 | 4750.00 | 1800.00 | 438.9 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1232 | 4750.00 | 1850.00 | 440.4 | 442.5 | 2.1 | 446.7 | 4.1 |
| 1233 | 4750.00 | 1900.00 | 454.3 | 456.5 | 2.2 | 459.7 | 3.1 |
| 1234 | 4750.00 | 1950.00 | 458.6 | 460.9 | 2.2 | 463.5 | 2.6 |
| 1235 | 4750.00 | 2000.00 | 447.6 | 449.8 | 2.2 | 455.2 | 5.4 |
| 1236 | 4700.00 | 1500.00 | 450.1 | 452.2 | 2.1 | 454.8 | 2.6 |
| 1237 | 4700.00 | 1550.00 | 439.0 | 441.2 | 2.3 | 443.3 | 2.1 |
| 1238 | 4700.00 | 1600.00 | 438.9 | 441.2 | 2.3 | 443.3 | 2.1 |
| 1239 | 4700.00 | 1650.00 | 438.9 | 441.2 | 2.3 | 443.4 | 2.2 |
| 1240 | 4700.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 444.1 | 2.9 |
| 1241 | 4700.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1242 | 4700.00 | 1800.00 | 439.0 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1243 | 4700.00 | 1850.00 | 439.0 | 441.1 | 2.1 | 443.5 | 2.4 |
| 1244 | 4700.00 | 1900.00 | 445.2 | 447.5 | 2.3 | 451.2 | 3.7 |
| 1245 | 4700.00 | 1950.00 | 459.1 | 461.4 | 2.3 | 463.9 | 2.6 |

| POINT No. | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | CERT THICK |
|---|---|---|---|---|---|---|---|
| 1246 | 4700.00 | 2000.00 | 457.4 | 459.7 | 2.3 | 463.3 | 3.6 |
| 1247 | 4650.00 | 1450.00 | 458.5 | 460.7 | 2.3 | 462.8 | 2.0 |
| 1248 | 4650.00 | 1500.00 | 443.3 | 445.5 | 2.2 | 448.4 | 2.9 |
| 1249 | 4650.00 | 1550.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.2 |
| 1250 | 4650.00 | 1600.00 | 439.0 | 441.1 | 2.2 | 443.1 | 2.0 |
| 1251 | 4650.00 | 1650.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1252 | 4650.00 | 1700.00 | 438.9 | 441.1 | 2.2 | 443.8 | 2.7 |
| 1253 | 4650.00 | 1750.00 | 439.0 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1254 | 4650.00 | 1800.00 | 439.0 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1255 | 4650.00 | 1850.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.1 |
| 1256 | 4650.00 | 1900.00 | 438.9 | 441.1 | 2.2 | 443.6 | 2.4 |
| 1257 | 4650.00 | 1950.00 | 450.0 | 452.2 | 2.2 | 455.9 | 3.7 |
| 1258 | 4600.00 | 1450.00 | 451.7 | 453.9 | 2.2 | 456.0 | 2.1 |
| 1259 | 4600.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 444.9 | 3.7 |
| 1260 | 4600.00 | 1550.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1261 | 4600.00 | 1600.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1262 | 4600.00 | 1650.00 | 438.9 | 441.0 | 2.1 | 443.1 | 2.1 |
| 1263 | 4600.00 | 1700.00 | 439.0 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1264 | 4600.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.0 |
| 1265 | 4600.00 | 1800.00 | 439.0 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1266 | 4600.00 | 1850.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1267 | 4600.00 | 1900.00 | 439.0 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1268 | 4600.00 | 1950.00 | 451.6 | 453.8 | 2.2 | 456.2 | 2.4 |
| 1269 | 4550.00 | 1400.00 | 460.0 | 462.2 | 2.3 | 464.1 | 1.9 |
| 1270 | 4550.00 | 1450.00 | 446.1 | 448.4 | 2.3 | 451.5 | 3.1 |
| 1271 | 4550.00 | 1500.00 | 438.9 | 441.2 | 2.3 | 443.5 | 2.2 |
| 1272 | 4550.00 | 1550.00 | 438.9 | 441.1 | 2.1 | 443.1 | 2.1 |
| 1273 | 4550.00 | 1600.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.0 |
| 1274 | 4550.00 | 1650.00 | 439.0 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1275 | 4550.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.0 |
| 1276 | 4550.00 | 1750.00 | 438.9 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1277 | 4550.00 | 1800.00 | 439.0 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1278 | 4550.00 | 1850.00 | 439.0 | 441.1 | 2.1 | 443.6 | 2.4 |
| 1279 | 4550.00 | 1899.14 | 442.9 | 445.3 | 2.3 | 448.5 | 3.3 |
| 1280 | 4550.00 | 1950.00 | 458.4 | 460.5 | 2.2 | 462.6 | 2.1 |
| 1281 | 4500.00 | 1400.00 | 453.4 | 455.7 | 2.3 | 458.6 | 2.9 |
| 1282 | 4500.00 | 1450.32 | 443.0 | 445.4 | 2.4 | 448.3 | 2.9 |
| 1283 | 4500.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 443.5 | 2.3 |
| 1284 | 4500.00 | 1550.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1285 | 4500.00 | 1600.00 | 439.0 | 441.1 | 2.1 | 444.5 | 3.4 |
| 1286 | 4500.00 | 1650.00 | 438.9 | 441.1 | 2.2 | 443.8 | 2.7 |
| 1287 | 4500.00 | 1700.00 | 438.9 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1288 | 4500.00 | 1750.00 | 438.9 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1289 | 4500.00 | 1800.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.1 |
| 1290 | 4500.00 | 1850.00 | 439.0 | 441.1 | 2.1 | 443.1 | 2.0 |
| 1291 | 4500.00 | 1900.00 | 449.9 | 452.2 | 2.2 | 455.0 | 2.8 |
| 1292 | 4450.00 | 1400.00 | 451.4 | 453.6 | 2.2 | 456.2 | 2.7 |
| 1293 | 4450.00 | 1450.00 | 438.9 | 441.1 | 2.2 | 451.6 | 10.5 |
| 1294 | 4450.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 452.3 | 11.1 |
| 1295 | 4450.00 | 1550.00 | 438.9 | 441.1 | 2.2 | 450.2 | 9.0 |
| 1296 | 4450.00 | 1600.00 | 439.0 | 441.1 | 2.1 | 445.1 | 4.1 |
| 1297 | 4450.00 | 1650.00 | 438.9 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1298 | 4450.00 | 1700.00 | 439.0 | 441.1 | 2.1 | 443.1 | 2.1 |
| 1299 | 4450.00 | 1750.00 | 439.0 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1300 | 4450.00 | 1800.00 | 439.0 | 441.1 | 2.1 | 443.1 | 2.0 |
| 1301 | 4450.00 | 1850.00 | 441.5 | 443.8 | 2.2 | 446.8 | 3.1 |
| 1302 | 4450.00 | 1900.00 | 456.7 | 458.9 | 2.2 | 461.2 | 2.3 |
| 1303 | 5350.00 | 1565.19 | 439.0 | 441.1 | 2.2 | 444.8 | 3.7 |
| 1304 | 4400.00 | 1400.00 | 444.6 | 446.9 | 2.2 | 461.6 | 14.8 |
| 1305 | 4400.00 | 1450.00 | 439.0 | 441.2 | 2.2 | 457.8 | 16.6 |
| 1306 | 4400.00 | 1500.00 | 439.0 | 441.1 | 2.2 | 451.7 | 10.6 |
| 1307 | 4400.00 | 1550.00 | 439.0 | 441.2 | 2.1 | 444.4 | 3.3 |
| 1308 | 4400.00 | 1600.00 | 439.0 | 441.2 | 2.2 | 443.5 | 2.3 |
| 1309 | 4400.00 | 1650.00 | 438.9 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1310 | 4400.00 | 1700.00 | 439.0 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1311 | 4400.00 | 1750.00 | 438.9 | 441.0 | 2.1 | 443.3 | 2.3 |
| 1312 | 4400.00 | 1800.00 | 439.0 | 441.0 | 2.0 | 443.4 | 2.4 |
| 1313 | 4400.00 | 1850.00 | 448.2 | 450.5 | 2.3 | 453.1 | 2.6 |
| 1314 | 5400.00 | 1641.64 | 439.0 | 441.1 | 2.2 | 444.9 | 3.8 |
| 1315 | 4350.00 | 1400.00 | 448.4 | 450.7 | 2.3 | 459.7 | 9.0 |
| 1316 | 4350.00 | 1450.00 | 441.7 | 443.9 | 2.2 | 449.8 | 5.9 |
| 1317 | 4350.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1318 | 4350.00 | 1550.00 | 438.9 | 441.1 | 2.1 | 443.5 | 2.5 |
| 1319 | 4350.00 | 1600.00 | 438.9 | 441.2 | 2.3 | 443.3 | 2.1 |
| 1320 | 4350.00 | 1650.00 | 439.0 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1321 | 4350.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 443.5 | 2.4 |
| 1322 | 4350.00 | 1750.00 | 439.0 | 441.0 | 2.1 | 443.2 | 2.2 |
| 1323 | 4350.00 | 1800.00 | 439.8 | 442.1 | 2.3 | 445.6 | 3.5 |
| 1324 | 4350.00 | 1849.69 | 454.9 | 457.1 | 2.2 | 459.4 | 2.3 |
| 1325 | 4300.00 | 1450.00 | 456.8 | 459.1 | 2.2 | 461.4 | 2.4 |
| 1326 | 4300.00 | 1500.00 | 450.1 | 452.3 | 2.2 | 455.0 | 2.8 |
| 1327 | 4300.00 | 1550.00 | 443.3 | 445.6 | 2.3 | 448.8 | 3.3 |
| 1328 | 4300.00 | 1600.00 | 439.0 | 441.2 | 2.3 | 443.3 | 2.1 |
| 1329 | 4300.00 | 1650.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1330 | 4300.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.1 |
| 1331 | 4300.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1332 | 4300.00 | 1800.00 | 446.5 | 448.8 | 2.3 | 451.5 | 2.8 |
| 1333 | 4250.00 | 1550.00 | 458.6 | 460.8 | 2.2 | 463.2 | 2.4 |
| 1334 | 4250.00 | 1600.00 | 451.8 | 454.0 | 2.2 | 456.1 | 2.1 |
| 1337 | 4250.00 | 1650.00 | 445.1 | 447.4 | 2.3 | 450.4 | 3.0 |
| 1338 | 4250.00 | 1700.00 | 439.0 | 441.2 | 2.3 | 444.0 | 2.7 |
| 1339 | 4250.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 444.4 | 3.2 |
| 1340 | 4250.00 | 1800.00 | 453.3 | 455.6 | 2.3 | 458.1 | 2.5 |
| 1342 | 4200.00 | 1700.00 | 453.5 | 455.7 | 2.2 | 458.0 | 2.3 |
| 1343 | 4200.00 | 1750.00 | 448.8 | 451.0 | 2.2 | 454.1 | 3.1 |
| 1345 | 5456.72 | 1728.35 | 438.9 | 441.1 | 2.2 | 445.1 | 4.0 |
| 1346 | 5450.00 | 1732.75 | 438.9 | 441.1 | 2.2 | 444.4 | 3.3 |
| 1347 | 5400.00 | 1765.45 | 438.9 | 441.2 | 2.3 | 444.1 | 3.0 |
| 1348 | 5350.00 | 1798.16 | 438.9 | 441.1 | 2.2 | 444.5 | 3.3 |
| 1349 | 5300.00 | 1830.86 | 438.9 | 441.1 | 2.2 | 444.7 | 3.6 |
| 1350 | 5250.00 | 1863.57 | 438.9 | 441.1 | 2.2 | 444.6 | 3.5 |
| 1351 | 5200.00 | 1896.27 | 438.9 | 441.2 | 2.3 | 444.9 | 3.8 |
| 1352 | 5150.00 | 1928.97 | 438.9 | 441.1 | 2.2 | 445.0 | 3.9 |
| 1353 | 5100.00 | 1961.68 | 438.9 | 441.1 | 2.2 | 445.1 | 4.0 |
| 1354 | 5050.00 | 1994.08 | 439.0 | 441.2 | 2.2 | 445.2 | 4.0 |
| 1355 | 5000.00 | 2016.61 | 439.0 | 441.2 | 2.2 | 445.1 | 3.9 |
| 1356 | 4950.00 | 2027.23 | 439.0 | 441.2 | 2.2 | 445.0 | 3.8 |
| 1357 | 4900.00 | 2027.50 | 439.1 | 441.2 | 2.1 | 445.4 | 4.2 |
| 1358 | 4850.00 | 2017.43 | 439.4 | 441.6 | 2.2 | 445.0 | 3.5 |
| 1359 | 4791.92 | 1993.47 | 439.0 | 441.1 | 2.1 | 446.0 | 4.9 |
| 1360 | 4800.00 | 1988.18 | 438.9 | 441.1 | 2.2 | 445.4 | 4.3 |
| 1361 | 4850.00 | 1955.48 | 438.9 | 441.1 | 2.2 | 445.1 | 4.1 |
| 1362 | 4900.00 | 1922.77 | 438.9 | 441.0 | 2.1 | 445.2 | 4.1 |
| 1363 | 4950.00 | 1890.07 | 438.9 | 441.1 | 2.2 | 445.3 | 4.2 |
| 1364 | 5000.00 | 1857.37 | 438.9 | 441.1 | 2.1 | 445.3 | 4.2 |
| 1365 | 5050.00 | 1824.66 | 438.9 | 441.1 | 2.2 | 445.2 | 4.1 |
| 1366 | 5100.00 | 1791.96 | 439.0 | 441.1 | 2.2 | 445.0 | 3.9 |
| 1367 | 5150.00 | 1759.26 | 438.9 | 441.1 | 2.2 | 445.2 | 4.1 |
| 1368 | 5188.63 | 1733.99 | 439.0 | 441.1 | 2.1 | 445.4 | 4.3 |
| 1369 | 5200.00 | 1733.65 | 439.0 | 441.1 | 2.2 | 444.9 | 3.8 |
| 1370 | 5250.00 | 1712.52 | 438.9 | 441.2 | 2.3 | 445.0 | 3.9 |
| 1371 | 5281.40 | 1650.00 | 439.0 | 441.1 | 2.1 | 445.8 | 4.7 |

| POINT No. | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | CERT THICK |
|---|---|---|---|---|---|---|---|
| 1371 | 5281.40 | 1650.00 | 439.0 | 441.1 | 2.1 | 445.8 | 4.7 |
| 1372 | 5270.09 | 1600.00 | 439.0 | 441.1 | 2.2 | 446.3 | 5.2 |
| 1373 | 5250.00 | 1575.56 | 439.0 | 441.1 | 2.1 | 445.3 | 4.2 |
| 1374 | 5200.00 | 1554.43 | 438.9 | 441.1 | 2.1 | 444.5 | 3.4 |
| 1375 | 5150.00 | 1564.23 | 438.9 | 441.1 | 2.2 | 443.8 | 2.7 |
| 1376 | 5113.11 | 1600.00 | 438.9 | 441.1 | 2.2 | 445.7 | 4.6 |
| 1377 | 5108.00 | 1610.72 | 438.9 | 441.1 | 2.2 | 445.9 | 4.9 |
| 1378 | 5100.00 | 1615.95 | 438.9 | 441.1 | 2.2 | 445.8 | 4.7 |
| 1379 | 5050.00 | 1648.65 | 438.9 | 441.2 | 2.3 | 445.6 | 4.5 |
| 1380 | 5000.00 | 1681.36 | 438.9 | 441.1 | 2.2 | 445.6 | 4.5 |
| 1381 | 4950.00 | 1714.06 | 438.9 | 441.1 | 2.2 | 445.7 | 4.6 |
| 1382 | 4900.00 | 1746.77 | 438.9 | 441.1 | 2.2 | 445.8 | 4.7 |
| 1383 | 4850.00 | 1779.47 | 438.9 | 441.1 | 2.2 | 445.9 | 4.8 |
| 1384 | 4800.00 | 1812.17 | 438.9 | 441.1 | 2.2 | 445.4 | 4.3 |
| 1385 | 4750.00 | 1844.88 | 438.9 | 441.1 | 2.2 | 445.4 | 4.3 |
| 1386 | 4700.00 | 1877.58 | 438.9 | 441.1 | 2.2 | 445.1 | 4.0 |
| 1387 | 4650.00 | 1910.28 | 438.9 | 441.1 | 2.2 | 445.2 | 4.1 |
| 1388 | 4631.66 | 1922.28 | 438.9 | 441.2 | 2.3 | 447.6 | 6.5 |
| 1389 | 4600.00 | 1908.22 | 438.9 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1390 | 4550.00 | 1886.01 | 438.9 | 441.1 | 2.2 | 444.7 | 3.6 |
| 1391 | 4500.00 | 1863.80 | 438.9 | 441.1 | 2.2 | 444.7 | 3.6 |
| 1392 | 4450.00 | 1841.59 | 438.9 | 441.1 | 2.2 | 444.4 | 3.4 |
| 1393 | 4400.00 | 1819.38 | 438.9 | 441.1 | 2.2 | 444.6 | 3.5 |
| 1394 | 4350.00 | 1797.17 | 438.9 | 441.1 | 2.2 | 444.8 | 3.6 |
| 1395 | 4300.00 | 1774.96 | 438.9 | 441.1 | 2.1 | 444.3 | 3.2 |
| 1396 | 4250.00 | 1752.75 | 438.9 | 441.1 | 2.2 | 444.7 | 3.6 |
| 1397 | 4228.74 | 1743.30 | 438.9 | 441.2 | 2.2 | 445.5 | 4.4 |
| 1398 | 4250.00 | 1695.44 | 438.9 | 441.1 | 2.1 | 444.6 | 3.5 |
| 1399 | 4270.18 | 1650.00 | 438.9 | 441.1 | 2.2 | 444.6 | 3.4 |
| 1400 | 4292.39 | 1600.00 | 438.9 | 441.1 | 2.1 | 445.0 | 3.9 |
| 1401 | 4314.60 | 1550.00 | 438.9 | 441.1 | 2.1 | 444.8 | 3.7 |
| 1402 | 4336.81 | 1500.00 | 438.9 | 441.1 | 2.2 | 445.0 | 3.8 |
| 1403 | 4359.02 | 1450.00 | 438.9 | 441.1 | 2.2 | 451.6 | 10.4 |
| 1404 | 4377.31 | 1408.84 | 438.9 | 441.1 | 2.1 | 461.5 | 20.5 |
| 1405 | 4400.00 | 1418.92 | 438.9 | 441.1 | 2.2 | 461.0 | 19.9 |
| 1406 | 4450.00 | 1441.13 | 438.9 | 441.2 | 2.2 | 451.3 | 10.1 |
| 1407 | 4500.00 | 1463.34 | 438.9 | 441.1 | 2.1 | 444.4 | 3.4 |
| 1408 | 4550.00 | 1485.55 | 438.9 | 441.1 | 2.2 | 444.3 | 3.1 |
| 1409 | 4595.26 | 1505.66 | 438.9 | 441.1 | 2.1 | 444.5 | 3.4 |
| 1410 | 4605.18 | 1494.40 | 438.9 | 441.0 | 2.1 | 445.2 | 4.1 |
| 1411 | 4650.00 | 1514.31 | 438.9 | 441.1 | 2.2 | 444.3 | 3.2 |
| 1412 | 4700.00 | 1536.53 | 438.9 | 441.1 | 2.2 | 444.4 | 3.2 |
| 1413 | 4750.00 | 1558.74 | 438.9 | 441.1 | 2.1 | 444.8 | 3.7 |
| 1414 | 4800.00 | 1579.86 | 438.9 | 441.1 | 2.2 | 444.1 | 3.0 |
| 1415 | 4850.00 | 1586.17 | 438.9 | 441.2 | 2.2 | 444.4 | 3.3 |
| 1416 | 4900.00 | 1574.53 | 438.9 | 441.1 | 2.1 | 444.0 | 2.9 |
| 1417 | 4950.00 | 1544.36 | 438.9 | 441.1 | 2.2 | 444.3 | 3.1 |
| 1418 | 5000.00 | 1511.66 | 438.9 | 441.1 | 2.1 | 444.4 | 3.4 |
| 1419 | 5050.00 | 1478.95 | 438.9 | 441.1 | 2.1 | 444.5 | 3.5 |
| 1420 | 5100.00 | 1446.25 | 438.9 | 441.1 | 2.2 | 444.6 | 3.5 |
| 1421 | 5150.00 | 1413.55 | 438.9 | 441.1 | 2.2 | 444.6 | 3.5 |
| 1422 | 5200.00 | 1380.84 | 438.9 | 441.1 | 2.2 | 444.9 | 3.9 |
| 1423 | 4532.15 | 1450.00 | 447.3 | 449.5 | 2.2 | 451.6 | 2.1 |
| 1424 | 4554.83 | 1450.00 | 445.5 | 447.8 | 2.3 | 451.4 | 3.6 |
| 1425 | 4475.46 | 1400.00 | 454.8 | 457.0 | 2.2 | 459.1 | 2.1 |
| 1426 | 4498.13 | 1400.00 | 453.2 | 455.4 | 2.3 | 458.6 | 3.1 |
| 1427 | 4437.89 | 1366.61 | 459.9 | 462.0 | 2.1 | 464.1 | 2.1 |
| 1428 | 4447.68 | 1355.51 | 459.9 | 462.1 | 2.2 | 465.3 | 3.2 |
| 1429 | 4689.42 | 1977.67 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1430 | 4669.61 | 1980.30 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1431 | 4715.93 | 1950.00 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1432 | 4731.73 | 1950.00 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1433 | 4792.37 | 1900.00 | 461.9 | 464.2 | 2.3 | 464.2 | 0.2 |
| 1434 | 4808.17 | 1900.00 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1435 | 4868.81 | 1850.00 | 462.0 | 464.2 | 2.2 | 464.2 | 0.0 |
| 1436 | 4884.62 | 1850.00 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1437 | 4945.26 | 1800.00 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1438 | 4961.06 | 1800.00 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1439 | 5021.70 | 1750.00 | 461.9 | 464.2 | 2.3 | 464.2 | 0.0 |
| 1440 | 5037.50 | 1750.00 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1441 | 5098.15 | 1700.00 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1442 | 5113.95 | 1700.00 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1443 | 5150.00 | 1665.87 | 462.0 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1444 | 5150.00 | 1676.42 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1445 | 5172.40 | 1636.39 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1446 | 5200.00 | 1625.15 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1447 | 5208.90 | 1632.72 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1448 | 5211.40 | 1650.00 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1449 | 5200.00 | 1662.93 | 461.9 | 464.2 | 2.3 | 464.2 | 0.0 |
| 1450 | 5190.92 | 1664.71 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1451 | 5169.93 | 1667.24 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1452 | 5161.67 | 1654.60 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |

| NO. | REVISIONS | BY | DATE |
|---|---|---|---|

PROJECT: GOLDER ASSOCIATES
OAK GROVE FGD POND C
JOB NUMBER: 35813-09
DATE: AUGUST 25, 2016
SCALE: 1"=50'
SURVEYOR: S.K.W.
TECHNICIAN: W.G.H.
DRAWING: 35813 FGD POND C.DWG
FIELDNOTES: N/A
PARTYCHIEF: J.SANDOVAL
FIELDBOOKS: 9999

SAM
SURVEYING•AERIAL MAPPING•ENGINEERING
7101 ENVOY COURT
DALLAS, TEXAS 75247
(214) 631-7888
FAX: (214) 631-7103
EMAIL: SAM@SAM.BIZ

# SUBGRADE AND CLAY LINER ELEVATIONS
AS OF JULY 29, 2015
FGD POND C
OAK GROVE POWER PLANT
ROBERTSON COUNTY, TEXAS

STATE OF TEXAS REGISTERED PROFESSIONAL LAND SURVEYOR S. KEVIN WENDELL 5500
8/25/16

SHEET 2 OF 2

DWG. NO.: 35813-09

# APPENDIX A
# RESUMES OF GOLDER PROJECT PERSONNEL

# Golder Associates Inc. – Houston

## Employment History

***Golder Associates Inc. – Houston, Texas***
*Senior Engineer (1997 to Present)*

Project manager and certifying engineer for multi-disciplined civil engineering projects, including preparing contract documents and engineering reports, managing projects, conducting permitting studies, preparing construction plans, and providing construction management. Project management responsibilities included coordinating bidding activities, overseeing contractors, tracking project costs and performance, and supervising field staff performing construction and/or CQA activities.

Projects include:

- Preparing municipal solid waste landfill design plans and specifications
- Administrating contracts for municipal solid waste collection and transportation
- Providing plans and recommendations for improving operational efficiency in waste collection and transportation
- Conducting economic modeling of site operations and profitability
- Providing municipal solid waste landfill construction quality assurance
- Providing municipal solid waste landfill closure designs, cost estimating, and construction quality assurance
- Preparing industrial solid waste landfill design plans and specifications
- Providing industrial waste landfill construction quality assurance
- Preparing municipal solid waste landfill permit applications, amendments, and modifications
- Conducting environmental site assessments and compliance audits

***Harding Lawson Associates – Houston, Texas***
*Senior Engineer (1987 to 1997)*

Certifying engineer and project manager for geotechnical, environmental, and construction quality assurance for solid and hazardous waste and civil engineering projects in Texas. Numerous projects involved municipal solid waste landfill composite liner system construction quality assurance. Projects also included preparing municipal solid waste landfill permit amendments or modifications and preparing construction plans and specifications, environmental due-diligence, and monitor well installation.

Projects included:
– Prepared municipal solid waste landfill design plans and specifications
– Conducted municipal solid waste landfill construction quality assurance
– Prepared municipal solid waste landfill permit applications, amendments, and modifications
– Provided RCRA Superfund site remediation management
– Prepared hazardous waste landfill design plans and specifications
– Provided hazardous waste landfill construction quality assurance
– Conducted hydrogeologic investigations

## Education

*BS Mining Engineering, Texas A&M University, College Station, Texas, 1984*

*Continuing Education & Short Courses:*

*CSTS, Fort McMurray, Alberta, CA., 2011*

*OSSA, Fort McMurray, Alberta, CA., 2011*

*Workplace Hazardous Material Information System, Fort McMurray, Alberta CA., 2011*

*H2S Alive, Fort McMurray, Alberta Ca., 2011*

*MSHA Mine Safety Certificate, Surface Metal and Nonmetal , Denver Co, 2011*

*Geosynthetic Clay Liner University, 2008*

*Landfill Gas Systems Operations and Maintenance, 2004*

*Designing with Tensar Geogrids, 2004*

*Geosynthetics for Advanced Solutions, 1999*

*Landfill Gas System Engineering Design, Landtec Inc., 1994*

*Geosynthetics Installation CQA/CQC, National Seal Corp., 1993*

*Landfill Liner System Design and Construction, University of Florida, 1991*

*Hydrology and Sedimentology, New Mexico Department of Mining and Mineral Resources, 1986*

*Xerox – Critical Skills for Supervision, 1986*

*Clay Liners and Covers for Waste Disposal Facilities, University of Texas, 1989*

## Certifications

- Performed municipal solid waste groundwater monitoring and reporting
- Provided design plans and specifications for sludge drying basins
- Completed environmental site assessments and compliance audits

***Santa Fe Pacific Coal Corporation – Grants, New Mexico***
*Engineer (1985 to 1987)*

Mine engineer responsible for environmental compliance of a surface mining facility. Responsibilities included providing surface water control, construction designs and monitoring; providing reclamation plans, specifications, and supervision; placing segregated mine spoil into a 15 million cubic yard stockpile; completing annual environmental report production; and coordinating archaeological and biological surveys, as well as various drilling, blasting, and surveying projects. Served on drilling and blasting crew, coal seam boring crew, and was also an 85 ton coal haul driver.

## PROJECT EXPERIENCE – MUNICIPAL AND INDUSTRIAL WASTE LANDFILLS

| | |
|---|---|
| **Suncor**<br>Fort McMurray, Alberta, Canada | Construction site manager for the final closure construction of two monofills and the construction of a new landfill, roads and surface water management structures. Managed a crew of up to 40 people performing the construction. Provided bi-weekly reporting to Suncor management on site progress, safety and scheduling. |
| **Waste Collections and Transportation**<br>Abu Dhabi, United Arab Emirates | Provided waste collection and transportation contract administration for the Abu Dhabi Emirate, UAE. Provided contract management, evaluated requests for variances, provided recommendations for improving operations, reported to the Municipality regarding all phases of contractor activities and provided recommendations for contract revisions to improve services. Assisted in implementing electronic data management system to track contractor performance. Assisted contractors in revising manpower and equipment resources and allocation to improve services and response to requests from the public. |
| **Construction Management at Municipal and Industrial Solid Waste Landfills**<br>Various Locations, Texas | Provided construction management services during the construction of numerous municipal solid waste landfill cells and site expansions. Prepared bid packages and evaluated contractor bids, provided oversight of construction progress and costs, and reviewed contractor invoicing, including reviewing and approving contractor change orders and progress billings. |
| **Construction Quality Assurance of Municipal Waste and Industrial Waste Landfills**<br>Oregon, Texas, and Mexico | Certifying engineer and project manager for construction quality assurance activities during the installation of both clay and geosynthetic components of composite liner systems at numerous landfills in Texas, Oregon, and Mexico. Typical work includes preparing or reviewing construction plans and specifications, conducting preconstruction sampling and testing of both soils and geosynthetic components, reviewing manufacturers' quality control documentation for geosynthetic products, directing field monitoring staff during construction activities, providing technical guidance to construction contractors, and preparing certification documents for site owners to submit to regulatory agencies. |
| **Municipal Solid Waste Landfill Permit Application Preparation**<br>Fort Worth and Houston, Texas | Project manager for preparing major amendments for two municipal solid waste landfills in Texas. Managed all aspects of the applications, including location restrictions, hydrogeologic investigations, geotechnical investigations, preliminary designs, operating plans, soils and liner quality control plans, closure and post closure plans, leachate and contaminated water plans, and groundwater monitoring plans. Participated in regulatory agency technical negotiations and public hearings. |

**Municipal Solid Waste Landfill Operations**
Hawaii and Texas

Assist site operations personnel in site management and regulatory compliance of active landfill sites. Assist in planning construction activities, managing stormwater, and controlling traffic. Prepared responses to notices of violations received by site managers relating to operations or environmental issues. Prepared permit modifications to update existing facilities to current standards.

Prepared the operations manual for the remaining active life and closure of a municipal solid waste landfill constructed in volcanic rock in Hawaii. Plans included the Surface Water Management Plan, Interim Groundwater Monitoring Plan, Hazardous Waste Exclusion Plan, Asbestos Management Plan, and the Landfill Gas Migration Monitoring Plan. The site was located in volcanic rock containing lava tubes, which allowed local tidal variations to affect the groundwater elevations daily.

Site engineer for the daily operations of a municipal solid waste landfill in Texas. Typical duties included consulting on disposal plans and traffic management, determining construction sequencing for liner systems, conducting groundwater monitoring, and coordinating regulatory agency inspections of landfill operations and responses. Managed the construction quality assurance for clay soil liners in landfill cells. Prepared construction reports for submittal to state regulatory agencies.

**Municipal Solid Waste Landfill Acquisitions**
Arkansas, Mississippi, Tennessee, and Texas

Worked with site owners to evaluate construction and operating costs for both existing landfill sites and potential acquisitions. Evaluated construction costs, airspace utilization, compliance monitoring, operating, and closure and post closure costs for the anticipated site life of each facility.

Conducted site investigations, compliance history audits, and personnel interviews at several existing solid waste management facilities being evaluated as potential acquisitions by clients in Texas, Tennessee, and Arkansas. Prepared Environmental Due Diligence reports of the findings of these audits.

## PROJECT EXPERIENCE – RCRA HAZARDOUS WASTE SITE REMEDIATION

**Site Remediation**
Great Falls, Montana

Site manager for the remediation of two sites in Great Falls, Montana with a total of over seven hundred drums of RCRA classified hazardous waste from the early 1940's. Responsibilities included managing a crew of four technicians during the remediation process. Activities included the opening and characterization of each intact drum, with work conducted in "Level C" personal protective equipment including full face respirators, in sub-zero weather. Arranged for the disposal of the drums and approximately ten feet of affected soils from beneath the drum areas, and managed the transportation of the drums and affected soil to an approved disposal location. The sites were successfully cleaned and the work accepted by the regulatory agencies.

**Remedial Design**
Weslaco, Texas

Assistant project manager for preparing construction drawings and specifications for the remediation of The Munoz Borrow Pits State Superfund site in Texas. The project involved removing affected soils from approximately 2 acres of private land. Design included detailed excavation and sampling plans to guide the remediation effort as well as site drainage and reconstruction. Prepared the Sampling and Analysis Plan and the Quality Assurance Project Plan for the project.

**Remedial Construction**
San Antonio, Texas

Site engineer for the remediation of PCB-containing soils located beneath an underground transformer vault in San Antonio, Texas. The project involved installing an injected grout curtain into the subsurface gravel around the affected site to restrict the inflow of groundwater into the excavation. Subsequent to the installation of the grout curtain, the site was excavated and sampled until the analyses indicated PCBs below action levels.

## PROJECT EXPERIENCE – SITE ASSESSMENTS AND SURVEYS

**Environmental Site Assessments**
Arkansas, California, Louisiana, Tennessee, and Texas

Performed Phase I Environmental Site Assessments at several multi-family residential units in California.

Performed Phase I Environmental Site assessments at two industrial sites in Texas and Louisiana.

Performed a Phase I Environmental Site Assessment of a multi-story (40+ floors) office building in Houston, Texas.

Performed Environmental Due Diligence assessments at solid waste management sites in Arkansas and in Tennessee.

**Electrical Resistivity Surveys**
Alvin, Texas

Performed two electrical resistivity surveys at a municipal solid waste landfill in Texas. The surveys included both sounding and profiling data collected from 140 stations spaced 100 feet apart around the perimeter of an existing landfill. The purpose of the study was to investigate the possibility of leachate migration from the landfill. The data was compared to that from previous field surveys to identify indicators of possible leachate migration from the landfill. Prepared reports for each survey, which was submitted to and accepted by the state regulatory agencies.

## PROJECT EXPERIENCE – MINING

**Chevron Mining Inc**
New Mexico, USA

Onsite construction management of remediation activities at the McKinley County surface coal mine. Responsible for oversight of contracted crews performing major earthworks construction and assuring work conformed with the facility permit, applicable regualtions and project designs. Earthworks included segregated fill and grading operations moving in excess of 20,000 cubic yards daily, topsoil placement and seeding and drainage channel construction covering over approximatley 20 miles.

**Site Environmental Compliance**
Grants, New Mexico

Site engineer responsible for conducting the environmental monitoring and reporting all aspects of the operation of a surface coal mine in Grants, New Mexico. Prepared soil management and reclamation plans to manage excess overburden material. Performed soil sampling and classification in advance of the mining. Conducted NPDES monitoring of stormwater at outfalls around the facility. Conducted groundwater monitoring at wells around the site. Coordinated wildlife and endangered species investigations in advance of the mining operations. Oversaw cultural resources site investigations. Prepared annual reports to the regulatory agencies detailing the yearly operations and environmental activities.

**Site Operations**
Grants, New Mexico

Actively participated in numerous activities related to operating the coal mine. Conducted surveys for site layout and blasting patterns. Conducted coring operations of coal seams in advance of the mining operations and prepared reserve estimates. Performed soils testing of samples of overburden material to prepare the overburden management plan for the facility. Worked as a laborer on blasting and 85 ton coal hauling crews.

## TRAINING

***CSTS***
*Fort McMurray, Alberta, CA, 2011*

***OSSA***
*Fort McMurray, Alberta, CA, 2011*

***Workplace Hazardous Material Information System***
*Fort McMurray, Alberta, CA, 2011*

***H2S Alive***
*Fort McMurray, Alberta, CA, 2011*

***MSHA Mine Safety Certificate***
*Surface Metal and Nonmetal, Denver, CO, 2011*

## PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers

## Education

*Bachelor of Science Civil Engineering, Texas A&M University, Texas, 1980*

*Continuing Engineering Studies Landfill Leachate and Gas Management Design, University of Florida, 1992*

*Continuing Education Technical and Business Writing, Murray Associates, 1989*

*Continuing Engineering Studies Clay Liners and Covers for Waste Disposal Facilities, University of Texas, Texas, 1989*

## Certifications

*Professional Engineer, Arkansas #9447*

*Professional Engineer, Mississippi #14154*

*Professional Engineer, Louisiana #27506*

*Professional Engineer, Oklahoma #18401*

*Professional Engineer, Texas #62392*

## Languages

*English – Fluent*

# Employment History

***Golder Associates Inc. – Houston, Texas***
*Associate (1995 to Present)*

Responsibilities include engineering and managing environmental, geotechnical, and construction quality assurance (CQA) projects. Projects have involved design and CQA for coal power plant ash landfills and surface impoundments, and municipal solid and hazardous waste landfill construction including the design and CQA services for containment cells and landfill gas systems.

***Harding Lawson Associates – Houston, Texas***
*Senior Engineer (1986 to 1995)*

Responsibilities included engineering and managing various environmental, geotechnical, and construction quality assurance projects. Projects included:

- Municipal solid waste landfill construction quality assurance
- Hazardous waste landfill construction quality assurance
- Hazardous landfill site feasibility study
- Hydrogeologic investigations
- Geotechnical investigation and shallow foundation design
- Hazardous facility/unit closures
- Environmental site assessment and compliance audits
- Environmental site investigation and remediation
- Underground storage tank investigations and closures

***Fugro Inter, Inc. – Houston, Texas***
*Project Engineer (1980 to 1986)*

Responsibilities included engineering and managing offshore geotechnical projects. Projects included:

- Geotechnical investigation and foundation design for offshore platforms
- Jack-up rig foundation investigations

## PROJECT EXPERIENCE – POWER

Project Manager for a viewshed analysis for the potential vertical expansion of the Luminant Oak Grove SES Ash Landfill including providing the client with a viewshed map showing the Zone of Theoretical Visibility (ZTV). Photomontages were created showing the project expansion from selected viewpoints. The photomontages rendered views of the proposed expansion and were modeled based on the proposed design and project components. The landfill was superimposed over the photos collected in the field and faded back to show the features blocking the view towards the project (e.g. trees).

Project Manager providing engineering services related to the continuing development of the Luminant Oak Grove SES Ash Landfill. The scope of work included preparation of construction drawings and related documents to support construction of a 30 acre ash landfill cell.

Project manager and engineer of record providing construction quality assurance (CQA) during the construction of a 50 acre ash landfill cell, FGD Pond and Lignite Run-off Pond at the Luminant Oak Grove SES.

Project manager during a screening-level siting evaluation of three potential new flue gas desulfurization (FGD) effluent pond locations at the Luminant Oak Grove SES, including evaluation of constructed liner options and order-of-magnitude costs. The objective was to provide a subjective ranking of each site's suitability, focusing on location restrictions, along with providing budgetary estimates for differing liner designs and overall construction costs.

## PROJECT EXPERIENCE – MUNICIPAL AND HAZARDOUS WASTE LANDFILLS

**Landfill Gas Systems**

Prepared construction drawings and contractor bid documents for landfill gas systems. Directed construction quality assurance of construction services during landfill gas system installation.

**Design and Construction Quality Assurance of Municipal Waste Landfills**

Prepared construction drawings and contractor bid documents for containment cell constructions. Directed construction quality assurance during construction of compacted clay liners. Work has included sampling and testing preconstruction soil, reviewing construction specifications, directing field monitoring staff, providing technical guidance to construction contractors, and preparing certification documents for the owners and state agencies. Work has also included direct monitoring during the installation of geosynthetic liners.

**Hazardous Waste Landfill Site Feasibility Study**

Conducted a study in conjunction with a Material and Area Feasibility Study to evaluate site-specific requirements for the construction of a hazardous waste landfill to meet applicable federal, state, and local regulatory requirements. The study included:

evaluating waste types, volumes, and generation rates
evaluating regulatory criteria
determining specific site considerations and limitations
providing conceptual design alternatives
evaluating and screening of alternatives
designing facility layout
evaluating material quantities and availability
determining construction cost estimates and schedules
evaluating operation and maintenance requirements

**Construction Quality Assurance of Hazardous Waste Landfills**

Directed construction quality control during the construction of a hazardous waste landfill cell. Work included reviewing construction specifications, fulfilling daily project management duties, directing field technicians, reviewing field documentation, and communicating with landfill personnel.

**Construction and Testing of Soil Test Pads**

Directed the construction and subsequent testing of clay and betonite amended soil test pads. The purpose of the test pads was to establish construction procedures for landfill liner systems and to demonstrate that the pad, constructed under specific controlled repeatable conditions, could achieve a specified hydraulic conductivity. Testing procedures for determining hydraulic conductivity included sealed double-ring infiltrometers, Boutwell permeameters, and laboratory permeability tests on selected samples.

## PROJECT EXPERIENCE – REPRESENTATIVE PROJECTS

**Site Assessments**

Project Manager on over 20 environmental site investigations for underground storage tanks. Project included drilling and sampling soil borings, installing groundwater monitor wells, conducting site hydrogeologic characterizations, analyzing soil and groundwater, and providing recommendations for site remediation.

Project Engineer on a project for site characterization of an abandoned hazardous waste disposal site located in Niagara Falls, New York. Under strict health and safety protocol, conducted site exploration, which included completing a buried metals survey, drilling and sampling, and installing groundwater monitoring wells.

Project Engineer for environmental site investigation. Duties included drilling and sampling soil borings, installing groundwater monitoring wells, assessing soil and groundwater contamination, developing closure plan, and implementing clean-up of an abandoned pit containing paint manufacturing waste and solvents. Clean closure involved excavating and disposing of approximately 3,500 cubic yards of Class I and Class II waste.

Senior Engineer responsible for collecting and classifying soil samples on inactive artillery/firing ranges at Fort Ord Army Base. Analyzed soils for explosives and metals. The work was performed under strict health and safety protocol due to live ornaments and biohazards.

Project Manager responsible for assessing and cleaning of a chemical spill beneath a hospital building. The spill material was an x-ray film development solution.

Senior Engineer providing oversight and recommendations for the cleanup of a marsh adjacent to a Superfund site.

**Facility/Unit Closures**

Project Manager responsible for constructing of a clay test pad to establish the construction procedure for a clay cover and liner system. The test pad demonstrated that a cover and liner constructed under specific controllable and repeatable conditions could attain a hydraulic conductivity of 1 x 10-7 cm/sec or less, as determined by in-situ sealed double-ring infiltrometer (SDRI) testing performed as a part of this project. Four SDRI's were installed on the test pad. Prepared a report for the client to present to the Texas Water Commission.

Project Manager responsible for providing Construction Quality Control (CDC) during construction of a clay cover for a RCRA closure of two hazardous waste surface impoundments. Project duties included monitoring the construction operations, providing quality control to comply with project specifications, and communicating with the facility personnel and contractors.

Project Manager responsible for providing CQC during construction of a clay liner for a storm water pond facility. Project duties included monitoring the construction operations, providing quality control to comply with project specifications, and communicating with the facility personnel and contractors.

Senior Engineer responsible for the RCRA closure of a hazardous waste incinerator and feed tank. Project duties included supervising the field crew, monitoring the decontamination operations, collecting verification samples, and preparing and submitting the certification report to the Texas Water Commission.

Developed a closure and contingency plan for 16 hazardous waste treatment/storage units at an industrial wastewater treatment facility.

**Underground Storage Tanks**

Project Engineer for closure of a leaking underground storage tank (UST) discovered during construction of Metro's Northwest Transit Center project in Houston, Texas. Project included performing electromagnetometer and ground penetrating radar surveys to clear work areas of other USTs.

**Preliminary Site Assessments**

Performed an Environmental Hazardous Materials Site Assessment to identify potential environmental concerns at three truck stop sites. The assessment included reviewing the site history and available data, conducting a regulatory agency review, completing a site visit, and performing off-site reconnaissance.

Performed an environmental site assessment (ESA) to identify potential environmental concerns for properties prior to real estate transactions. The ESA included reviewing the site history and available data, conducting regulatory agency review, completing a site visit, and performing off-site reconnaissance.

**Landfill Construction**

Project Engineer responsible for providing CQC during the construction of two soil/bentonite test liners to establish the construction procedures for a landfill liner system. Provided significant guidance to the contractor who was inexperienced in constructing liners with soils available at the site. The purpose of the test liners was to demonstrate that the designed soil/bentonite liner, constructed under specific controlled repeatable conditions, could attain a hydraulic conductivity of 1 x 10-6 cm/sec or less. Intalled and monitored two in-situ sealed double-ring infiltrometer (SDRI) units on each test liner to determine the hydraulic conductivity.

Project Manager providing Construction Quality Assurance (CQA) services during construction of a cell at a hazardous waste landfill in Oklahoma. Duties included reviewing construction specifications, fulfilling daily project management duties, providing guidance for the field technicians, reviewing field reports and test results, and communicating with landfill personnel.

Project Manager responsible for overseeing construction of a clay liner for cell expansions at Type I and Type IV landfills. Project duties included monitoring the construction operations, providing quality control to comply with regulatory specifications, and submitting a soil liner evaluation report (SLER) to the state.

Project Manager responsible for providing CQC services during the initial construction of a landfill facility. The project included overseeing and monitoring site grading, constructing detention basins and drainage ditches, and observing and testing concrete poured for spillways, flow channels, and junction boxes.

Senior Engineer responsible for overseeing drilling and sampling pilot soil borings and designing and installing monitor wells for a new landfill facility.

**Construction Monitoring**

Project Engineering responsible for construction surveillance of new fluid milk plant in Austin, Texas. Project involved testing soil and concrete, preparing subgrade, and placing concrete for pavements and foundations. Duties included supervising field test fill, fulfilling daily project management duties, reviewing field reports and test results, and preparing periodic summary reports.

Performed construction surveillance for a jet engine test facility at Ellington Air Force Base, Texas. Project included conducting an on-site inspection of foundation construction and preparing subgrade.

Managed soil and concrete testing for a new church in Houston, Texas. Responsibilities included reviewing field technician's daily reports and test results.

**Geotechnical**

Project Manager responsible for conducting a geotechnical investigation to assess the stability of a containment dike surrounding an above-ground surface impoundment. Duties included supervising the drilling and sampling operations, assigning a laboratory testing program to determine the engineering characteristics of the soils, and preparing a report summarizing the field activities and laboratory testing.

Senior Engineer responsible for preparing a geotechnical and geological assessment for a proposed asbestos pit. Duties included supervising the soils investigation, assigning laboratory testing to evaluate the engineering characteristics of the subsurface soils, and preparing a report providing slope stability analyses and construction recommendations.

Managed field exploration to determine subsurface characteristics and to provide engineering design and construction recommendations for an extraneous water treatment plant for an expansion of a bromine facility in Magnolia, Arkansas.

Managed field exploration for geotechnical investigations at several gasoline service stations. Provided recommendations for foundation support of the service station facilities.

Performed geotechnical investigations for onshore exploratory drilling rigs. Used cone penetration testing (CPT), interpreted CPT data, and calculated axial capacities for pile foundations.

Participated in dynamic compaction investigation for levee design using cone penetration testing (CPT). Responsible for aquiring soils data and reporting.

Supervised more than 65 onshore and offshore projects including mobilization of equipment, site investigation and demobilization. Duties included classifying soil samples, performing field tests, and preparing field reports.

Performed engineering analyses and developed recommendations for foundation design on over 40 offshore projects. Analyses included axial pile capacity, lateral soil resistance, load transfer, mudline bearing capacity, and pile driveability.

Performed over 40 jack-up rig foundation investigations. Supervised drilling and soil sampling operations. Analyses included estimating leg penetrations after preloading, and assessing rig stability with respect to punch-through failure.

**Permitting**

Senior Engineer responsible for preparing the Engineering Report, Section III of the Texas Water Commission Permit Application for Hazardous Waste Storage/Processing/Disposal Facility (Part B instructions) for two hazardous waste impoundments.

## TRAINING

***SWANA Landfill Gas Systems Operation & Maintenance Training***

## PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers, Member

## Education

*Master of Science in Civil Engineering Geotechnical engineering emphasis, Purdue University, West Lafayette, 2011*

*Bachelor of Technology Civil Engineering, National Institute of Technology, Tiruchirapalli, India, 2009*

## Certifications

*Engineer in Training (EIT), May 2011*

## Languages

*English – Fluent*

*Hindi – Fluent*

# Golder Associates Inc. – Houston

***Geotechnical Engineer***

Varenya Kumar is a geotechnical engineer with over four years of experience in the consulting industry. His areas of interests include slope stability, deep foundations, earthquake engineering, mine-ore stockpiles, MSE Walls, CPTs, and ground improvement. At Golder, he has worked on projects serving the oil and gas, mining, waste management and urban infrastructure industries. The projects involved geotechnical exploration, geotechnical/earthquake engineering analyses and field assignments, focusing on foundations for onshore and offshore LNG terminals, stability of dams and landfills, probabilistic seismic hazard analysis, risk assessment, stability and drainage of leaching stockpiles, and mine tailings management. He has worked on research projects associated with MSE walls, compaction control and geotechnical change orders in construction.

# Employment History

***Golder Associates – Houston, Texas (Previously in Irvine, CA)***

*Geotechnical Engineer (2012 to Present)*

Involved in engineering analyses for projects serving the mining, oil and gas, waste management and urban infrastructure industries. Carried out geotechnical exploration, seismic hazard analysis, risk assessment, slope stability (for cut slopes, levees, stockpiles), tailings management, and foundation design. Field assignments include subsurface exploration - CPTu investigations and drilling in soils and rock - for assessing stability of mining pits and heap leach pads.

***Purdue University – West Lafayette***

*Teaching Assistant (2010 to 2010)*

Worked as a teaching assistant for geotechnical engineering course, CE-383. Was awarded the Nellie Munson Teaching Award and the Committee for Education of Teaching Assistants (CETA) Award for the year 2010.

***Purdue University – West Lafayette***

*Research Assistant (2009 to 2011)*

Handled research projects in geotechnical engineering that included field and laboratory testing, and engineering analyses. The different areas of work included assessing geotechnical properties of a backfill mixture for MSE walls, use of dynamic cone penetrometer testing for compaction control and analysing geotechnical change order data from pavement construction projects for the Indiana Department of Transportation.

## PROJECT EXPERIENCE – GEOTECHNICAL ENGINEERING

| | |
|---|---|
| **LNG Processing, Storage and Export Terminal**<br>Nova Scotia, Canada | Performed foundation design for the nearshore jetty and wharf. Characterized the site based on soils investigation, and determined design parameters. Designed pile foundations in rock sockets for resisting axial and very high lateral loads. |
| **Confidential Client**<br>Southwest US, USA | Geotechnical exploration and analysis at two separate mine sites, directed towards assessing the drainage conditions and stability of heap leach pads. Tasks involved on-site supervision of CPTu investigation, horizontal drilling, and piezometer installation for investigating and remediating slope movement. Performed analysis of CPTu data to determine soil properties and pore pressure conditions. Supervised the installation of vertical pumping wells as part of a drainage improvement program on the heap leach pad. Worked with hollow-stem auger, vertical air-hammer and horizontal drill rigs. |
| **Confidential Client**<br>Papua, Indonesia | Geotechnical design of two 50 km long tailings levees. The major tasks involved analysis of CPT, SPT, laboratory tests and surface wave (MASW) data. The data analysis was used to determine the soil properties across 94 sections for use in slope stability/deformation assessment, seepage evaluation, liquefaction analysis and foundation settlement on highly plastic clays. Performed static and seismic slope stability analysis using SLIDE for the levees. |
| **US Army Corps of Engineers**<br>Alaska, USA | Geotechnical analysis of a ring-levee system surrounding an airfield in Galena located in West-Central Alaska. The project was part of an emergency FEMA response to ice-jam floods that occurred in May 2013 in the village of Galena. Work involved analysing geotechnical data and performing levee stability, seepage, piping and liquefaction analysis under permafrost considerations, and providing appropriate repair measures and recommendations. |
| **Oak Grove Steam Electric Station**<br>Texas, USA | Conducted slope stability assessment on three flue gas desulpharization ponds to evaluate the ponds according to latest coal combustion residue regulations. |
| **LNG Processing, Storage and Export Terminal**<br>Cyprus | Involved in the characterization of the brownfield site, with existing fill and abandoned underground structures and foundations, and significant topographic relief. Processed borehole logs, CPT information, field and lab test data to characterize site topography. |
| **Cortez Mines**<br>Southwest US, USA | Geotechnical exploration for designing the mine pit slope and assessing stability of existing pits. Tasks included managing a rotary air-blast drill rig and, soils and rock core logging. |
| **Temple Landfill**<br>TX, USA | Geotechnical exploration and analysis for the permitting of proposed expansion at the Temple Waste Storage and Disposal Facility. Tasks include planning for geotechnical exploration, laboratory test assignment and review, stability and settlement analysis, and leachate collection system design. |
| **Confidential Client - Alvin, TX**<br>TX, USA | Performed design and construction quality control for remediation of a failed landfill slope containing chemical waste. Performed back analysis to identify the the causes of failure, and designed the repair and reconstruction. |

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| **Ridgecrest Landfill**<br>California, USA | Involved in the proposed design of the leachate collection and removal system. Used the HELP model to evaluate leachate drainage layer capacity and calculate leachate drainage rates for design. |
| **Simi Valley Landfill**<br>California, USA | Performed stability analyses for design of a landfill system. Used SLIDE 6.0 to conduct 2-D static and pseudostatic analyses for different landfill configurations. Designed landfill geometry and seismic berms under site constraints, by computing the static and pseudo-static factors of safety and seismic displacement. Performed pile design for a settlement mitigation effort for the weight scales at the landfill. |
| **Elkwater and Bullshead Lakes, Alberta**<br>Alberta, Canada | Evaluated the applicability of past dam safety reviews for two dams based on current data and field observations. Conducted static slope stability analysis for the two dams under relevant loading conditions to assess the dams' compliance with design guidelines. |
| **PAN Mine**<br>Nevada, USA | Performed construction quality control assurance for subgrade, liner and overliner placement for a heap leach pad. |
| **Battle Mountain Mine**<br>Nevada, USA | Construction quality assurance for liner/overliner installation for tailings management facility. |
| **Anchorage YMCA Site**<br>Alaska, USA | Designed a lightweight foundation for the storm drain system at the site. Design involved use of geofoam foundations for seating the storm drain system on peat. Manhole foundation was also designed with geotextile/geogrid reinforced soil embankment resting on underlying soft ground. |
| **Barrow-Atqasuk Powerline**<br>Alaska, USA | Involved in the conceptual geotechnical design of a powerline between Atqasuk and Barrow in Northern Alaska. Work includes design of a laboratory testing scheme for determining adfreeze strength of a fibre-reinforced polymer (FRP) pole material with slurry and estimating compressive strength of the polymer pole under compressive loads from freezing slurry. Laboratory testing was performed in a specially designed soil tank to estimate compressive hoop stresses acting on the FRP pole. Adfreeze strength between FRP and slurry was estimated by custom-designed direct shear tests. |
| **Indiana Department of Transportation**<br>West Lafayette, Indiana | Masters Thesis on geotechnical properties of tire shred-sand mixture for its use as backfill material for MSE walls. Determined the shear strength of the mixture and estimated the pullout resistance of various reinforcements embedded in the mixture. |
| **Indiana Department of Transportation**<br>Indiana, USA | Use of dynamic cone penetrometer testing for subgrade compaction control. Was involved in DCP testing and data collection across various sites in Indiana, for assessing the use of DCP in place of nuclear gauge testing for compaction control. |
| **Indiana Department of Transportation**<br>Indiana, USA | Analysis of geotechnical change orders in INDOT projects for 5 years between 2003 and 2007. A case-by-case investigation was carried out to determine the major geotechnical reasons for change orders in pavement and bridge construction projects. Tasks involved data analysis and geotechnical assessment of various change orders recorded in the 5-year period. |

## PROJECT EXPERIENCE – EARTHQUAKE/SEISMIC ENGINEERING

**High Commission of Canada Sites**
New Delhi, India

Performed a detailed site-specific seismic hazard analysis for the Canadian consulate building and the residence of the High Commissioner in New Delhi, as part of a retrofit effort on the structures. Used EZFrisk 7.6 to perform the deterministic and probabilistic seismic hazard analysis.

**Jack Hills Expansion Project**
Jack Hills, Australia

Performed seismic hazard analysis for a site located in Western Australia. Carried out deterministic and probabilistic seismic hazard analysis using EZFrisk 7.6, for the proposed expansion of mining and tailing facilities at the site.

**Confidential Client**
Jakarta, Indonesia

Part of the team performing probabilistic seismic hazard analysis for a land reclamation project. Involved in collecting and processing historic earthquake data and determining the seismic sources and source parameters, around the site.

**Fairbanks Natural Gas Plant**
Alaska, USA

Involved in the site-specific probabilistic seismic hazard analysis for a liquified natural gas tank located in Fairbanks

## PROJECT EXPERIENCE – RISK

**Confidential Client**
Southwest US, USA

Performed a preliminary risk assessment of 25-30 run-of-mine stockpiles under leaching. Tasks included collection and review of data from all stockpiles, performing geotechnical stability analysis using SLIDE, and risk evaluation based on stability, importance and consequence.

## PROJECT EXPERIENCE – PROJECT MANAGEMENT

**Morenci, AZ**
AZ, USA

Geotechnical assessment of a run-of-mine stockpile to assess its stability and the possibility of side-slope leaching. Project includes a field program for sonic drilling and sampling on the stockpile, piezometer installation, laboratory testing, stability and run-out analysis for the stockpile. Managed the entire project from proposal to issue of final report.

**Galena Park, TX**
Texas, USA

Geotechnical exploration and foundation design recommendations for the construction of a vapour construction unit near the ship channel. Managed the fieldwork, analysis and report writing for the project.

## TRAINING

***Houston Basic Plus Safety Training***
*Houston Area Safety Council, 12/2015*

***OSHA 40 hr HAZWOPER***
*Compliance Solutions, 12/2015*

***OSHA 10 hr Construction***
*Online, 2013*

***MSHA 24 hr training for surface, construction, metal and non-metal mining***
*Rio Tinto/US Borax Mine, Boron, CA, 2014*

## SUPPLEMENTAL SKILLS

***Professional Software and programming***
*SLIDE, GeoStudio, EZ-Frisk, gINT, Pygmy, Grapher, Kaleidagraph, Surfesis, EZstrobe and Minitab.*
*Programming: 'The Statistics R package' and C++.*

## PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers

## PUBLICATIONS

**Conference Proceedings**

Hsiao, Evan, Varenya Kumar, Feng Li, Alan Hull and Donald Lowry. 2013. *Site-Specific Seismic Hazard Analysis in the Low Historical Seismicity Region of Western Australia.* NZSOLD/ANCOLD 2013 Conference, November. , November. Rotorua, New Zealand.

**Journal Articles**

D. Mohan, Varenya Kumar et al. Pullout capacity of ladder-type metal reinforcements in tire-shred sand mixture. *Construction and Building Materials*, JCBM 7888 (2016)

Balunaini, Umashankar, Varenya Kumar D Mohan, Monica Prezzi and Rodrigo Salgado. Large Scale Direct Shear Testing on Tire Shred-Sand. *Proceedings of the ICE*, Article GE-D-13-00097R1 (2014)

Prezzi, Monica and Varenya Kumar Duvvuru Mohan. Construction of MSE Wall Using Tire Shred-sand Mixture as Backfill (SPR-3470). *JTRP Other publications and reports*, 10.5703/1288284314675 (2011)

Duvvuru Mohan, Varenya Kumar, Monica Prezzi and Bob McCullouch. Analysis of Change Orders in Geotechnical Engineering Work at INDOT. *Joint Transportation Research Program, INDOT and Purdue University*,

10.5703/1288284314623 (2011)

## Education

*AA Computer and Electronic Engineering, ITT Technical Institute*

## Certifications

*TWIC , 10/29/2015*

*HAZMAT, 03/19/2015*

*Nuclear Gauge Safety, 03/19/2015*

*40 Hour HAZWOPER, 03/27/2015*

*360 Training - OSHA 10 hour Construction Industry, 03/17/2015*

## Languages

*French – Fluent*

*English – Fluent*

# Golder Associates Inc. – Houston

# Employment History

### *Golder Associates Inc. – Houston, TX*

*Field Technician (03/2015 to Present)*

Mr. Sylla's responsibilites include conducting environmental monitoring activities; soils and geosynthetics field observations and testing for containment system construction; construction observation, in-place soil testing, obtaining soil samples for laboratory testing, geosynthetic monitoring and other construction monitoring activities as needed;
Mr. Sylla also assistances with field work for geotechnical and other environmental projects.
*Concrete testing , in accordance with ASTM regulations.
*Soil tesing in the lab in accordance with ASTM regulations.
*Lab sample shipment and data sheet completion while in the field.
*Proper field form docu entation for reporting purposes.
*Communication with Project Managers for all aspects of work load.
*Preparation of project JSAs prior to starting field related activities.

### *Fugro Roadware – Houston, TX*

*Field Service Technician (02/2014 to 01/2015)*

Mr. Sylla operated and maintained multi computerized data acquisition systems to collect real time data over roadways. His responsibilities included meeting data collection quotas accurately, daily vehicle and test equipment checks, calibrations, operation, data QC checking, processing and storage, completing scheduled maintenance and data shipments and associated administrative work. He also developed data collection routes in different areas to facilitate collection, performed regular surveys and facilitated collection data, and performed daily vehicle and test equipment checks, calibrations, operation, data QC checking, processing and storage, completing scheduled maintenance and data shipments and associated administrative work. Mr. Sylla monitered various collection areas. He was responsible for troubleshooting computers and any associated electronics, and preparaing JSAs prior to starting field related activities.

### *Transcore – Houston, TX*

*Field Service Technician (03/2013 to 01/2014)*

Mr. Sylla's was responbile for the installation, preventive and corrective maintenance of equipment including but not limited to traffic controllers, CCTV cameras, switches, fiber optic patch panels, cabling, various terminal blocks, roadway signage and lighting. He assisted in repairing HOV lane equipments to operational status as quickly as possible. His responsibilites also included traffic control placement in high or low speed environments, installation, preventive and corrective maintenance of toll collection equipment to include computers, video surveillance equipments and network communication equipments. He was also responsible for completing reports, logs and performing shift-to-shift communications in accordance with established policies, reporting technical status of system with accuracy and completeness. Mr. Sylla maintained spare

equipment and parts including inventory management and filed work orders electronically.

### *TD Williamson Inc. – Houston, TX*

*Field Service Technician (02/2012 to 08/2012)*

Mr. Sylla was responsible for basic troubleshooting, installation, maintenance and service repair needs on pipeline inspection tools. He assembled mechanical components and electrical wiring to test inspection tools. Mr. Sylla also prepared project logistics, managed front-end and back-end mobilation phases, and supervised survey execution in regards to both company personnel and client personnel. More repsonsbilites included launching and receiving the inspection tools in accordance to the client's specifications, validating the survey data and check for completeness and whether the quality is sufficient for data processing, facilitating all pre-job safety meetings with the client and contractors, completing all field reports for data evaluation, and preparing project JSAs prior to related field activities.

### *Rosen USA Inc. – Houston, TX*

*Field Service Technician (05/2009 to 12/2011)*

Mr. Sylla launched and received pipeline inspection tools on onshore and offshore. He was also responsible for pipeline cleaning services using corrosion tools such as MFL, GEO, CDP, AFD, EGP, UT and EMAT. As a field technician, Mr, Sylla facilitated all pre-job safety meetings with clients and contractors, performed site visits and briefings with the client onsite representative to clarify the inspection run circumstances, especially the launching and receiving as well as inspection tool tracking. He also prepared and maintained all equipment used in safety and compliance testing, generated and prepared inspection data for data analysis, verified proper utilization of marker boxes and assisted clients with locating stuck tools and abnormal operations. Mr. Sylla prepared documentation on run reports, repairs needed, and repairs completed.

### *GE Oil and Gas/Granite Services – Houston*

*Field Service Technician (01/2006 to 07/2007)*

Mr. Sylla was responsible for assessing the inspection tool condition and performing reconditioning when applicable, performing preventative maintenance, bench and field repair, diagnosis and part ordering, rebuilding and preparing pipeline inspection tools for projects, and performing mechanical and electronic repairs on various MFL tools. Mr. He also prepared and maintained paperwork for each project which included detailed documentation concerning the condition of equipment, repairs needed and repairs completed

## PROJECT EXPERIENCE – CONSTRUCTION QUALITY ASSURANCE

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|---|---|
| **Kinder Morgan, Galena Park**<br>Texas, United States | Concrete testing |
| **Waste Management/Baytown**<br>Texas, United States | Protective cover Monitoring. |

## PROJECT EXPERIENCE – LANDFILL

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|---|---|
| **Waste Managemnt/City of Edinburg**<br>Texas, United States | Cell construction. |

## PROJECT EXPERIENCE – LANDFILL

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|---|---|
| **Luminant Oak Grove**<br>Texas, United States | GeoTechnical and Clay Liner. |
| **Austin Community Landfill**<br>Texas, United States | GeoTechnical |
| **Rosen USA Inc;**<br>Texas, United States | Pipeline Inspections. |
| **GE Oil and Gas**<br>Texas, United States | Pipeline Inspections. |

## PROFESSIONAL AFFILIATIONS

## Education

*AFCENT International High School*

*KU College - 120 hours, 1995*

## Certifications

*Radiation Safety and Nuclear Gauge Operation*

*NICET Level II – Geotechnical*

*HAZWOPER 24-hour training*

# Golder Associates Inc. – Houston

# Employment History

***Golder Associates Inc. – Houston, Texas***

*Engineering Technician (September 2003 to Present)*

Resident CQA Manager and CQA Technician during construction of composite lining systems at solid and hazardous waste landfill facilities in Michigan, Virginia, Louisiana and Texas. Responsibilities on these projects include management of field data, monitoring construction/installation of the soil and synthetic lining systems, communication with client and contractor, and assistance with report preparation. Experience totaling over 9.5 million square feet of geomembrane installation, 1,000 cubic yards of concrete placement, and over 200 thousand cubic yards of soil placement. Also, conducted a variety of soil tests at the Golder Associates laboratory in Houston, Texas. Established horizontal and vertical control for site development and aerial controls. Provided client with construction staking for site. Collected as-built data for completion of CQA Reports.

Specific Project Responsibilities include:

- Resident CQA Manager, Chemical Waste Management, Lake Charles, Louisiana
- Resident CQA Manager, Solid Waste Landfill, Galveston, Texas
- Resident CQA Manager, Greenshadow Landfill, Pasadena, Texas
- Resident CQA Manager, Edinburg Municipal Landfill, Edinburg, Texas
- Resident CQA Manager, Coastal Plains Recycling and Disposal Facility, Alvin, Texas
- Resident CQA Manager, Cougar Construction Debris Landfill, Houston, Texas
- Resident CQA Manager, King George County Landfill, King George, Virginia
- Resident CQA Manager, Love Landfill, Bad Axe, Michigan
- Resident CQA Manager, Jasper Creosoting Superfund Site, Jasper, Texas
- MQA Monitor, GSE, Houston, Texas
- MQA Monitor, CETCO, Lovell, Wyoming

## Education

*Bachelor of Science Civil Engineering, Prairie View A&M University, Prairie View, TX, 2015*

## Certifications

*CQA Compacted Clay Liner Inspector, 04/29/2016*

*HAZMAT Training , 06/08/2015*

# Golder Associates Inc. – Houston

***Field Engineer***

Daniel Williams is Field Engineer with 1 year of experience at Golder Associates in Houston. In addition to experience performing Construction Quality Assurance (CQA), Daniel is a certified nuclear density gauge operator and has experience testing soils and asphalt. Before joining Golder Daniel attended Prairie View A&M University where he earned a Bachelor of Science in Civil Engineering. While in college, Daniel gained summer employement as an intern at Waste Management where he gained exposure to landfill gas management systems, landfill construction, and environmental compliance.

# Employment History

***Golder Associates – Houston, TX***
*Field Engineer (2015 to Present)*

Provide Construction Quality Assurance (CQA) on various earthwork projects.

Procure and document various material samples as needed per CQA plan.

Perform field testing of various construction materials as needed.

Communicate with clients, contractors, and senior Golder staff members as needed to prevent and resolve issues.

***Waste Management, Inc. – Houston, TX***
*Engineering Intern (2013 to 2014)*

Revised sketches to redirect work of consultants and contractors.

Created and edited gas system schematics using computer software.

Performed quality assurance on landfill gas monitoring system.

Performed quality assurance on greenhouse gas reporting system.

Created Excel macros to update 2013-14 financials.

## PROJECT EXPERIENCE – CONSTRUCTION QUALITY ASSURANCE

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|---|---|
| **Roseburg Forest Products Dillard Landfill**<br>Douglas County, OR | Closure of a wood waste landfill which included the construction of 1400ft gabion retaining wall, ditch construction, drainage ditch and culvert installations, and soil capping. |
| **Luminant Oak Grove Power Plant**<br>Robertson County, TX | Construction of a 26-Acre coal ash landfill cell which included construction of a containment dike, installation of 3-foot thick clay liner, and tie-in to adjacent cell existing clay liner. |

## TRAINING

***40-Hour HAZWOPER Training***
*Compliance Solutions, 12/04/2015*

***Nuclear Gauge Operator Training***
*Component Sales & Services, Inc., 06/08/2015*

## SUPPLEMENTAL SKILLS

***Software***
*Experience with AutoCad Civil 3D*

***Relevant College Coursework***
*Geotechnical Engineering, Hydraulics, Water Resources Engineering, Environmental Engineering,*

## PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers (ASCE)

## Education

*Geology/Environmental Studies Bachelors of Science, Shippensburg University, PA, 2011*

## Certifications

*OSHA 2255 Ergonomics Certification, May 2015*

*OSHA 511 General Industry Safety Certification, March 2015*

*OSHA 510 Construction Safety Certification , February, 2015*

*MSHA Miner certification, August, 2014*

*XRF safety Certification, May, 2014*

*Nuclear Gauge Certification, June 10, 2014*

*HAZMAT Certification, June 10, 2014*

*OSHA 8 hour refresh, February, 2014*

*OSHA 40 hour HAZWOPER, March, 2012*

## Languages

*German – Fluent*

*English – Fluent*

# Golder Associates Inc. – Jacksonville

***Geologist***

Mr. Kendall is a geologist in the geosciences group located at the Jacksonville office and has been with the firm since June, 2013. His primary practice areas are taking part in field efforts and supporting numerous projects including comprehensive environmental response, compensation and liability act (CERCLA) and resource conservation and recovery act (RCRA) sites, petroleum facilities, dry cleaning facilities, landfills, and voluntary clean-up programs for acquisition by private sector clients.

# Employment History

***Golder Associates – Jacksonville, FL***

*Geologist (2013 to Present)*

Geologist from June 2013 to present.

***Tetra Tech – Whitehouse Station, NJ***

*Staff Geologist (2012 to 2013)*

Staff Geologist from March 2012 to May 2013.

## PROJECT EXPERIENCE – MINING

**Midway Mine**
NV, USA

Assisted in soil sampling and soil lab testing, soil density and moisture testing, concrete and excavation oversight of multiple subcontractor teams, liner quality testing of destructs, and health and safety oversight.

## PROJECT EXPERIENCE – CONSTRUCTION QUALITY ASSURANCE

**Gillette Dig**
TX, USA

Assisted in CQA to backfilling of a soil excavation by testing the density of soil and sampling the backfilled soil.

## PROJECT EXPERIENCE – LANDFILL

**Austin Community Landfill**
TX, USA

Sole oversight of several subcontractor teams for excavation of new landfill cell expansion. Was responsible for moisture and density testing of backfill soil of new cell expansion, and sole correspondent between subcontractor teams, Golder, and landfill crews.

**Twin Valley**
PA, USA

Provided assistance with onsite landfill water sampling using monitoring wells, as well air monitoring using methane and other gas detection and monitoring, as well as leachate sampling.

## PROJECT EXPERIENCE – CONSTRUCTION QUALITY ASSURANCE

**Alcatel-Lucent Demo**
NJ, USA

Gathered and collected concrete samples from numerous on site locations to determine impacts of potential contaminants so that the building on site could gain permission to be demolished.

## PROJECT EXPERIENCE – HYDROGEOLOGY

**Pfizer Carolina**
Puerto Rico, USA colony

Oversaw drilling subcontractor team perform several new well installations at various depths while performing well developments and numerous well sampling across the entire site to determine the extent of the contaminated groundwater plume.

**Folcroft**
PA, USA

Assisted with installation of several temporary wells and borings to assess the extent of a contamination plume in Philadelphia PA. Soil boring, rock coring, and water sampling of numerous locations were undertaken over a period of 4 weeks.

**Kearny**
NJ, USA

Provided oversight of deep overburden and bedrock monitoring wells to determine the extent of a contaminated groundwater plume in NJ. Provided oversight of subcontractor teams which installed numerous monitoring and injection wells which were then used for a bedrock injection pilot study and soil cap using injected hydrogen peroxide.

## PROJECT EXPERIENCE – ENVIRONMENTAL ASSESSMENT

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| **Former Ethio**<br>FL, USA | Lead Field Geologist responsible for directing subcontracted drilling team while overseeing numerous groundwater well installs, vault abandonments, well abandonments, soil boring sample collection and groundwater well development and sample collection. |
| **Caldwell Superfund sight**<br>NJ, USA | Provided groundwater sampling and monitoring on an extensive list of sampling parameters on a site with difficult site access issues. |
| **L+D Landfill**<br>NJ, USA | Performed groundwater sampling using multiple water extraction methods, while working with challenging environmental and site factors such as difficult site access and well location. |
| **Trinity**<br>PA, USA | Assisted in coil sampling and testing, dust monitoring, air quality monitoring, and excavation oversight |
| **Exide Tampa**<br>FL, USA | Took several soil boring samples at numerous locations and depths to determine the extent of contamination impacts |
| **Malnove**<br>FL, USA | Groundwater Sampling in Jacksonville, FL of numerous wells to determine the extent of impacted groundwater. |
| **Quincy Phase I**<br>FL, USA | Performed a phase I assessment of a cellular tower in Quincy Florida. Numerous photographs were taken and analysed to determine the extent of any potential contamination sources. |
| **Trinity PA**<br>PA, USA | Provided oversight of subcontractor teams during an excavation of PCB and VOC impacted soil. Also assisted in soil sampling in Level D and C. Assisted with onsite air monitoring and Industrial hygiene. |
| **Bayer New Brunswick**<br>NJ, USA | Provided on site assistance with Vapour Intrusion drilling, setup, and sampling over a period of months to determine the extent of a contamination plume in a mixed residential and commercial area. |
| **DS+G**<br>DE, USA | Helped manage and sample over 70 monitoring wells using Low-Flow groundwater sampling at the DS+G Superfund site in New Castle, Delaware. |

## PROJECT EXPERIENCE – ENVIRONMENTAL MANAGEMENT

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|---|---|
| **Bayer Whippany**<br>NJ, USA | Provided oversight of several subcontractor teams undertaking a large scale excavation of PCB impacted soil and sediment and subsequent delineation while following strict EPA and NJDEP regulations. |

## TRAINING

## SUPPLEMENTAL SKILLS

***GIS***
*Experience in shapefile creation to assist with any map/layer type.*

## PROFESSIONAL AFFILIATIONS

Geological Society of America

## Education

*Master of Science Civil Geotechnical Engineering, Colorado School of Mines, Golden, CO, 2015*

*Bachelor of Science Civil Engineering, Colorado School of Mines, Golden, CO, 2011*

## Certifications

*EIT-Colorado, April 2011*

*Nuclear Gauge Safety Certification, June 2011*

*HAZMAT Certification, June 2015*

*CPR/AED/First Aid Training, June 2015*

## Languages

*Spanish – Fluent*

*German – Fluent*

*English – Fluent*

# Golder Associates Inc. – Houston

***Civil Engineer***

Alexandra is a registered engineer in training (EIT) in Colorado with a bachelor of science in Civil Engineering from the Colorado School of Mines (CSM) and 5 years of experience as a civil engineer with civil and environmental consulting companies. Alex is currently pursuing a master of science degree in Civil Geotechnical Engineering from CSM which will be completed in December, 2015.

Alex's experience comprises of performing geotechnical investigations, data analysis, engineering design, and on-site construction quality assurance and control for various mining structures such as water diversion channels, heap leach facilities, and earthen dams. Since relocating to Texas in 2015, Alex has been focusing on solid waste management facility analysis, design, and construction.

# Employment History

***Golder Associates – Houston, TX***

*Civil Geotechnical Engineer (2015 to Present)*

Conducting geotechnical analyses and assisting in various aspects of the design and construction of landfills.

***Knight Piesold and Co. – Denver, CO***

*Civil Engineer/Scientist (2010 to 2015)*

Performed geotechnical investigations, data analysis, engineering design, and on-site construction quality assurance and control for various mining facilities such as water diversion channels, heap leach facilities, and earthen dams.

## PROJECT EXPERIENCE – CONSTRUCTION QUALITY ASSURANCE

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|---|---|
| **Baytown Landfill**<br>Houston, Texas, USA | Provided CQA at Baytown for approximately 90,000 sq. ft. of geomembrane liner installation. |
| **Minas Conga**<br>Cajamarca, Peru | Provided construction quality assurance for close-out construction details of the Chailhuagon Sediment Pond and Chailhuagon Reservoir. The close-out construction occurred in the spillway, outlet works, and downstream embankment face areas. |
| **Fort Knox Mine**<br>Fairbanks, Alaska | Provided construction quality assurance and quality control (CQA/QC) services to the Stage 3 and 4 Walter Creek Valley Heap Leach Pad expansions during the 2011 and 2012 construction seasons and to a raise on the Tailings Storage Facility in 2011. CQA/QC involved checking for compliance with the intent of design, compliance with Earthwork Specifications (regarding spreading, layer thickness, and material gradation), geomembrane installation inspections, and supervision of an on-site soils laboratory. On-site soils laboratory responsibilities included performing sieve analysis of fine and coarse aggregates and proctor/moisture-density relationship testing to confirm soil compliance with design specifications. Experienced both dayshift and nightshift activities on both facilities.<br><br>Collaborated with a team of engineers during completion of the Stage 3 Construction Completion Report drawing set (representing 2011 construction progress). Prepared the Stage 4 Construction Completion Report drawing set (representing 2012 construction progress). Compiled appendix data and field data summary tables for the Stage 3 and 4 Completion Reports. Developed an initial budget estimate and proposal for the 2013 construction season. For Kinross Gold. |

## PROJECT EXPERIENCE – GEOTECHNICAL ENGINEERING

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|---|---|
| **Galena Park**<br>Texas/Houston, USA | Provided drilled shaft construction observation and geotechnical engineering support services. |
| **Round Mountain Gold Mine**<br>Nevada/Nye County, USA | Supervised geotechnical pneumatic core drilling, core logging, in-situ testing, and sampling. Performed Standard Penetration Tests, using mostly split spoon samplers and occasional modified California samplers. For Kinross Gold. |
| **Gramalote Project**<br>Antoquia/San Roque, Colombia | Analyzed lab testing data and reconciled results with borehole and testpit logs provided from the field. Assisted in characterization and analysis of the foundation material for the Tailings Management and Waste Rock Facilities. For AngloGold Ashanti. |

## PROJECT EXPERIENCE – GEOPHYSICS

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|---|---|
| **Georgia-Pacific Gypsum**<br>Texas/Sweetwater, USA | Assisted in using Ground Penetrating Radar (GPR) and Multichannel Analysis of Surface Waves (MASW) to map the location of potential voids near the gypsum plant. |

## PROJECT EXPERIENCE – TAILINGS

**Yellowknife Gold Project**
Yellowknife, Canada

Conducted storage capacity analyses on various tailings storage facility arrangements. Established design details such as dam heights, pipeline routes, and a preliminary staging plan for the conceptual layout of the Tailings Storage Facility during the Project Feasibility Study. For Tyhee NWT Corp.

**Pinos Altos Mine**
Chihuahua/Pinos Altos, Mexico

Supervised on-site cone penetrometer testing performed by ConeTec personnel to get additional information for slope stability analyses and to identify zones in which it might be beneficial to instill a wick drain program in the tailings storage facility. For Agnico Eagle Mines.

**La Colosa Project**
Tolima, Colombia

Created design drawings, conducted storage capacity analyses, established material quantity takeoffs, and budget estimates for various tailings storage facilities during the development of a Mining Methods Alternatives Assessment. For AngloGold Ashanti Colombia S.A.

## PROJECT EXPERIENCE – DAM ENGINEERING

**Minas Conga**
Cajamarca, Peru

Minas Conga is a copper and gold porphyry deposit which currently consists of water retaining structures and future construction is on hold due to civil unrest. Alex compiled and assisted with review of field data as the basis for design of zoned earthfill dams during the geotechnical investigation of the Chailhuagon Sediment Pond, Chailhuagon Reservoir, and Perol Reservoir. During design, updated Final Design Report and Technical Specifications Report to reflect most current design changes. Performed gradation design of sand and gravel filters as a part of updating Perol Reservoir's technical specifications. After construction, travelled onto site to complete quality assurance for close-out construction details of the Chailhuagon Sediment Pond and Reservoir. Co-wrote and compiled the Chailhuagon structures' Construction Completion Reports. Developed Operation, Maintenance, and Surveillance Manuals for both Chailhuagon structures. For Minera Yanacocha S.R.L.

## PROJECT EXPERIENCE – MINING

**Carlota Mine**
Arizona/Gila County, USA

Carlota is an open-pit copper mine preparing for mine closure. Alex identified catchment areas to be applied in water balance modelling for the Pit Lake closure plan. Conducted storage capacity analyses on the PLS and Raffinate ponds affecting the Pit Lake's final volume. For KGHM International.

**Constancia Project**
Chumbivilcas/Chilloroya, Peru

Wrote an initial revision of the Construction Completion Reports for the Water Diversion Channels, Tailings Management Facility, Bog Storage Facility, and Waste Rock Facility. Lived on-site in order to more effectively communicate and collaborate with the field engineers while observing the structures and their construction. For Hudbay Minerals.

## SUPPLEMENTAL SKILLS

***Microsoft Office Suite***

***Auto-CAD Civil 3D***

***gINT***

*Adept with gINT, the geotechnical software currently used for reporting borehole and well logs, fence diagrams, geotechnical testing and other engineering data.*

***Phase2 Tunnel Design Software***

## PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists

Society of Women Engineers

American Society of Civil Engineers

Society of Hispanic Professional Engineers

# APPENDIX B
# LABORATORY PRECONSTRUCTION AND CONSTRUCTION TEST RESULTS

# APPENDIX B-1
# PRECONSTRUCTION TEST DATA

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# SUMMARY OF LABORATORY RESULTS



**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA - Preconstruction
**PROJECT NUMBER** 1525714
**PROJECT LOCATION** Robertson County, TX

| Sample ID | Lift | Natural Moisture (%) | Atterberg Limits | | | %<#200 Sieve | Class-ification | Unit Weight | | Permeability (cm/sec) | Additional Lab Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Liquid Limit | Plastic Limit | Plasticity Index | | | Moisture Content (%) | Dry Density (pcf) | | |
| QCL-2-1 | 0 | 23.8 | 77 | 23 | 54 | 95 | CH | 24.1 | 87.9 | 2.17E-08 | |
| QCL-2-4 | 0 | 16.4 | 52 | 13 | 39 | 88 | CH | 21.9 | 92.0 | 8.38E-09 | |
| QCL-3-02 | 0 | 13.0 | 44 | 15 | 29 | 62 | CL | 17.4 | 100.4 | 3.71E-08 | |
| QCL-3-03 | 0 | 8.9 | 34 | 17 | 17 | 41 | SC | | | | |
| QCL-3-04 | 0 | 6.6 | 43 | 14 | 29 | 65 | CL | 14.4 | 104.4 | 4.07E-08 | |
| QCL-3-06 | 0 | 18.0 | 43 | 16 | 27 | 74 | CL | 16.5 | 101.3 | 8.7E-08 | |
| QCL-3-07 | 0 | 29.9 | 49 | 17 | 32 | 78 | CL | 16.4 | 99.9 | 7.5E-08 | |
| QCL-3-10 | 0 | 12.4 | 38 | 16 | 22 | 65 | CL | | | | |
| QCL-3-15 | 0 | 20.2 | 60 | 21 | 39 | 98 | CH | 19.8 | 93.2 | 4.5E-08 | |
| QCL-3-18 | 0 | 18.7 | 59 | 22 | 37 | 96 | CH | 20.5 | 94.8 | 9.1E-08 | |
| QCL-14-1 | 0 | 13.0 | 55 | 17 | 38 | 91 | CH | 17.6 | 95.2 | 2.73E-08 | |
| QCL-FGD-C-004 | 6 | 14.9 | 48 | 17 | 31 | 82 | CL | | | | |

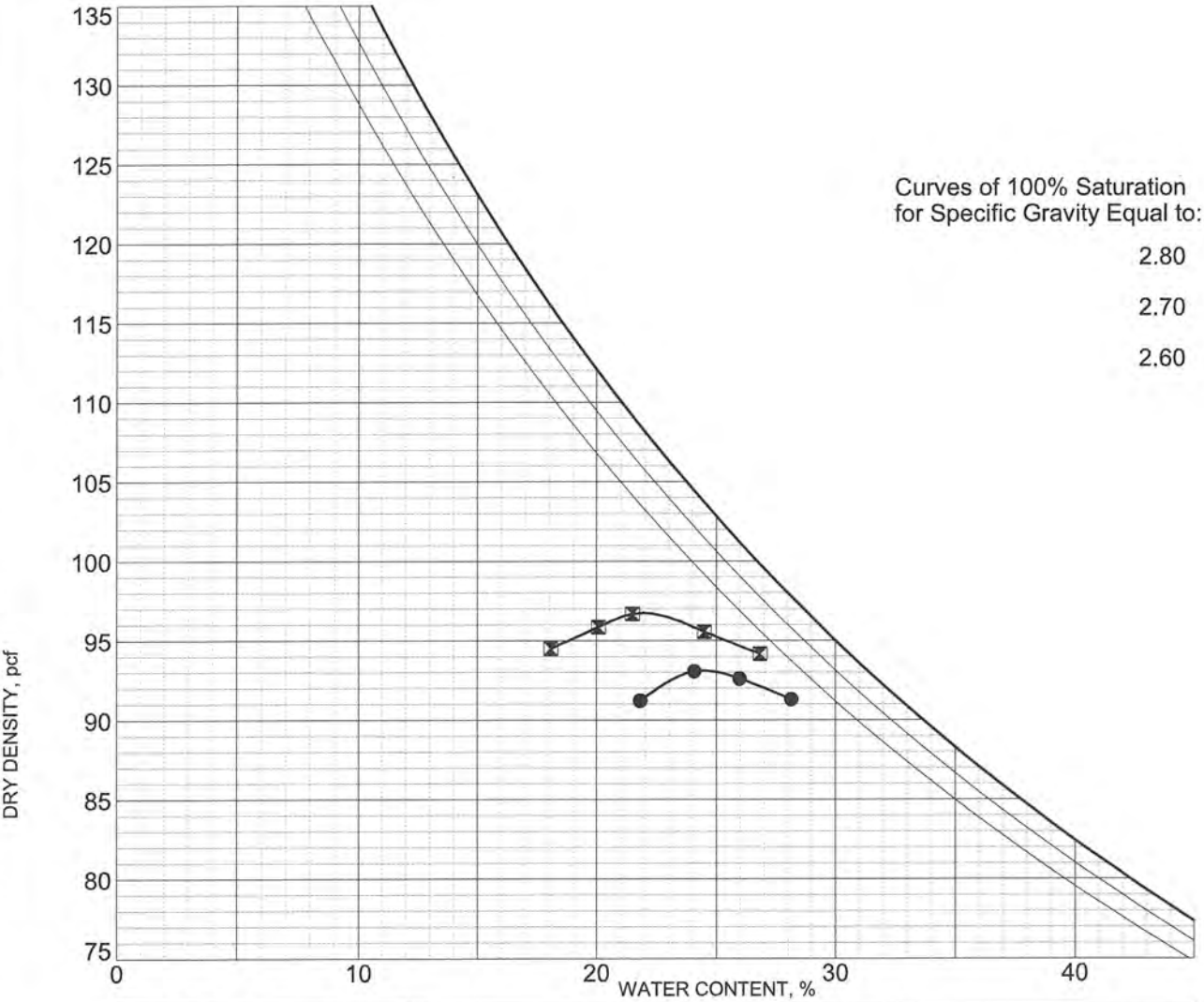
LAB SUMMARY - CQA - GINT STD US LAB.GDT - 8/10/16 17:24 - P:_2015 PROJECT FOLDERS\1525714 LUMINANT FGD-C CQA\LAB DATA\TEMP.GPJ

# MOISTURE/DENSITY RELATIONSHIP

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# MOISTURE-DENSITY RELATIONSHIP

**CLIENT** Luminant
**PROJECT NAME** Oak Grove SES / Ash Landfill 1 Cell 1 Final Cover
**PROJECT NUMBER** 1404716
**PROJECT LOCATION** Robertson County, Texas




| | SAMPLE ID | Description of Materials |
|---|---|---|
| ● | QCL-2-1 | FAT CLAY (CH) |
| ⊠ | QCL-2-4 | FAT CLAY (CH) |

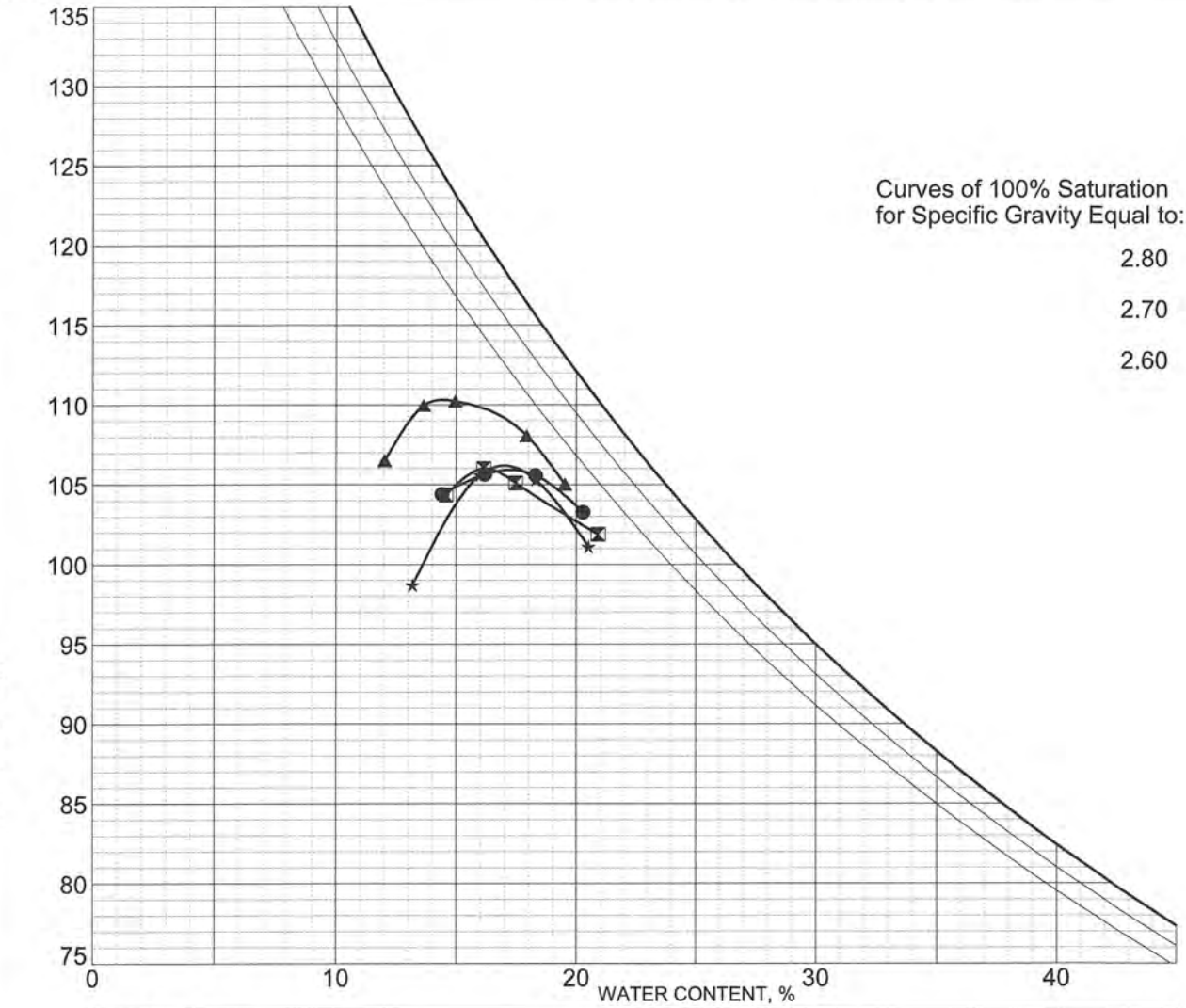
| | SAMPLE ID | Test Method | LL | PL | PI | Max DD | Optimum WC |
|---|---|---|---|---|---|---|---|
| ● | QCL-2-1 | ASTM D698 Method A | 77 | 23 | 54 | 93.1 PCF | 24.5 % |
| ⊠ | QCL-2-4 | ASTM D698 Method A | 52 | 13 | 39 | 96.7 PCF | 22.0 % |

COMPACTION (MULTIPLE CURVES) - GINT STD US LAB.GDT - 8/10/16 14:31 - P:_2013 PROJECT FOLDERS\3394246 - LUMINANT CELL 3\LAB TESTING\COMBINEDGINT.GPJ

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# MOISTURE-DENSITY RELATIONSHIP

**CLIENT** Luminant
**PROJECT NAME** Oak Grove SES / Ash Landfill 1 Cell 1 Final Cover
**PROJECT NUMBER** 1404716
**PROJECT LOCATION** Robertson County, Texas




| SAMPLE ID | Description of Materials |
|---|---|
| ● QCL-3-02 | SANDY LEAN CLAY (CL) |
| ⊠ QCL-3-03 | CLAYEY SAND (SC) |
| ▲ QCL-3-04 | SANDY LEAN CLAY (CL) |
| ★ QCL-3-06 | LEAN CLAY with SAND (CL) |
| | |
| | |

| SAMPLE ID | Test Method | LL | PL | PI | Max DD | Optimum WC |
|---|---|---|---|---|---|---|
| ● QCL-3-02 | | 44 | 15 | 29 | 105.9 PCF | 17.3 % |
| ⊠ QCL-3-03 | | 34 | 17 | 17 | 106.0 PCF | 16.2 % |
| ▲ QCL-3-04 | | 43 | 14 | 29 | 110.3 PCF | 14.4 % |
| ★ QCL-3-06 | | 43 | 16 | 27 | 106.1 PCF | 17.0 % |
| | | | | | | |
| | | | | | | |

COMPACTION (MULTIPLE CURVES) - GINT STD US LAB.GDT - 8/10/16 14:28 - P:\ 2013 PROJECT FOLDERS\3394246 - LUMINANT CELL 3\LAB TESTING\COMBINEDGINT.GPJ

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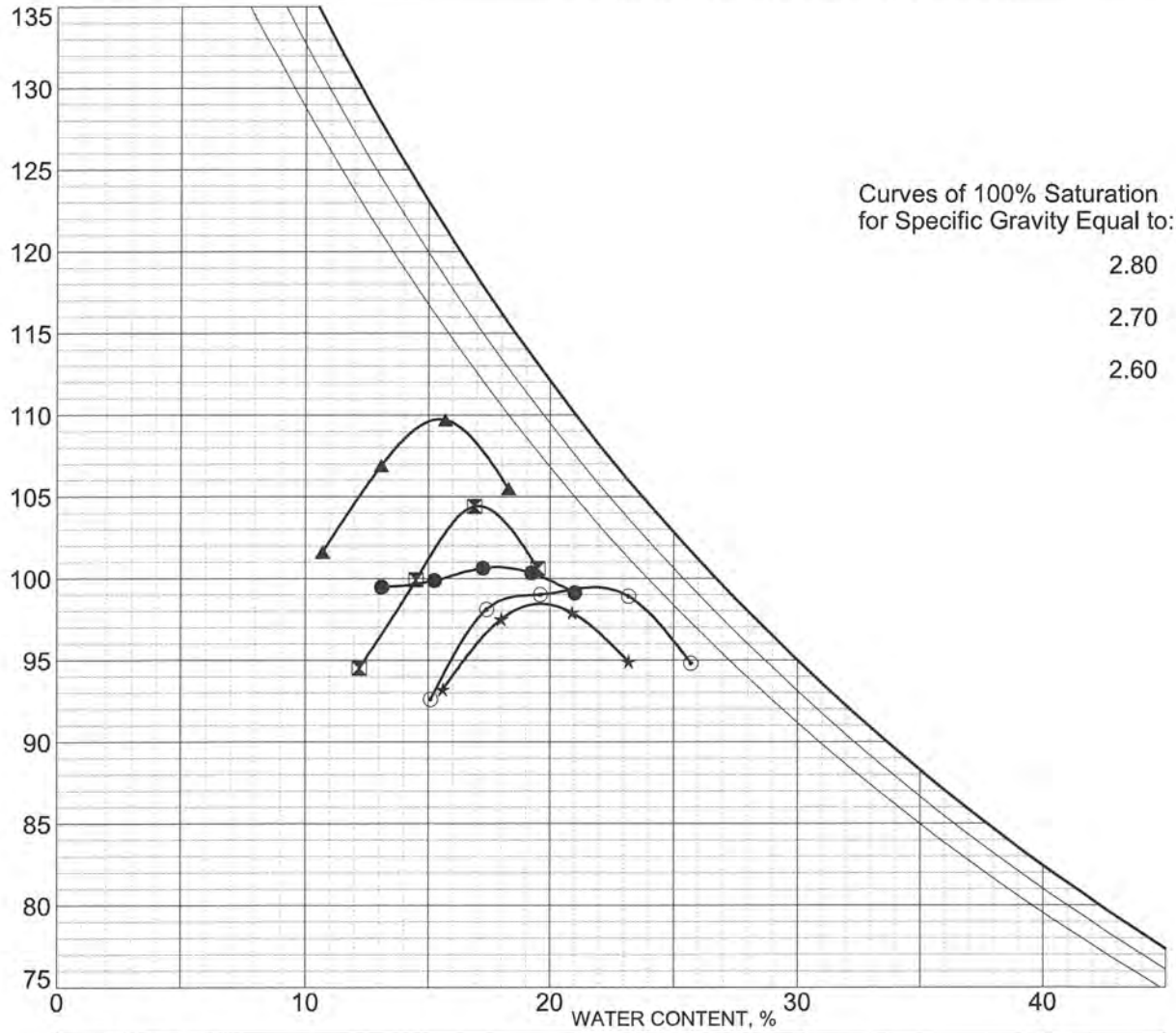
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# MOISTURE-DENSITY RELATIONSHIP

**CLIENT** Luminant
**PROJECT NAME** Oak Grove SES / Ash Landfill 1 Cell 1 Final Cover
**PROJECT NUMBER** 1404716
**PROJECT LOCATION** Robertson County, Texas




| SAMPLE ID | Description of Materials |
|---|---|
| ● QCL-14-1 | FAT CLAY (CH) |
| ⊠ QCL-3-07 | LEAN CLAY with SAND (CL) |
| ▲ QCL-3-10 | SANDY LEAN CLAY (CL) |
| ★ QCL-3-15 | FAT CLAY (CH) |
| ⊙ QCL-3-18 | FAT CLAY (CH) |

| SAMPLE ID | Test Method | LL | PL | PI | Max DD | Optimum WC |
|---|---|---|---|---|---|---|
| ● QCL-14-1 | | 55 | 17 | 38 | 100.7 PCF | 17.8 % |
| ⊠ QCL-3-07 | | 49 | 17 | 32 | 104.5 PCF | 17.4 % |
| ▲ QCL-3-10 | | 38 | 16 | 22 | 109.7 PCF | 15.7 % |
| ★ QCL-3-15 | | 60 | 21 | 39 | 98.4 PCF | 19.6 % |
| ⊙ QCL-3-18 | | 59 | 22 | 37 | 100.0 PCF | 20.5 % |

COMPACTION (MULTIPLE CURVES) - GINT STD US LAB.GDT - 8/10/16 14:33 - P:\ 2013 PROJECT FOLDERS\3394246 - LUMINANT CELL 3\LAB TESTING\COMBINEDGINT.GPJ

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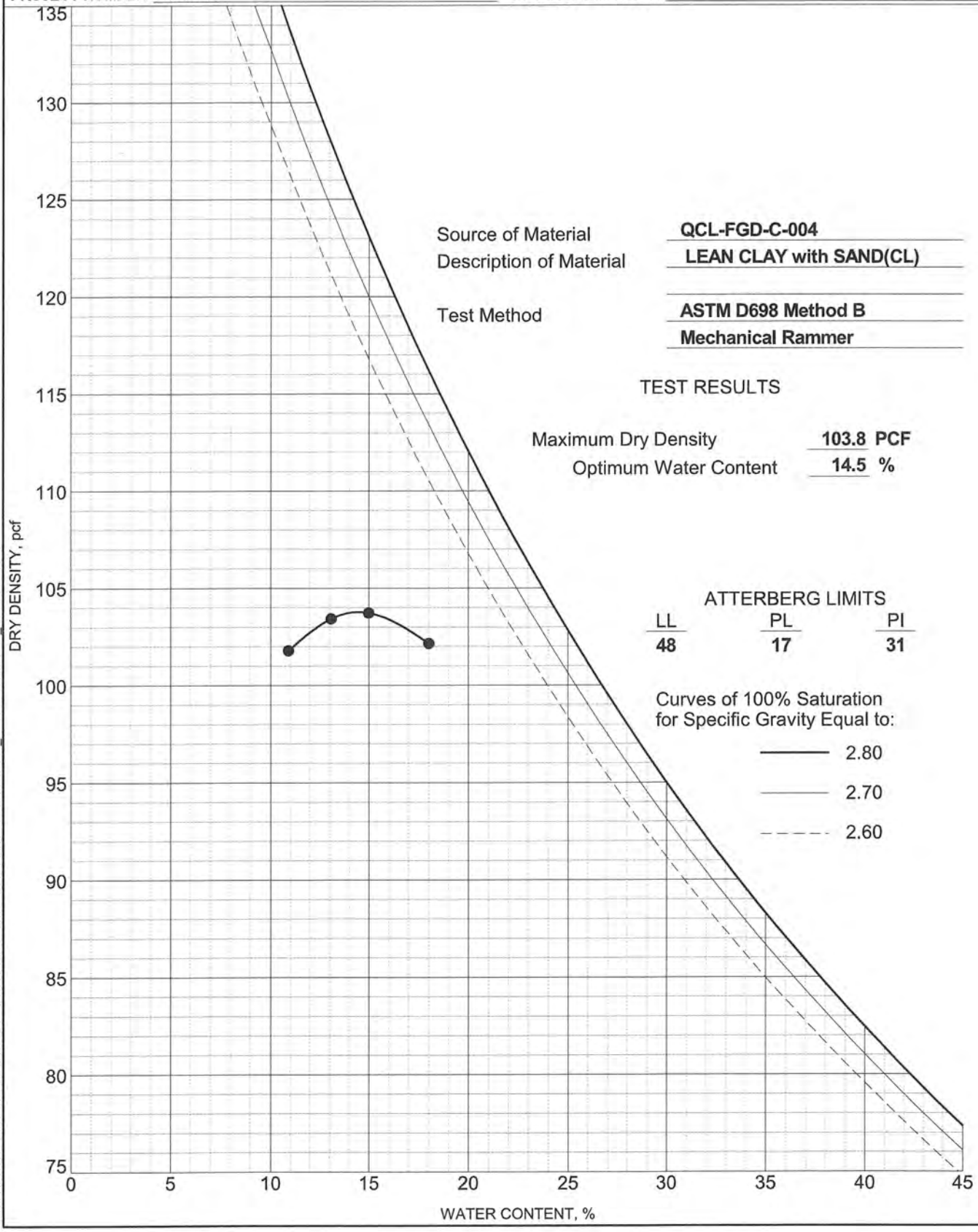
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# MOISTURE-DENSITY RELATIONSHIP

TECHNICIAN:MR
DATE PERFORMED:7/7/2015
COLOR:
NATURAL MOISTURE %:

**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA
**PROJECT NUMBER** 1525714
**PROJECT LOCATION**




Source of Material: QCL-FGD-C-004
Description of Material: LEAN CLAY with SAND(CL)

Test Method: ASTM D698 Method B
Mechanical Rammer

TEST RESULTS

Maximum Dry Density: 103.8 PCF
Optimum Water Content: 14.5 %

ATTERBERG LIMITS

| LL | PL | PI |
|---|---|---|
| 48 | 17 | 31 |

Curves of 100% Saturation for Specific Gravity Equal to:
2.80
2.70
2.60

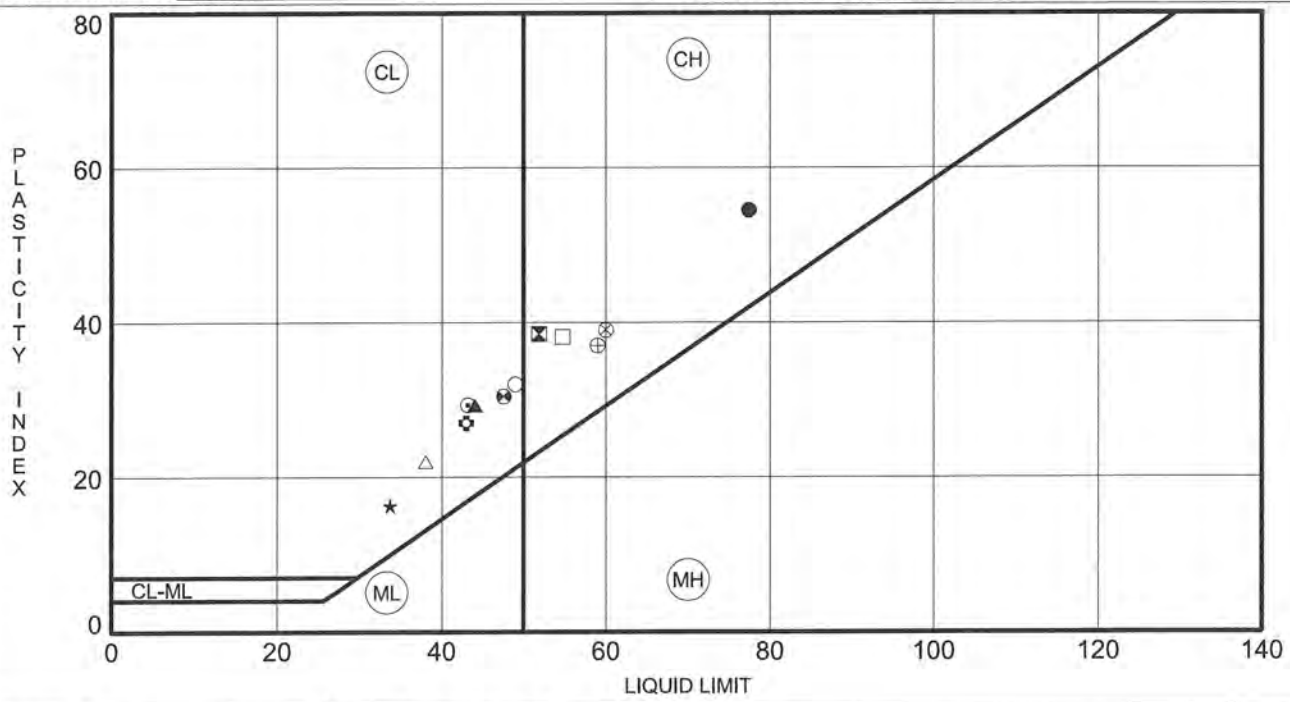
COMPACTION - GINT STD US LAB.GDT - 8/10/16 13:58 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

# ATTERBERG LIMITS

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# ATTERBERG LIMITS' RESULTS

**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA - Preconstruction
**PROJECT NUMBER** 1525714
**PROJECT LOCATION** Robertson County, TX




| | SAMPLE ID | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|
| ● | QCL-2-1 | 77 | 23 | 54 | 95 | FAT CLAY (CH) |
| ⊠ | QCL-2-4 | 52 | 13 | 39 | 88 | FAT CLAY (CH) |
| ▲ | QCL-3-02 | 44 | 15 | 29 | 62 | SANDY LEAN CLAY (CL) |
| ★ | QCL-3-03 | 34 | 17 | 17 | 41 | CLAYEY SAND (SC) |
| ⊙ | QCL-3-04 | 43 | 14 | 29 | 65 | SANDY LEAN CLAY (CL) |
| ✿ | QCL-3-06 | 43 | 16 | 27 | 74 | LEAN CLAY with SAND (CL) |
| ○ | QCL-3-07 | 49 | 17 | 32 | 78 | LEAN CLAY with SAND (CL) |
| △ | QCL-3-10 | 38 | 16 | 22 | 65 | SANDY LEAN CLAY (CL) |
| ⊗ | QCL-3-15 | 60 | 21 | 39 | 98 | FAT CLAY (CH) |
| ⊕ | QCL-3-18 | 59 | 22 | 37 | 96 | FAT CLAY (CH) |
| □ | QCL-14-1 | 55 | 17 | 38 | 91 | FAT CLAY (CH) |
| ⊛ | QCL-FGD-C-004 | 48 | 17 | 31 | 82 | LEAN CLAY with SAND (CL) |

ATTERBERG LIMITS - CQA - PRECONSTRUCTION - GINT STD US LAB.GDT - 8/10/16 17:08 - P:_2015 PROJECT FOLDERS\1525714 LUMINANT FGD-C CQA\LAB DATA\TEMP.GPJ

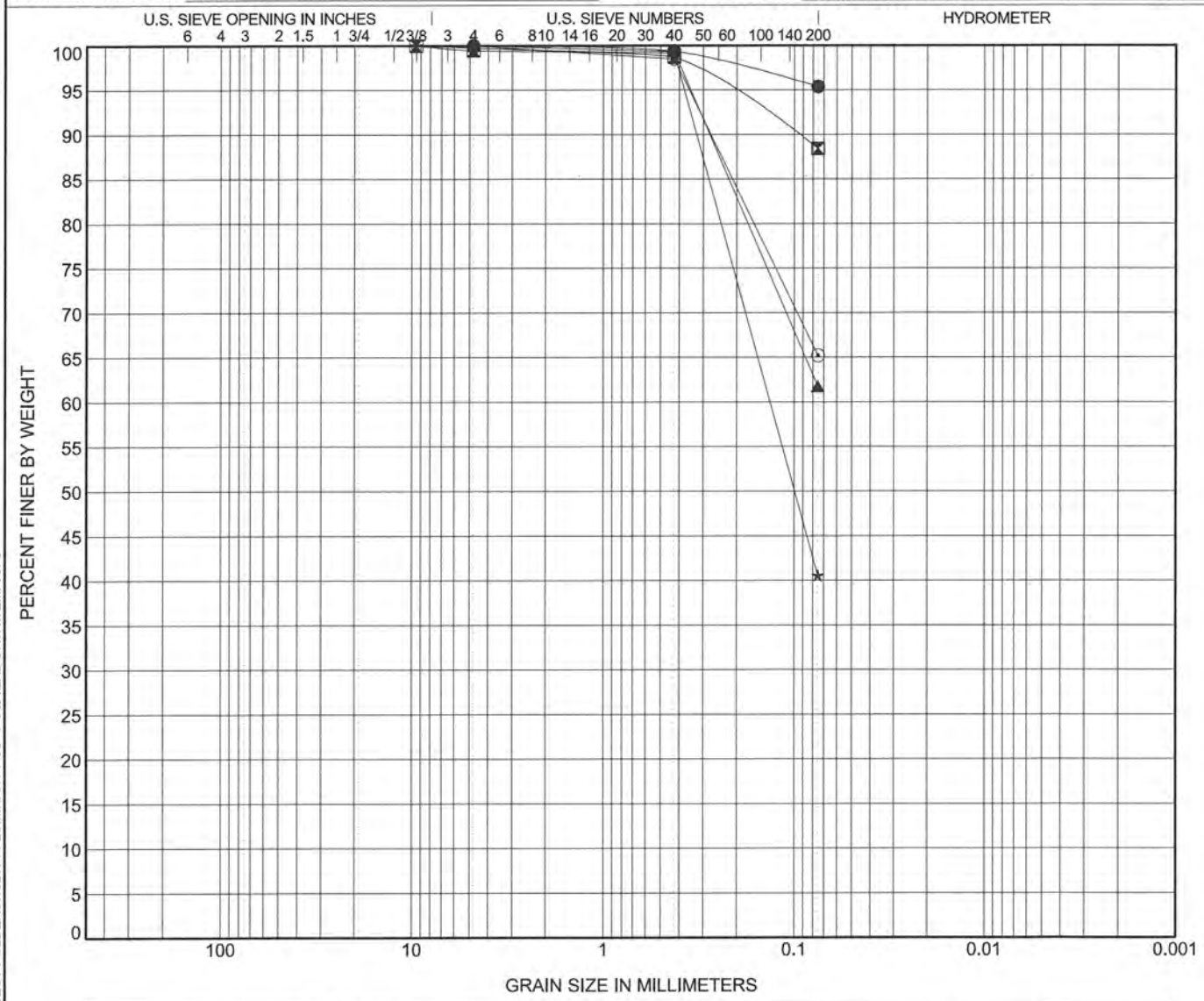
# GRAIN SIZE ANALYSIS

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# GRAIN SIZE DISTRIBUTION
## ASTM D1140
## Method B

TECHNICIAN:
DATE PERFORMED:
SOAK TIME:

**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA - Preconstruction
**PROJECT NUMBER** 1525714
**PROJECT LOCATION** Robertson County, TX




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | QCL-2-1 | 0 ft | FAT CLAY (CH) | 77 | 23 | 54 |
| ⊠ | QCL-2-4 | 0 ft | FAT CLAY (CH) | 52 | 13 | 39 |
| ▲ | QCL-3-02 | 0 ft | SANDY LEAN CLAY (CL) | 44 | 15 | 29 |
| ★ | QCL-3-03 | 0 ft | CLAYEY SAND (SC) | 34 | 17 | 17 |
| ⊙ | QCL-3-04 | 0 ft | SANDY LEAN CLAY (CL) | 43 | 14 | 29 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | QCL-2-1 | 0 ft | 4.75 | | | | 0.0 | 4.6 | 95 | |
| ⊠ | QCL-2-4 | 0 ft | 9.5 | | | | 0.5 | 11.0 | 88 | |
| ▲ | QCL-3-02 | 0 ft | 4.75 | | | | 0.0 | 38.3 | 62 | |
| ★ | QCL-3-03 | 0 ft | 9.5 | 0.133 | | | 0.3 | 59.2 | 41 | |
| ⊙ | QCL-3-04 | 0 ft | 4.75 | | | | 0.0 | 34.8 | 65 | |

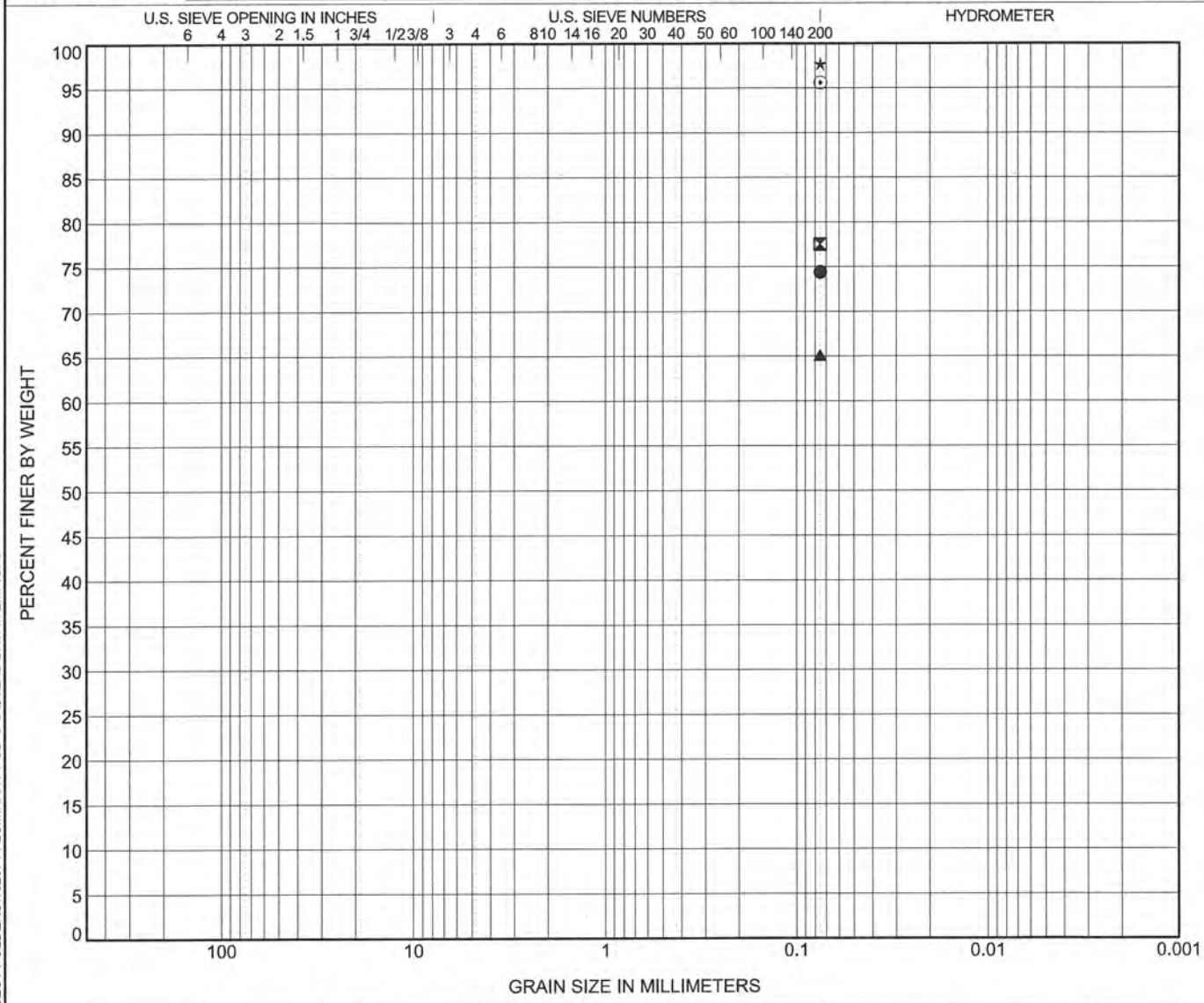
GRAIN SIZE (-200) - GINT STD US LAB.GDT - 8/10/16 17:13 - P:\ 2015 PROJECT FOLDERS\1525714 LUMINANT FGD-C CQA\LAB DATA\TEMP.GPJ

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# GRAIN SIZE DISTRIBUTION
## ASTM D1140
## Method B

TECHNICIAN:
DATE PERFORMED:
SOAK TIME:

**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA - Preconstruction
**PROJECT NUMBER** 1525714
**PROJECT LOCATION** Robertson County, TX




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | QCL-3-06 | 0 ft | LEAN CLAY with SAND (CL) | 43 | 16 | 27 |
| ⊠ | QCL-3-07 | 0 ft | LEAN CLAY with SAND (CL) | 49 | 17 | 32 |
| ▲ | QCL-3-10 | 0 ft | SANDY LEAN CLAY (CL) | 38 | 16 | 22 |
| ★ | QCL-3-15 | 0 ft | FAT CLAY (CH) | 60 | 21 | 39 |
| ⊙ | QCL-3-18 | 0 ft | FAT CLAY (CH) | 59 | 22 | 37 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | QCL-3-06 | 0 ft | 0.075 | | | | | | 74 | |
| ⊠ | QCL-3-07 | 0 ft | 0.075 | | | | | | 78 | |
| ▲ | QCL-3-10 | 0 ft | 0.075 | | | | | | 65 | |
| ★ | QCL-3-15 | 0 ft | 0.075 | | | | | | 98 | |
| ⊙ | QCL-3-18 | 0 ft | 0.075 | | | | | | 96 | |

GRAIN SIZE (-200) - GINT STD US LAB.GDT - 8/10/16 17:13 - P:_2015 PROJECT FOLDERS\1525714 LUMINANT FGD-C CQA\LAB DATA\TEMP.GPJ

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# GRAIN SIZE DISTRIBUTION
## ASTM D1140
## Method B

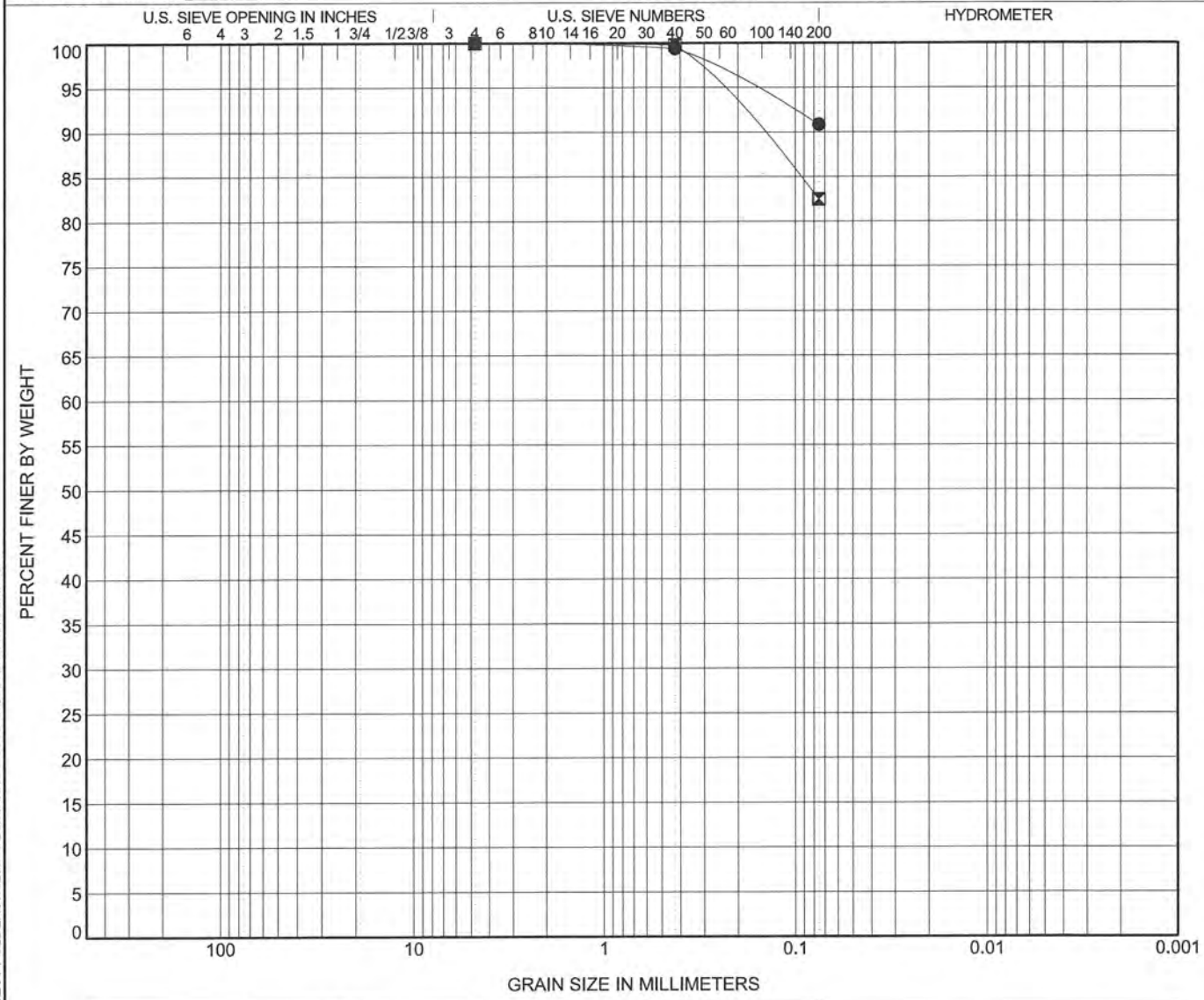
TECHNICIAN:
DATE PERFORMED:
SOAK TIME:

**CLIENT** Luminant Power

**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA - Preconstruction

**PROJECT NUMBER** 1525714

**PROJECT LOCATION** Robertson County, TX




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | QCL-14-1 | 0 ft | FAT CLAY (CH) | 55 | 17 | 38 |
| ⊠ | QCL-FGD-C-004 | 6 ft | LEAN CLAY with SAND (CL) | 48 | 17 | 31 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | QCL-14-1 | 0 ft | 4.75 | | | | 0.0 | 9.1 | 91 | |
| ⊠ | QCL-FGD-C-004 | 6 ft | 4.75 | | | | 0.0 | 17.5 | 82 | |

GRAIN SIZE (-200) - GINT STD US LAB.GDT - 8/10/16 17:13 - P:_2015 PROJECT FOLDERS\1525714 LUMINANT FGD-C CQA\LAB DATA\TEMP.GPJ

# HYDRAULIC CONDUCTIVITY

# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE: | LUMINANT/OAK GROVE LF 1 CELL 2/TX | | Cell Pressure = | 80 | psi |
| PROJECT NUMBER: | 113-94788 | | Backwater Pressure = | 70 | psi |
| SAMPLE ID: | QCL-2-1 | | Run Number = | 1 | |
| LIFT NUMBER: | | | | | |

| **Sample Data, Initial** | | inches |
|---|---|---|
| Height, cm | 8.67 | 3.413 |
| Diameter, cm | 7.30 | 2.873 |
| Area, $cm^2$ | 41.82 | |
| Volume, $cm^3$ | 362.58 | |
| Wet Mass, g | 633.7 | |
| Wt. wet soil + tare, gm | 114.80 | |
| Wt. dry soil + tare, gm | 94.17 | |
| Wt. tare, gm | 8.4 | |
| Moisture Content, % | 24.1% | |
| Dry Density, pcf | 87.9 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.92 | |
| Saturation, % | 70.9% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.4

Annulus = 0.35

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.21 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

| **Sample Data, Final** | | inches |
|---|---|---|
| Height, cm | 8.76 | 3.449 |
| Diameter, cm | 7.36 | 2.898 |
| Area, $cm^2$ | 42.56 | |
| Volume, $cm^3$ | 372.80 | |
| Wet Mass, g | 673.6 | |
| Wt. wet soil + tare, gm | 683.60 | |
| Wt. dry soil + tare, gm | 524.72 | |
| Wt. tare, gm | 10 | |
| Moisture Content, % | 30.9% | |
| Dry Density, pcf | 86.2 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.96 | |
| Saturation, % | 87.2% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.4 | 0.35 | 0 | | 0.038 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 2 | 34 | 154 | 26.7 | 0.38 | 0.7 | 3.2E-06 | 0.040 | 0.972 | 9.08E-08 | 22 | 0.956 | 8.68E-08 |
| 6 | 55 | 261 | 26.1 | 0.40 | 0.6 | 1.9E-06 | 0.041 | 0.976 | 4.70E-08 | 22 | 0.956 | 4.49E-08 |
| 9 | 39 | 164 | 25.8 | 0.42 | 0.3 | 3.0E-06 | 0.041 | 0.988 | 3.76E-08 | 22 | 0.956 | 3.59E-08 |
| 13 | 31 | 232 | 25.4 | 0.43 | 0.4 | 2.1E-06 | 0.042 | 0.983 | 3.61E-08 | 22 | 0.956 | 3.45E-08 |
| 16 | 9 | 158 | 25.2 | 0.44 | 0.2 | 3.2E-06 | 0.042 | 0.992 | 2.66E-08 | 22 | 0.956 | 2.54E-08 |
| 19 | 21 | 192 | 24.9 | 0.45 | 0.3 | 2.6E-06 | 0.043 | 0.987 | 3.33E-08 | 22 | 0.956 | 3.19E-08 |
| 24 | 16 | 295 | 24.5 | 0.47 | 0.4 | 1.7E-06 | 0.043 | 0.983 | 2.95E-08 | 22 | 0.956 | 2.82E-08 |
| 31 | 46 | 450 | 24.0 | 0.49 | 0.5 | 1.1E-06 | 0.044 | 0.978 | 2.48E-08 | 22 | 0.956 | 2.37E-08 |
| 39 | 24 | 458 | 23.5 | 0.51 | 0.5 | 1.1E-06 | 0.045 | 0.977 | 2.49E-08 | 22 | 0.956 | 2.38E-08 |
| 44 | 53 | 329 | 23.2 | 0.52 | 0.3 | 1.5E-06 | 0.046 | 0.986 | 2.10E-08 | 22 | 0.956 | 2.01E-08 |
| 52 | 7 | 434 | 22.8 | 0.54 | 0.4 | 1.1E-06 | 0.047 | 0.981 | 2.17E-08 | 22 | 0.956 | 2.07E-08 |
| 60 | 43 | 516 | 22.3 | 0.56 | 0.5 | 9.7E-07 | 0.048 | 0.976 | 2.34E-08 | 22 | 0.956 | 2.23E-08 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **2.17E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | DM |
| DATE: | 6/16/2011 | DATE: | 6/17/2011 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | | | | |
|---|---|---|---|---|
| PROJECT TITLE: | LUMINANT/OAK GROVE LF 1 CELL 2/TX | Cell Pressure = | 80 | psi |
| PROJECT NUMBER: | 113-94788 | Backwater Pressure = | 70 | psi |
| SAMPLE ID: | QCL-2-4 | Run Number = | 1 | |
| LIFT NUMBER: | | | | |

| **Sample Data, Initial** | | inches |
|---|---|---|
| Height, cm | 8.38 | 3.298 |
| Diameter, cm | 7.25 | 2.853 |
| Area, $cm^2$ | 41.24 | |
| Volume, $cm^3$ | 345.50 | |
| Wet Mass, g | 620.9 | |
| Wt. wet soil + tare, gm | 154.80 | |
| Wt. dry soil + tare, gm | 128.50 | |
| Wt. tare, gm | 8.3 | |
| Moisture Content, % | 21.9% | |
| Dry Density, pcf | 92.0 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.83 | |
| Saturation, % | 71.1% | |
| Effective Stress, psi | 10 | |

**Initial Manometer Readings**

Pipette = 27.8

Annulus = 0.85

**Calculation Constants:**

**Manometer Constants:**

$M_1$ = 0.03 $cm^2$

$M_2$ = 1.04

**Sample Constants:**

S = 0.20 $cm^{-1}$

**Specific Gravity Constant:**

G = 12.56

**Test Constant:**

C = 0.0005

$T = M_2/z_1$

where $z_1$ = Pipette reading - annulus reading for each time step

| **Sample Data, Final** | | inches |
|---|---|---|
| Height, cm | 8.42 | 3.313 |
| Diameter, cm | 7.33 | 2.884 |
| Area, $cm^2$ | 42.15 | |
| Volume, $cm^3$ | 354.65 | |
| Wet Mass, g | 656.2 | |
| Wt. wet soil + tare, gm | 664.10 | |
| Wt. dry soil + tare, gm | 521.08 | |
| Wt. tare, gm | 8.1 | |
| Moisture Content, % | 27.9% | |
| Dry Density, pcf | 90.3 | |
| Specific Gravity | 2.7 | |
| Void Ratio | 0.87 | |
| Saturation, % | 86.9% | |

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | $\Delta Z_p$ (cm) | C/t | T | $(1-\Delta Z_p * T)$ | PERMEABILITY (cm/sec) | Temp. °C | rt temp. corr. | PERMEABILITY (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.8 | 0.85 | 0 | | 0.039 | 1.000 | 0.00E+00 | 22 | 0.956 | 0.00E+00 |
| 1 | 36 | 96 | 27.5 | 0.86 | 0.3 | 5.1E-06 | 0.039 | 0.988 | 6.00E-08 | 22 | 0.956 | 5.73E-08 |
| 3 | 24 | 108 | 27.3 | 0.87 | 0.2 | 4.5E-06 | 0.039 | 0.992 | 3.57E-08 | 22 | 0.956 | 3.41E-08 |
| 8 | 43 | 319 | 26.9 | 0.89 | 0.4 | 1.5E-06 | 0.040 | 0.984 | 2.47E-08 | 22 | 0.956 | 2.36E-08 |
| 13 | 45 | 302 | 26.6 | 0.90 | 0.3 | 1.6E-06 | 0.041 | 0.988 | 1.98E-08 | 22 | 0.956 | 1.89E-08 |
| 23 | 33 | 588 | 26.2 | 0.92 | 0.4 | 8.3E-07 | 0.041 | 0.984 | 1.38E-08 | 22 | 0.956 | 1.32E-08 |
| 31 | 36 | 483 | 26.0 | 0.92 | 0.2 | 1.0E-06 | 0.042 | 0.992 | 8.42E-09 | 22 | 0.956 | 8.05E-09 |
| 54 | 45 | 1389 | 25.4 | 0.95 | 0.6 | 3.5E-07 | 0.043 | 0.974 | 9.09E-09 | 22 | 0.956 | 8.69E-09 |
| 66 | 34 | 709 | 25.1 | 0.96 | 0.3 | 6.9E-07 | 0.043 | 0.987 | 8.96E-09 | 22 | 0.956 | 8.56E-09 |
| 79 | 3 | 749 | 24.8 | 0.97 | 0.3 | 6.5E-07 | 0.044 | 0.987 | 8.60E-09 | 22 | 0.956 | 8.21E-09 |
| | | | | | | | | | PERMEABILITY REPORTED AS | | | **8.38E-09** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | DM |
| DATE: | 6/24/2011 | DATE: | 6/27/2011 |

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**HOUSTON, TEXAS**

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant / ALF Cell 3 CQA / TX |
| PROJECT NUMBER: | 3394246 |
| SAMPLE ID: | QCL-03-02 |
| LIFT NUMBER: | |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.433 | 8.72 | Height, in | 3.483 | 8.85 |
| Diameter, in | 2.858 | 7.26 | Diameter, in | 2.859 | 7.26 |
| Area, $cm^2$ | 41.39 | | Area, $cm^2$ | 41.42 | |
| Volume, $cm^3$ | 360.90 | | Volume, $cm^3$ | 366.41 | |
| Wet Mass, g | 681.9 | | Wet Mass, g | 727.9 | |
| Wt. wet soil + tare, gm | 196.20 | | Wt. wet soil + tare, gm | 736.10 | |
| Wt. dry soil + tare, gm | 168.34 | | Wt. dry soil + tare, gm | 596.29 | |
| Wt. tare, gm | 8.2 | | Wt. tare, gm | 8.4 | |
| Moisture Content, % | 17.4% | | Moisture Content, % | 23.8% | |
| Dry Density, pcf | 100.4 | | Dry Density, pcf | 100.1 | |
| Specific Gravity | 2.6 | | Specific Gravity | 2.6 | |
| Void Ratio | 0.62 | | Void Ratio | 0.62 | |
| Saturation, % | 73.5% | | Saturation, % | 99.7% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 29.1

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 29.1 | 0.85 | | | | 23 | 0.931 | |
| 0 | 27 | 27 | 28.0 | 0.90 | 1.280E-03 | 38.21 | 8.09E-07 | 23 | 0.931 | 7.54E-07 |
| 2 | 43 | 136 | 27.0 | 0.94 | 2.310E-04 | 36.79 | 1.52E-07 | 23 | 0.931 | 1.41E-07 |
| 7 | 11 | 268 | 26.0 | 0.98 | 1.172E-04 | 35.29 | 8.03E-08 | 23 | 0.931 | 7.47E-08 |
| 12 | 8 | 297 | 25.2 | 1.01 | 8.462E-05 | 34.24 | 5.97E-08 | 23 | 0.931 | 5.56E-08 |
| 17 | 25 | 317 | 24.5 | 1.04 | 6.937E-05 | 33.27 | 5.04E-08 | 23 | 0.931 | 4.69E-08 |
| 23 | 12 | 347 | 23.9 | 1.06 | 5.432E-05 | 32.44 | 4.05E-08 | 23 | 0.931 | 3.77E-08 |
| 28 | 20 | 308 | 23.3 | 1.09 | 6.120E-05 | 31.54 | 4.69E-08 | 23 | 0.931 | 4.37E-08 |
| 34 | 48 | 388 | 22.7 | 1.11 | 4.858E-05 | 30.64 | 3.83E-08 | 23 | 0.931 | 3.57E-08 |
| 40 | 52 | 364 | 22.1 | 1.14 | 5.178E-05 | 29.74 | 4.21E-08 | 23 | 0.931 | 3.92E-08 |
| 46 | 43 | 351 | 21.6 | 1.16 | 4.475E-05 | 29.07 | 3.72E-08 | 23 | 0.931 | 3.46E-08 |
| 56 | 50 | 607 | 20.8 | 1.19 | 4.140E-05 | 27.64 | 3.62E-08 | 23 | 0.931 | 3.37E-08 |
| 65 | 32 | 522 | 20.0 | 1.22 | 4.815E-05 | 26.44 | 4.40E-08 | 23 | 0.931 | 4.10E-08 |
| | | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | **3.71E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | HR |
| DATE: | 7/9/2013 | DATE: | 2/16/2013 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant / ALF Cell 3 CQA / TX |
| PROJECT NUMBER: | 3394246 |
| SAMPLE ID: | QCL-03-04 |
| LIFT NUMBER: | |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.402 | 8.64 | Height, in | 3.463 | 8.80 |
| Diameter, in | 2.874 | 7.30 | Diameter, in | 2.886 | 7.33 |
| Area, cm² | 41.85 | | Area, cm² | 42.20 | |
| Volume, cm³ | 361.66 | | Volume, cm³ | 371.22 | |
| Wet Mass, g | 692.1 | | Wet Mass, g | 728.5 | |
| Wt. wet soil + tare, gm | 164.40 | | Wt. wet soil + tare, gm | 736.90 | |
| Wt. dry soil + tare, gm | 145.04 | | Wt. dry soil + tare, gm | 593.27 | |
| Wt. tare, gm | 10.5 | | Wt. tare, gm | 8.5 | |
| Moisture Content, % | 14.4% | | Moisture Content, % | 24.6% | |
| Dry Density, pcf | 104.4 | | Dry Density, pcf | 98.3 | |
| Specific Gravity | 2.6 | | Specific Gravity | 2.6 | |
| Void Ratio | 0.55 | | Void Ratio | 0.65 | |
| Saturation, % | 67.5% | | Saturation, % | 98.2% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 cm²

$a_{center\ pipette}$ = 0.03142 cm³

**Initial Manometer Readings**

Pipette = 24.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.5 | 0.85 | | | | 23 | 0.931 | |
| 2 | 49 | 169 | 24.1 | 0.87 | 7.436E-05 | 33.47 | 5.31E-08 | 23 | 0.931 | 4.94E-08 |
| 5 | 52 | 183 | 23.7 | 0.88 | 6.867E-05 | 32.86 | 4.99E-08 | 23 | 0.931 | 4.65E-08 |
| 14 | 13 | 501 | 22.6 | 0.93 | 6.898E-05 | 30.66 | 5.38E-08 | 23 | 0.931 | 5.01E-08 |
| 23 | 54 | 581 | 21.5 | 0.97 | 5.948E-05 | 29.00 | 4.90E-08 | 23 | 0.931 | 4.56E-08 |
| 28 | 7 | 253 | 21.1 | 0.99 | 4.967E-05 | 28.93 | 4.10E-08 | 23 | 0.931 | 3.82E-08 |
| 38 | 52 | 645 | 20.0 | 1.03 | 5.358E-05 | 26.73 | 4.79E-08 | 23 | 0.931 | 4.46E-08 |
| 43 | 29 | 277 | 19.6 | 1.05 | 4.537E-05 | 26.66 | 4.07E-08 | 23 | 0.931 | 3.79E-08 |
| 49 | 57 | 388 | 19.0 | 1.08 | 4.858E-05 | 25.60 | 4.53E-08 | 23 | 0.931 | 4.22E-08 |
| 56 | 54 | 417 | 18.4 | 1.10 | 4.520E-05 | 24.69 | 4.37E-08 | 23 | 0.931 | 4.07E-08 |
| 63 | 55 | 421 | 17.8 | 1.12 | 4.477E-05 | 23.78 | 4.50E-08 | 23 | 0.931 | 4.19E-08 |
| | | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | **4.07E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | HR |
| DATE: | 7/11/2013 | DATE: | 7/16/2013 |

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**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/ASH LF CELL 3/TX | | Board # | 5 | COMMENTS: The sample was remolded to 95.5% of the Maximum Dry Density and OPTM - 0.5% (using ASTM D 698). |
| PROJECT NUMBER | QCL-3-06 | | Flow Pump | 1 | |
| SAMPLE ID | 3394246 | | Flow Pump Speed | 9 | |
| SAMPLE TYPE | Bulk | | Technician | SDM | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.001 | B-Value, f | 0.96 | Height, inches | 3.027 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 | Diameter, inches | 2.791 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 | Area, cm² | 39.47 |
| Volume, cm³ | 300.65 | Top Pres. | 80.0 | Volume, cm³ | 303.48 |
| Mass, g | 568.31 | Tot. B.P. | 80.0 | Mass, g | 603.80 |
| Moisture Content, % | 16.46 | Head, max. | 99.88 | Moisture Content, % | 23.73 |
| Dry Density, pcf | 101.28 | Head, min. | 99.88 | Dry Density, pcf | 100.34 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 12.99 | Volume Solids, cm³ | 180.74 |
| Volume Solids, cm³ | 180.74 | Min. Grad. | 12.99 | Volume Voids, cm³ | 122.73 |
| Volume Voids, cm³ | 119.91 | | | Void Ratio | 0.68 |
| Void Ratio | 0.66 | | | Saturation, % | 94.3% |
| Saturation, % | 67.0% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 568.31 | 612.06 |
| Wt Soil & Tare, f | g | 488.01 | 496.30 |
| Wt Tare | g | 0.00 | 8.44 |
| Wt Moisture Lost | g | 80.30 | 115.76 |
| Wt Dry Soil | g | 488.01 | 487.86 |
| Water Content | % | 16.46% | 23.73% |

DESCRIPTION: sandy SILTY CLAY, trace gravel; grayish brown.

Flow Pump Rate: 4.48E-05 cm³/sec

USCS: CL

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/27/13 | 41513 | 9 | 5 | 20 | 0 | 0 | 0 | 0 | 1.42 | 99.88 | 12.99 | 8.7E-08 |
| 08/27/13 | 41513 | 9 | 10 | 20 | 5 | 5 | 300 | 300 | 1.42 | 99.88 | 12.99 | 8.7E-08 |
| 08/27/13 | 41513 | 9 | 15 | 20 | 5 | 10 | 300 | 600 | 1.42 | 99.88 | 12.99 | 8.7E-08 |
| 08/27/13 | 41513 | 9 | 20 | 20 | 5 | 15 | 300 | 900 | 1.42 | 99.88 | 12.99 | 8.7E-08 * |
| 08/27/13 | 41513 | 9 | 25 | 20 | 5 | 20 | 300 | 1200 | 1.42 | 99.88 | 12.99 | 8.7E-08 * |
| 08/27/13 | 41513 | 9 | 30 | 20 | 5 | 25 | 300 | 1500 | 1.42 | 99.88 | 12.99 | 8.7E-08 * |
| 08/27/13 | 41513 | 9 | 35 | 20 | 5 | 30 | 300 | 1800 | 1.42 | 99.88 | 12.99 | 8.7E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 8.7E-08 cm/sec **

| | |
|---|---|
| DATE | 8/27/13 |
| CHECK | DA |
| REVIEW | TWM |
| APPROVE | CRE |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | | | | | |
|---|---|---|---|---|---|
| PROJECT TITLE | LUMINANT/ASH LF CELL 3/TX | Board # | 7 | COMMENTS | The sample was remolded to 95.7% of the Maximum Dry Density and OPTM - 1.0% (using ASTM D 698). |
| PROJECT NUMBER | QCL-3-07 | Flow Pump | 1 | | |
| SAMPLE ID | 3394246 | Flow Pump Speed | 9 | | |
| SAMPLE TYPE | Bulk | Technician | SDM | | |

| Sample Data, Initial | | | | Sample Data, Final | |
|---|---|---|---|---|---|
| Height, inches | 3.013 | B-Value, f | 0.99 | Height, inches | 3.024 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 | Diameter, inches | 2.786 |
| Area, cm² | 39.44 | Bot. Pres. | 80.0 | Area, cm² | 39.33 |
| Volume, cm³ | 301.86 | Top Pres. | 80.0 | Volume, cm³ | 302.09 |
| Mass, g | 562.71 | Tot. B.P. | 80.0 | Mass, g | 599.29 |
| Moisture Content, % | 16.43 | Head, max. | 115.36 | Moisture Content, % | 23.99 |
| Dry Density, pcf | 99.91 | Head, min. | 115.36 | Dry Density, pcf | 99.83 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 15.02 | Volume Solids, cm³ | 179.01 |
| Volume Solids, cm³ | 179.01 | Min. Grad. | 15.02 | Volume Voids, cm³ | 123.08 |
| Volume Voids, cm³ | 122.85 | | | Void Ratio | 0.69 |
| Void Ratio | 0.69 | | | Saturation, % | 94.2% |
| Saturation, % | 64.6% | | | | |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 562.71 | 607.52 |
| Wt Soil & Tare, f | g | 483.32 | 491.61 |
| Wt Tare | g | 0.00 | 8.55 |
| Wt Moisture Lost | g | 79.39 | 115.91 |
| Wt Dry Soil | g | 483.32 | 483.06 |
| Water Content | % | 16.43% | 23.99% |

DESCRIPTION: sandy SILTY CLAY, trace gravel; grayish brown.

Flow Pump Rate: 4.48E-05 cm³/sec

USCS: CL

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 08/27/13 | 41513 | 9 | 40 | 20.4 | 0 | 0 | 0 | 0 | 1.64 | 115.36 | 15.02 | 7.5E-08 |
| 08/27/13 | 41513 | 9 | 45 | 20.4 | 5 | 5 | 300 | 300 | 1.64 | 115.36 | 15.02 | 7.5E-08 |
| 08/27/13 | 41513 | 9 | 50 | 20.4 | 5 | 10 | 300 | 600 | 1.64 | 115.36 | 15.02 | 7.5E-08 |
| 08/27/13 | 41513 | 9 | 55 | 20.4 | 5 | 15 | 300 | 900 | 1.64 | 115.36 | 15.02 | 7.5E-08 * |
| 08/27/13 | 41513 | 10 | 0 | 20.4 | 5 | 20 | 300 | 1200 | 1.64 | 115.36 | 15.02 | 7.5E-08 * |
| 08/27/13 | 41513 | 10 | 5 | 20.4 | 5 | 25 | 300 | 1500 | 1.64 | 115.36 | 15.02 | 7.5E-08 * |
| 08/27/13 | 41513 | 10 | 10 | 20.4 | 5 | 30 | 300 | 1800 | 1.64 | 115.36 | 15.02 | 7.5E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 7.5E-08 cm/sec **

| | |
|---|---|
| DATE | 8/27/13 |
| CHECK | DA |
| REVIEW | [illegible] |
| APPROVE | [illegible] |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | |
|---|---|
| PROJECT TITLE | LUMINANT/ASH LF CELL 3/TX |
| PROJECT NUMBER | 3394246 |
| SAMPLE ID | QCL-3-15 |
| SAMPLE TYPE | Bulk |

| | |
|---|---|
| Board # | 2 |
| Flow Pump | 1 |
| Flow Pump Speed | 10 |
| Technician | DA |

COMMENTS: The sample was remolded to 94.9% of the Maximum Dry Density and OPTM + 0.1% (using ASTM D 698).

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 3.009 | B-Value, f | 0.99 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 |
| Area, $cm^2$ | 39.44 | Bot. Pres. | 80.0 |
| Volume, $cm^3$ | 301.45 | Top Pres. | 80.0 |
| Mass, g | 539.01 | Tot. B.P. | 80.0 |
| Moisture Content, % | 19.76 | Head, max. | 89.33 |
| Dry Density, pcf | 93.16 | Head, min. | 89.33 |
| Spec. Gravity (assumed) | 2.700 | Max. Grad. | 11.39 |
| Volume Solids, $cm^3$ | 166.69 | Min. Grad. | 11.39 |
| Volume Voids, $cm^3$ | 134.76 | | |
| Void Ratio | 0.81 | | |
| Saturation, % | 66.0% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.089 |
| Diameter, inches | 2.810 |
| Area, $cm^2$ | 40.01 |
| Volume, $cm^3$ | 313.92 |
| Mass, g | 586.40 |
| Moisture Content, % | 30.29 |
| Dry Density, pcf | 89.46 |
| Volume Solids, $cm^3$ | 166.69 |
| Volume Voids, $cm^3$ | 147.23 |
| Void Ratio | 0.88 |
| Saturation, % | 92.6% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 539.01 | 594.51 |
| Wt Soil & Tare, f | g | 450.06 | 458.24 |
| Wt Tare | g | 0.00 | 8.39 |
| Wt Moisture Lost | g | 88.95 | 136.27 |
| Wt Dry Soil | g | 450.06 | 449.85 |
| Water Content | % | 19.76% | 30.29% |

Flow Pump Rate: 2.07E-05 $cm^3$/sec

USCS: CH

DESCRIPTION: CLAY, trace sand; olive.

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/12/13 | 41559 | 11 | 0 | 20.5 | 0 | 0 | 0 | 0 | 1.27 | 89.33 | 11.39 | 4.5E-08 |
| 10/12/13 | 41559 | 11 | 5 | 20.5 | 5 | 5 | 300 | 300 | 1.27 | 89.33 | 11.39 | 4.5E-08 |
| 10/12/13 | 41559 | 11 | 10 | 20.5 | 5 | 10 | 300 | 600 | 1.27 | 89.33 | 11.39 | 4.5E-08 |
| 10/12/13 | 41559 | 11 | 15 | 20.5 | 5 | 15 | 300 | 900 | 1.27 | 89.33 | 11.39 | 4.5E-08 * |
| 10/12/13 | 41559 | 11 | 20 | 20.5 | 5 | 20 | 300 | 1200 | 1.27 | 89.33 | 11.39 | 4.5E-08 * |
| 10/12/13 | 41559 | 11 | 25 | 20.5 | 5 | 25 | 300 | 1500 | 1.27 | 89.33 | 11.39 | 4.5E-08 * |
| 10/12/13 | 41559 | 11 | 30 | 20.5 | 5 | 30 | 300 | 1800 | 1.27 | 89.33 | 11.39 | 4.5E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 4.5E-08 cm/sec **

| | |
|---|---|
| DATE | 10/12/13 |
| CHECK | aem |
| REVIEW | MWA |
| APPROVE | CAK |

# FLEXIBLE WALL PERMEABILITY
## ASTM D 5084
## METHOD D, CONSTANT RATE OF FLOW

| | |
|---|---|
| PROJECT TITLE | LUMINANT/ASH LF CELL 3/TX |
| PROJECT NUMBER | 3394246 |
| SAMPLE ID | QCL-3-18 |
| SAMPLE TYPE | Bulk |

| | |
|---|---|
| Board # | 15 |
| Flow Pump | 1 |
| Flow Pump Speed | 9 |
| Technician | SDM |

COMMENTS: The sample was remolded to 94.9% of the Maximum Dry Density and OPTM + 0.0% (using ASTM D 698).

| Sample Data, Initial | | | |
|---|---|---|---|
| Height, inches | 3.014 | B-Value, f | 0.99 |
| Diameter, inches | 2.790 | Cell Pres. | 90.0 |
| Area, $cm^2$ | 39.44 | Bot. Pres. | 80.0 |
| Volume, $cm^3$ | 301.96 | Top Pres. | 80.0 |
| Mass, g | 552.81 | Tot. B.P. | 80.0 |
| Moisture Content, % | 20.46 | Head, max. | 95.66 |
| Dry Density, pcf | 94.84 | Head, min. | 95.66 |
| Spec. Gravity (assumed) | 2.750 | Max. Grad. | 12.32 |
| Volume Solids, $cm^3$ | 166.88 | Min. Grad. | 12.32 |
| Volume Voids, $cm^3$ | 135.07 | | |
| Void Ratio | 0.81 | | |
| Saturation, % | 69.5% | | |

| Sample Data, Final | |
|---|---|
| Height, inches | 3.056 |
| Diameter, inches | 2.789 |
| Area, $cm^2$ | 39.41 |
| Volume, $cm^3$ | 305.94 |
| Mass, g | 595.16 |
| Moisture Content, % | 29.69 |
| Dry Density, pcf | 93.60 |
| Volume Solids, $cm^3$ | 166.88 |
| Volume Voids, $cm^3$ | 139.06 |
| Void Ratio | 0.83 |
| Saturation, % | 98.0% |

| WATER CONTENTS | | Sample Initial | Sample Final |
|---|---|---|---|
| Wt Soil & Tare, i | g | 552.81 | 603.31 |
| Wt Soil & Tare, f | g | 458.93 | 467.13 |
| Wt Tare | g | 0.00 | 8.39 |
| Wt Moisture Lost | g | 93.88 | 136.18 |
| Wt Dry Soil | g | 458.93 | 458.74 |
| Water Content | % | 20.46% | 29.69% |

DESCRIPTION: CLAY, trace sand; very pale brown.

Flow Pump Rate: 4.48E-05 $cm^3$/sec

USCS: CH

| TIME FUNCTIONS, SECONDS | | | | | | | | dP | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DAY | HOUR | MIN | TEMP (°C) | dt (min) | dt,acc (min) | dt (sec) | dt,acc (sec) | Reading (psi) | Head (cm) | Gradient | Permeability (cm/sec) |
| 10/16/13 | 41563 | 9 | 40 | 20.7 | 0 | 0 | 0 | 0 | 1.36 | 95.66 | 12.32 | 9.1E-08 |
| 10/16/13 | 41563 | 9 | 45 | 20.7 | 5 | 5 | 300 | 300 | 1.36 | 95.66 | 12.32 | 9.1E-08 |
| 10/16/13 | 41563 | 9 | 50 | 20.7 | 5 | 10 | 300 | 600 | 1.36 | 95.66 | 12.32 | 9.1E-08 |
| 10/16/13 | 41563 | 9 | 55 | 20.7 | 5 | 15 | 300 | 900 | 1.36 | 95.66 | 12.32 | 9.1E-08 * |
| 10/16/13 | 41563 | 10 | 0 | 20.7 | 5 | 20 | 300 | 1200 | 1.36 | 95.66 | 12.32 | 9.1E-08 * |
| 10/16/13 | 41563 | 10 | 5 | 20.7 | 5 | 25 | 300 | 1500 | 1.36 | 95.66 | 12.32 | 9.1E-08 * |
| 10/16/13 | 41563 | 10 | 10 | 20.7 | 5 | 30 | 300 | 1800 | 1.36 | 95.66 | 12.32 | 9.1E-08 * |

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 9.1E-08 cm/sec **

| | |
|---|---|
| DATE | 10/16/13 |
| CHECK | Adam |
| REVIEW | Kelly |
| APPROVE | Dr |

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1404716 |
| SAMPLE ID: | QCL-14-1 |
| LIFT NUMBER: | |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |

| Sample Data, Initial | | centimeters | Sample Data, Final | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.454 | 8.77 | Height, in | 3.46 | 8.79 |
| Top Diameter, mm | 72.500 | | Top Diameter, mm | 72.330 | |
| Middle Diameter, mm | 72.480 | | Middle Diameter, mm | 72.270 | |
| Bottom Diameter, mm | 72.550 | | Bottom Diameter, mm | 72.360 | |
| Average Diameter, cm | 7.251 | | Average Diameter, cm | 7.232 | |
| Area, $cm^2$ | 41.29 | | Area, $cm^2$ | 41.08 | |
| Volume, $cm^3$ | 362.28 | | Volume, $cm^3$ | 361.01 | |
| Wet Mass, g | 650.2 | | Wet Mass, g | 673.7 | |
| Wt. tare, gm | 8.5 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 208.30 | | Wt. wet soil + tare, gm | 682.1 | |
| Wt. dry soil + tare, gm | 178.36 | | Wt. dry soil + tare, gm | 539.35 | |
| Moisture Content, % | 17.6% | | Moisture Content, % | 26.9% | |
| Dry Density, pcf | 95.2 | | Dry Density, pcf | 91.8 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.74 | | Void Ratio | 0.80 | |
| Saturation, % | 63% | | Saturation, % | 89% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^2$

**Initial Manometer Readings**

Pipette = 21.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 21.5 | 0.85 | | 29.56 | | 23 | 0.931 | |
| 2 | 4 | 124 | 21.1 | 0.87 | 1.013E-04 | 28.62 | 8.58E-08 | 23 | 0.931 | 7.99E-08 |
| 3 | 51 | 107 | 20.8 | 0.88 | 8.808E-05 | 28.25 | 7.55E-08 | 23 | 0.931 | 7.03E-08 |
| 6 | 4 | 133 | 20.6 | 0.89 | 4.724E-05 | 28.02 | 4.08E-08 | 23 | 0.931 | 3.80E-08 |
| 8 | 21 | 137 | 20.4 | 0.90 | 4.586E-05 | 27.73 | 4.01E-08 | 23 | 0.931 | 3.73E-08 |
| 10 | 50 | 149 | 20.2 | 0.90 | 4.217E-05 | 27.43 | 3.72E-08 | 23 | 0.931 | 3.47E-08 |
| 13 | 37 | 167 | 20.0 | 0.91 | 3.762E-05 | 27.13 | 3.36E-08 | 23 | 0.931 | 3.13E-08 |
| 16 | 45 | 188 | 19.8 | 0.92 | 3.342E-05 | 26.83 | 3.02E-08 | 23 | 0.931 | 2.81E-08 |
| 19 | 30 | 165 | 19.6 | 0.93 | 3.808E-05 | 26.54 | 3.48E-08 | 23 | 0.931 | 3.24E-08 |
| 23 | 1 | 211 | 19.4 | 0.94 | 2.978E-05 | 26.24 | 2.75E-08 | 23 | 0.931 | 2.56E-08 |
| 28 | 4 | 303 | 19.1 | 0.95 | 3.110E-05 | 25.72 | 2.93E-08 | 23 | 0.931 | 2.73E-08 |
| 31 | 55 | 231 | 18.9 | 0.96 | 2.720E-05 | 25.50 | 2.58E-08 | 23 | 0.931 | 2.41E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **2.73E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VM |
| DATE: | 3/5/2015 | DATE: | 3/17/2015 |

**GEOTECHNICAL TESTING LABORATORY**
**GOLDER ASSOCIATES**
**HOUSTON, TEXAS**

# APPENDIX B-2
# CONSTRUCTION TEST RESULTS

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# SUMMARY OF LABORATORY RESULTS



**CLIENT** Luminant Power **PROJECT NAME** Luminant / OGSES FGD-C Pond CQA

**PROJECT NUMBER** 1525714 **PROJECT LOCATION**

| Sample ID | Lift | Natural Moisture (%) | Atterberg Limits | | | %<#200 Sieve | Class-ification | Unit Weight | | Permeability (cm/sec) | Additional Lab Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Liquid Limit | Plastic Limit | Plasticity Index | | | Moisture Content (%) | Dry Density (pcf) | | |
| CL-005 | 1 | 15.4 | 64 | 19 | 45 | 74 | CH | 25.3 | 97.1 | 7.90E-08 | |
| CL-010 | 1 | 12.8 | 48 | 18 | 30 | 58 | CL | 27.8 | 95.5 | 2.07E-08 | |
| CL-015 | 1 | 15.7 | 63 | 17 | 46 | 82 | CH | 23.7 | 93.6 | 7.62E-08 | |
| CL-022 | 1 | 25.5 | 58 | 17 | 41 | 83 | CH | 16.8 | 108.5 | 1.77E-08 | |
| CL-026 | 1 | 28.7 | 62 | 17 | 45 | 78 | CH | 20.5 | 103.5 | 7.96E-08 | |
| CL-029 | 1 | 17.6 | 58 | 16 | 42 | 86 | CH | 18.8 | 106.4 | 5.69E-08 | |
| CL-032 | 1 | 29.9 | 67 | 18 | 49 | 85 | CH | 26.4 | 95.1 | 2.01E-08 | |
| CL-035 | 1 | 25.8 | 67 | 19 | 48 | 80 | CH | 20.9 | 102.3 | 7.75E-08 | |
| CL-037 | 1 | 24.5 | 64 | 16 | 48 | 80 | CH | 18.7 | 106.2 | 4.59E-08 | |
| CL-040 | 1 | 21.6 | 62 | 16 | 46 | 89 | CH | 18.1 | 104.9 | 2.38E-08 | |
| CL-050 | 2 | 23.6 | 55 | 18 | 37 | 73 | CH | 21.4 | 103.6 | 4.61E-08 | |
| CL-055 | 2 | 24.8 | 59 | 18 | 41 | 85 | CH | 26.5 | 98.9 | 2.00E-08 | |
| CL-060 | 2 | 28.7 | 69 | 18 | 51 | 77 | CH | 22.1 | 97.5 | 9.47E-08 | |
| CL-065 | 2 | 20.8 | 53 | 16 | 37 | 88 | CH | 16.7 | 108.8 | 3.33E-08 | |
| CL-070 | 2 | 25.9 | 59 | 17 | 42 | 80 | CH | 22.1 | 102.0 | 1.26E-08 | |
| CL-075 | 2 | 29.2 | 62 | 17 | 45 | 88 | CH | 24.5 | 97.9 | 2.53E-08 | |
| CL-080 | 2 | 30.4 | 55 | 17 | 38 | 84 | CH | 23.2 | 102.3 | 7.13E-08 | |
| CL-085 | 2 | 22.2 | 66 | 17 | 49 | 90 | CH | 25.0 | 99.0 | 1.78E-08 | |
| CL-090 | 2 | 22.5 | 58 | 16 | 42 | 84 | CH | 21.9 | 103.4 | 7.64E-08 | |
| CL-095 | 2 | 24.4 | 61 | 16 | 45 | 86 | CH | 21.7 | 100.0 | 6.89E-08 | |
| CL-100 | 3 | 21.4 | 51 | 15 | 36 | 62 | CH | 17.3 | 108.5 | 7.03E-08 | |
| CL-105 | 3 | 18.6 | 45 | 15 | 30 | 55 | CL | 17.7 | 103.0 | 8.27E-08 | |
| CL-110 | 3 | 25.0 | 65 | 17 | 48 | 79 | CH | 19.6 | 103.6 | 2.14E-08 | |
| CL-115 | 3 | 25.4 | 62 | 16 | 46 | 82 | CH | 21.8 | 103.4 | 2.26E-08 | |
| CL-120 | 3 | 28.0 | 52 | 16 | 36 | 76 | CH | 19.1 | 104.8 | 8.72E-08 | |
| CL-125 | 3 | 24.3 | 50 | 16 | 34 | 74 | CH | 20.6 | 100.4 | 7.15E-08 | |
| CL-130 | 3 | 27.2 | 50 | 16 | 34 | 80 | CH | 16.6 | 100.8 | 2.84E-08 | |
| CL-135 | 3 | 30.5 | 51 | 16 | 35 | 72 | CH | 17.2 | 102.3 | 3.04E-08 | |
| CL-140 | 3 | 29.2 | 58 | 17 | 41 | 84 | CH | 18.4 | 104.7 | 2.20E-08 | |
| CL-145 | 3 | 29.3 | 55 | 16 | 39 | 81 | CH | 19.4 | 104.4 | 7.66E-08 | |
| CL-150 | 4 | 23.8 | 47 | 17 | 30 | 72 | CL | 19.6 | 102.0 | 8.38E-08 | |
| CL-155 | 4 | 23.3 | 47 | 16 | 31 | 73 | CL | 24.0 | 100.5 | 1.64E-08 | |
| CL-160 | 4 | 25.2 | 50 | 15 | 35 | 75 | CH | 25.7 | 97.8 | 2.16E-08 | |
| CL-165 | 4 | 25.9 | 44 | 15 | 29 | 69 | CL | 21.9 | 101.6 | 1.76E-08 | |
| CL-170 | 4 | 21.1 | 46 | 15 | 31 | 73 | CL | 25.2 | 95.9 | 1.80E-08 | |
| CL-175 | 4 | 21.1 | 45 | 15 | 30 | 69 | CL | 22.9 | 101.3 | 1.56E-08 | |
| CL-180 | 4 | 24.3 | 48 | 14 | 34 | 73 | CL | 26.2 | 95.2 | 1.91E-08 | |
| CL-185 | 4 | 25.8 | 48 | 15 | 33 | 73 | CL | 23.7 | 98.6 | 2.18E-08 | |
| CL-190 | 4 | 23.4 | 44 | 16 | 28 | 71 | CL | 24.1 | 94.7 | 1.66E-08 | |
| CL-195 | 4 | 23.1 | 48 | 15 | 33 | 69 | CL | 25.3 | 97.5 | 1.63E-08 | |
| CL-200 | 1 | 30.2 | 45 | 17 | 28 | 73 | CL | 23.9 | 99.3 | 3.38E-08 | |

LAB SUMMARY - CQA - GINT STD US LAB.GDT - 11/3/15 09:49 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# SUMMARY OF LABORATORY RESULTS



**CLIENT** Luminant Power **PROJECT NAME** Luminant / OGSES FGD-C Pond CQA

**PROJECT NUMBER** 1525714 **PROJECT LOCATION**

| Sample ID | Lift | Natural Moisture (%) | Atterberg Limits | | | %<#200 Sieve | Class-ification | Unit Weight | | Permeability (cm/sec) | Additional Lab Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Liquid Limit | Plastic Limit | Plasticity Index | | | Moisture Content (%) | Dry Density (pcf) | | |
| CL-205 | 1 | 25.2 | 49 | 16 | 33 | 76 | CL | 21.1 | 100.5 | 9.48E-08 | |
| CL-210 | 1 | 23.8 | 47 | 15 | 32 | 75 | CL | 22.9 | 101.6 | 7.55E-08 | |
| CL-215 | 1 | 27.7 | 45 | 16 | 29 | 70 | CL | 12.8 | 113.4 | 1.47E-08 | |
| CL-220 | 1 | 27.4 | 45 | 15 | 30 | 68 | CL | 23.5 | 100.9 | 2.03E-08 | |
| CL-225 | 1 | 29.1 | 48 | 15 | 33 | 70 | CL | 19.6 | 102.4 | 7.21E-08 | |
| CL-230 | 1 | 23.6 | 48 | 15 | 33 | 73 | CL | 21.5 | 100.4 | 4.54E-08 | |
| CL-235 | 1 | 29.6 | 53 | 17 | 36 | 68 | CH | 20.1 | 102.9 | 2.23E-08 | |
| CL-240 | 1 | 28.2 | 54 | 18 | 36 | 66 | CH | 20.0 | 103.1 | 3.32E-08 | |
| CL-242 | 1 | 30.5 | 53 | 17 | 36 | 64 | CH | 20.5 | 103.9 | 6.99E-08 | |
| CL-245 | 1 | 29.6 | 55 | 17 | 38 | 67 | CH | 24.8 | 99.3 | 2.01E-08 | |
| CL-250 | 2 | 29.4 | 56 | 17 | 39 | 68 | CH | 19.9 | 105.6 | 1.92E-08 | |
| CL-255 | 2 | 28.8 | 55 | 17 | 38 | 69 | CH | 22.6 | 103.5 | 4.56E-08 | |
| CL-265 | 2 | 24.4 | 55 | 17 | 38 | 67 | CH | 20.9 | 102.6 | 1.84E-08 | |
| CL-270 | 2 | 23.7 | 53 | 17 | 36 | 59 | CH | 23.3 | 99.0 | 1.71E-08 | |
| CL-280 | 2 | 29.4 | 52 | 16 | 36 | 61 | CH | 21.1 | 104.1 | 2.65E-08 | |
| CL-285 | 2 | 31.2 | 51 | 15 | 36 | 57 | CH | 19.5 | 102.9 | 6.09E-08 | |
| CL-290 | 2 | 29.3 | 54 | 16 | 38 | 54 | CH | 21.1 | 100.6 | 8.01E-08 | |
| CL-295 | 2 | 29.8 | 53 | 16 | 37 | 52 | CH | 20.9 | 99.4 | 2.15E-08 | |
| CL-297 | 2 | 29.9 | 57 | 17 | 40 | 53 | CH | 20.0 | 104.5 | 1.77E-08 | |
| CL-300 | 3 | 31.5 | 55 | 17 | 38 | 62 | CH | 21.1 | 101.0 | 5.06E-08 | |
| CL-305 | 3 | 24.8 | 60 | 17 | 43 | 77 | CH | 21.8 | 95.4 | 2.54E-08 | |
| CL-310 | 3 | 27.9 | 58 | 16 | 42 | 76 | CH | 23.0 | 98.2 | 6.56E-08 | |
| CL-325 | 3 | 34.0 | 58 | 15 | 43 | 78 | CH | 26.4 | 92.6 | 3.06E-08 | |
| CL-330 | 3 | 31.1 | 56 | 16 | 40 | 78 | CH | 23.3 | 101.1 | 1.96E-08 | |
| CL-335 | 3 | 30.2 | 56 | 16 | 40 | 82 | CH | 23.8 | 96.3 | 2.08E-08 | |
| CL-340 | 3 | 26.3 | 56 | 15 | 41 | 78 | CH | 25.9 | 95.4 | 4.38E-08 | |
| CL-345 | 3 | 24.5 | 57 | 16 | 41 | 80 | CH | 24.6 | 95.7 | 5.54E-08 | |
| CL-347 | 3 | 30.0 | 60 | 16 | 44 | 76 | CH | 23.7 | 99.3 | 7.23E-08 | |
| CL-350 | 3 | 29.9 | 60 | 16 | 44 | 77 | CH | 20.2 | 103.5 | 4.38E-08 | |
| CL-355 | 4 | 28.7 | 57 | 16 | 41 | 78 | CH | 25.1 | 92.2 | 6.55E-08 | |
| CL-360 | 4 | 29.7 | 64 | 17 | 47 | 74 | CH | 21.4 | 97.6 | 3.43E-08 | |
| CL-365 | 4 | 28.6 | 60 | 16 | 44 | 72 | CH | 21.2 | 102.3 | 1.82E-08 | |
| CL-370 | 4 | 30.9 | 63 | 17 | 46 | 74 | CH | 24.8 | 99.0 | 8.63E-08 | |
| CL-375 | 4 | 27.3 | 64 | 17 | 47 | 74 | CH | 21.3 | 100.5 | 5.68E-08 | |
| CL-380 | 4 | 31.4 | 61 | 17 | 44 | 74 | CH | 23.3 | 100.2 | 6.34E-08 | |
| CL-385 | 4 | 30.1 | 61 | 16 | 45 | 74 | CH | 16.9 | 98.8 | 2.01E-08 | |
| CL-390 | 4 | 30.1 | 61 | 17 | 44 | 70 | CH | 21.3 | 95.2 | 4.76E-08 | |
| CL-395 | 4 | 31.8 | 61 | 16 | 45 | 70 | CH | 22.8 | 98.8 | 2.81E-08 | |
| CL-397 | 4 | 29.4 | 61 | 16 | 45 | 70 | CH | 25.6 | 97.7 | 1.92E-08 | |
| CL-400 | 4 | 29.4 | 58 | 16 | 42 | 74 | CH | 28.4 | 93.4 | 2.50E-08 | |
| CL-405 | 4 | 28.4 | 62 | 17 | 45 | 77 | CH | 24.1 | 97.2 | 5.87E-08 | |

LAB SUMMARY - CQA - GINT STD US LAB.GDT - 11/3/15 09:49 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# SUMMARY OF LABORATORY RESULTS



**CLIENT** Luminant Power **PROJECT NAME** Luminant / OGSES FGD-C Pond CQA

**PROJECT NUMBER** 1525714 **PROJECT LOCATION**

| Sample ID | Lift | Natural Moisture (%) | Atterberg Limits | | | %<#200 Sieve | Class-ification | Unit Weight | | Permeability (cm/sec) | Additional Lab Testing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Liquid Limit | Plastic Limit | Plasticity Index | | | Moisture Content (%) | Dry Density (pcf) | | |
| CL-410 | 4 | 30.4 | 64 | 18 | 46 | 76 | CH | 20.5 | 104.3 | 4.28E-08 | |

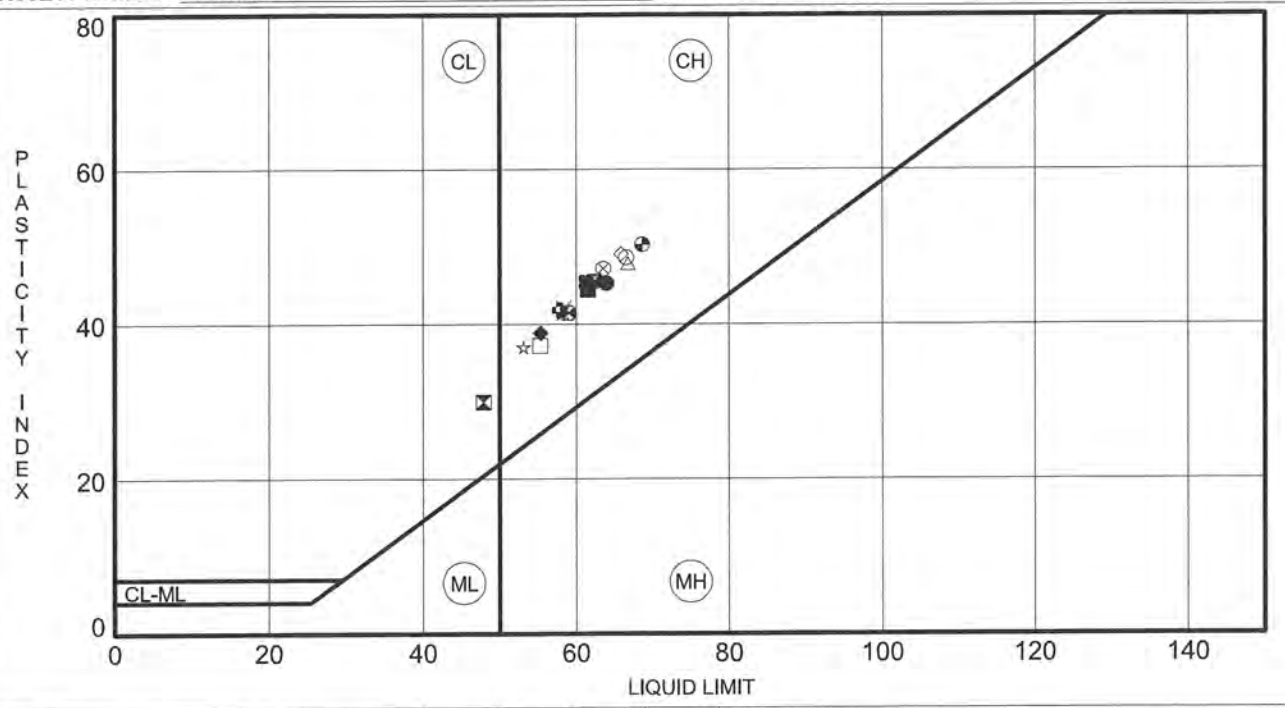
LAB SUMMARY - CQA - GINT STD US LAB.GDT - 11/3/15 09:49 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

# ATTERBERG LIMITS

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

**ATTERBERG LIMITS RESULTS**
**ASTM D4318**
**Method B**
Machine Type:
Plastic Limit Type:
Grooving Tool Type:
Preparation Type:

**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA
**PROJECT NUMBER** 1525714
**PROJECT LOCATION**



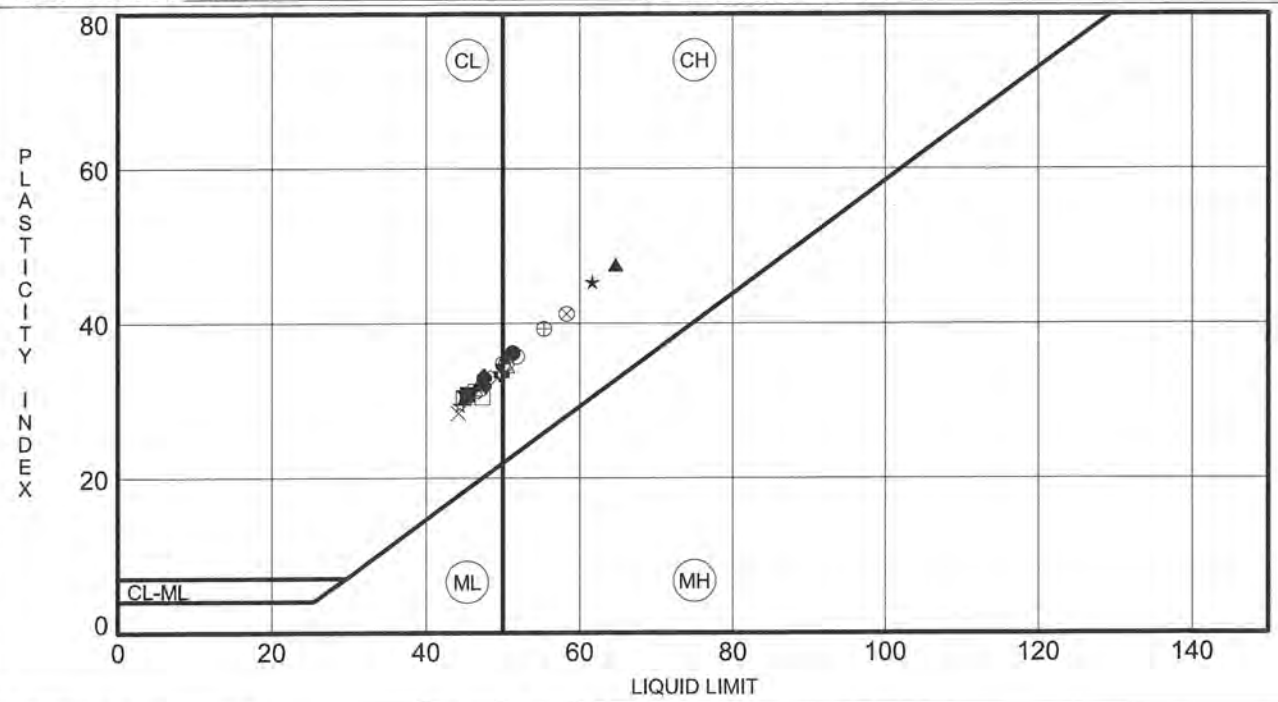

| BOREHOLE | DEPTH | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|
| CL-005 | Lift 1 | 64 | 19 | 45 | 74 | FAT CLAY with SAND (CH) |
| CL-010 | Lift 1 | 48 | 18 | 30 | 58 | SANDY LEAN CLAY (CL) |
| CL-015 | Lift 1 | 63 | 17 | 46 | 82 | FAT CLAY with SAND (CH) |
| CL-022 | Lift 1 | 58 | 17 | 41 | 83 | FAT CLAY with SAND (CH) |
| CL-026 | Lift 1 | 62 | 17 | 45 | 78 | FAT CLAY with SAND (CH) |
| CL-029 | Lift 1 | 58 | 16 | 42 | 86 | FAT CLAY (CH) |
| CL-032 | Lift 1 | 67 | 18 | 49 | 85 | FAT CLAY with SAND (CH) |
| CL-035 | Lift 1 | 67 | 19 | 48 | 80 | FAT CLAY with SAND (CH) |
| CL-037 | Lift 1 | 64 | 16 | 48 | 80 | FAT CLAY with SAND (CH) |
| CL-040 | Lift 1 | 62 | 16 | 46 | 89 | FAT CLAY (CH) |
| CL-050 | Lift 2 | 55 | 18 | 37 | 73 | FAT CLAY with SAND (CH) |
| CL-055 | Lift 2 | 59 | 18 | 41 | 85 | FAT CLAY (CH) |
| CL-060 | Lift 2 | 69 | 18 | 51 | 77 | FAT CLAY with SAND (CH) |
| CL-065 | Lift 2 | 53 | 16 | 37 | 88 | FAT CLAY (CH) |
| CL-070 | Lift 2 | 59 | 17 | 42 | 80 | FAT CLAY with SAND (CH) |
| CL-075 | Lift 2 | 62 | 17 | 45 | 88 | FAT CLAY (CH) |
| CL-080 | Lift 2 | 55 | 17 | 38 | 84 | FAT CLAY with SAND (CH) |
| CL-085 | Lift 2 | 66 | 17 | 49 | 90 | FAT CLAY (CH) |
| CL-090 | Lift 2 | 58 | 16 | 42 | 84 | FAT CLAY with SAND (CH) |
| CL-095 | Lift 2 | 61 | 16 | 45 | 86 | FAT CLAY (CH) |

ATTERBERG LIMITS METHOD B (LIFT) - GINT STD US LAB.GDT - 11/3/15 11:03 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

**ATTERBERG LIMITS RESULTS**
**ASTM D4318**
**Method B**
Machine Type:
Plastic Limit Type:
Grooving Tool Type:
Preparation Type:

**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA
**PROJECT NUMBER** 1525714
**PROJECT LOCATION**




| | BOREHOLE | DEPTH | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|---|
| ● | CL-100 | Lift 3 | 51 | 15 | 36 | 62 | SANDY FAT CLAY (CH) |
| ⊠ | CL-105 | Lift 3 | 45 | 15 | 30 | 55 | SANDY LEAN CLAY (CL) |
| ▲ | CL-110 | Lift 3 | 65 | 17 | 48 | 79 | FAT CLAY with SAND (CH) |
| ★ | CL-115 | Lift 3 | 62 | 16 | 46 | 82 | FAT CLAY with SAND (CH) |
| ⊙ | CL-120 | Lift 3 | 52 | 16 | 36 | 76 | FAT CLAY with SAND (CH) |
| ✪ | CL-125 | Lift 3 | 50 | 16 | 34 | 74 | FAT CLAY with SAND (CH) |
| ○ | CL-130 | Lift 3 | 50 | 16 | 34 | 80 | FAT CLAY with SAND (CH) |
| △ | CL-135 | Lift 3 | 51 | 16 | 35 | 72 | FAT CLAY with SAND (CH) |
| ⊗ | CL-140 | Lift 3 | 58 | 17 | 41 | 84 | FAT CLAY with SAND (CH) |
| ⊕ | CL-145 | Lift 3 | 55 | 16 | 39 | 81 | FAT CLAY with SAND (CH) |
| □ | CL-150 | Lift 4 | 47 | 17 | 30 | 72 | LEAN CLAY with SAND (CL) |
| ⊗ | CL-155 | Lift 4 | 47 | 16 | 31 | 73 | LEAN CLAY with SAND (CL) |
| ◔ | CL-160 | Lift 4 | 50 | 15 | 35 | 75 | FAT CLAY with SAND (CH) |
| ☆ | CL-165 | Lift 4 | 44 | 15 | 29 | 69 | SANDY LEAN CLAY (CL) |
| ⊠ | CL-170 | Lift 4 | 46 | 15 | 31 | 73 | LEAN CLAY with SAND (CL) |
| ■ | CL-175 | Lift 4 | 45 | 15 | 30 | 69 | SANDY LEAN CLAY (CL) |
| ◆ | CL-180 | Lift 4 | 48 | 14 | 34 | 73 | LEAN CLAY with SAND (CL) |
| ◇ | CL-185 | Lift 4 | 48 | 15 | 33 | 73 | LEAN CLAY with SAND (CL) |
| × | CL-190 | Lift 4 | 44 | 16 | 28 | 71 | LEAN CLAY with SAND (CL) |
| ⊠ | CL-195 | Lift 4 | 48 | 15 | 33 | 69 | SANDY LEAN CLAY (CL) |

ATTERBERG LIMITS METHOD B (LIFT) - GINT STD US LAB.GDT - 11/3/15 11:03 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

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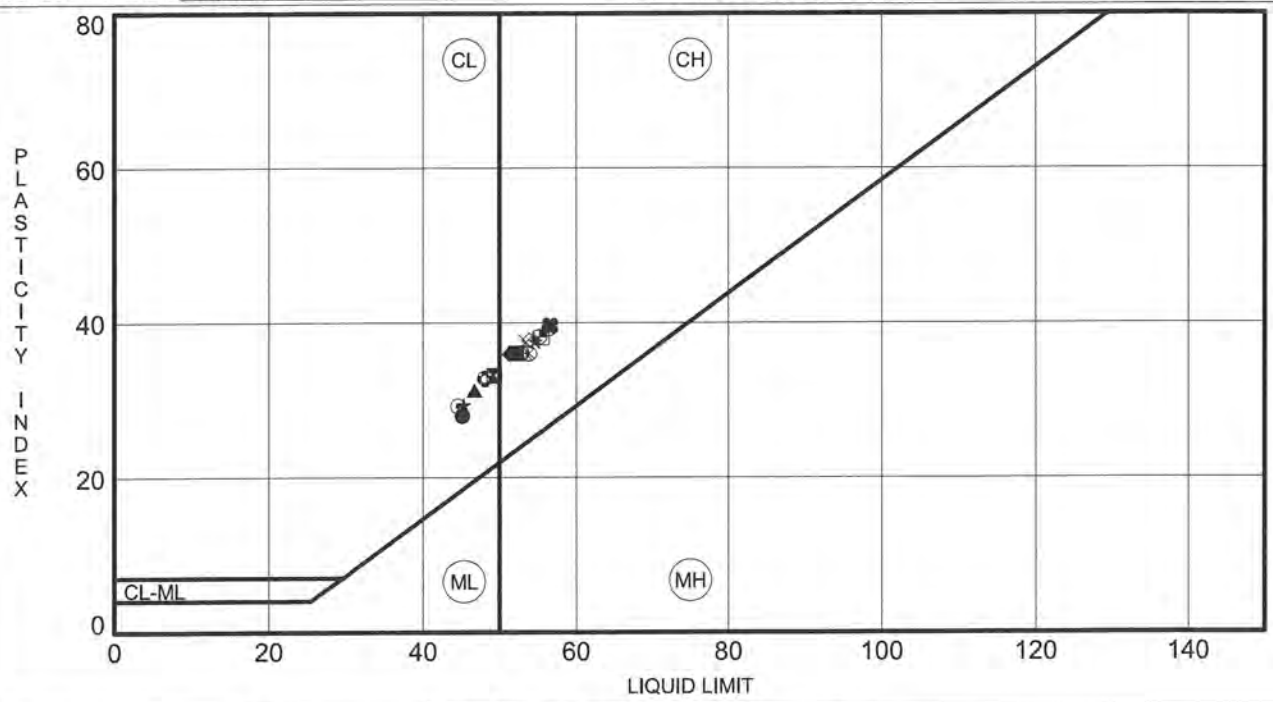
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

**ATTERBERG LIMITS RESULTS**
**ASTM D4318**
**Method B**
Machine Type:
Plastic Limit Type:
Grooving Tool Type:
Preparation Type:

**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA
**PROJECT NUMBER** 1525714
**PROJECT LOCATION**




| | BOREHOLE | DEPTH | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|---|
| ● | CL-200 | Lift 1 | 45 | 17 | 28 | 73 | LEAN CLAY with SAND (CL) |
| ⊠ | CL-205 | Lift 1 | 49 | 16 | 33 | 76 | LEAN CLAY with SAND (CL) |
| ▲ | CL-210 | Lift 1 | 47 | 15 | 32 | 75 | LEAN CLAY with SAND (CL) |
| ★ | CL-215 | Lift 1 | 45 | 16 | 29 | 70 | LEAN CLAY with SAND (CL) |
| ⊙ | CL-220 | Lift 1 | 45 | 15 | 30 | 68 | SANDY LEAN CLAY (CL) |
| ✪ | CL-225 | Lift 1 | 48 | 15 | 33 | 70 | LEAN CLAY with SAND (CL) |
| ○ | CL-230 | Lift 1 | 48 | 15 | 33 | 73 | LEAN CLAY with SAND (CL) |
| △ | CL-235 | Lift 1 | 53 | 17 | 36 | 68 | SANDY FAT CLAY (CH) |
| ⊗ | CL-240 | Lift 1 | 54 | 18 | 36 | 66 | SANDY FAT CLAY (CH) |
| ⊕ | CL-242 | Lift 1 | 53 | 17 | 36 | 64 | SANDY FAT CLAY (CH) |
| □ | CL-245 | Lift 1 | 55 | 17 | 38 | 67 | SANDY FAT CLAY (CH) |
| ⊖ | CL-250 | Lift 2 | 56 | 17 | 39 | 68 | SANDY FAT CLAY (CH) |
| ◔ | CL-255 | Lift 2 | 55 | 17 | 38 | 69 | SANDY FAT CLAY (CH) |
| ☆ | CL-265 | Lift 2 | 55 | 17 | 38 | 67 | SANDY FAT CLAY (CH) |
| ⊡ | CL-270 | Lift 2 | 53 | 17 | 36 | 59 | SANDY FAT CLAY (CH) |
| ■ | CL-280 | Lift 2 | 52 | 16 | 36 | 61 | SANDY FAT CLAY (CH) |
| ◆ | CL-285 | Lift 2 | 51 | 15 | 36 | 57 | SANDY FAT CLAY (CH) |
| ◇ | CL-290 | Lift 2 | 54 | 16 | 38 | 54 | SANDY FAT CLAY (CH) |
| × | CL-295 | Lift 2 | 53 | 16 | 37 | 52 | SANDY FAT CLAY (CH) |
| ⊠ | CL-297 | Lift 2 | 57 | 17 | 40 | 53 | SANDY FAT CLAY (CH) |

ATTERBERG LIMITS METHOD B (LIFT) - GINT STD US LAB.GDT - 11/3/15 11:03 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

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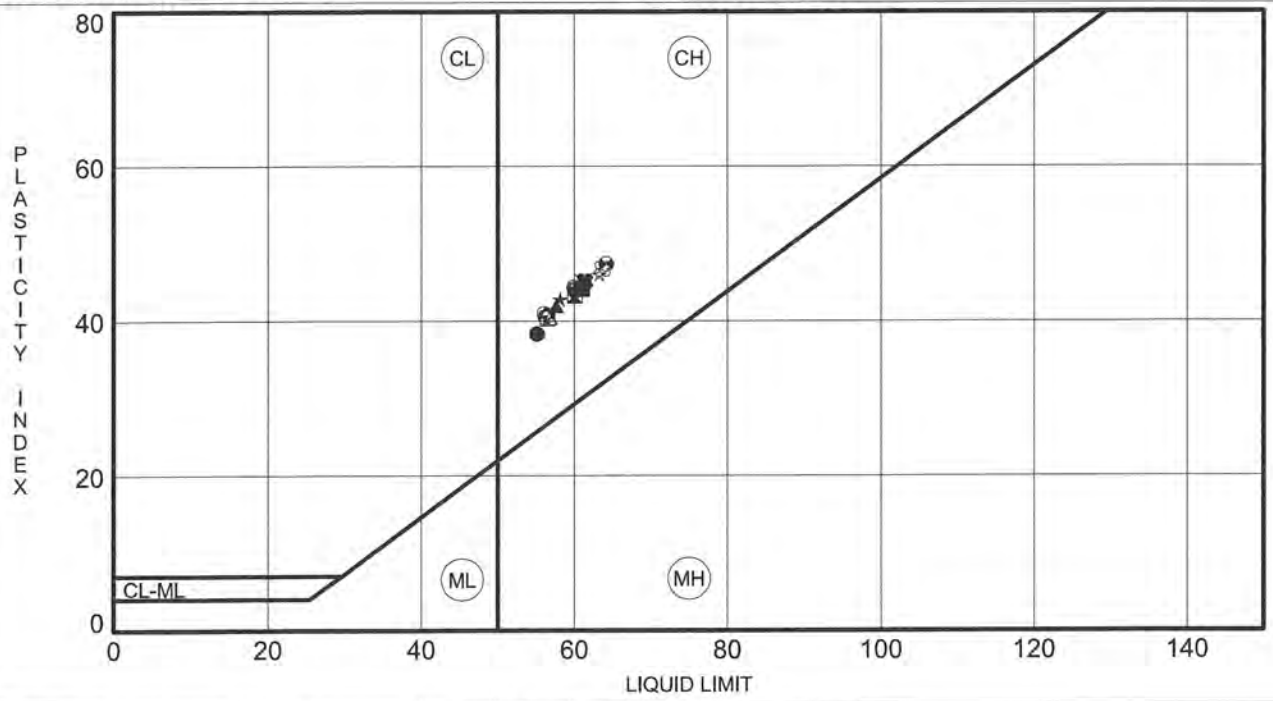
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

**ATTERBERG LIMITS RESULTS**
**ASTM D4318**
**Method B**
Machine Type:
Plastic Limit Type:
Grooving Tool Type:
Preparation Type:

**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA
**PROJECT NUMBER** 1525714
**PROJECT LOCATION**




| | BOREHOLE | DEPTH | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|---|
| ● | CL-300 | Lift 3 | 55 | 17 | 38 | 62 | SANDY FAT CLAY (CH) |
| ⊠ | CL-305 | Lift 3 | 60 | 17 | 43 | 77 | FAT CLAY with SAND (CH) |
| ▲ | CL-310 | Lift 3 | 58 | 16 | 42 | 76 | FAT CLAY with SAND (CH) |
| ★ | CL-325 | Lift 3 | 58 | 15 | 43 | 78 | FAT CLAY with SAND (CH) |
| ⊙ | CL-330 | Lift 3 | 56 | 16 | 40 | 78 | FAT CLAY with SAND (CH) |
| ✿ | CL-335 | Lift 3 | 56 | 16 | 40 | 82 | FAT CLAY with SAND (CH) |
| ○ | CL-340 | Lift 3 | 56 | 15 | 41 | 78 | FAT CLAY with SAND (CH) |
| △ | CL-345 | Lift 3 | 57 | 16 | 41 | 80 | FAT CLAY with SAND (CH) |
| ⊗ | CL-347 | Lift 3 | 60 | 16 | 44 | 76 | FAT CLAY with SAND (CH) |
| ⊕ | CL-350 | Lift 3 | 60 | 16 | 44 | 77 | FAT CLAY with SAND (CH) |
| □ | CL-355 | Lift 4 | 57 | 16 | 41 | 78 | FAT CLAY with SAND (CH) |
| ⊛ | CL-360 | Lift 4 | 64 | 17 | 47 | 74 | FAT CLAY with SAND (CH) |
| ◔ | CL-365 | Lift 4 | 60 | 16 | 44 | 72 | FAT CLAY with SAND (CH) |
| ☆ | CL-370 | Lift 4 | 63 | 17 | 46 | 74 | FAT CLAY with SAND (CH) |
| ⊠ | CL-375 | Lift 4 | 64 | 17 | 47 | 74 | FAT CLAY with SAND (CH) |
| ■ | CL-380 | Lift 4 | 61 | 17 | 44 | 74 | FAT CLAY with SAND (CH) |
| ◆ | CL-385 | Lift 4 | 61 | 16 | 45 | 74 | FAT CLAY with SAND (CH) |
| ◇ | CL-390 | Lift 4 | 61 | 17 | 44 | 70 | FAT CLAY with SAND (CH) |
| × | CL-395 | Lift 4 | 61 | 16 | 45 | 70 | SANDY FAT CLAY (CH) |
| ⊠ | CL-397 | Lift 4 | 61 | 16 | 45 | 70 | FAT CLAY with SAND (CH) |

ATTERBERG LIMITS METHOD B (LIFT) - GINT STD US LAB.GDT - 11/3/15 11:03 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

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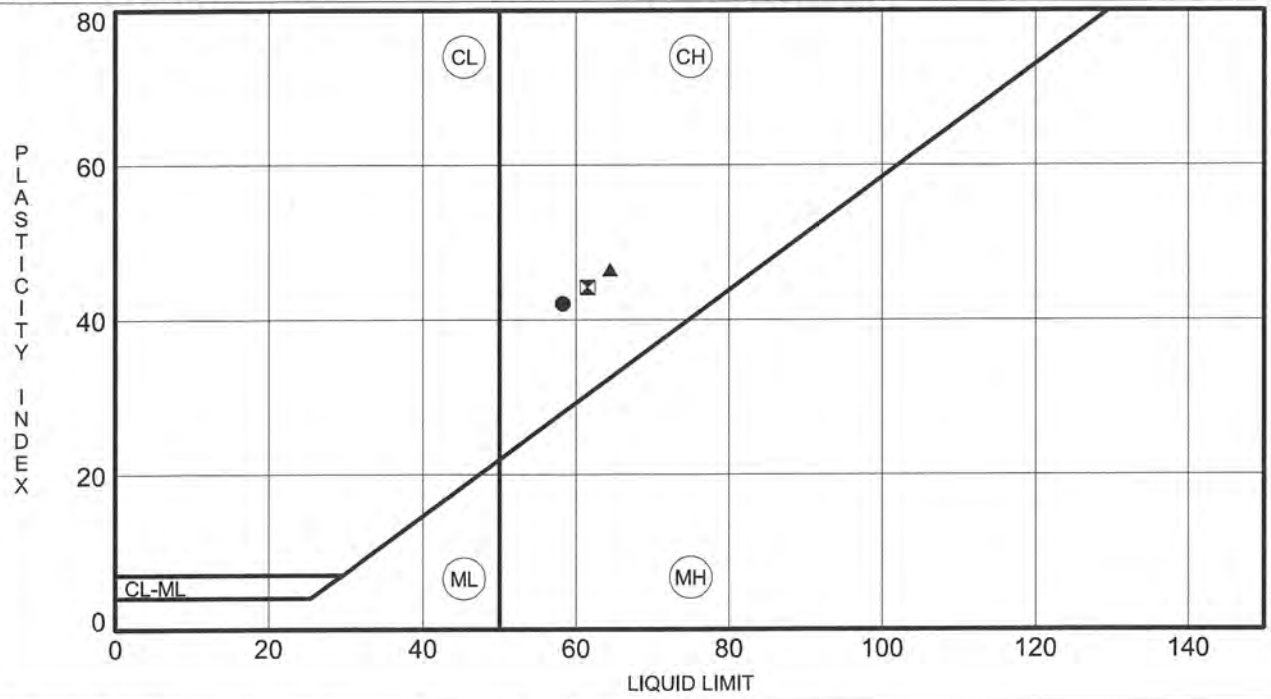
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

**ATTERBERG LIMITS RESULTS**
**ASTM D4318**
**Method B**
Machine Type:
Plastic Limit Type:
Grooving Tool Type:
Preparation Type:

**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA
**PROJECT NUMBER** 1525714
**PROJECT LOCATION**




| | BOREHOLE | DEPTH | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|---|
| ● | CL-400 | Lift 4 | 58 | 16 | 42 | 74 | FAT CLAY with SAND (CH) |
| ⊠ | CL-405 | Lift 4 | 62 | 17 | 45 | 77 | FAT CLAY with SAND (CH) |
| ▲ | CL-410 | Lift 4 | 64 | 18 | 46 | 76 | FAT CLAY with SAND (CH) |

ATTERBERG LIMITS METHOD B (LIFT) - GINT STD US LAB.GDT - 11/3/15 11:03 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

# GRAIN SIZE ANALYSIS

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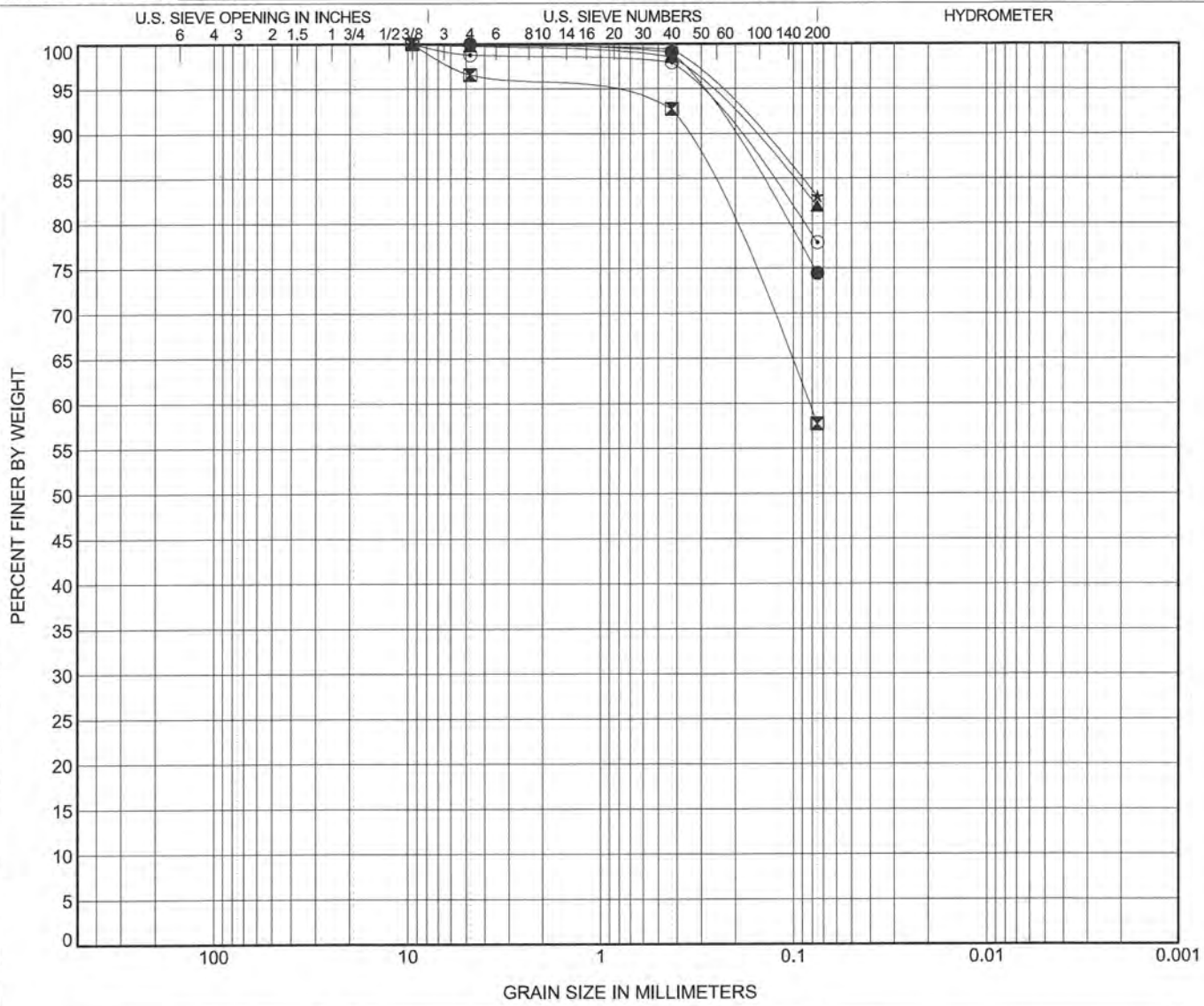
# GRAIN SIZE DISTRIBUTION
# ASTM D422

**CLIENT** Luminant Power
**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA
**PROJECT NUMBER** 1525714
**PROJECT LOCATION**




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-005 | Lift 1 | FAT CLAY with SAND (CH) | 64 | 19 | 45 |
| ⊠ | CL-010 | Lift 1 | SANDY LEAN CLAY (CL) | 48 | 18 | 30 |
| ▲ | CL-015 | Lift 1 | FAT CLAY with SAND (CH) | 63 | 17 | 46 |
| ★ | CL-022 | Lift 1 | FAT CLAY with SAND (CH) | 58 | 17 | 41 |
| ⊙ | CL-026 | Lift 1 | FAT CLAY with SAND (CH) | 62 | 17 | 45 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-005 | Lift 1 | 4.75 | | | | 0.0 | 25.5 | 74 | |
| ⊠ | CL-010 | Lift 1 | 9.5 | 0.084 | | | 3.5 | 38.8 | 58 | |
| ▲ | CL-015 | Lift 1 | 9.5 | | | | 0.2 | 17.9 | 82 | |
| ★ | CL-022 | Lift 1 | 9.5 | | | | 0.2 | 16.8 | 83 | |
| ⊙ | CL-026 | Lift 1 | 9.5 | | | | 1.2 | 20.9 | 78 | |

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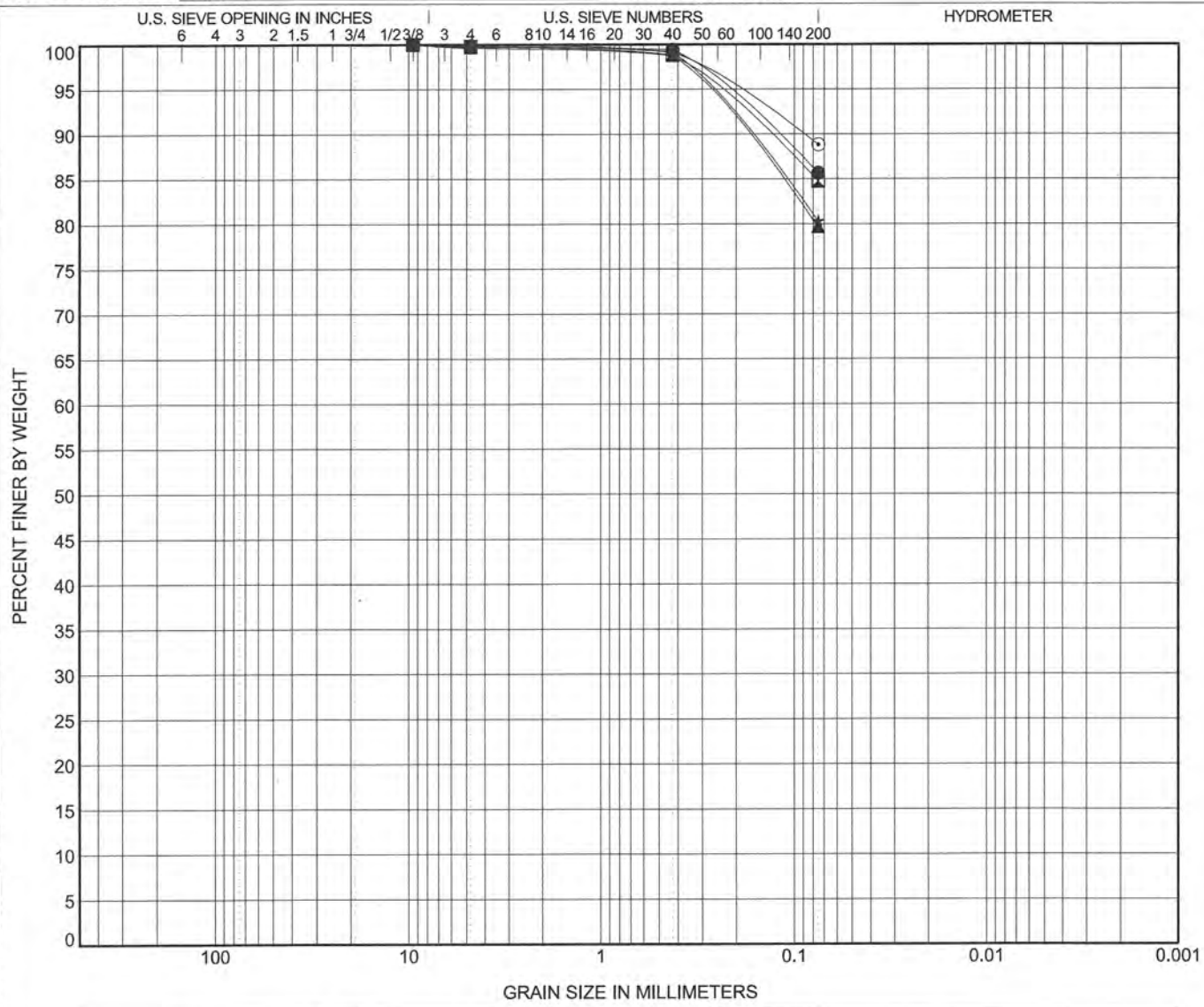
# GRAIN SIZE DISTRIBUTION
# ASTM D422

**CLIENT** Luminant Power **PROJECT NAME** Luminant / OGSES FGD-C Pond CQA

**PROJECT NUMBER** 1525714 **PROJECT LOCATION**




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-029 | Lift 1 | FAT CLAY (CH) | 58 | 16 | 42 |
| ⊠ | CL-032 | Lift 1 | FAT CLAY with SAND (CH) | 67 | 18 | 49 |
| ▲ | CL-035 | Lift 1 | FAT CLAY with SAND (CH) | 67 | 19 | 48 |
| ★ | CL-037 | Lift 1 | FAT CLAY with SAND (CH) | 64 | 16 | 48 |
| ⊙ | CL-040 | Lift 1 | FAT CLAY (CH) | 62 | 16 | 46 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-029 | Lift 1 | 9.5 | | | | 0.3 | 14.1 | 86 | |
| ⊠ | CL-032 | Lift 1 | 9.5 | | | | 0.2 | 15.0 | 85 | |
| ▲ | CL-035 | Lift 1 | 9.5 | | | | 0.4 | 20.0 | 80 | |
| ★ | CL-037 | Lift 1 | 4.75 | | | | 0.0 | 19.7 | 80 | |
| ⊙ | CL-040 | Lift 1 | 9.5 | | | | 0.2 | 11.0 | 89 | |

GRAIN SIZE D422 - GINT STD US LAB.GDT - 11/3/15 11:02 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

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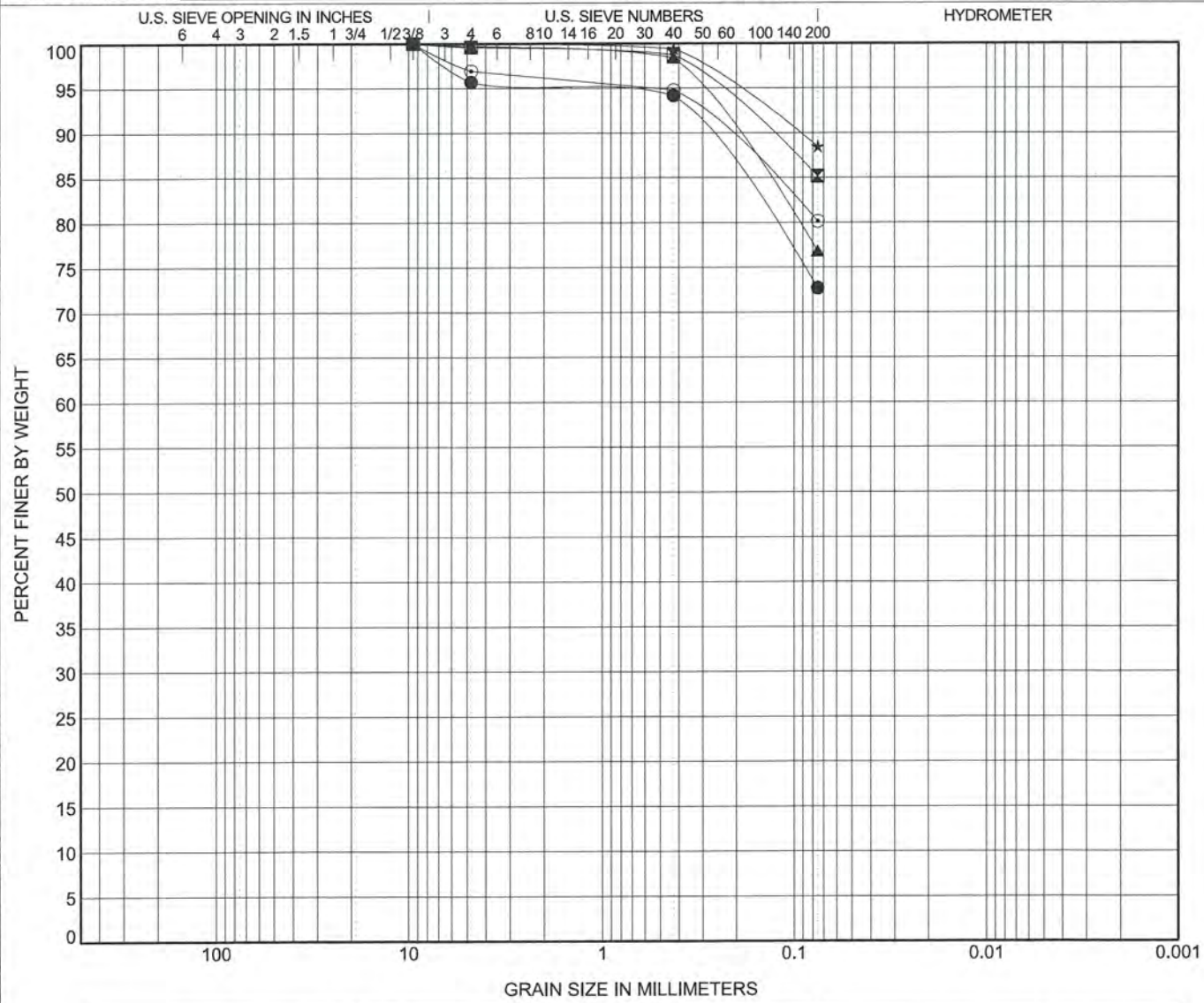
# GRAIN SIZE DISTRIBUTION
# ASTM D422

**CLIENT** Luminant Power

**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA

**PROJECT NUMBER** 1525714

**PROJECT LOCATION**




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-050 | Lift 2 | FAT CLAY with SAND (CH) | 55 | 18 | 37 |
| ⊠ | CL-055 | Lift 2 | FAT CLAY (CH) | 59 | 18 | 41 |
| ▲ | CL-060 | Lift 2 | FAT CLAY with SAND (CH) | 69 | 18 | 51 |
| ★ | CL-065 | Lift 2 | FAT CLAY (CH) | 53 | 16 | 37 |
| ⊙ | CL-070 | Lift 2 | FAT CLAY with SAND (CH) | 59 | 17 | 42 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-050 | Lift 2 | 9.5 | | | | 4.3 | 23.0 | 73 | |
| ⊠ | CL-055 | Lift 2 | 9.5 | | | | 0.4 | 14.4 | 85 | |
| ▲ | CL-060 | Lift 2 | 9.5 | | | | 0.3 | 22.9 | 77 | |
| ★ | CL-065 | Lift 2 | 4.75 | | | | 0.0 | 11.5 | 88 | |
| ⊙ | CL-070 | Lift 2 | 9.5 | | | | 3.1 | 16.8 | 80 | |

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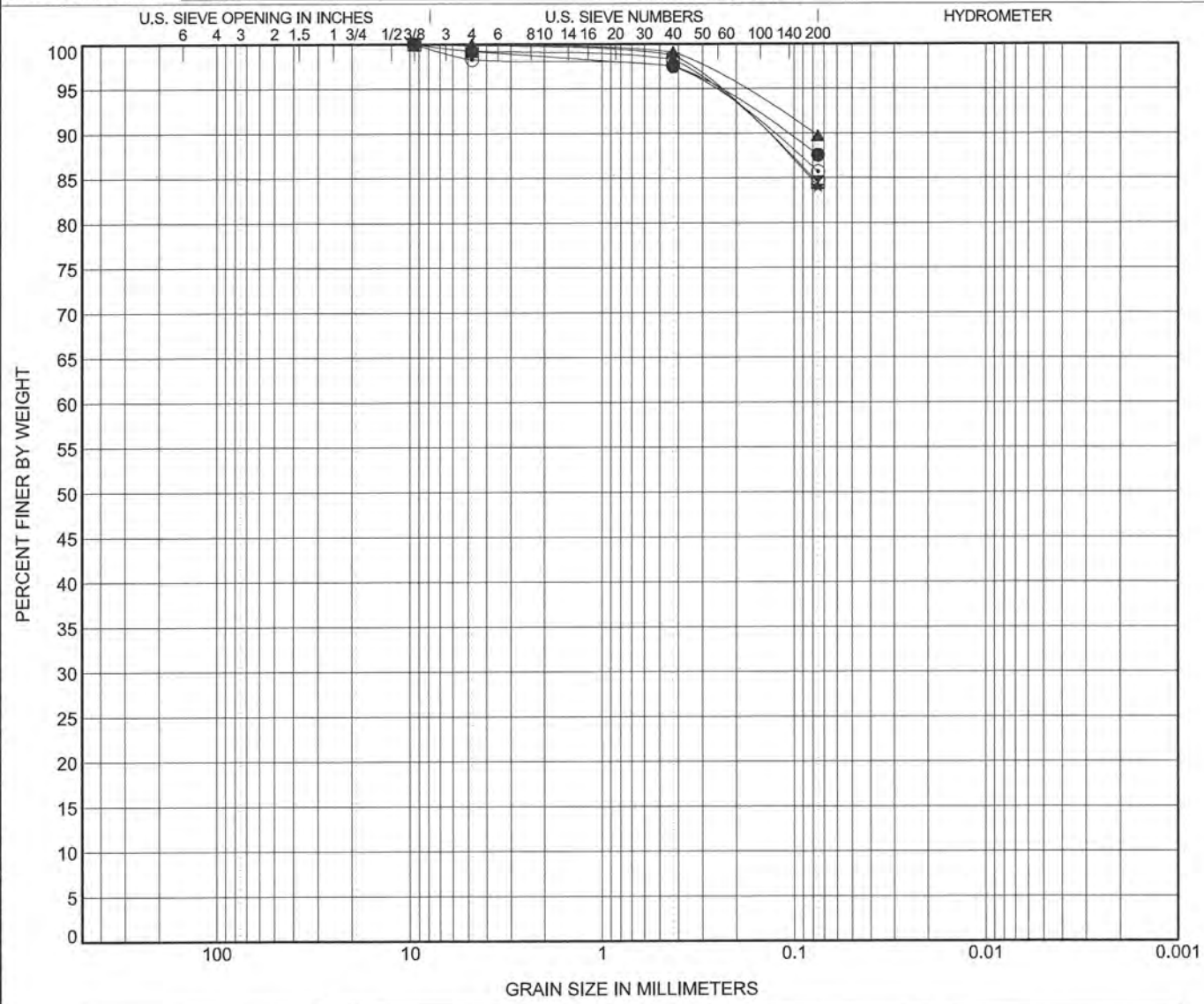
# GRAIN SIZE DISTRIBUTION
# ASTM D422

**CLIENT** Luminant Power **PROJECT NAME** Luminant / OGSES FGD-C Pond CQA

**PROJECT NUMBER** 1525714 **PROJECT LOCATION**




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-075 | Lift 2 | FAT CLAY (CH) | 62 | 17 | 45 |
| ⊠ | CL-080 | Lift 2 | FAT CLAY with SAND (CH) | 55 | 17 | 38 |
| ▲ | CL-085 | Lift 2 | FAT CLAY (CH) | 66 | 17 | 49 |
| ★ | CL-090 | Lift 2 | FAT CLAY with SAND (CH) | 58 | 16 | 42 |
| ⊙ | CL-095 | Lift 2 | FAT CLAY (CH) | 61 | 16 | 45 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-075 | Lift 2 | 9.5 | | | | 0.8 | 11.7 | 88 | |
| ⊠ | CL-080 | Lift 2 | 9.5 | | | | 0.7 | 14.8 | 84 | |
| ▲ | CL-085 | Lift 2 | 4.75 | | | | 0.0 | 10.3 | 90 | |
| ★ | CL-090 | Lift 2 | 9.5 | | | | 0.1 | 15.8 | 84 | |
| ⊙ | CL-095 | Lift 2 | 9.5 | | | | 1.7 | 12.6 | 86 | |

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# GRAIN SIZE DISTRIBUTION
# ASTM D422

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**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA
**PROJECT NUMBER** 1525714
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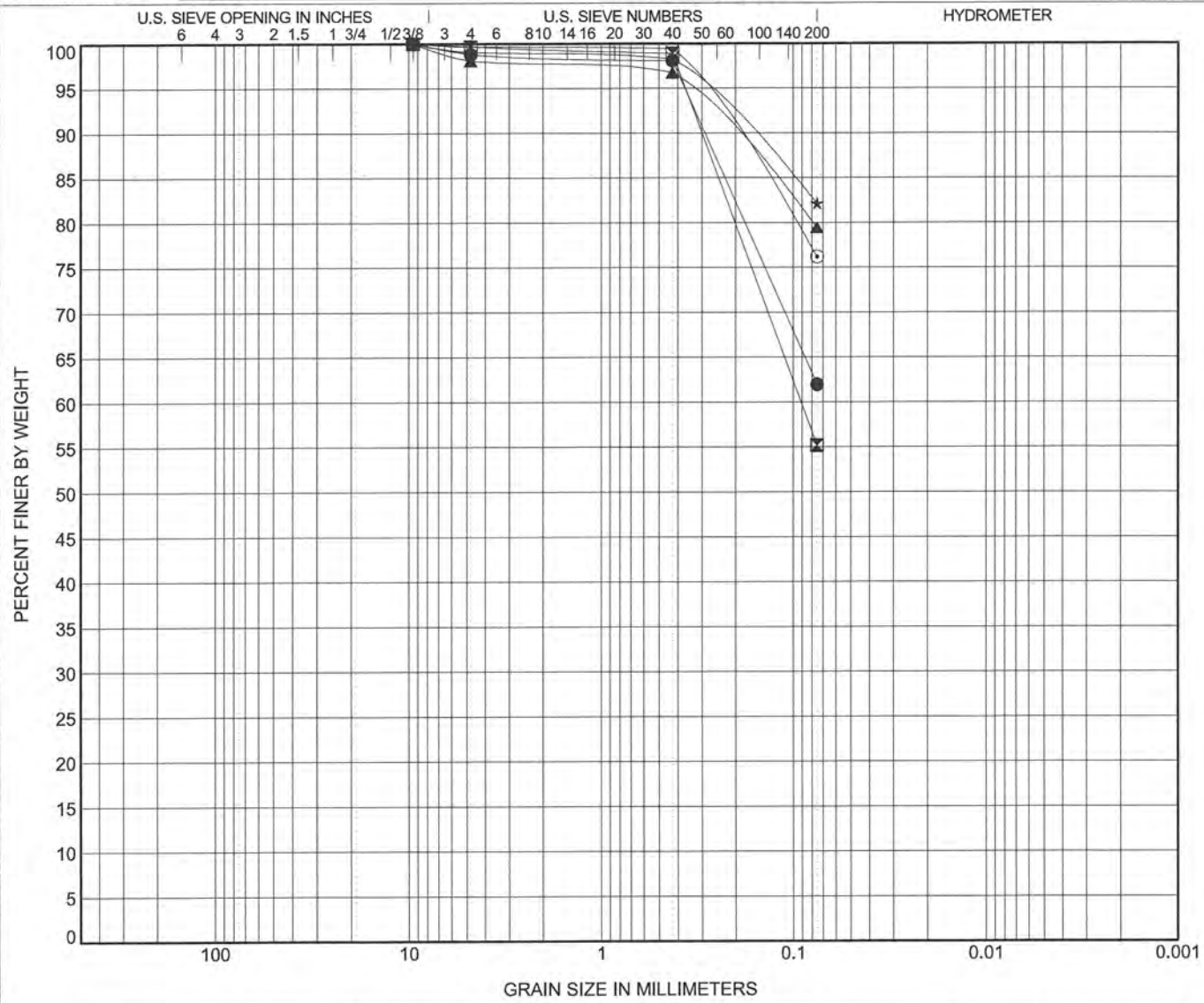


| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-100 | Lift 3 | SANDY FAT CLAY (CH) | 51 | 15 | 36 |
| ⊠ | CL-105 | Lift 3 | SANDY LEAN CLAY (CL) | 45 | 15 | 30 |
| ▲ | CL-110 | Lift 3 | FAT CLAY with SAND (CH) | 65 | 17 | 48 |
| ★ | CL-115 | Lift 3 | FAT CLAY with SAND (CH) | 62 | 16 | 46 |
| ⊙ | CL-120 | Lift 3 | FAT CLAY with SAND (CH) | 52 | 16 | 36 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-100 | Lift 3 | 9.5 | | | | 1.2 | 36.8 | 62 | |
| ⊠ | CL-105 | Lift 3 | 9.5 | 0.091 | | | 0.4 | 44.5 | 55 | |
| ▲ | CL-110 | Lift 3 | 9.5 | | | | 1.9 | 18.6 | 79 | |
| ★ | CL-115 | Lift 3 | 9.5 | | | | 1.0 | 16.9 | 82 | |
| ⊙ | CL-120 | Lift 3 | 9.5 | | | | 0.3 | 23.5 | 76 | |

GRAIN SIZE D422 - GINT STD US LAB.GDT - 11/3/15 11:02 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

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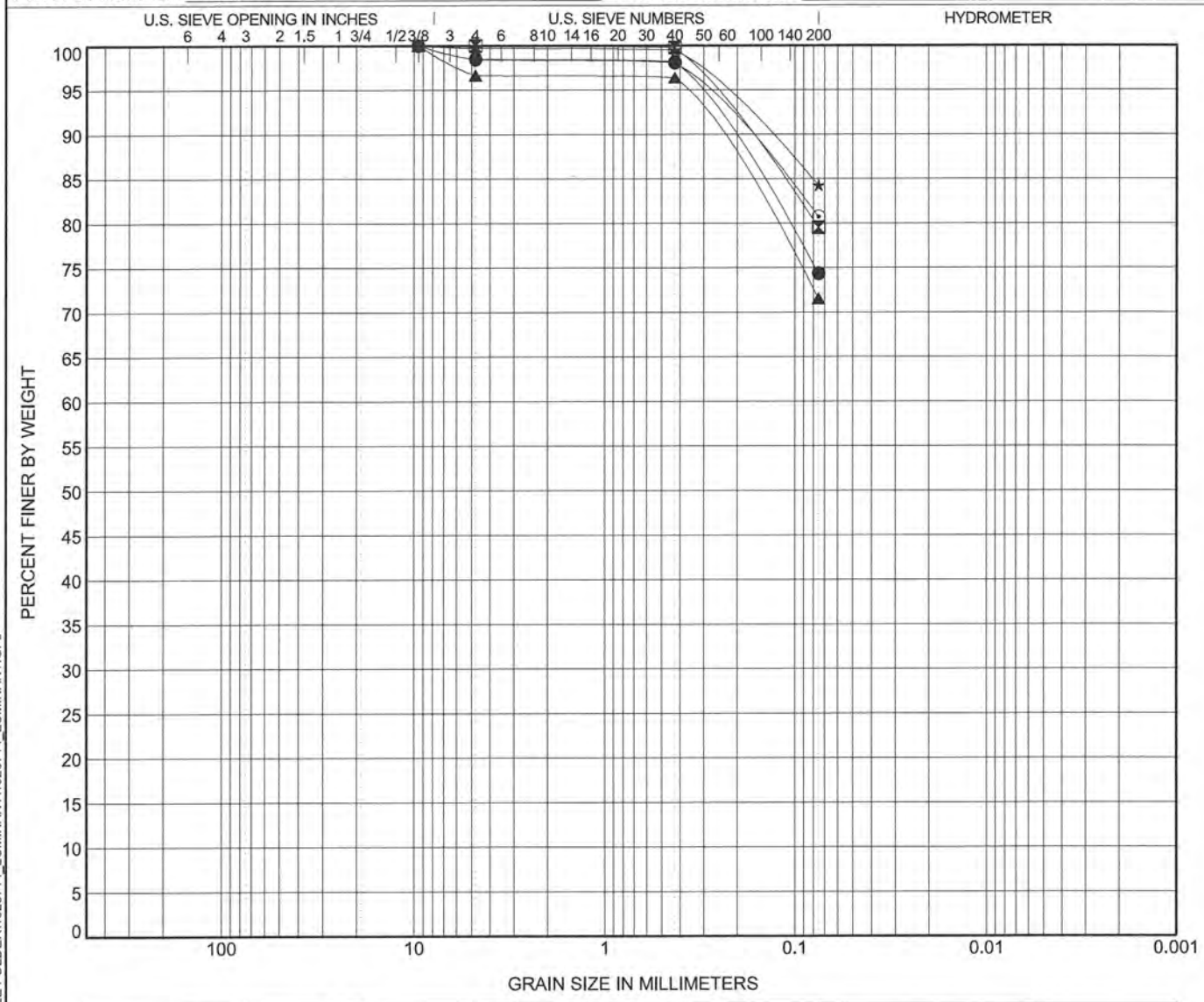
# GRAIN SIZE DISTRIBUTION
# ASTM D422

**CLIENT** Luminant Power

**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA

**PROJECT NUMBER** 1525714

**PROJECT LOCATION**




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-125 | Lift 3 | FAT CLAY with SAND (CH) | 50 | 16 | 34 |
| ⊠ | CL-130 | Lift 3 | FAT CLAY with SAND (CH) | 50 | 16 | 34 |
| ▲ | CL-135 | Lift 3 | FAT CLAY with SAND (CH) | 51 | 16 | 35 |
| ★ | CL-140 | Lift 3 | FAT CLAY with SAND (CH) | 58 | 17 | 41 |
| ⊙ | CL-145 | Lift 3 | FAT CLAY with SAND (CH) | 55 | 16 | 39 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-125 | Lift 3 | 9.5 | | | | 1.5 | 24.1 | 74 | |
| ⊠ | CL-130 | Lift 3 | 4.75 | | | | 0.0 | 20.5 | 80 | |
| ▲ | CL-135 | Lift 3 | 9.5 | | | | 3.3 | 25.1 | 72 | |
| ★ | CL-140 | Lift 3 | 9.5 | | | | 0.3 | 15.5 | 84 | |
| ⊙ | CL-145 | Lift 3 | 9.5 | | | | 1.5 | 17.7 | 81 | |

GRAIN SIZE D422 - GINT STD US LAB.GDT - 11/3/15 11:02 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

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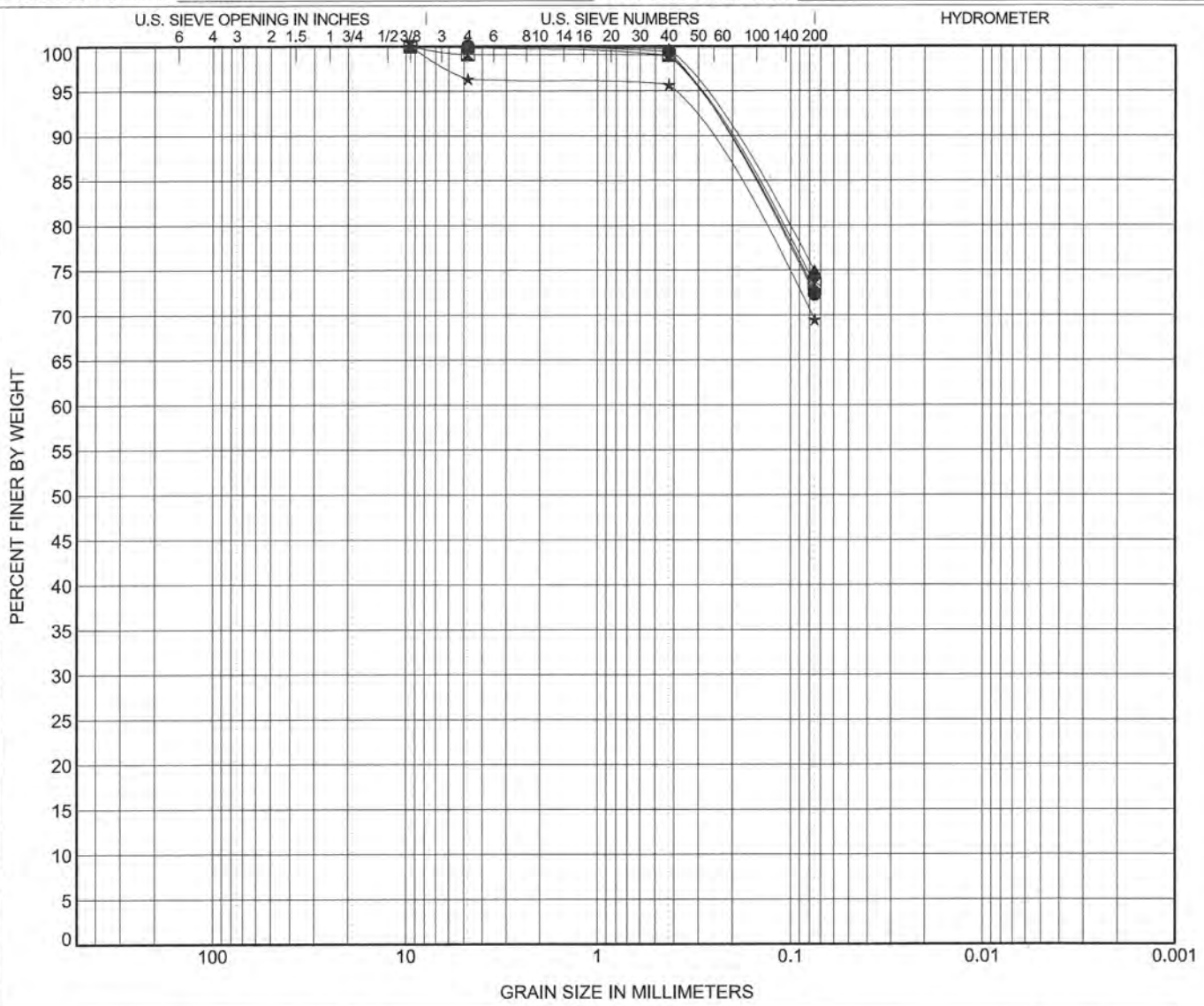
# GRAIN SIZE DISTRIBUTION
# ASTM D422

**CLIENT** Luminant Power

**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA

**PROJECT NUMBER** 1525714

**PROJECT LOCATION**




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-150 | Lift 4 | LEAN CLAY with SAND (CL) | 47 | 17 | 30 |
| ⊠ | CL-155 | Lift 4 | LEAN CLAY with SAND (CL) | 47 | 16 | 31 |
| ▲ | CL-160 | Lift 4 | FAT CLAY with SAND (CH) | 50 | 15 | 35 |
| ★ | CL-165 | Lift 4 | SANDY LEAN CLAY (CL) | 44 | 15 | 29 |
| ⊙ | CL-170 | Lift 4 | LEAN CLAY with SAND (CL) | 46 | 15 | 31 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-150 | Lift 4 | 4.75 | | | | 0.0 | 27.7 | 72 | |
| ⊠ | CL-155 | Lift 4 | 9.5 | | | | 0.9 | 25.7 | 73 | |
| ▲ | CL-160 | Lift 4 | 9.5 | | | | 0.1 | 25.0 | 75 | |
| ★ | CL-165 | Lift 4 | 9.5 | | | | 3.7 | 26.9 | 69 | |
| ⊙ | CL-170 | Lift 4 | 9.5 | | | | 0.2 | 27.0 | 73 | |

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**PROJECT NUMBER** 1525714
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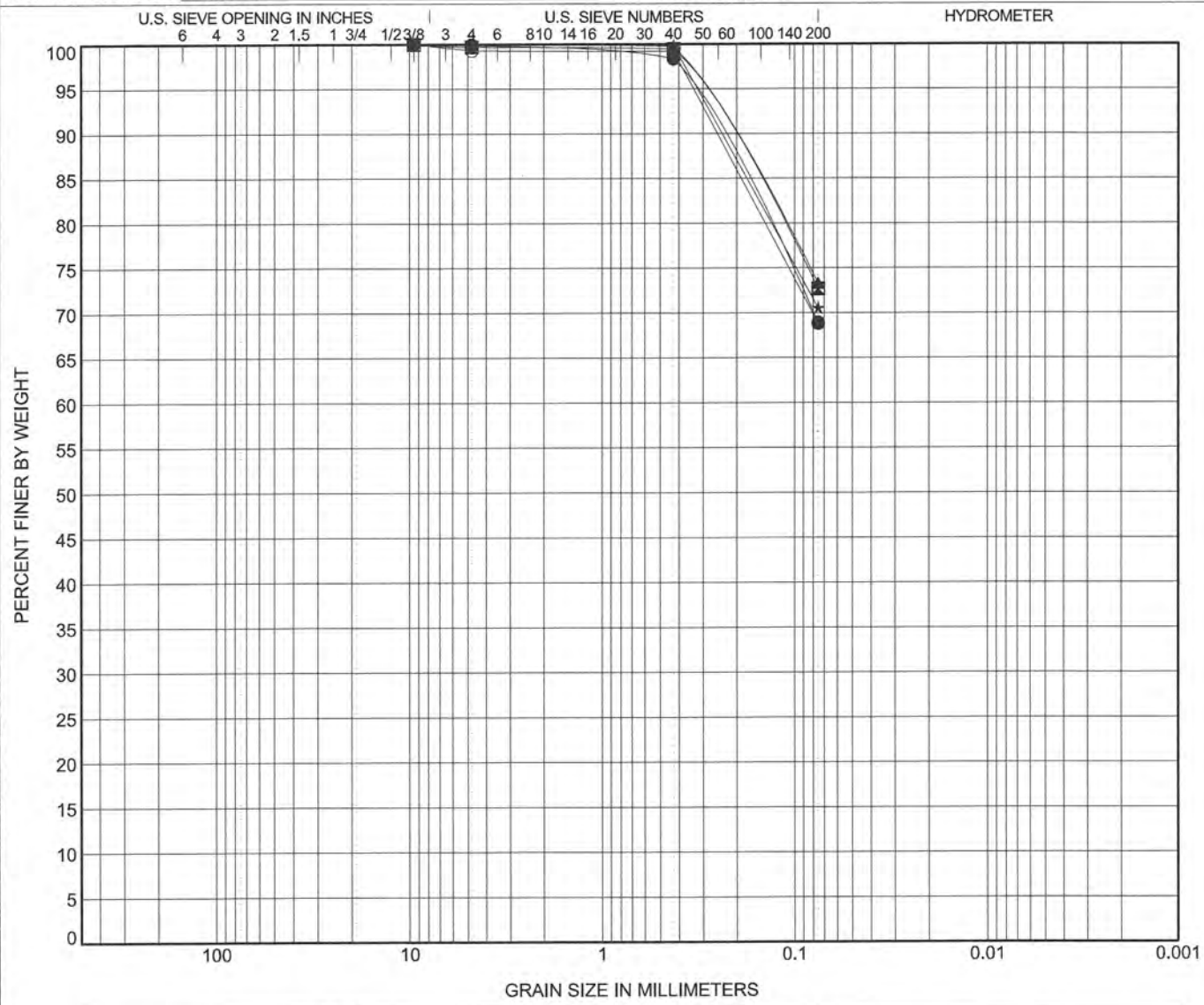


| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-175 | Lift 4 | SANDY LEAN CLAY (CL) | 45 | 15 | 30 |
| ⊠ | CL-180 | Lift 4 | LEAN CLAY with SAND (CL) | 48 | 14 | 34 |
| ▲ | CL-185 | Lift 4 | LEAN CLAY with SAND (CL) | 48 | 15 | 33 |
| ★ | CL-190 | Lift 4 | LEAN CLAY with SAND (CL) | 44 | 16 | 28 |
| ⊙ | CL-195 | Lift 4 | SANDY LEAN CLAY (CL) | 48 | 15 | 33 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-175 | Lift 4 | 9.5 | | | | 0.1 | 31.0 | 69 | |
| ⊠ | CL-180 | Lift 4 | 9.5 | | | | 0.3 | 27.0 | 73 | |
| ▲ | CL-185 | Lift 4 | 4.75 | | | | 0.0 | 26.7 | 73 | |
| ★ | CL-190 | Lift 4 | 4.75 | | | | 0.0 | 29.4 | 71 | |
| ⊙ | CL-195 | Lift 4 | 9.5 | | | | 0.7 | 30.5 | 69 | |

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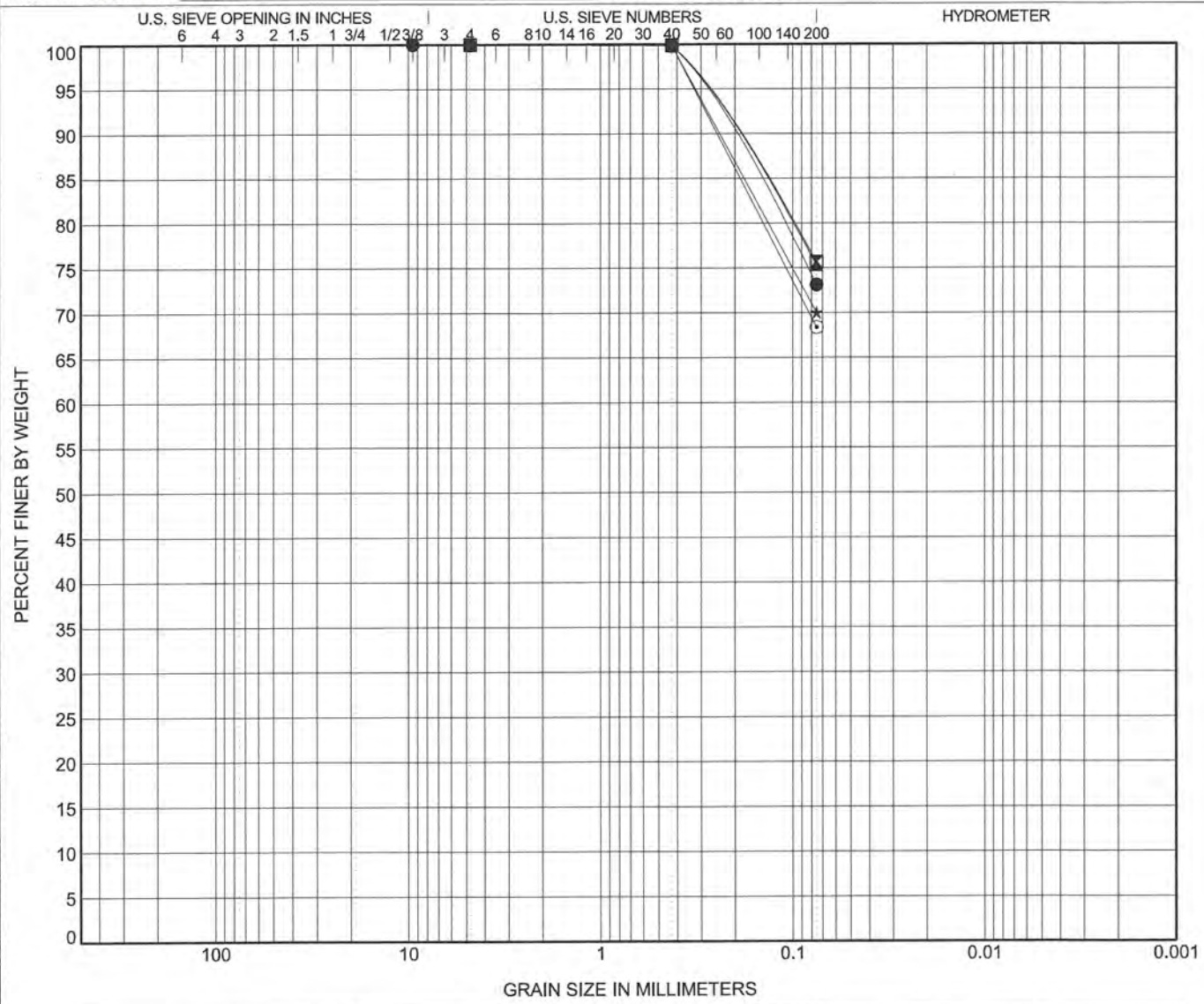


| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-200 | Lift 1 | LEAN CLAY with SAND (CL) | 45 | 17 | 28 |
| ⊠ | CL-205 | Lift 1 | LEAN CLAY with SAND (CL) | 49 | 16 | 33 |
| ▲ | CL-210 | Lift 1 | LEAN CLAY with SAND (CL) | 47 | 15 | 32 |
| ★ | CL-215 | Lift 1 | LEAN CLAY with SAND (CL) | 45 | 16 | 29 |
| ⊙ | CL-220 | Lift 1 | SANDY LEAN CLAY (CL) | 45 | 15 | 30 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-200 | Lift 1 | 9.5 | | | | 0.1 | 26.8 | 73 | |
| ⊠ | CL-205 | Lift 1 | 4.75 | | | | 0.0 | 24.3 | 76 | |
| ▲ | CL-210 | Lift 1 | 4.75 | | | | 0.0 | 24.7 | 75 | |
| ★ | CL-215 | Lift 1 | 4.75 | | | | 0.0 | 30.0 | 70 | |
| ⊙ | CL-220 | Lift 1 | 4.75 | | | | 0.0 | 31.6 | 68 | |

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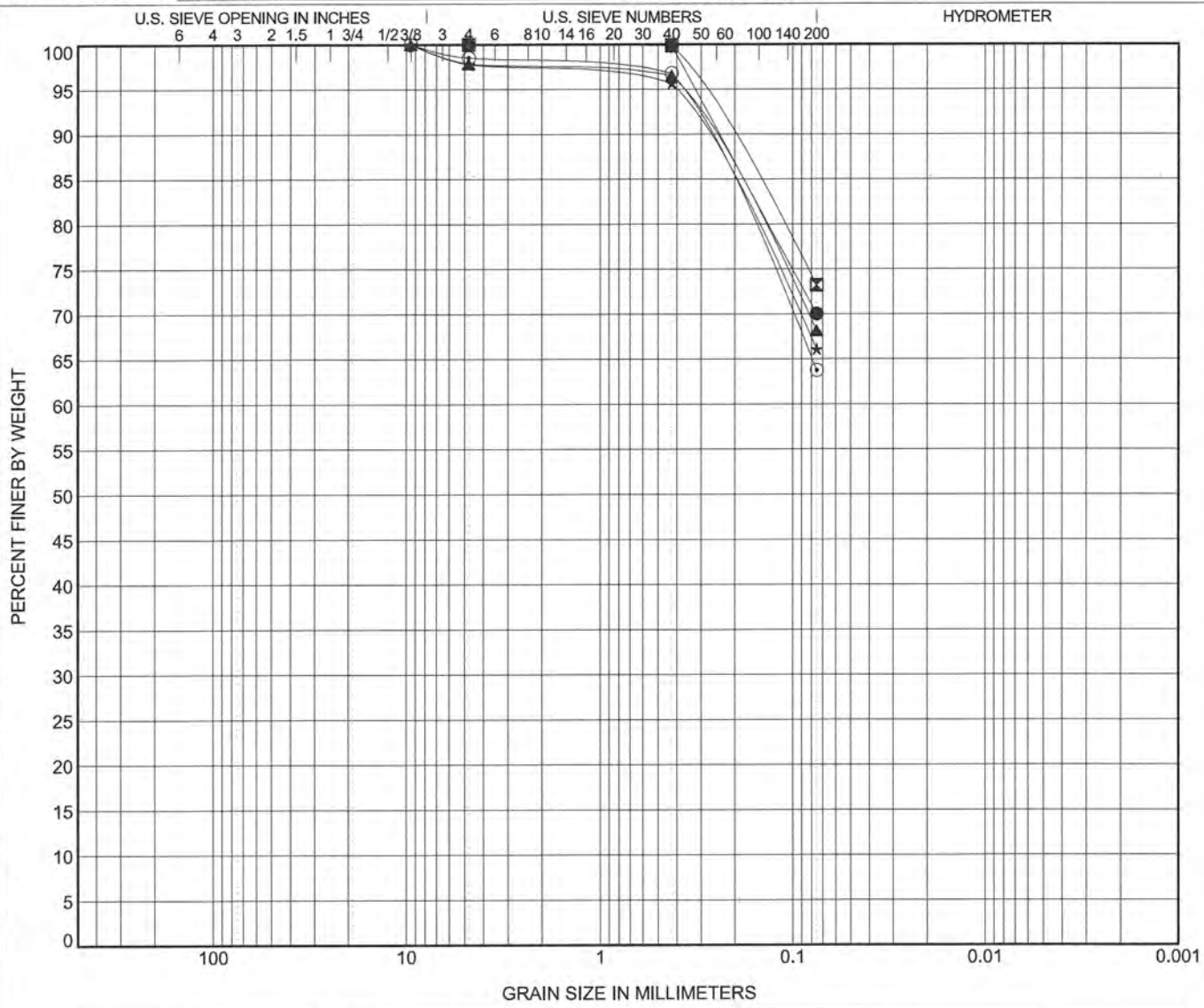
**PROJECT LOCATION**




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-225 | Lift 1 | LEAN CLAY with SAND (CL) | 48 | 15 | 33 |
| ⊠ | CL-230 | Lift 1 | LEAN CLAY with SAND (CL) | 48 | 15 | 33 |
| ▲ | CL-235 | Lift 1 | SANDY FAT CLAY (CH) | 53 | 17 | 36 |
| ★ | CL-240 | Lift 1 | SANDY FAT CLAY (CH) | 54 | 18 | 36 |
| ⊙ | CL-242 | Lift 1 | SANDY FAT CLAY (CH) | 53 | 17 | 36 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-225 | Lift 1 | 4.75 | | | | 0.0 | 30.0 | 70 | |
| ⊠ | CL-230 | Lift 1 | 4.75 | | | | 0.0 | 26.8 | 73 | |
| ▲ | CL-235 | Lift 1 | 9.5 | | | | 2.2 | 29.7 | 68 | |
| ★ | CL-240 | Lift 1 | 9.5 | | | | 2.2 | 31.7 | 66 | |
| ⊙ | CL-242 | Lift 1 | 9.5 | | | | 1.5 | 34.8 | 64 | |

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**PROJECT NAME** Luminant / OGSES FGD-C Pond CQA

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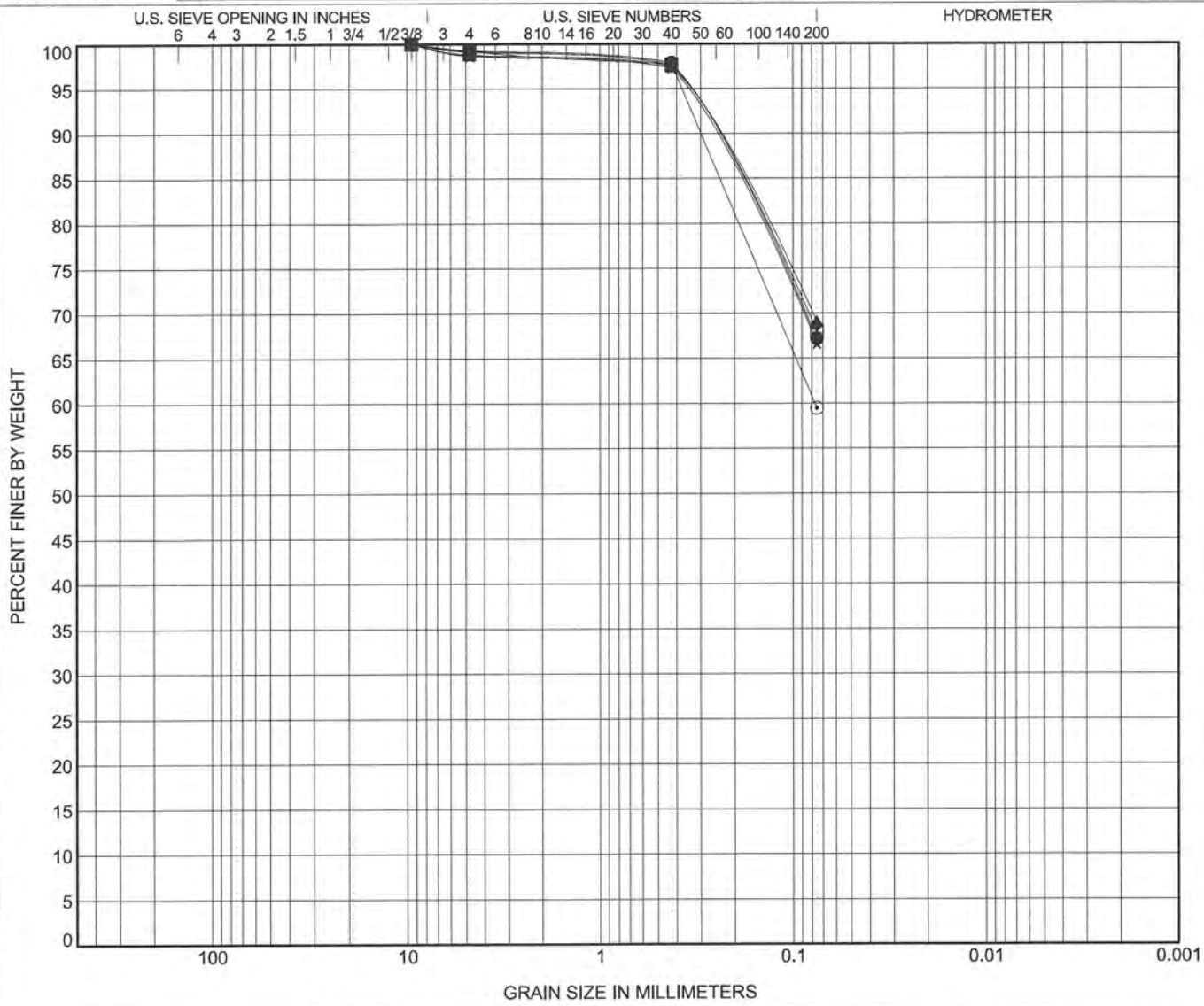


| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-245 | Lift 1 | SANDY FAT CLAY (CH) | 55 | 17 | 38 |
| ⊠ | CL-250 | Lift 2 | SANDY FAT CLAY (CH) | 56 | 17 | 39 |
| ▲ | CL-255 | Lift 2 | SANDY FAT CLAY (CH) | 55 | 17 | 38 |
| ★ | CL-265 | Lift 2 | SANDY FAT CLAY (CH) | 55 | 17 | 38 |
| ⊙ | CL-270 | Lift 2 | SANDY FAT CLAY (CH) | 53 | 17 | 36 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-245 | Lift 1 | 9.5 | | | | 0.7 | 32.1 | 67 | |
| ⊠ | CL-250 | Lift 2 | 9.5 | | | | 0.9 | 31.2 | 68 | |
| ▲ | CL-255 | Lift 2 | 9.5 | | | | 1.2 | 29.7 | 69 | |
| ★ | CL-265 | Lift 2 | 9.5 | | | | 1.3 | 32.0 | 67 | |
| ⊙ | CL-270 | Lift 2 | 9.5 | 0.077 | | | 0.8 | 39.7 | 59 | |

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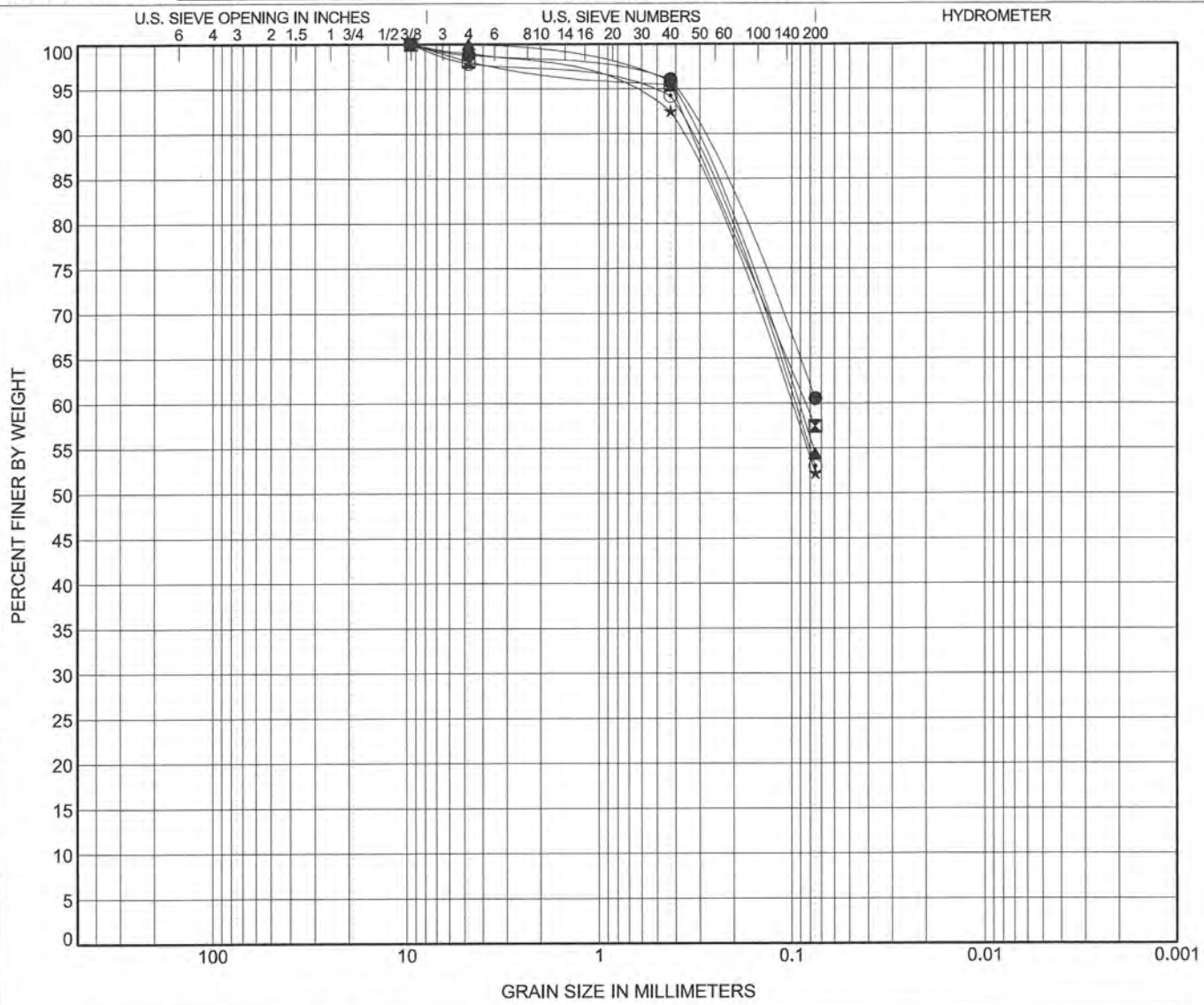


| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-280 | Lift 2 | SANDY FAT CLAY (CH) | 52 | 16 | 36 |
| ⊠ | CL-285 | Lift 2 | SANDY FAT CLAY (CH) | 51 | 15 | 36 |
| ▲ | CL-290 | Lift 2 | SANDY FAT CLAY (CH) | 54 | 16 | 38 |
| ★ | CL-295 | Lift 2 | SANDY FAT CLAY (CH) | 53 | 16 | 37 |
| ⊙ | CL-297 | Lift 2 | SANDY FAT CLAY (CH) | 57 | 17 | 40 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-280 | Lift 2 | 9.5 | | | | 1.2 | 38.3 | 61 | |
| ⊠ | CL-285 | Lift 2 | 9.5 | 0.084 | | | 1.9 | 40.6 | 57 | |
| ▲ | CL-290 | Lift 2 | 4.75 | 0.095 | | | 0.0 | 45.6 | 54 | |
| ★ | CL-295 | Lift 2 | 9.5 | 0.105 | | | 1.0 | 46.8 | 52 | |
| ⊙ | CL-297 | Lift 2 | 9.5 | 0.101 | | | 2.2 | 44.8 | 53 | |

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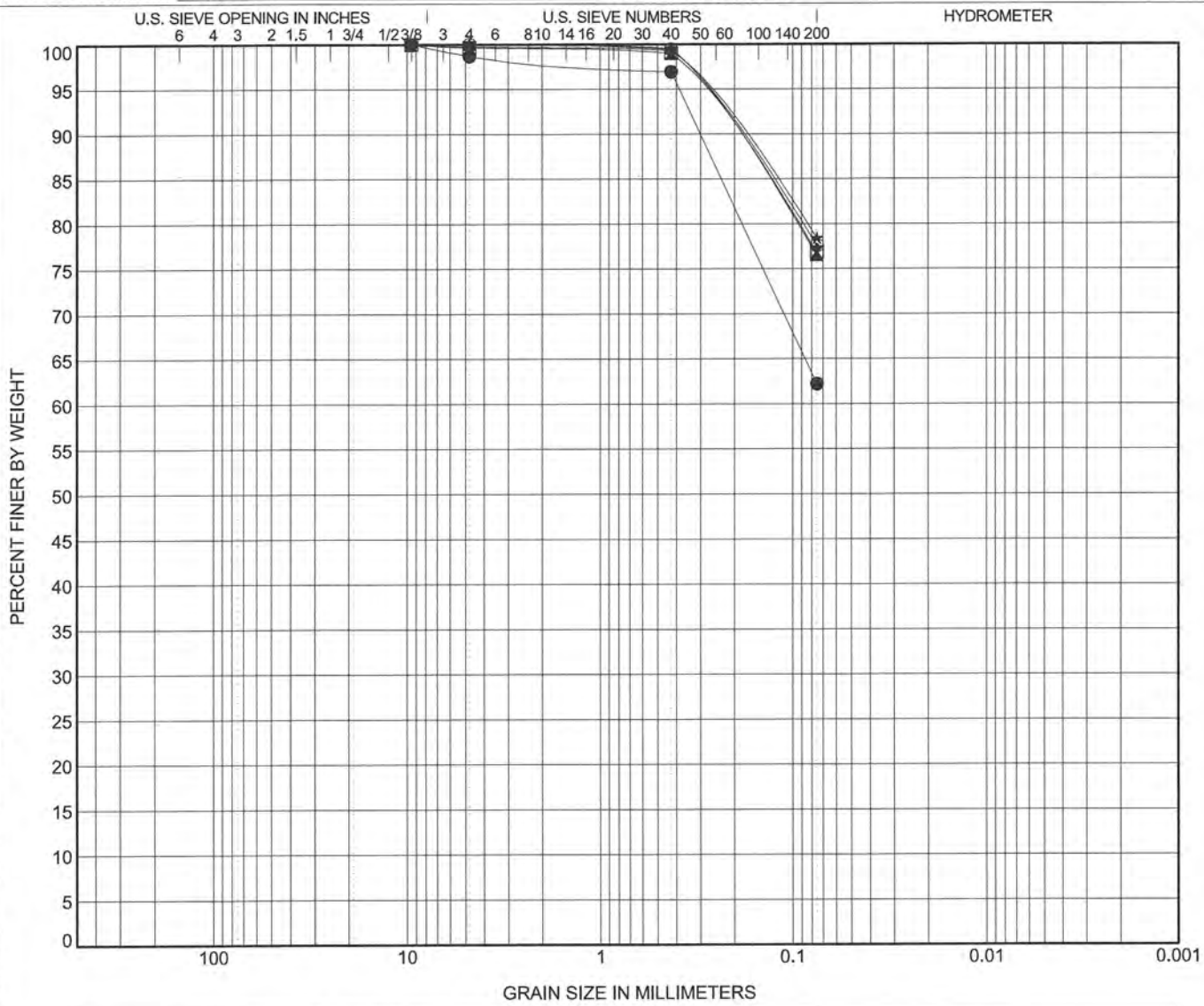


| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-300 | Lift 3 | SANDY FAT CLAY (CH) | 55 | 17 | 38 |
| ⊠ | CL-305 | Lift 3 | FAT CLAY with SAND (CH) | 60 | 17 | 43 |
| ▲ | CL-310 | Lift 3 | FAT CLAY with SAND (CH) | 58 | 16 | 42 |
| ★ | CL-325 | Lift 3 | FAT CLAY with SAND (CH) | 58 | 15 | 43 |
| ⊙ | CL-330 | Lift 3 | FAT CLAY with SAND (CH) | 56 | 16 | 40 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-300 | Lift 3 | 9.5 | | | | 1.3 | 36.5 | 62 | |
| ⊠ | CL-305 | Lift 3 | 9.5 | | | | 0.4 | 22.8 | 77 | |
| ▲ | CL-310 | Lift 3 | 4.75 | | | | 0.0 | 23.5 | 76 | |
| ★ | CL-325 | Lift 3 | 9.5 | | | | 0.3 | 21.3 | 78 | |
| ⊙ | CL-330 | Lift 3 | 4.75 | | | | 0.0 | 22.4 | 78 | |

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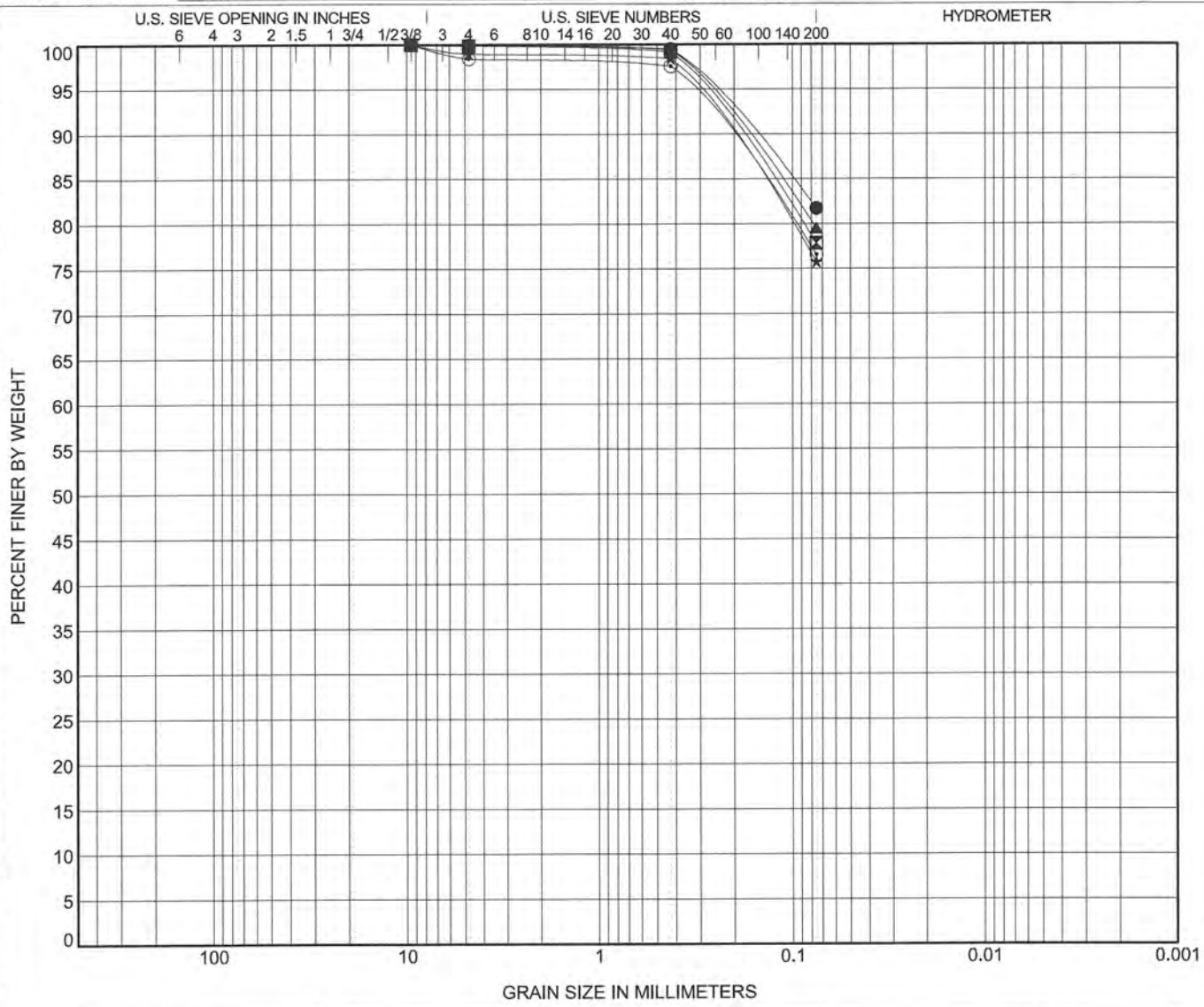


| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-335 | Lift 3 | FAT CLAY with SAND (CH) | 56 | 16 | 40 |
| ⊠ | CL-340 | Lift 3 | FAT CLAY with SAND (CH) | 56 | 15 | 41 |
| ▲ | CL-345 | Lift 3 | FAT CLAY with SAND (CH) | 57 | 16 | 41 |
| ★ | CL-347 | Lift 3 | FAT CLAY with SAND (CH) | 60 | 16 | 44 |
| ⊙ | CL-350 | Lift 3 | FAT CLAY with SAND (CH) | 60 | 16 | 44 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-335 | Lift 3 | 9.5 | | | | 0.1 | 18.2 | 82 | |
| ⊠ | CL-340 | Lift 3 | 9.5 | | | | 0.1 | 22.0 | 78 | |
| ▲ | CL-345 | Lift 3 | 9.5 | | | | 0.1 | 20.4 | 80 | |
| ★ | CL-347 | Lift 3 | 9.5 | | | | 1.0 | 23.2 | 76 | |
| ⊙ | CL-350 | Lift 3 | 9.5 | | | | 1.6 | 21.8 | 77 | |

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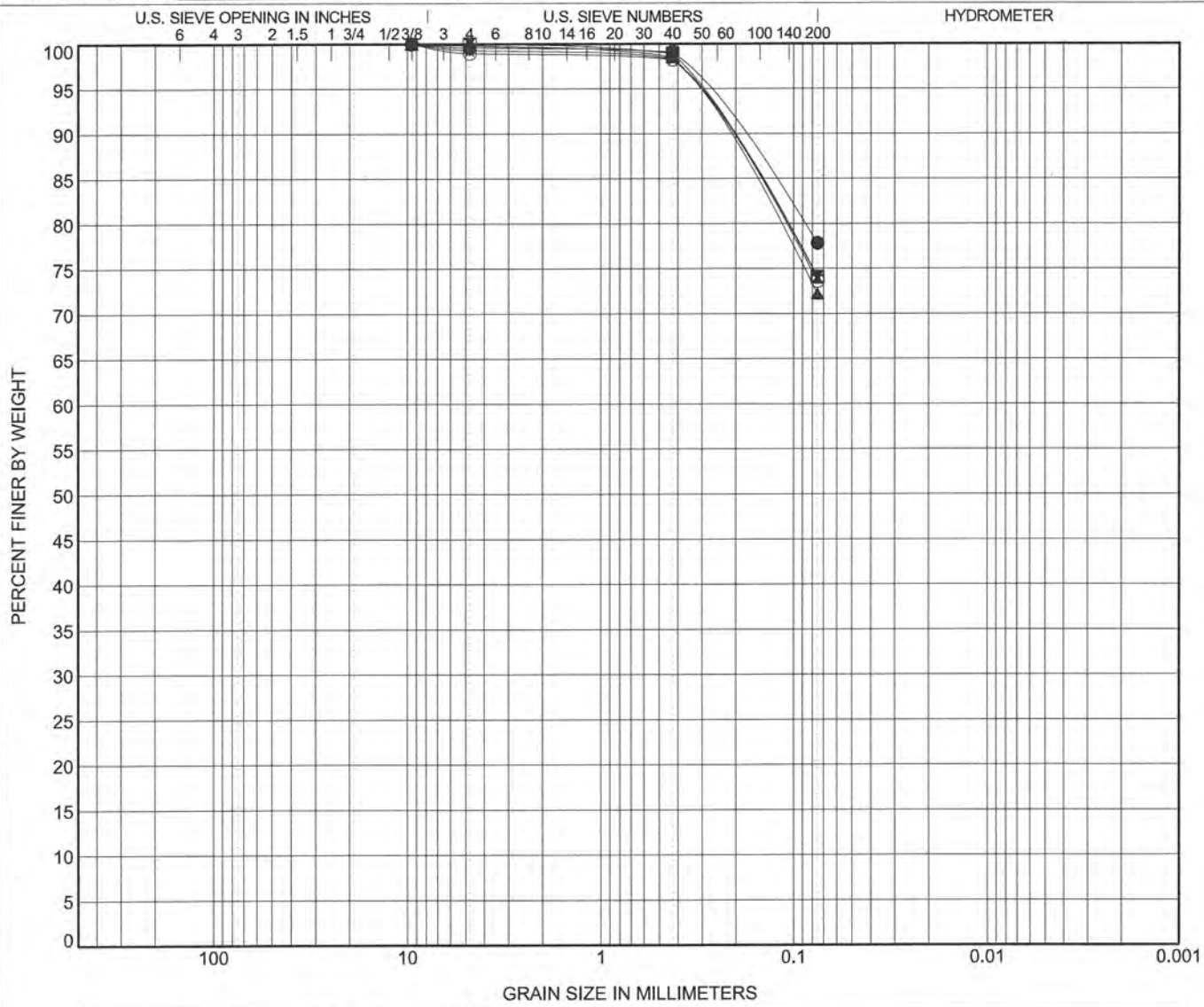


| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-355 | Lift 4 | FAT CLAY with SAND (CH) | 57 | 16 | 41 |
| ⊠ | CL-360 | Lift 4 | FAT CLAY with SAND (CH) | 64 | 17 | 47 |
| ▲ | CL-365 | Lift 4 | FAT CLAY with SAND (CH) | 60 | 16 | 44 |
| ★ | CL-370 | Lift 4 | FAT CLAY with SAND (CH) | 63 | 17 | 46 |
| ⊙ | CL-375 | Lift 4 | FAT CLAY with SAND (CH) | 64 | 17 | 47 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-355 | Lift 4 | 9.5 | | | | 0.4 | 21.8 | 78 | |
| ⊠ | CL-360 | Lift 4 | 4.75 | | | | 0.0 | 25.9 | 74 | |
| ▲ | CL-365 | Lift 4 | 9.5 | | | | 0.2 | 27.6 | 72 | |
| ★ | CL-370 | Lift 4 | 9.5 | | | | 0.7 | 25.2 | 74 | |
| ⊙ | CL-375 | Lift 4 | 9.5 | | | | 1.0 | 25.3 | 74 | |

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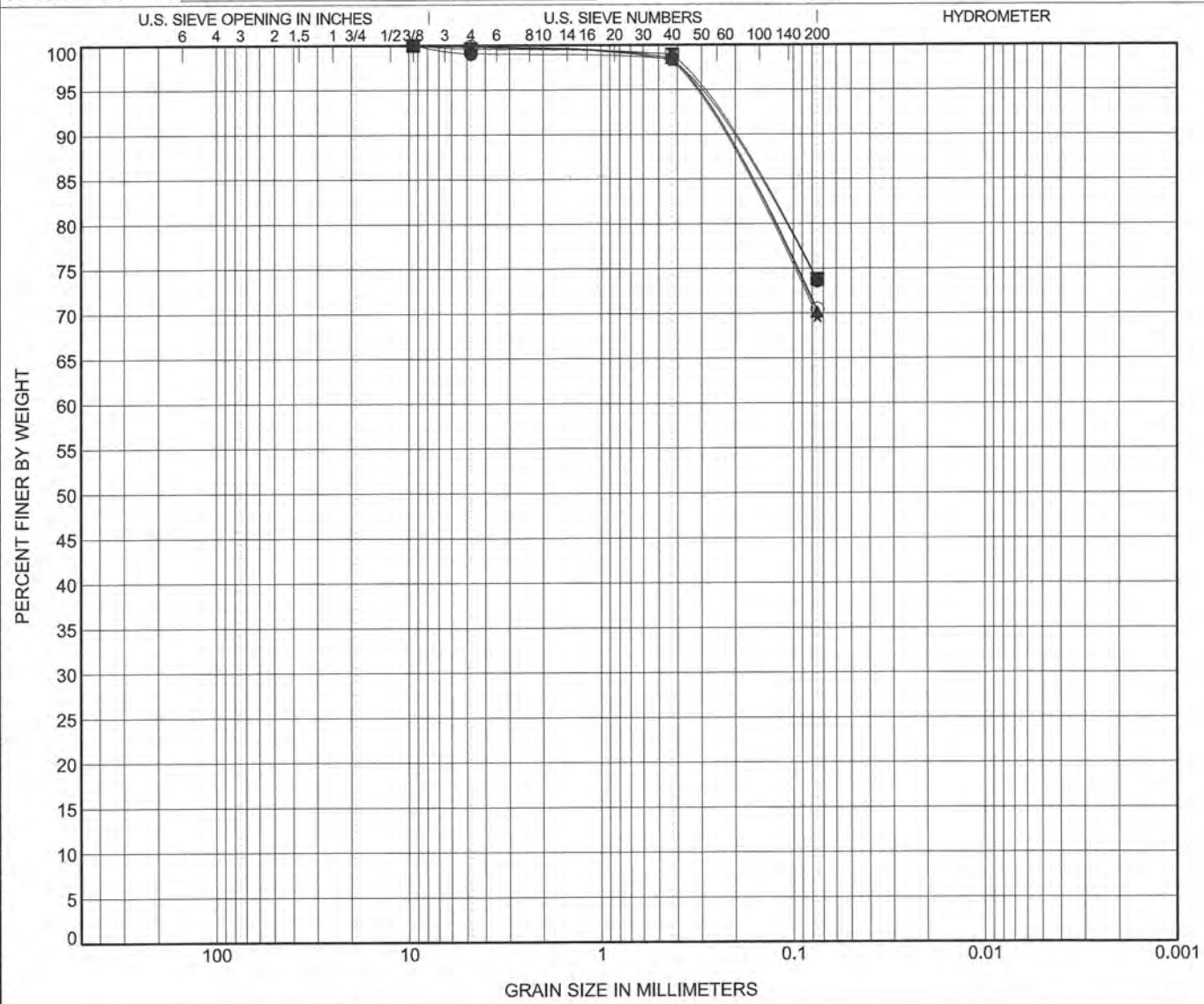


| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-380 | Lift 4 | FAT CLAY with SAND (CH) | 61 | 17 | 44 |
| ⊠ | CL-385 | Lift 4 | FAT CLAY with SAND (CH) | 61 | 16 | 45 |
| ▲ | CL-390 | Lift 4 | FAT CLAY with SAND (CH) | 61 | 17 | 44 |
| ★ | CL-395 | Lift 4 | SANDY FAT CLAY (CH) | 61 | 16 | 45 |
| ⊙ | CL-397 | Lift 4 | FAT CLAY with SAND (CH) | 61 | 16 | 45 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-380 | Lift 4 | 9.5 | | | | 0.9 | 25.5 | 74 | |
| ⊠ | CL-385 | Lift 4 | 9.5 | | | | 0.4 | 25.8 | 74 | |
| ▲ | CL-390 | Lift 4 | 9.5 | | | | 0.1 | 29.8 | 70 | |
| ★ | CL-395 | Lift 4 | 9.5 | | | | 0.2 | 30.2 | 70 | |
| ⊙ | CL-397 | Lift 4 | 9.5 | | | | 0.1 | 29.4 | 70 | |

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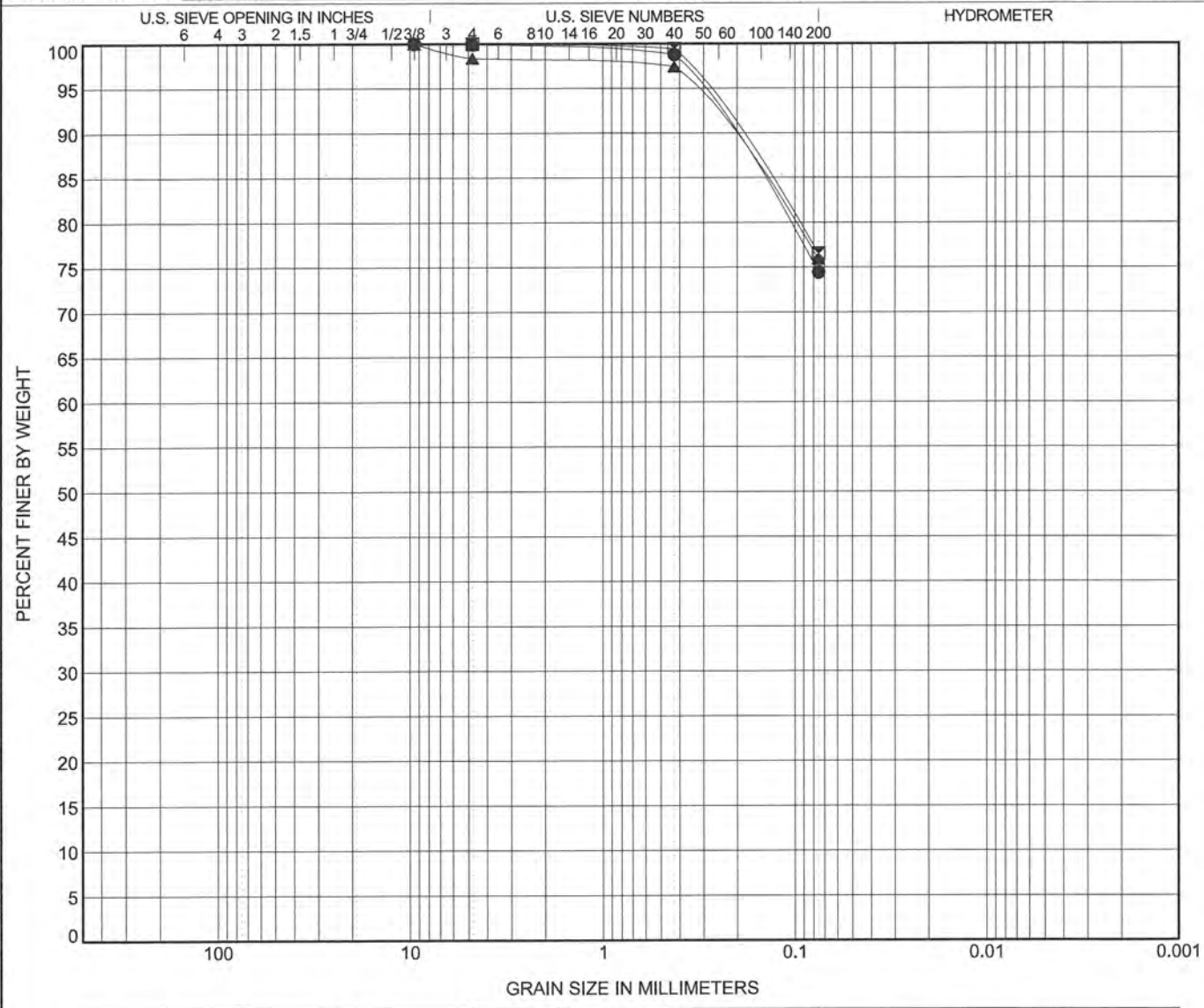
**PROJECT NUMBER** 1525714
**PROJECT LOCATION**




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | Classification | LL | PL | PI |
|---|---|---|---|---|---|---|
| ● | CL-400 | Lift 4 | FAT CLAY with SAND (CH) | 58 | 16 | 42 |
| ⊠ | CL-405 | Lift 4 | FAT CLAY with SAND (CH) | 62 | 17 | 45 |
| ▲ | CL-410 | Lift 4 | FAT CLAY with SAND (CH) | 64 | 18 | 46 |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | CL-400 | Lift 4 | 9.5 | | | | 0.1 | 25.5 | 74 | |
| ⊠ | CL-405 | Lift 4 | 4.75 | | | | 0.0 | 23.5 | 77 | |
| ▲ | CL-410 | Lift 4 | 9.5 | | | | 1.6 | 22.5 | 76 | |

GRAIN SIZE D422 - GINT STD US LAB.GDT - 11/3/15 11:03 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

# HYDRAULIC CONDUCTIVITY

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-005 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.328 | 10.99 | Height, in | 4.36 | 11.07 |
| Top Diameter, mm | 72.050 | | Top Diameter, mm | 72.38 | |
| Middle Diameter, mm | 71.980 | | Middle Diameter, mm | 72.45 | |
| Bottom Diameter, mm | 72.010 | | Bottom Diameter, mm | 72.43 | |
| Average Diameter, cm | 7.201 | | Average Diameter, cm | 7.242 | |
| Area, $cm^2$ | 40.73 | | Area, $cm^2$ | 41.19 | |
| Volume, $cm^3$ | 447.75 | | Volume, $cm^3$ | 456.17 | |
| Wet Mass, g | 873.7 | | Wet Mass, g | 886 | |
| Wt. tare, gm | 6.8 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 218.70 | | Wt. wet soil + tare, gm | 894.4 | |
| Wt. dry soil + tare, gm | 175.86 | | Wt. dry soil + tare, gm | 700.74 | |
| Moisture Content, % | 25.3% | | Moisture Content, % | 28.0% | |
| Dry Density, pcf | 97.1 | | Dry Density, pcf | 94.7 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.70 | | Void Ratio | 0.75 | |
| Saturation, % | 96% | | Saturation, % | 99% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 28.73 | | 23 | 0.931 | |
| 2 | 4 | 124 | 25.2 | 0.88 | 2.027E-04 | 27.10 | 1.82E-07 | 23 | 0.931 | 1.69E-07 |
| 3 | 59 | 115 | 24.7 | 0.90 | 1.366E-04 | 26.69 | 1.24E-07 | 23 | 0.931 | 1.16E-07 |
| 6 | 42 | 163 | 24.1 | 0.93 | 1.156E-04 | 25.92 | 1.08E-07 | 23 | 0.931 | 1.01E-07 |
| 9 | 41 | 179 | 23.5 | 0.95 | 1.053E-04 | 25.22 | 1.01E-07 | 23 | 0.931 | 9.44E-08 |
| 12 | 19 | 158 | 23.0 | 0.97 | 9.942E-05 | 24.69 | 9.78E-08 | 23 | 0.931 | 9.10E-08 |
| 15 | 36 | 197 | 22.4 | 1.00 | 9.568E-05 | 23.92 | 9.71E-08 | 23 | 0.931 | 9.04E-08 |
| 20 | 28 | 292 | 21.6 | 1.03 | 8.607E-05 | 22.85 | 9.14E-08 | 23 | 0.931 | 8.51E-08 |
| 24 | 27 | 239 | 21.0 | 1.05 | 7.887E-05 | 22.26 | 8.60E-08 | 23 | 0.931 | 8.01E-08 |
| 28 | 36 | 249 | 20.4 | 1.08 | 7.570E-05 | 21.56 | 8.53E-08 | 23 | 0.931 | 7.94E-08 |
| 32 | 33 | 237 | 19.9 | 1.10 | 6.628E-05 | 21.03 | 7.65E-08 | 23 | 0.931 | 7.13E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **7.90E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 8/29/2015 | DATE: | 8/31/2015 |

**GEOTECHNICAL TESTING LABORATORY**
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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-010 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.975 | 10.10 | Height, in | 4.044 | 10.27 |
| Top Diameter, mm | 72.320 | | Top Diameter, mm | 72.74 | |
| Middle Diameter, mm | 72.250 | | Middle Diameter, mm | 72.79 | |
| Bottom Diameter, mm | 72.270 | | Bottom Diameter, mm | 72.73 | |
| Average Diameter, cm | 7.228 | | Average Diameter, cm | 7.275 | |
| Area, $cm^2$ | 41.03 | | Area, $cm^2$ | 41.57 | |
| Volume, $cm^3$ | 414.28 | | Volume, $cm^3$ | 427.01 | |
| Wet Mass, g | 810.5 | | Wet Mass, g | 833 | |
| Wt. tare, gm | 8.5 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 112.80 | | Wt. wet soil + tare, gm | 841.4 | |
| Wt. dry soil + tare, gm | 90.11 | | Wt. dry soil + tare, gm | 657.78 | |
| Moisture Content, % | 27.8% | | Moisture Content, % | 28.3% | |
| Dry Density, pcf | 95.5 | | Dry Density, pcf | 94.9 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.73 | | Void Ratio | 0.74 | |
| Saturation, % | 101% | | Saturation, % | 101% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.6

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.6 | 0.85 | | 29.54 | | 23 | 0.931 | |
| 2 | 21 | 141 | 24.3 | 0.86 | 6.684E-05 | 28.47 | 5.65E-08 | 23 | 0.931 | 5.26E-08 |
| 5 | 19 | 178 | 24.0 | 0.87 | 5.295E-05 | 28.09 | 4.53E-08 | 23 | 0.931 | 4.22E-08 |
| 8 | 25 | 186 | 23.8 | 0.88 | 3.378E-05 | 27.90 | 2.91E-08 | 23 | 0.931 | 2.71E-08 |
| 12 | 7 | 222 | 23.6 | 0.89 | 2.830E-05 | 27.64 | 2.46E-08 | 23 | 0.931 | 2.29E-08 |
| 18 | 20 | 373 | 23.3 | 0.90 | 2.527E-05 | 27.19 | 2.24E-08 | 23 | 0.931 | 2.08E-08 |
| 21 | 56 | 216 | 23.1 | 0.91 | 2.909E-05 | 27.00 | 2.59E-08 | 23 | 0.931 | 2.41E-08 |
| 26 | 45 | 289 | 22.9 | 0.92 | 2.174E-05 | 26.75 | 1.96E-08 | 23 | 0.931 | 1.82E-08 |
| 31 | 16 | 271 | 22.7 | 0.93 | 2.319E-05 | 26.49 | 2.11E-08 | 23 | 0.931 | 1.96E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.07E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 8/29/2015 | DATE: | 8/31/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-015 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.21 | 10.69 | Height, in | 4.214 | 10.70 |
| Top Diameter, mm | 72.190 | | Top Diameter, mm | 72.2 | |
| Middle Diameter, mm | 72.160 | | Middle Diameter, mm | 72.23 | |
| Bottom Diameter, mm | 72.270 | | Bottom Diameter, mm | 72.29 | |
| Average Diameter, cm | 7.221 | | Average Diameter, cm | 7.224 | |
| Area, $cm^2$ | 40.95 | | Area, $cm^2$ | 40.99 | |
| Volume, $cm^3$ | 437.88 | | Volume, $cm^3$ | 438.71 | |
| Wet Mass, g | 812.6 | | Wet Mass, g | 822.7 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 226.30 | | Wt. wet soil + tare, gm | 831.1 | |
| Wt. dry soil + tare, gm | 184.53 | | Wt. dry soil + tare, gm | 641.89 | |
| Moisture Content, % | 23.7% | | Moisture Content, % | 29.9% | |
| Dry Density, pcf | 93.6 | | Dry Density, pcf | 90.1 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.77 | | Void Ratio | 0.84 | |
| Saturation, % | 82% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.5 | 0.85 | | 28.95 | | 23 | 0.931 | |
| 1 | 17 | 77 | 25.0 | 0.87 | 2.040E-04 | 28.01 | 1.78E-07 | 23 | 0.931 | 1.65E-07 |
| 3 | 1 | 104 | 24.5 | 0.89 | 1.510E-04 | 27.40 | 1.35E-07 | 23 | 0.931 | 1.25E-07 |
| 5 | 15 | 134 | 24.0 | 0.91 | 1.172E-04 | 26.79 | 1.07E-07 | 23 | 0.931 | 9.94E-08 |
| 8 | 24 | 189 | 23.4 | 0.94 | 9.973E-05 | 25.99 | 9.36E-08 | 23 | 0.931 | 8.72E-08 |
| 10 | 36 | 132 | 23.0 | 0.95 | 9.520E-05 | 25.63 | 9.06E-08 | 23 | 0.931 | 8.44E-08 |
| 16 | 1 | 325 | 22.1 | 0.99 | 8.700E-05 | 24.22 | 8.76E-08 | 23 | 0.931 | 8.16E-08 |
| 19 | 45 | 224 | 21.5 | 1.01 | 8.415E-05 | 23.67 | 8.67E-08 | 23 | 0.931 | 8.08E-08 |
| 24 | 38 | 293 | 20.8 | 1.04 | 7.506E-05 | 22.75 | 8.05E-08 | 23 | 0.931 | 7.49E-08 |
| 29 | 31 | 293 | 20.1 | 1.07 | 7.506E-05 | 21.90 | 8.36E-08 | 23 | 0.931 | 7.79E-08 |
| 35 | 4 | 333 | 19.4 | 1.10 | 6.604E-05 | 21.04 | 7.66E-08 | 23 | 0.931 | 7.13E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **7.62E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 8/29/2015 | DATE: | 8/31/3015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-022 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.721 | 9.45 | Height, in | 3.73 | 9.47 |
| Top Diameter, mm | 72.020 | | Top Diameter, mm | 72.44 | |
| Middle Diameter, mm | 72.010 | | Middle Diameter, mm | 72.5 | |
| Bottom Diameter, mm | 72.070 | | Bottom Diameter, mm | 72.42 | |
| Average Diameter, cm | 7.203 | | Average Diameter, cm | 7.245 | |
| Area, $cm^2$ | 40.75 | | Area, $cm^2$ | 41.23 | |
| Volume, $cm^3$ | 385.17 | | Volume, $cm^3$ | 390.61 | |
| Wet Mass, g | 782.6 | | Wet Mass, g | 797.9 | |
| Wt. tare, gm | 8.4 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 254.10 | | Wt. wet soil + tare, gm | 806.3 | |
| Wt. dry soil + tare, gm | 218.75 | | Wt. dry soil + tare, gm | 666.66 | |
| Moisture Content, % | 16.8% | | Moisture Content, % | 21.2% | |
| Dry Density, pcf | 108.5 | | Dry Density, pcf | 105.2 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.52 | | Void Ratio | 0.57 | |
| Saturation, % | 85% | | Saturation, % | 98% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 22.7

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 22.7 | 0.85 | | 29.04 | | 23 | 0.931 | |
| 1 | 8 | 68 | 22.5 | 0.86 | 9.240E-05 | 28.55 | 7.85E-08 | 23 | 0.931 | 7.31E-08 |
| 5 | 35 | 267 | 22.2 | 0.87 | 3.530E-05 | 28.07 | 3.05E-08 | 23 | 0.931 | 2.84E-08 |
| 10 | 44 | 309 | 21.9 | 0.88 | 3.050E-05 | 27.66 | 2.68E-08 | 23 | 0.931 | 2.49E-08 |
| 17 | 2 | 378 | 21.7 | 0.89 | 1.662E-05 | 27.45 | 1.47E-08 | 23 | 0.931 | 1.37E-08 |
| 24 | 51 | 469 | 21.4 | 0.90 | 2.010E-05 | 26.97 | 1.81E-08 | 23 | 0.931 | 1.68E-08 |
| 30 | 33 | 342 | 21.2 | 0.91 | 1.837E-05 | 26.76 | 1.67E-08 | 23 | 0.931 | 1.55E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.77E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 8/29/2015 | DATE: | 8/31/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-026 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.357 | 11.07 | Height, in | 4.364 | 11.08 |
| Top Diameter, mm | 72.080 | | Top Diameter, mm | 72.19 | |
| Middle Diameter, mm | 72.070 | | Middle Diameter, mm | 72.26 | |
| Bottom Diameter, mm | 72.100 | | Bottom Diameter, mm | 72.25 | |
| Average Diameter, cm | 7.208 | | Average Diameter, cm | 7.223 | |
| Area, $cm^2$ | 40.81 | | Area, $cm^2$ | 40.98 | |
| Volume, $cm^3$ | 451.63 | | Volume, $cm^3$ | 454.24 | |
| Wet Mass, g | 903.2 | | Wet Mass, g | 912.2 | |
| Wt. tare, gm | 8.5 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 239.10 | | Wt. wet soil + tare, gm | 920.7 | |
| Wt. dry soil + tare, gm | 199.81 | | Wt. dry soil + tare, gm | 736.66 | |
| Moisture Content, % | 20.5% | | Moisture Content, % | 25.3% | |
| Dry Density, pcf | 103.5 | | Dry Density, pcf | 100.0 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.60 | | Void Ratio | 0.65 | |
| Saturation, % | 91% | | Saturation, % | 103% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.4

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.4 | 0.85 | | 29.00 | | 23 | 0.931 | |
| 0 | 47 | 47 | 25.9 | 0.87 | 3.342E-04 | 28.07 | 2.91E-07 | 23 | 0.931 | 2.71E-07 |
| 2 | 22 | 95 | 25.5 | 0.89 | 1.323E-04 | 27.65 | 1.17E-07 | 23 | 0.931 | 1.09E-07 |
| 4 | 34 | 132 | 25.0 | 0.91 | 1.190E-04 | 27.00 | 1.08E-07 | 23 | 0.931 | 1.00E-07 |
| 7 | 19 | 165 | 24.4 | 0.93 | 1.142E-04 | 26.24 | 1.06E-07 | 23 | 0.931 | 9.89E-08 |
| 11 | 1 | 222 | 23.7 | 0.96 | 9.906E-05 | 25.35 | 9.54E-08 | 23 | 0.931 | 8.88E-08 |
| 13 | 43 | 162 | 23.2 | 0.98 | 9.696E-05 | 24.88 | 9.51E-08 | 23 | 0.931 | 8.86E-08 |
| 16 | 5 | 142 | 22.8 | 1.00 | 8.850E-05 | 24.47 | 8.83E-08 | 23 | 0.931 | 8.22E-08 |
| 20 | 19 | 254 | 22.1 | 1.03 | 8.658E-05 | 23.46 | 9.00E-08 | 23 | 0.931 | 8.38E-08 |
| 24 | 10 | 231 | 21.5 | 1.05 | 8.160E-05 | 22.82 | 8.73E-08 | 23 | 0.931 | 8.13E-08 |
| 28 | 16 | 246 | 20.9 | 1.08 | 7.662E-05 | 22.11 | 8.46E-08 | 23 | 0.931 | 7.88E-08 |
| 32 | 44 | 268 | 20.3 | 1.10 | 7.033E-05 | 21.40 | 8.02E-08 | 23 | 0.931 | 7.47E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **7.96E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 8/29/2015 | DATE: | 8/31/3015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-029 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters |
|---|---|---|
| Height, in | 4.218 | 10.71 |
| Top Diameter, mm | 72.330 | |
| Middle Diameter, mm | 72.350 | |
| Bottom Diameter, mm | 72.300 | |
| Average Diameter, cm | 7.233 | |
| Area, $cm^2$ | 41.09 | |
| Volume, $cm^3$ | 440.18 | |
| Wet Mass, g | 891.7 | |
| Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 164.20 | |
| Wt. dry soil + tare, gm | 139.50 | |
| Moisture Content, % | 18.8% | |
| Dry Density, pcf | 106.4 | |
| Specific Gravity | 2.65 | Assumed |
| Void Ratio | 0.55 | |
| Saturation, % | 90% | |
| Effective Stress, psi | 10 | |

| **Sample Data, Final** | | centimeters |
|---|---|---|
| Height, in | 4.256 | 10.81 |
| Top Diameter, mm | 72.71 | |
| Middle Diameter, mm | 72.77 | |
| Bottom Diameter, mm | 72.75 | |
| Average Diameter, cm | 7.274 | |
| Area, $cm^2$ | 41.56 | |
| Volume, $cm^3$ | 449.27 | |
| Wet Mass, g | 913.4 | |
| Wt. tare, gm | 8.2 | |
| Wt. wet soil + tare, gm | 921.6 | |
| Wt. dry soil + tare, gm | 755.29 | |
| Moisture Content, % | 22.3% | |
| Dry Density, pcf | 103.8 | |
| Specific Gravity | 2.65 | |
| Void Ratio | 0.59 | |
| Saturation, % | 99% | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.9

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.9 | 0.85 | | 29.37 | | 23 | 0.931 | |
| 1 | 8 | 68 | 25.2 | 0.88 | 3.234E-04 | 27.83 | 2.80E-07 | 23 | 0.931 | 2.60E-07 |
| 2 | 13 | 65 | 24.8 | 0.90 | 1.933E-04 | 27.53 | 1.69E-07 | 23 | 0.931 | 1.57E-07 |
| 3 | 10 | 57 | 24.5 | 0.91 | 1.653E-04 | 27.23 | 1.46E-07 | 23 | 0.931 | 1.36E-07 |
| 4 | 49 | 99 | 24.1 | 0.92 | 1.269E-04 | 26.69 | 1.14E-07 | 23 | 0.931 | 1.07E-07 |
| 7 | 21 | 152 | 23.6 | 0.94 | 1.033E-04 | 26.02 | 9.56E-08 | 23 | 0.931 | 8.90E-08 |
| 9 | 11 | 110 | 23.3 | 0.96 | 8.568E-05 | 25.78 | 8.00E-08 | 23 | 0.931 | 7.45E-08 |
| 12 | 50 | 219 | 22.8 | 0.98 | 7.173E-05 | 25.05 | 6.89E-08 | 23 | 0.931 | 6.41E-08 |
| 17 | 34 | 284 | 22.2 | 1.00 | 6.637E-05 | 24.27 | 6.58E-08 | 23 | 0.931 | 6.13E-08 |
| 22 | 3 | 269 | 21.7 | 1.02 | 5.839E-05 | 23.72 | 5.92E-08 | 23 | 0.931 | 5.52E-08 |
| 25 | 37 | 214 | 21.3 | 1.04 | 5.872E-05 | 23.30 | 6.06E-08 | 23 | 0.931 | 5.65E-08 |
| 30 | 21 | 284 | 20.8 | 1.06 | 5.531E-05 | 22.63 | 5.88E-08 | 23 | 0.931 | 5.48E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **5.69E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 8/29/2015 | DATE: | 8/31/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-032 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.818 | 9.70 | Height, in | 3.813 | 9.69 |
| Top Diameter, mm | 72.270 | | Top Diameter, mm | 72.44 | |
| Middle Diameter, mm | 72.280 | | Middle Diameter, mm | 72.47 | |
| Bottom Diameter, mm | 72.230 | | Bottom Diameter, mm | 72.46 | |
| Average Diameter, cm | 7.226 | | Average Diameter, cm | 7.246 | |
| Area, $cm^2$ | 41.01 | | Area, $cm^2$ | 41.23 | |
| Volume, $cm^3$ | 397.70 | | Volume, $cm^3$ | 399.34 | |
| Wet Mass, g | 765.6 | | Wet Mass, g | 769.8 | |
| Wt. tare, gm | 6.7 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 244.80 | | Wt. wet soil + tare, gm | 778.2 | |
| Wt. dry soil + tare, gm | 195.14 | | Wt. dry soil + tare, gm | 605.65 | |
| Moisture Content, % | 26.4% | | Moisture Content, % | 28.9% | |
| Dry Density, pcf | 95.1 | | Dry Density, pcf | 93.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.74 | | Void Ratio | 0.77 | |
| Saturation, % | 94% | | Saturation, % | 99% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^2$

**Initial Manometer Readings**

Pipette = 24.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.0 | 0.85 | | 29.98 | | 23 | 0.931 | |
| 1 | 46 | 106 | 23.8 | 0.86 | 5.928E-05 | 29.62 | 4.85E-08 | 23 | 0.931 | 4.52E-08 |
| 4 | 1 | 135 | 23.6 | 0.87 | 4.654E-05 | 29.35 | 3.85E-08 | 23 | 0.931 | 3.58E-08 |
| 6 | 42 | 161 | 23.4 | 0.87 | 3.903E-05 | 29.08 | 3.26E-08 | 23 | 0.931 | 3.03E-08 |
| 10 | 5 | 203 | 23.2 | 0.88 | 3.095E-05 | 28.81 | 2.61E-08 | 23 | 0.931 | 2.43E-08 |
| 14 | 2 | 237 | 23.0 | 0.89 | 2.651E-05 | 28.54 | 2.25E-08 | 23 | 0.931 | 2.10E-08 |
| 19 | 52 | 350 | 22.7 | 0.90 | 2.693E-05 | 28.06 | 2.33E-08 | 23 | 0.931 | 2.17E-08 |
| 23 | 56 | 244 | 22.5 | 0.91 | 2.575E-05 | 27.86 | 2.24E-08 | 23 | 0.931 | 2.09E-08 |
| 28 | 17 | 261 | 22.3 | 0.92 | 2.407E-05 | 27.59 | 2.12E-08 | 23 | 0.931 | 1.97E-08 |
| 33 | 2 | 285 | 22.1 | 0.93 | 2.205E-05 | 27.32 | 1.96E-08 | 23 | 0.931 | 1.82E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **2.01E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/1/2015 | DATE: | 9/3/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-035 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.164 | 10.58 | Height, in | 4.218 | 10.71 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.9 | |
| Middle Diameter, mm | 72.470 | | Middle Diameter, mm | 72.94 | |
| Bottom Diameter, mm | 72.480 | | Bottom Diameter, mm | 72.88 | |
| Average Diameter, cm | 7.249 | | Average Diameter, cm | 7.291 | |
| Area, $cm^2$ | 41.27 | | Area, $cm^2$ | 41.75 | |
| Volume, $cm^3$ | 436.47 | | Volume, $cm^3$ | 447.26 | |
| Wet Mass, g | 864.8 | | Wet Mass, g | 893.9 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 194.60 | | Wt. wet soil + tare, gm | 902.3 | |
| Wt. dry soil + tare, gm | 162.41 | | Wt. dry soil + tare, gm | 730.62 | |
| Moisture Content, % | 20.9% | | Moisture Content, % | 23.8% | |
| Dry Density, pcf | 102.3 | | Dry Density, pcf | 100.8 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.62 | | Void Ratio | 0.64 | |
| Saturation, % | 90% | | Saturation, % | 98% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.5 | 0.85 | | 29.27 | | 23 | 0.931 | |
| 1 | 1 | 61 | 25.0 | 0.87 | 2.575E-04 | 27.98 | 2.20E-07 | 23 | 0.931 | 2.05E-07 |
| 2 | 58 | 117 | 24.5 | 0.89 | 1.343E-04 | 27.37 | 1.17E-07 | 23 | 0.931 | 1.09E-07 |
| 7 | 11 | 253 | 23.6 | 0.93 | 1.118E-04 | 26.03 | 1.03E-07 | 23 | 0.931 | 9.58E-08 |
| 12 | 27 | 316 | 22.6 | 0.97 | 9.942E-05 | 24.74 | 9.62E-08 | 23 | 0.931 | 8.96E-08 |
| 17 | 2 | 275 | 21.8 | 1.00 | 9.139E-05 | 23.89 | 9.16E-08 | 23 | 0.931 | 8.53E-08 |
| 23 | 11 | 369 | 20.9 | 1.04 | 7.662E-05 | 22.73 | 8.07E-08 | 23 | 0.931 | 7.52E-08 |
| 28 | 44 | 333 | 20.1 | 1.07 | 7.547E-05 | 21.82 | 8.29E-08 | 23 | 0.931 | 7.72E-08 |
| 34 | 56 | 372 | 19.3 | 1.10 | 6.756E-05 | 20.84 | 7.77E-08 | 23 | 0.931 | 7.23E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **7.75E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/1/2015 | DATE: | 9/3/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-037 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.218 | 8.17 | Height, in | 3.278 | 8.33 |
| Top Diameter, mm | 72.400 | | Top Diameter, mm | 72.9 | |
| Middle Diameter, mm | 72.420 | | Middle Diameter, mm | 72.97 | |
| Bottom Diameter, mm | 72.390 | | Bottom Diameter, mm | 72.95 | |
| Average Diameter, cm | 7.240 | | Average Diameter, cm | 7.294 | |
| Area, $cm^2$ | 41.17 | | Area, $cm^2$ | 41.79 | |
| Volume, $cm^3$ | 336.53 | | Volume, $cm^3$ | 347.91 | |
| Wet Mass, g | 680.1 | | Wet Mass, g | 702.8 | |
| Wt. tare, gm | 8.5 | | Wt. tare, gm | 8.2 | |
| Wt. wet soil + tare, gm | 152.10 | | Wt. wet soil + tare, gm | 710.9 | |
| Wt. dry soil + tare, gm | 129.43 | | Wt. dry soil + tare, gm | 575.02 | |
| Moisture Content, % | 18.7% | | Moisture Content, % | 24.0% | |
| Dry Density, pcf | 106.2 | | Dry Density, pcf | 101.7 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.56 | | Void Ratio | 0.63 | |
| Saturation, % | 89% | | Saturation, % | 101% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 20.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 20.0 | 0.85 | | 29.43 | | 23 | 0.931 | |
| 1 | 6 | 66 | 19.7 | 0.86 | 1.428E-04 | 28.18 | 1.21E-07 | 23 | 0.931 | 1.13E-07 |
| 3 | 15 | 129 | 19.3 | 0.88 | 9.741E-05 | 27.47 | 8.49E-08 | 23 | 0.931 | 7.90E-08 |
| 6 | 10 | 175 | 18.9 | 0.90 | 7.181E-05 | 26.85 | 6.40E-08 | 23 | 0.931 | 5.96E-08 |
| 9 | 8 | 178 | 18.5 | 0.91 | 7.060E-05 | 26.22 | 6.44E-08 | 23 | 0.931 | 6.00E-08 |
| 12 | 42 | 214 | 18.1 | 0.93 | 5.872E-05 | 25.59 | 5.49E-08 | 23 | 0.931 | 5.11E-08 |
| 14 | 44 | 122 | 17.9 | 0.94 | 5.150E-05 | 25.43 | 4.85E-08 | 23 | 0.931 | 4.51E-08 |
| 19 | 50 | 306 | 17.4 | 0.96 | 5.133E-05 | 24.41 | 5.03E-08 | 23 | 0.931 | 4.69E-08 |
| 22 | 58 | 188 | 17.1 | 0.97 | 5.013E-05 | 24.10 | 4.98E-08 | 23 | 0.931 | 4.64E-08 |
| 26 | 11 | 193 | 16.8 | 0.98 | 4.883E-05 | 23.63 | 4.95E-08 | 23 | 0.931 | 4.61E-08 |
| 30 | 47 | 276 | 16.4 | 1.00 | 4.553E-05 | 22.92 | 4.75E-08 | 23 | 0.931 | 4.43E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **4.59E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/1/2015 | DATE: | 9/3/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-040 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| Sample Data, Initial | | centimeters | Sample Data, Final | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.621 | 9.20 | Height, in | 3.645 | 9.26 |
| Top Diameter, mm | 72.400 | | Top Diameter, mm | 72.77 | |
| Middle Diameter, mm | 72.450 | | Middle Diameter, mm | 72.81 | |
| Bottom Diameter, mm | 72.390 | | Bottom Diameter, mm | 72.75 | |
| Average Diameter, cm | 7.241 | | Average Diameter, cm | 7.278 | |
| Area, $cm^2$ | 41.18 | | Area, $cm^2$ | 41.60 | |
| Volume, $cm^3$ | 378.78 | | Volume, $cm^3$ | 385.13 | |
| Wet Mass, g | 752.2 | | Wet Mass, g | 770.8 | |
| Wt. tare, gm | 8.2 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 216.90 | | Wt. wet soil + tare, gm | 779.4 | |
| Wt. dry soil + tare, gm | 184.90 | | Wt. dry soil + tare, gm | 635.28 | |
| Moisture Content, % | 18.1% | | Moisture Content, % | 23.0% | |
| Dry Density, pcf | 104.9 | | Dry Density, pcf | 101.5 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.58 | | Void Ratio | 0.63 | |
| Saturation, % | 83% | | Saturation, % | 97% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 22.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 22.5 | 0.85 | | 29.57 | | 23 | 0.931 | |
| 0 | 51 | 51 | 22.0 | 0.87 | 3.080E-04 | 28.31 | 2.62E-07 | 23 | 0.931 | 2.44E-07 |
| 2 | 23 | 92 | 21.7 | 0.88 | 1.024E-04 | 28.03 | 8.79E-08 | 23 | 0.931 | 8.18E-08 |
| 7 | 10 | 287 | 21.3 | 0.90 | 4.379E-05 | 27.39 | 3.84E-08 | 23 | 0.931 | 3.58E-08 |
| 12 | 22 | 312 | 21.0 | 0.91 | 3.021E-05 | 27.04 | 2.69E-08 | 23 | 0.931 | 2.50E-08 |
| 18 | 32 | 370 | 20.7 | 0.92 | 2.547E-05 | 26.62 | 2.30E-08 | 23 | 0.931 | 2.14E-08 |
| 26 | 29 | 477 | 20.3 | 0.94 | 2.634E-05 | 25.98 | 2.44E-08 | 23 | 0.931 | 2.27E-08 |
| 33 | 31 | 422 | 19.9 | 0.96 | 2.978E-05 | 25.42 | 2.82E-08 | 23 | 0.931 | 2.62E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **2.38E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/1/2015 | DATE: | 9/3/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-050 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.265 | 10.83 | Height, in | 4.303 | 10.93 |
| Top Diameter, mm | 72.200 | | Top Diameter, mm | 72.89 | |
| Middle Diameter, mm | 72.260 | | Middle Diameter, mm | 72.97 | |
| Bottom Diameter, mm | 72.180 | | Bottom Diameter, mm | 72.92 | |
| Average Diameter, cm | 7.221 | | Average Diameter, cm | 7.293 | |
| Area, $cm^2$ | 40.96 | | Area, $cm^2$ | 41.77 | |
| Volume, $cm^3$ | 443.69 | | Volume, $cm^3$ | 456.53 | |
| Wet Mass, g | 894.9 | | Wet Mass, g | 926.3 | |
| Wt. tare, gm | 8.4 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 278.30 | | Wt. wet soil + tare, gm | 934.8 | |
| Wt. dry soil + tare, gm | 230.64 | | Wt. dry soil + tare, gm | 757.02 | |
| Moisture Content, % | 21.4% | | Moisture Content, % | 23.7% | |
| Dry Density, pcf | 103.6 | | Dry Density, pcf | 102.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.60 | | Void Ratio | 0.62 | |
| Saturation, % | 95% | | Saturation, % | 102% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.5 | 0.85 | | 28.58 | | 23 | 0.931 | |
| 0 | 55 | 55 | 25.0 | 0.87 | 2.856E-04 | 27.43 | 2.49E-07 | 23 | 0.931 | 2.32E-07 |
| 3 | 22 | 147 | 24.5 | 0.89 | 1.069E-04 | 26.83 | 9.53E-08 | 23 | 0.931 | 8.88E-08 |
| 6 | 32 | 190 | 24.0 | 0.91 | 8.267E-05 | 26.23 | 7.55E-08 | 23 | 0.931 | 7.03E-08 |
| 9 | 46 | 194 | 23.6 | 0.93 | 6.478E-05 | 25.81 | 6.01E-08 | 23 | 0.931 | 5.59E-08 |
| 13 | 7 | 201 | 23.2 | 0.94 | 6.252E-05 | 25.34 | 5.91E-08 | 23 | 0.931 | 5.50E-08 |
| 17 | 1 | 234 | 22.8 | 0.96 | 5.370E-05 | 24.86 | 5.17E-08 | 23 | 0.931 | 4.82E-08 |
| 21 | 58 | 297 | 22.3 | 0.98 | 5.289E-05 | 24.20 | 5.23E-08 | 23 | 0.931 | 4.87E-08 |
| 28 | 32 | 394 | 21.7 | 1.01 | 4.784E-05 | 23.42 | 4.89E-08 | 23 | 0.931 | 4.55E-08 |
| 32 | 7 | 215 | 21.4 | 1.02 | 4.384E-05 | 23.24 | 4.52E-08 | 23 | 0.931 | 4.20E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **4.61E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/3/2015 | DATE: | 9/8/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-055 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.285 | 10.88 | Height, in | 4.329 | 11.00 |
| Top Diameter, mm | 73.010 | | Top Diameter, mm | 73.51 | |
| Middle Diameter, mm | 73.090 | | Middle Diameter, mm | 73.59 | |
| Bottom Diameter, mm | 72.990 | | Bottom Diameter, mm | 73.48 | |
| Average Diameter, cm | 7.303 | | Average Diameter, cm | 7.353 | |
| Area, $cm^2$ | 41.89 | | Area, $cm^2$ | 42.46 | |
| Volume, $cm^3$ | 455.91 | | Volume, $cm^3$ | 466.87 | |
| Wet Mass, g | 914.0 | | Wet Mass, g | 938.5 | |
| Wt. tare, gm | 8.4 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 198.90 | | Wt. wet soil + tare, gm | 946.8 | |
| Wt. dry soil + tare, gm | 159.00 | | Wt. dry soil + tare, gm | 750.72 | |
| Moisture Content, % | 26.5% | | Moisture Content, % | 26.4% | |
| Dry Density, pcf | 98.9 | | Dry Density, pcf | 99.2 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.67 | | Void Ratio | 0.67 | |
| Saturation, % | 104% | | Saturation, % | 105% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.4

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.4 | 0.85 | | 29.48 | | 23 | 0.931 | |
| 1 | 11 | 71 | 26.0 | 0.87 | 1.770E-04 | 28.47 | 1.46E-07 | 23 | 0.931 | 1.36E-07 |
| 6 | 47 | 336 | 25.3 | 0.90 | 6.545E-05 | 27.46 | 5.61E-08 | 23 | 0.931 | 5.23E-08 |
| 10 | 33 | 226 | 25.0 | 0.91 | 4.170E-05 | 27.34 | 3.59E-08 | 23 | 0.931 | 3.34E-08 |
| 16 | 12 | 339 | 24.7 | 0.92 | 2.780E-05 | 26.98 | 2.43E-08 | 23 | 0.931 | 2.26E-08 |
| 20 | 45 | 273 | 24.5 | 0.93 | 2.302E-05 | 26.81 | 2.02E-08 | 23 | 0.931 | 1.88E-08 |
| 27 | 31 | 406 | 24.2 | 0.94 | 2.321E-05 | 26.39 | 2.07E-08 | 23 | 0.931 | 1.93E-08 |
| 32 | 4 | 273 | 24.0 | 0.95 | 2.302E-05 | 26.21 | 2.07E-08 | 23 | 0.931 | 1.93E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.00E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/3/2015 | DATE: | 9/8/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-060 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.395 | 8.62 | Height, in | 3.441 | 8.74 |
| Top Diameter, mm | 72.500 | | Top Diameter, mm | 73.05 | |
| Middle Diameter, mm | 72.530 | | Middle Diameter, mm | 73.09 | |
| Bottom Diameter, mm | 72.450 | | Bottom Diameter, mm | 73.17 | |
| Average Diameter, cm | 7.249 | | Average Diameter, cm | 7.310 | |
| Area, $cm^2$ | 41.27 | | Area, $cm^2$ | 41.97 | |
| Volume, $cm^3$ | 355.93 | | Volume, $cm^3$ | 366.84 | |
| Wet Mass, g | 678.7 | | Wet Mass, g | 702.6 | |
| Wt. tare, gm | 8.1 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 208.90 | | Wt. wet soil + tare, gm | 711 | |
| Wt. dry soil + tare, gm | 172.59 | | Wt. dry soil + tare, gm | 559.62 | |
| Moisture Content, % | 22.1% | | Moisture Content, % | 27.5% | |
| Dry Density, pcf | 97.5 | | Dry Density, pcf | 93.8 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.70 | | Void Ratio | 0.76 | |
| Saturation, % | 84% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 21.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 21.0 | 0.85 | | 29.35 | | 23 | 0.931 | |
| 1 | 12 | 72 | 20.3 | 0.88 | 3.054E-04 | 27.38 | 2.66E-07 | 23 | 0.931 | 2.47E-07 |
| 2 | 34 | 82 | 19.9 | 0.90 | 1.532E-04 | 27.01 | 1.35E-07 | 23 | 0.931 | 1.26E-07 |
| 4 | 1 | 87 | 19.5 | 0.91 | 1.444E-04 | 26.41 | 1.30E-07 | 23 | 0.931 | 1.21E-07 |
| 5 | 57 | 116 | 19.0 | 0.93 | 1.354E-04 | 25.59 | 1.26E-07 | 23 | 0.931 | 1.17E-07 |
| 9 | 17 | 200 | 18.2 | 0.96 | 1.257E-04 | 24.16 | 1.24E-07 | 23 | 0.931 | 1.15E-07 |
| 12 | 1 | 164 | 17.6 | 0.99 | 1.149E-04 | 23.42 | 1.17E-07 | 23 | 0.931 | 1.09E-07 |
| 15 | 9 | 188 | 17.0 | 1.01 | 1.003E-04 | 22.52 | 1.06E-07 | 23 | 0.931 | 9.88E-08 |
| 17 | 18 | 129 | 16.6 | 1.03 | 9.741E-05 | 22.07 | 1.05E-07 | 23 | 0.931 | 9.79E-08 |
| 23 | 18 | 360 | 15.6 | 1.07 | 8.727E-05 | 20.12 | 1.03E-07 | 23 | 0.931 | 9.62E-08 |
| 27 | 9 | 231 | 15.0 | 1.10 | 8.160E-05 | 19.53 | 9.96E-08 | 23 | 0.931 | 9.27E-08 |
| 31 | 13 | 244 | 14.4 | 1.12 | 7.725E-05 | 18.63 | 9.88E-08 | 23 | 0.931 | 9.20E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **9.47E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/3/2015 | DATE: | 9/8/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-065 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| Sample Data, Initial | | centimeters | Sample Data, Final | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.645 | 9.26 | Height, in | 3.708 | 9.42 |
| Top Diameter, mm | 72.200 | | Top Diameter, mm | 72.48 | |
| Middle Diameter, mm | 72.210 | | Middle Diameter, mm | 72.55 | |
| Bottom Diameter, mm | 72.160 | | Bottom Diameter, mm | 72.54 | |
| Average Diameter, cm | 7.219 | | Average Diameter, cm | 7.252 | |
| Area, $cm^2$ | 40.93 | | Area, $cm^2$ | 41.31 | |
| Volume, $cm^3$ | 378.94 | | Volume, $cm^3$ | 389.06 | |
| Wet Mass, g | 770.8 | | Wet Mass, g | 800.3 | |
| Wt. tare, gm | 6.8 | | Wt. tare, gm | 8.46 | |
| Wt. wet soil + tare, gm | 252.50 | | Wt. wet soil + tare, gm | 808.74 | |
| Wt. dry soil + tare, gm | 217.35 | | Wt. dry soil + tare, gm | 665.45 | |
| Moisture Content, % | 16.7% | | Moisture Content, % | 21.8% | |
| Dry Density, pcf | 108.8 | | Dry Density, pcf | 105.4 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.52 | | Void Ratio | 0.57 | |
| Saturation, % | 85% | | Saturation, % | 102% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 22.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 22.5 | 0.85 | | 29.37 | | 23 | 0.931 | |
| 0 | 47 | 47 | 22.0 | 0.87 | 3.342E-04 | 27.83 | 2.91E-07 | 23 | 0.931 | 2.71E-07 |
| 2 | 10 | 83 | 21.5 | 0.89 | 1.893E-04 | 27.14 | 1.69E-07 | 23 | 0.931 | 1.57E-07 |
| 4 | 34 | 144 | 21.0 | 0.91 | 1.091E-04 | 26.44 | 9.99E-08 | 23 | 0.931 | 9.30E-08 |
| 7 | 27 | 173 | 20.6 | 0.93 | 7.264E-05 | 25.96 | 6.77E-08 | 23 | 0.931 | 6.31E-08 |
| 11 | 8 | 221 | 20.2 | 0.94 | 5.686E-05 | 25.40 | 5.42E-08 | 23 | 0.931 | 5.05E-08 |
| 16 | 24 | 316 | 19.8 | 0.96 | 3.977E-05 | 24.85 | 3.87E-08 | 23 | 0.931 | 3.61E-08 |
| 20 | 57 | 273 | 19.5 | 0.97 | 3.452E-05 | 24.50 | 3.41E-08 | 23 | 0.931 | 3.18E-08 |
| 25 | 31 | 274 | 19.2 | 0.99 | 3.440E-05 | 24.08 | 3.46E-08 | 23 | 0.931 | 3.22E-08 |
| 31 | 36 | 365 | 18.8 | 1.00 | 3.443E-05 | 23.46 | 3.55E-08 | 23 | 0.931 | 3.31E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **3.33E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/3/2015 | DATE: | 9/8/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-070 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.67 | 9.32 | Height, in | 3.661 | 9.30 |
| Top Diameter, mm | 72.390 | | Top Diameter, mm | 73.02 | |
| Middle Diameter, mm | 72.440 | | Middle Diameter, mm | 73.13 | |
| Bottom Diameter, mm | 72.310 | | Bottom Diameter, mm | 73.05 | |
| Average Diameter, cm | 7.238 | | Average Diameter, cm | 7.307 | |
| Area, $cm^2$ | 41.15 | | Area, $cm^2$ | 41.93 | |
| Volume, $cm^3$ | 383.55 | | Volume, $cm^3$ | 389.91 | |
| Wet Mass, g | 765.9 | | Wet Mass, g | 770.34 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 6.86 | |
| Wt. wet soil + tare, gm | 256.10 | | Wt. wet soil + tare, gm | 777.24 | |
| Wt. dry soil + tare, gm | 211.18 | | Wt. dry soil + tare, gm | 627.52 | |
| Moisture Content, % | 22.1% | | Moisture Content, % | 24.1% | |
| Dry Density, pcf | 102.0 | | Dry Density, pcf | 99.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.62 | | Void Ratio | 0.66 | |
| Saturation, % | 95% | | Saturation, % | 96% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 23.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 23.0 | 0.85 | | 29.84 | | 23 | 0.931 | |
| 2 | 46 | 166 | 22.8 | 0.86 | 3.785E-05 | 29.50 | 3.06E-08 | 23 | 0.931 | 2.85E-08 |
| 7 | 34 | 288 | 22.5 | 0.87 | 3.273E-05 | 29.00 | 2.69E-08 | 23 | 0.931 | 2.51E-08 |
| 12 | 13 | 279 | 22.3 | 0.88 | 2.252E-05 | 28.79 | 1.87E-08 | 23 | 0.931 | 1.74E-08 |
| 19 | 15 | 422 | 22.1 | 0.89 | 1.489E-05 | 28.51 | 1.25E-08 | 23 | 0.931 | 1.16E-08 |
| 24 | 9 | 294 | 21.9 | 0.90 | 2.137E-05 | 28.23 | 1.81E-08 | 23 | 0.931 | 1.68E-08 |
| 31 | 56 | 467 | 21.7 | 0.90 | 1.345E-05 | 27.95 | 1.15E-08 | 23 | 0.931 | 1.07E-08 |
| 39 | 28 | 452 | 21.5 | 0.91 | 1.390E-05 | 27.67 | 1.20E-08 | 23 | 0.931 | 1.12E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.26E-08 cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/3/2015 | DATE: | 9/8/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-075 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.243 | 10.78 | Height, in | 4.212 | 10.70 |
| Top Diameter, mm | 72.550 | | Top Diameter, mm | 72.68 | |
| Middle Diameter, mm | 72.510 | | Middle Diameter, mm | 72.65 | |
| Bottom Diameter, mm | 72.510 | | Bottom Diameter, mm | 72.71 | |
| Average Diameter, cm | 7.252 | | Average Diameter, cm | 7.268 | |
| Area, $cm^2$ | 41.31 | | Area, $cm^2$ | 41.49 | |
| Volume, $cm^3$ | 445.20 | | Volume, $cm^3$ | 443.86 | |
| Wet Mass, g | 869.5 | | Wet Mass, g | 873.1 | |
| Wt. tare, gm | 6.9 | | Wt. tare, gm | 8.7 | |
| Wt. wet soil + tare, gm | 291.70 | | Wt. wet soil + tare, gm | 881.8 | |
| Wt. dry soil + tare, gm | 235.67 | | Wt. dry soil + tare, gm | 695.65 | |
| Moisture Content, % | 24.5% | | Moisture Content, % | 27.1% | |
| Dry Density, pcf | 97.9 | | Dry Density, pcf | 96.6 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.69 | | Void Ratio | 0.71 | |
| Saturation, % | 94% | | Saturation, % | 101% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 29.31 | | 23 | 0.931 | |
| 2 | 52 | 172 | 25.5 | 0.87 | 9.133E-05 | 28.61 | 7.69E-08 | 23 | 0.931 | 7.16E-08 |
| 6 | 25 | 213 | 25.2 | 0.88 | 4.425E-05 | 28.36 | 3.76E-08 | 23 | 0.931 | 3.50E-08 |
| 13 | 28 | 423 | 24.7 | 0.90 | 3.713E-05 | 27.63 | 3.24E-08 | 23 | 0.931 | 3.02E-08 |
| 19 | 7 | 339 | 24.4 | 0.92 | 2.780E-05 | 27.39 | 2.45E-08 | 23 | 0.931 | 2.28E-08 |
| 24 | 36 | 329 | 24.1 | 0.93 | 2.865E-05 | 27.02 | 2.56E-08 | 23 | 0.931 | 2.38E-08 |
| 31 | 49 | 433 | 23.7 | 0.94 | 2.902E-05 | 26.47 | 2.64E-08 | 23 | 0.931 | 2.46E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.53E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/4/2015 | DATE: | 9/9/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-080 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.252 | 10.80 | Height, in | 4.26 | 10.82 |
| Top Diameter, mm | 73.100 | | Top Diameter, mm | 73.39 | |
| Middle Diameter, mm | 73.020 | | Middle Diameter, mm | 73.45 | |
| Bottom Diameter, mm | 73.050 | | Bottom Diameter, mm | 73.43 | |
| Average Diameter, cm | 7.306 | | Average Diameter, cm | 7.342 | |
| Area, $cm^2$ | 41.92 | | Area, $cm^2$ | 42.34 | |
| Volume, $cm^3$ | 452.73 | | Volume, $cm^3$ | 458.14 | |
| Wet Mass, g | 914.6 | | Wet Mass, g | 923.6 | |
| Wt. tare, gm | 8.1 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 262.80 | | Wt. wet soil + tare, gm | 932.2 | |
| Wt. dry soil + tare, gm | 214.79 | | Wt. dry soil + tare, gm | 756.05 | |
| Moisture Content, % | 23.2% | | Moisture Content, % | 23.6% | |
| Dry Density, pcf | 102.3 | | Dry Density, pcf | 101.8 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.62 | | Void Ratio | 0.62 | |
| Saturation, % | 100% | | Saturation, % | 100% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 29.25 | | 23 | 0.931 | |
| 1 | 10 | 70 | 25.5 | 0.87 | 2.244E-04 | 28.29 | 1.87E-07 | 23 | 0.931 | 1.74E-07 |
| 2 | 26 | 76 | 25.0 | 0.89 | 2.067E-04 | 27.68 | 1.76E-07 | 23 | 0.931 | 1.64E-07 |
| 4 | 16 | 110 | 24.5 | 0.91 | 1.428E-04 | 27.08 | 1.25E-07 | 23 | 0.931 | 1.16E-07 |
| 5 | 58 | 102 | 24.1 | 0.93 | 1.232E-04 | 26.66 | 1.09E-07 | 23 | 0.931 | 1.02E-07 |
| 9 | 32 | 214 | 23.4 | 0.96 | 1.028E-04 | 25.63 | 9.47E-08 | 23 | 0.931 | 8.82E-08 |
| 12 | 21 | 169 | 22.9 | 0.98 | 9.295E-05 | 25.14 | 8.73E-08 | 23 | 0.931 | 8.13E-08 |
| 17 | 55 | 334 | 22.0 | 1.01 | 8.465E-05 | 23.81 | 8.40E-08 | 23 | 0.931 | 7.82E-08 |
| 23 | 38 | 343 | 21.2 | 1.05 | 7.327E-05 | 22.91 | 7.55E-08 | 23 | 0.931 | 7.03E-08 |
| 28 | 7 | 269 | 20.6 | 1.07 | 7.007E-05 | 22.30 | 7.42E-08 | 23 | 0.931 | 6.91E-08 |
| 31 | 13 | 186 | 20.2 | 1.09 | 6.756E-05 | 21.94 | 7.27E-08 | 23 | 0.931 | 6.77E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **7.13E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/4/2015 | DATE: | 9/9/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-085 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.313 | 10.96 | Height, in | 4.305 | 10.93 |
| Top Diameter, mm | 72.300 | | Top Diameter, mm | 72.44 | |
| Middle Diameter, mm | 72.350 | | Middle Diameter, mm | 72.49 | |
| Bottom Diameter, mm | 72.280 | | Bottom Diameter, mm | 72.42 | |
| Average Diameter, cm | 7.231 | | Average Diameter, cm | 7.245 | |
| Area, $cm^2$ | 41.07 | | Area, $cm^2$ | 41.23 | |
| Volume, $cm^3$ | 449.88 | | Volume, $cm^3$ | 450.79 | |
| Wet Mass, g | 891.9 | | Wet Mass, g | 897.3 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 285.80 | | Wt. wet soil + tare, gm | 905.6 | |
| Wt. dry soil + tare, gm | 230.31 | | Wt. dry soil + tare, gm | 724 | |
| Moisture Content, % | 25.0% | | Moisture Content, % | 25.4% | |
| Dry Density, pcf | 99.0 | | Dry Density, pcf | 99.1 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.67 | | Void Ratio | 0.67 | |
| Saturation, % | 99% | | Saturation, % | 100% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.9

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.9 | 0.85 | | 29.87 | | 23 | 0.931 | |
| 2 | 26 | 146 | 26.6 | 0.86 | 6.455E-05 | 29.38 | 5.33E-08 | 23 | 0.931 | 4.96E-08 |
| 7 | 57 | 331 | 26.3 | 0.87 | 2.847E-05 | 29.02 | 2.38E-08 | 23 | 0.931 | 2.22E-08 |
| 13 | 11 | 314 | 26.0 | 0.89 | 3.002E-05 | 28.67 | 2.54E-08 | 23 | 0.931 | 2.37E-08 |
| 18 | 8 | 297 | 25.8 | 0.90 | 2.116E-05 | 28.49 | 1.80E-08 | 23 | 0.931 | 1.68E-08 |
| 26 | 14 | 486 | 25.5 | 0.91 | 1.939E-05 | 28.07 | 1.68E-08 | 23 | 0.931 | 1.56E-08 |
| 31 | 49 | 335 | 25.3 | 0.92 | 1.876E-05 | 27.89 | 1.63E-08 | 23 | 0.931 | 1.52E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.78E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/4/2015 | DATE: | 9/9/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-090 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.336 | 11.01 | Height, in | 4.357 | 11.07 |
| Top Diameter, mm | 73.180 | | Top Diameter, mm | 73.41 | |
| Middle Diameter, mm | 73.260 | | Middle Diameter, mm | 73.49 | |
| Bottom Diameter, mm | 73.210 | | Bottom Diameter, mm | 73.47 | |
| Average Diameter, cm | 7.322 | | Average Diameter, cm | 7.346 | |
| Area, $cm^2$ | 42.10 | | Area, $cm^2$ | 42.38 | |
| Volume, $cm^3$ | 463.69 | | Volume, $cm^3$ | 469.00 | |
| Wet Mass, g | 936.8 | | Wet Mass, g | 946.6 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 293.40 | | Wt. wet soil + tare, gm | 955.1 | |
| Wt. dry soil + tare, gm | 242.21 | | Wt. dry soil + tare, gm | 773.14 | |
| Moisture Content, % | 21.9% | | Moisture Content, % | 23.8% | |
| Dry Density, pcf | 103.4 | | Dry Density, pcf | 101.7 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.60 | | Void Ratio | 0.63 | |
| Saturation, % | 97% | | Saturation, % | 101% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.8

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.8 | 0.85 | | 29.59 | | 23 | 0.931 | |
| 1 | 3 | 63 | 26.2 | 0.87 | 2.992E-04 | 28.39 | 2.49E-07 | 23 | 0.931 | 2.32E-07 |
| 2 | 28 | 85 | 25.7 | 0.90 | 1.848E-04 | 27.86 | 1.57E-07 | 23 | 0.931 | 1.46E-07 |
| 5 | 29 | 181 | 25.0 | 0.92 | 1.215E-04 | 26.91 | 1.07E-07 | 23 | 0.931 | 9.92E-08 |
| 11 | 43 | 374 | 23.9 | 0.97 | 9.240E-05 | 25.37 | 8.59E-08 | 23 | 0.931 | 8.00E-08 |
| 16 | 55 | 312 | 23.0 | 1.01 | 9.062E-05 | 24.43 | 8.75E-08 | 23 | 0.931 | 8.15E-08 |
| 22 | 13 | 318 | 22.2 | 1.04 | 7.903E-05 | 23.54 | 7.92E-08 | 23 | 0.931 | 7.38E-08 |
| 28 | 20 | 367 | 21.3 | 1.08 | 7.704E-05 | 22.42 | 8.11E-08 | 23 | 0.931 | 7.55E-08 |
| 34 | 3 | 343 | 20.5 | 1.11 | 7.327E-05 | 21.53 | 8.03E-08 | 23 | 0.931 | 7.48E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **7.64E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/4/2015 | DATE: | 9/9/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-095 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters |
|---|---|---|
| Height, in | 3.867 | 9.82 |
| Top Diameter, mm | 70.140 | |
| Middle Diameter, mm | 70.010 | |
| Bottom Diameter, mm | 70.220 | |
| Average Diameter, cm | 7.012 | |
| Area, $cm^2$ | 38.62 | |
| Volume, $cm^3$ | 379.33 | |
| Wet Mass, g | 739.8 | |
| Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 244.30 | |
| Wt. dry soil + tare, gm | 202.18 | |
| Moisture Content, % | 21.7% | |
| Dry Density, pcf | 100.0 | |
| Specific Gravity | 2.65 | Assumed |
| Void Ratio | 0.65 | |
| Saturation, % | 88% | |
| Effective Stress, psi | 10 | |

| **Sample Data, Final** | | centimeters |
|---|---|---|
| Height, in | 3.891 | 9.88 |
| Top Diameter, mm | 70.28 | |
| Middle Diameter, mm | 70.12 | |
| Bottom Diameter, mm | 70.34 | |
| Average Diameter, cm | 7.025 | |
| Area, $cm^2$ | 38.76 | |
| Volume, $cm^3$ | 383.03 | |
| Wet Mass, g | 752.2 | |
| Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 760.6 | |
| Wt. dry soil + tare, gm | 609.32 | |
| Moisture Content, % | 25.2% | |
| Dry Density, pcf | 97.9 | |
| Specific Gravity | 2.65 | |
| Void Ratio | 0.69 | |
| Saturation, % | 97% | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.5 | 0.85 | | 30.24 | | 23 | 0.931 | |
| 1 | 39 | 99 | 23.7 | 0.88 | 2.539E-04 | 28.46 | 2.30E-07 | 23 | 0.931 | 2.14E-07 |
| 3 | 2 | 83 | 23.3 | 0.90 | 1.514E-04 | 28.20 | 1.39E-07 | 23 | 0.931 | 1.29E-07 |
| 4 | 40 | 98 | 22.9 | 0.92 | 1.282E-04 | 27.67 | 1.20E-07 | 23 | 0.931 | 1.11E-07 |
| 6 | 32 | 112 | 22.5 | 0.93 | 1.122E-04 | 27.14 | 1.07E-07 | 23 | 0.931 | 9.93E-08 |
| 11 | 1 | 269 | 21.7 | 0.96 | 9.343E-05 | 25.82 | 9.34E-08 | 23 | 0.931 | 8.69E-08 |
| 17 | 42 | 401 | 20.6 | 1.01 | 8.618E-05 | 24.16 | 9.20E-08 | 23 | 0.931 | 8.57E-08 |
| 25 | 28 | 466 | 19.7 | 1.05 | 6.067E-05 | 23.11 | 6.78E-08 | 23 | 0.931 | 6.31E-08 |
| 30 | 47 | 319 | 19.1 | 1.07 | 5.909E-05 | 22.51 | 6.77E-08 | 23 | 0.931 | 6.31E-08 |
| 37 | 13 | 386 | 18.4 | 1.10 | 5.697E-05 | 21.52 | 6.83E-08 | 23 | 0.931 | 6.36E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **6.89E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/4/2015 | DATE: | 9/9/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-100 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.001 | 7.62 | Height, in | 3.031 | 7.70 |
| Top Diameter, mm | 72.170 | | Top Diameter, mm | 72.38 | |
| Middle Diameter, mm | 72.190 | | Middle Diameter, mm | 72.45 | |
| Bottom Diameter, mm | 72.110 | | Bottom Diameter, mm | 72.43 | |
| Average Diameter, cm | 7.216 | | Average Diameter, cm | 7.242 | |
| Area, $cm^2$ | 40.89 | | Area, $cm^2$ | 41.19 | |
| Volume, $cm^3$ | 311.70 | | Volume, $cm^3$ | 317.12 | |
| Wet Mass, g | 635.8 | | Wet Mass, g | 652.7 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.2 | |
| Wt. wet soil + tare, gm | 223.50 | | Wt. wet soil + tare, gm | 661 | |
| Wt. dry soil + tare, gm | 191.76 | | Wt. dry soil + tare, gm | 556.86 | |
| Moisture Content, % | 17.3% | | Moisture Content, % | 19.0% | |
| Dry Density, pcf | 108.5 | | Dry Density, pcf | 107.9 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.52 | | Void Ratio | 0.53 | |
| Saturation, % | 88% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 19.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 19.0 | 0.85 | | 29.91 | | 23 | 0.931 | |
| 0 | 56 | 56 | 18.6 | 0.87 | 2.244E-04 | 28.59 | 1.91E-07 | 23 | 0.931 | 1.77E-07 |
| 3 | 8 | 132 | 18.0 | 0.89 | 1.428E-04 | 27.40 | 1.27E-07 | 23 | 0.931 | 1.18E-07 |
| 5 | 42 | 154 | 17.4 | 0.92 | 1.224E-04 | 26.38 | 1.13E-07 | 23 | 0.931 | 1.05E-07 |
| 8 | 7 | 145 | 16.9 | 0.94 | 1.083E-04 | 25.62 | 1.03E-07 | 23 | 0.931 | 9.56E-08 |
| 10 | 30 | 143 | 16.5 | 0.95 | 8.788E-05 | 25.02 | 8.53E-08 | 23 | 0.931 | 7.94E-08 |
| 15 | 12 | 282 | 15.8 | 0.98 | 7.798E-05 | 23.58 | 8.03E-08 | 23 | 0.931 | 7.48E-08 |
| 22 | 37 | 445 | 14.8 | 1.02 | 7.060E-05 | 21.62 | 7.93E-08 | 23 | 0.931 | 7.38E-08 |
| 28 | 23 | 346 | 14.1 | 1.05 | 6.356E-05 | 20.69 | 7.46E-08 | 23 | 0.931 | 6.94E-08 |
| 33 | 4 | 281 | 13.6 | 1.07 | 5.590E-05 | 20.01 | 6.78E-08 | 23 | 0.931 | 6.31E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **7.03E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/4/2015 | DATE: | 9/9/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-105 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.057 | 10.30 | Height, in | 4.057 | 10.30 |
| Top Diameter, mm | 72.230 | | Top Diameter, mm | 72.23 | |
| Middle Diameter, mm | 72.250 | | Middle Diameter, mm | 72.5 | |
| Bottom Diameter, mm | 72.190 | | Bottom Diameter, mm | 72.19 | |
| Average Diameter, cm | 7.222 | | Average Diameter, cm | 7.231 | |
| Area, $cm^2$ | 40.97 | | Area, $cm^2$ | 41.06 | |
| Volume, $cm^3$ | 422.17 | | Volume, $cm^3$ | 423.14 | |
| Wet Mass, g | 820.0 | | Wet Mass, g | 867.5 | |
| Wt. tare, gm | 8.5 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 217.70 | | Wt. wet soil + tare, gm | 875.8 | |
| Wt. dry soil + tare, gm | 186.26 | | Wt. dry soil + tare, gm | 720.87 | |
| Moisture Content, % | 17.7% | | Moisture Content, % | 21.7% | |
| Dry Density, pcf | 103.0 | | Dry Density, pcf | 105.1 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.61 | | Void Ratio | 0.57 | |
| Saturation, % | 77% | | Saturation, % | 100% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.0 | 0.85 | | 29.44 | | 23 | 0.931 | |
| 2 | 15 | 135 | 24.0 | 0.89 | 2.327E-04 | 27.53 | 2.06E-07 | 23 | 0.931 | 1.92E-07 |
| 4 | 34 | 139 | 23.4 | 0.92 | 1.356E-04 | 27.02 | 1.22E-07 | 23 | 0.931 | 1.14E-07 |
| 7 | 30 | 176 | 22.7 | 0.94 | 1.250E-04 | 26.07 | 1.17E-07 | 23 | 0.931 | 1.09E-07 |
| 10 | 56 | 206 | 22.0 | 0.97 | 1.068E-04 | 25.18 | 1.03E-07 | 23 | 0.931 | 9.61E-08 |
| 14 | 34 | 218 | 21.3 | 1.00 | 1.009E-04 | 24.29 | 1.01E-07 | 23 | 0.931 | 9.42E-08 |
| 17 | 29 | 175 | 20.8 | 1.02 | 8.976E-05 | 23.79 | 9.19E-08 | 23 | 0.931 | 8.56E-08 |
| 21 | 47 | 258 | 20.1 | 1.05 | 8.524E-05 | 22.77 | 9.12E-08 | 23 | 0.931 | 8.49E-08 |
| 25 | 1 | 194 | 19.6 | 1.07 | 8.097E-05 | 22.27 | 8.86E-08 | 23 | 0.931 | 8.25E-08 |
| 27 | 40 | 159 | 19.2 | 1.09 | 7.903E-05 | 21.82 | 8.82E-08 | 23 | 0.931 | 8.21E-08 |
| 32 | 36 | 296 | 18.5 | 1.12 | 7.429E-05 | 20.74 | 8.72E-08 | 23 | 0.931 | 8.12E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | 8.27E-08 cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/5/2015 | DATE: | 9/9/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-110 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.132 | 10.50 | Height, in | 4.132 | 10.50 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.51 | |
| Middle Diameter, mm | 72.530 | | Middle Diameter, mm | 72.53 | |
| Bottom Diameter, mm | 72.460 | | Bottom Diameter, mm | 72.46 | |
| Average Diameter, cm | 7.250 | | Average Diameter, cm | 7.250 | |
| Area, $cm^2$ | 41.28 | | Area, $cm^2$ | 41.28 | |
| Volume, $cm^3$ | 433.27 | | Volume, $cm^3$ | 433.27 | |
| Wet Mass, g | 859.8 | | Wet Mass, g | 891 | |
| Wt. tare, gm | 8.38 | | Wt. tare, gm | 6.8 | |
| Wt. wet soil + tare, gm | 256.18 | | Wt. wet soil + tare, gm | 897.6 | |
| Wt. dry soil + tare, gm | 215.64 | | Wt. dry soil + tare, gm | 724.42 | |
| Moisture Content, % | 19.6% | | Moisture Content, % | 24.1% | |
| Dry Density, pcf | 103.6 | | Dry Density, pcf | 103.4 | |
| Specific Gravity | 2.70 | Assumed | Specific Gravity | 2.7 | |
| Void Ratio | 0.63 | | Void Ratio | 0.63 | |
| Saturation, % | 84% | | Saturation, % | 103% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.0 | 0.85 | | 28.90 | | 23 | 0.931 | |
| 3 | 48 | 228 | 24.5 | 0.87 | 6.889E-05 | 27.97 | 5.97E-08 | 23 | 0.931 | 5.56E-08 |
| 8 | 3 | 255 | 24.1 | 0.89 | 4.928E-05 | 27.53 | 4.34E-08 | 23 | 0.931 | 4.04E-08 |
| 12 | 16 | 253 | 23.9 | 0.90 | 2.483E-05 | 27.41 | 2.20E-08 | 23 | 0.931 | 2.04E-08 |
| 17 | 55 | 339 | 23.6 | 0.91 | 2.780E-05 | 26.97 | 2.50E-08 | 23 | 0.931 | 2.33E-08 |
| 26 | 31 | 516 | 23.2 | 0.92 | 2.435E-05 | 26.41 | 2.23E-08 | 23 | 0.931 | 2.08E-08 |
| 32 | 59 | 388 | 22.9 | 0.94 | 2.429E-05 | 26.10 | 2.25E-08 | 23 | 0.931 | 2.10E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.14E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/5/2015 | DATE: | 9/9/2015 |

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**HOUSTON, TEXAS**

Golder Associates

## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-115 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.235 | 10.76 | Height, in | 4.235 | 10.76 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.51 | |
| Middle Diameter, mm | 72.550 | | Middle Diameter, mm | 72.55 | |
| Bottom Diameter, mm | 72.490 | | Bottom Diameter, mm | 72.49 | |
| Average Diameter, cm | 7.252 | | Average Diameter, cm | 7.252 | |
| Area, $cm^2$ | 41.30 | | Area, $cm^2$ | 41.30 | |
| Volume, $cm^3$ | 444.28 | | Volume, $cm^3$ | 444.28 | |
| Wet Mass, g | 896.5 | | Wet Mass, g | 924.5 | |
| Wt. tare, gm | 8.32 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 248.11 | | Wt. wet soil + tare, gm | 932.9 | |
| Wt. dry soil + tare, gm | 205.19 | | Wt. dry soil + tare, gm | 761.08 | |
| Moisture Content, % | 21.8% | | Moisture Content, % | 22.8% | |
| Dry Density, pcf | 103.4 | | Dry Density, pcf | 105.7 | |
| Specific Gravity | 2.70 | Assumed | Specific Gravity | 2.7 | |
| Void Ratio | 0.63 | | Void Ratio | 0.59 | |
| Saturation, % | 93% | | Saturation, % | 104% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.2

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.2 | 0.85 | | 29.60 | | 23 | 0.931 | |
| 3 | 5 | 185 | 25.7 | 0.87 | 8.491E-05 | 28.69 | 7.17E-08 | 23 | 0.931 | 6.67E-08 |
| 7 | 41 | 276 | 25.3 | 0.89 | 4.553E-05 | 28.26 | 3.90E-08 | 23 | 0.931 | 3.63E-08 |
| 12 | 28 | 287 | 25.0 | 0.90 | 3.284E-05 | 27.96 | 2.84E-08 | 23 | 0.931 | 2.65E-08 |
| 18 | 11 | 343 | 24.7 | 0.91 | 2.748E-05 | 27.59 | 2.41E-08 | 23 | 0.931 | 2.25E-08 |
| 26 | 44 | 513 | 24.3 | 0.93 | 2.450E-05 | 27.05 | 2.19E-08 | 23 | 0.931 | 2.04E-08 |
| 35 | 13 | 509 | 23.9 | 0.94 | 2.469E-05 | 26.56 | 2.25E-08 | 23 | 0.931 | 2.10E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.26E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/5/2015 | DATE: | 9/9/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-120 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| Sample Data, Initial | | centimeters | Sample Data, Final | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.226 | 10.73 | Height, in | 4.287 | 10.89 |
| Top Diameter, mm | 72.230 | | Top Diameter, mm | 72.9 | |
| Middle Diameter, mm | 72.240 | | Middle Diameter, mm | 73.04 | |
| Bottom Diameter, mm | 72.210 | | Bottom Diameter, mm | 73.02 | |
| Average Diameter, cm | 7.223 | | Average Diameter, cm | 7.299 | |
| Area, $cm^2$ | 40.97 | | Area, $cm^2$ | 41.84 | |
| Volume, $cm^3$ | 439.79 | | Volume, $cm^3$ | 455.58 | |
| Wet Mass, g | 879.7 | | Wet Mass, g | 915.5 | |
| Wt. tare, gm | 8.4 | | Wt. tare, gm | 6.8 | |
| Wt. wet soil + tare, gm | 225.60 | | Wt. wet soil + tare, gm | 922.3 | |
| Wt. dry soil + tare, gm | 190.81 | | Wt. dry soil + tare, gm | 749.61 | |
| Moisture Content, % | 19.1% | | Moisture Content, % | 23.2% | |
| Dry Density, pcf | 104.8 | | Dry Density, pcf | 101.7 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.58 | | Void Ratio | 0.63 | |
| Saturation, % | 88% | | Saturation, % | 99% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.5 | 0.85 | | 28.84 | | 23 | 0.931 | |
| 1 | 25 | 85 | 25.0 | 0.87 | 1.848E-04 | 27.53 | 1.60E-07 | 23 | 0.931 | 1.49E-07 |
| 3 | 54 | 149 | 24.3 | 0.90 | 1.476E-04 | 26.57 | 1.33E-07 | 23 | 0.931 | 1.24E-07 |
| 11 | 6 | 432 | 22.8 | 0.96 | 1.091E-04 | 24.28 | 1.07E-07 | 23 | 0.931 | 1.00E-07 |
| 14 | 52 | 226 | 22.1 | 0.99 | 9.731E-05 | 23.93 | 9.72E-08 | 23 | 0.931 | 9.05E-08 |
| 20 | 1 | 309 | 21.2 | 1.03 | 9.150E-05 | 22.73 | 9.62E-08 | 23 | 0.931 | 8.96E-08 |
| 23 | 31 | 210 | 20.6 | 1.05 | 8.976E-05 | 22.19 | 9.67E-08 | 23 | 0.931 | 9.00E-08 |
| 26 | 33 | 182 | 20.1 | 1.07 | 8.631E-05 | 21.65 | 9.53E-08 | 23 | 0.931 | 8.87E-08 |
| 29 | 4 | 151 | 19.7 | 1.09 | 8.322E-05 | 21.23 | 9.37E-08 | 23 | 0.931 | 8.73E-08 |
| 32 | 29 | 205 | 19.2 | 1.11 | 7.662E-05 | 20.57 | 8.90E-08 | 23 | 0.931 | 8.29E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **8.72E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/10/2015 | DATE: | 9/14/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-125 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.836 | 9.74 | Height, in | 3.835 | 9.74 |
| Top Diameter, mm | 72.330 | | Top Diameter, mm | 72.44 | |
| Middle Diameter, mm | 72.370 | | Middle Diameter, mm | 72.47 | |
| Bottom Diameter, mm | 72.310 | | Bottom Diameter, mm | 72.39 | |
| Average Diameter, cm | 7.234 | | Average Diameter, cm | 7.243 | |
| Area, $cm^2$ | 41.10 | | Area, $cm^2$ | 41.21 | |
| Volume, $cm^3$ | 400.42 | | Volume, $cm^3$ | 401.39 | |
| Wet Mass, g | 777.3 | | Wet Mass, g | 787 | |
| Wt. tare, gm | 8.4 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 288.00 | | Wt. wet soil + tare, gm | 795.4 | |
| Wt. dry soil + tare, gm | 240.17 | | Wt. dry soil + tare, gm | 639.61 | |
| Moisture Content, % | 20.6% | | Moisture Content, % | 24.7% | |
| Dry Density, pcf | 100.4 | | Dry Density, pcf | 98.1 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.65 | | Void Ratio | 0.69 | |
| Saturation, % | 85% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.0 | 0.85 | | 29.84 | | 23 | 0.931 | |
| 1 | 35 | 95 | 23.4 | 0.87 | 1.984E-04 | 28.64 | 1.68E-07 | 23 | 0.931 | 1.57E-07 |
| 4 | 25 | 170 | 22.8 | 0.90 | 1.109E-04 | 27.83 | 9.67E-08 | 23 | 0.931 | 9.00E-08 |
| 6 | 51 | 146 | 22.3 | 0.92 | 1.076E-04 | 27.23 | 9.59E-08 | 23 | 0.931 | 8.93E-08 |
| 10 | 33 | 222 | 21.7 | 0.94 | 8.491E-05 | 26.36 | 7.82E-08 | 23 | 0.931 | 7.28E-08 |
| 13 | 42 | 189 | 21.2 | 0.96 | 8.311E-05 | 25.75 | 7.83E-08 | 23 | 0.931 | 7.29E-08 |
| 18 | 23 | 281 | 20.5 | 0.99 | 7.826E-05 | 24.68 | 7.70E-08 | 23 | 0.931 | 7.17E-08 |
| 21 | 44 | 201 | 20.0 | 1.01 | 7.815E-05 | 24.14 | 7.86E-08 | 23 | 0.931 | 7.31E-08 |
| 26 | 1 | 257 | 19.4 | 1.04 | 7.334E-05 | 23.27 | 7.65E-08 | 23 | 0.931 | 7.12E-08 |
| 30 | 32 | 271 | 18.8 | 1.06 | 6.956E-05 | 22.47 | 7.51E-08 | 23 | 0.931 | 7.00E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **7.15E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/10/2015 | DATE: | 9/14/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-130 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.846 | 9.77 | Height, in | 3.838 | 9.75 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.9 | |
| Middle Diameter, mm | 72.470 | | Middle Diameter, mm | 73.04 | |
| Bottom Diameter, mm | 72.590 | | Bottom Diameter, mm | 73.06 | |
| Average Diameter, cm | 7.252 | | Average Diameter, cm | 7.300 | |
| Area, $cm^2$ | 41.31 | | Area, $cm^2$ | 41.85 | |
| Volume, $cm^3$ | 403.54 | | Volume, $cm^3$ | 408.01 | |
| Wet Mass, g | 759.5 | | Wet Mass, g | 788.6 | |
| Wt. tare, gm | 8.1 | | Wt. tare, gm | 8.6 | |
| Wt. wet soil + tare, gm | 226.40 | | Wt. wet soil + tare, gm | 797.2 | |
| Wt. dry soil + tare, gm | 195.39 | | Wt. dry soil + tare, gm | 634.98 | |
| Moisture Content, % | 16.6% | | Moisture Content, % | 25.9% | |
| Dry Density, pcf | 100.8 | | Dry Density, pcf | 95.8 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.64 | | Void Ratio | 0.73 | |
| Saturation, % | 68% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.0 | 0.85 | | 29.76 | | 23 | 0.931 | |
| 1 | 42 | 102 | 23.5 | 0.87 | 1.540E-04 | 28.82 | 1.28E-07 | 23 | 0.931 | 1.19E-07 |
| 3 | 24 | 102 | 23.2 | 0.88 | 9.240E-05 | 28.55 | 7.73E-08 | 23 | 0.931 | 7.20E-08 |
| 8 | 41 | 317 | 22.6 | 0.91 | 5.946E-05 | 27.54 | 5.16E-08 | 23 | 0.931 | 4.80E-08 |
| 14 | 35 | 354 | 22.1 | 0.93 | 4.437E-05 | 26.94 | 3.94E-08 | 23 | 0.931 | 3.66E-08 |
| 19 | 48 | 313 | 21.8 | 0.94 | 3.011E-05 | 26.67 | 2.70E-08 | 23 | 0.931 | 2.51E-08 |
| 26 | 32 | 404 | 21.4 | 0.96 | 3.110E-05 | 26.07 | 2.85E-08 | 23 | 0.931 | 2.65E-08 |
| 31 | 56 | 324 | 21.1 | 0.97 | 2.909E-05 | 25.74 | 2.70E-08 | 23 | 0.931 | 2.51E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.84E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/10/2015 | DATE: | 9/14/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-135 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.008 | 10.18 | Height, in | 4.026 | 10.23 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.8 | |
| Middle Diameter, mm | 72.460 | | Middle Diameter, mm | 72.81 | |
| Bottom Diameter, mm | 72.500 | | Bottom Diameter, mm | 72.74 | |
| Average Diameter, cm | 7.249 | | Average Diameter, cm | 7.278 | |
| Area, $cm^2$ | 41.27 | | Area, $cm^2$ | 41.61 | |
| Volume, $cm^3$ | 420.15 | | Volume, $cm^3$ | 425.46 | |
| Wet Mass, g | 807.3 | | Wet Mass, g | 828.5 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 263.30 | | Wt. wet soil + tare, gm | 837.1 | |
| Wt. dry soil + tare, gm | 225.84 | | Wt. dry soil + tare, gm | 669.71 | |
| Moisture Content, % | 17.2% | | Moisture Content, % | 25.3% | |
| Dry Density, pcf | 102.3 | | Dry Density, pcf | 97.0 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.62 | | Void Ratio | 0.71 | |
| Saturation, % | 74% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.0 | 0.85 | | 29.80 | | 23 | 0.931 | |
| 1 | 12 | 72 | 24.6 | 0.87 | 1.745E-04 | 28.89 | 1.45E-07 | 23 | 0.931 | 1.35E-07 |
| 4 | 1 | 169 | 24.1 | 0.89 | 9.295E-05 | 28.19 | 7.92E-08 | 23 | 0.931 | 7.38E-08 |
| 10 | 35 | 394 | 23.4 | 0.92 | 5.582E-05 | 27.17 | 4.94E-08 | 23 | 0.931 | 4.60E-08 |
| 17 | 24 | 409 | 22.8 | 0.94 | 4.609E-05 | 26.46 | 4.19E-08 | 23 | 0.931 | 3.90E-08 |
| 22 | 1 | 277 | 22.5 | 0.95 | 3.402E-05 | 26.27 | 3.11E-08 | 23 | 0.931 | 2.90E-08 |
| 27 | 3 | 302 | 22.2 | 0.96 | 3.121E-05 | 25.89 | 2.90E-08 | 23 | 0.931 | 2.70E-08 |
| 32 | 12 | 309 | 21.9 | 0.98 | 3.050E-05 | 25.51 | 2.87E-08 | 23 | 0.931 | 2.68E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **3.04E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/10/2015 | DATE: | 9/15/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-140 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.024 | 10.22 | Height, in | 4.081 | 10.37 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 73.04 | |
| Middle Diameter, mm | 72.490 | | Middle Diameter, mm | 73.07 | |
| Bottom Diameter, mm | 72.550 | | Bottom Diameter, mm | 72.97 | |
| Average Diameter, cm | 7.252 | | Average Diameter, cm | 7.303 | |
| Area, $cm^2$ | 41.30 | | Area, $cm^2$ | 41.88 | |
| Volume, $cm^3$ | 422.14 | | Volume, $cm^3$ | 434.16 | |
| Wet Mass, g | 838.7 | | Wet Mass, g | 865.2 | |
| Wt. tare, gm | 8.2 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 223.50 | | Wt. wet soil + tare, gm | 873.7 | |
| Wt. dry soil + tare, gm | 190.11 | | Wt. dry soil + tare, gm | 707.37 | |
| Moisture Content, % | 18.4% | | Moisture Content, % | 23.8% | |
| Dry Density, pcf | 104.7 | | Dry Density, pcf | 100.4 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.58 | | Void Ratio | 0.65 | |
| Saturation, % | 84% | | Saturation, % | 98% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.0 | 0.85 | | 29.68 | | 23 | 0.931 | |
| 2 | 37 | 157 | 24.6 | 0.87 | 8.004E-05 | 28.50 | 6.70E-08 | 23 | 0.931 | 6.24E-08 |
| 6 | 50 | 253 | 24.2 | 0.88 | 4.967E-05 | 28.00 | 4.24E-08 | 23 | 0.931 | 3.94E-08 |
| 16 | 8 | 558 | 23.8 | 0.90 | 2.252E-05 | 27.50 | 1.96E-08 | 23 | 0.931 | 1.82E-08 |
| 19 | 25 | 197 | 23.6 | 0.91 | 3.189E-05 | 27.37 | 2.78E-08 | 23 | 0.931 | 2.59E-08 |
| 25 | 40 | 375 | 23.3 | 0.92 | 2.513E-05 | 26.93 | 2.23E-08 | 23 | 0.931 | 2.07E-08 |
| 31 | 23 | 343 | 23.0 | 0.93 | 2.748E-05 | 26.55 | 2.47E-08 | 23 | 0.931 | 2.30E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.20E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/10/2015 | DATE: | 9/14/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-145 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.927 | 9.97 | Height, in | 3.992 | 10.14 |
| Top Diameter, mm | 72.100 | | Top Diameter, mm | 72.9 | |
| Middle Diameter, mm | 72.120 | | Middle Diameter, mm | 73.02 | |
| Bottom Diameter, mm | 72.050 | | Bottom Diameter, mm | 72.95 | |
| Average Diameter, cm | 7.209 | | Average Diameter, cm | 7.296 | |
| Area, $cm^2$ | 40.82 | | Area, $cm^2$ | 41.80 | |
| Volume, $cm^3$ | 407.13 | | Volume, $cm^3$ | 423.88 | |
| Wet Mass, g | 812.8 | | Wet Mass, g | 849.3 | |
| Wt. tare, gm | 6.8 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 230.80 | | Wt. wet soil + tare, gm | 857.7 | |
| Wt. dry soil + tare, gm | 194.48 | | Wt. dry soil + tare, gm | 704 | |
| Moisture Content, % | 19.4% | | Moisture Content, % | 22.1% | |
| Dry Density, pcf | 104.4 | | Dry Density, pcf | 102.4 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.58 | | Void Ratio | 0.61 | |
| Saturation, % | 88% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 23.7

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 23.7 | 0.85 | | 28.77 | | 23 | 0.931 | |
| 1 | 23 | 83 | 23.2 | 0.87 | 1.893E-04 | 27.34 | 1.66E-07 | 23 | 0.931 | 1.54E-07 |
| 2 | 40 | 77 | 22.9 | 0.88 | 1.224E-04 | 27.08 | 1.08E-07 | 23 | 0.931 | 1.01E-07 |
| 4 | 28 | 108 | 22.5 | 0.90 | 1.164E-04 | 26.50 | 1.05E-07 | 23 | 0.931 | 9.78E-08 |
| 8 | 50 | 262 | 21.7 | 0.93 | 9.593E-05 | 25.21 | 9.10E-08 | 23 | 0.931 | 8.48E-08 |
| 13 | 48 | 298 | 20.9 | 0.96 | 8.434E-05 | 24.17 | 8.35E-08 | 23 | 0.931 | 7.77E-08 |
| 19 | 16 | 328 | 20.1 | 1.00 | 7.662E-05 | 23.14 | 7.92E-08 | 23 | 0.931 | 7.37E-08 |
| 26 | 55 | 459 | 19.0 | 1.04 | 7.529E-05 | 21.53 | 8.37E-08 | 23 | 0.931 | 7.79E-08 |
| 32 | 46 | 351 | 18.2 | 1.08 | 7.160E-05 | 20.69 | 8.28E-08 | 23 | 0.931 | 7.71E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **7.66E-08 cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/10/2015 | DATE: | 9/14/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-150 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters |
|---|---|---|
| Height, in | 4.156 | 10.56 |
| Top Diameter, mm | 72.010 | |
| Middle Diameter, mm | 72.140 | |
| Bottom Diameter, mm | 72.200 | |
| Average Diameter, cm | 7.212 | |
| Area, $cm^2$ | 40.85 | |
| Volume, $cm^3$ | 431.19 | |
| Wet Mass, g | 843.0 | |
| Wt. tare, gm | 8.1 | |
| Wt. wet soil + tare, gm | 321.90 | |
| Wt. dry soil + tare, gm | 270.52 | |
| Moisture Content, % | 19.6% | |
| Dry Density, pcf | 102.0 | |
| Specific Gravity | 2.65 | Assumed |
| Void Ratio | 0.62 | |
| Saturation, % | 84% | |
| Effective Stress, psi | 10 | |

| **Sample Data, Final** | | centimeters |
|---|---|---|
| Height, in | 4.164 | 10.58 |
| Top Diameter, mm | 72.09 | |
| Middle Diameter, mm | 72.2 | |
| Bottom Diameter, mm | 72.21 | |
| Average Diameter, cm | 7.217 | |
| Area, $cm^2$ | 40.90 | |
| Volume, $cm^3$ | 432.62 | |
| Wet Mass, g | 855.9 | |
| Wt. tare, gm | 7 | |
| Wt. wet soil + tare, gm | 862.9 | |
| Wt. dry soil + tare, gm | 701.27 | |
| Moisture Content, % | 23.3% | |
| Dry Density, pcf | 100.1 | |
| Specific Gravity | 2.65 | |
| Void Ratio | 0.65 | |
| Saturation, % | 95% | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 29.92 | | 23 | 0.931 | |
| 1 | 4 | 64 | 25.2 | 0.88 | 3.927E-04 | 28.38 | 3.38E-07 | 23 | 0.931 | 3.15E-07 |
| 3 | 10 | 126 | 24.6 | 0.91 | 1.496E-04 | 27.76 | 1.32E-07 | 23 | 0.931 | 1.23E-07 |
| 5 | 15 | 125 | 24.1 | 0.93 | 1.257E-04 | 27.21 | 1.13E-07 | 23 | 0.931 | 1.05E-07 |
| 8 | 25 | 190 | 23.4 | 0.96 | 1.157E-04 | 26.22 | 1.08E-07 | 23 | 0.931 | 1.01E-07 |
| 10 | 55 | 150 | 22.9 | 0.98 | 1.047E-04 | 25.72 | 9.95E-08 | 23 | 0.931 | 9.27E-08 |
| 16 | 43 | 348 | 21.9 | 1.02 | 9.028E-05 | 24.17 | 9.13E-08 | 23 | 0.931 | 8.50E-08 |
| 21 | 38 | 295 | 21.1 | 1.05 | 8.520E-05 | 23.31 | 8.93E-08 | 23 | 0.931 | 8.32E-08 |
| 27 | 28 | 350 | 20.2 | 1.09 | 8.078E-05 | 22.14 | 8.92E-08 | 23 | 0.931 | 8.31E-08 |
| 32 | 49 | 321 | 19.4 | 1.12 | 7.830E-05 | 21.21 | 9.02E-08 | 23 | 0.931 | 8.40E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **8.38E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | |
| DATE: | 9/15/2015 | DATE: | |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-155 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.12 | 10.46 | Height, in | 4.122 | 10.47 |
| Top Diameter, mm | 72.210 | | Top Diameter, mm | 72.26 | |
| Middle Diameter, mm | 72.170 | | Middle Diameter, mm | 72.25 | |
| Bottom Diameter, mm | 72.230 | | Bottom Diameter, mm | 72.3 | |
| Average Diameter, cm | 7.220 | | Average Diameter, cm | 7.227 | |
| Area, $cm^2$ | 40.95 | | Area, $cm^2$ | 41.02 | |
| Volume, $cm^3$ | 428.48 | | Volume, $cm^3$ | 429.48 | |
| Wet Mass, g | 855.4 | | Wet Mass, g | 861.4 | |
| Wt. tare, gm | 8.34 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 261.72 | | Wt. wet soil + tare, gm | 869.7 | |
| Wt. dry soil + tare, gm | 212.72 | | Wt. dry soil + tare, gm | 704.07 | |
| Moisture Content, % | 24.0% | | Moisture Content, % | 23.8% | |
| Dry Density, pcf | 100.5 | | Dry Density, pcf | 101.1 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.65 | | Void Ratio | 0.64 | |
| Saturation, % | 98% | | Saturation, % | 99% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.4

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.4 | 0.85 | | 29.47 | | 23 | 0.931 | |
| 2 | 58 | 178 | 25.0 | 0.87 | 7.060E-05 | 28.70 | 6.00E-08 | 23 | 0.931 | 5.58E-08 |
| 7 | 6 | 248 | 24.7 | 0.88 | 3.800E-05 | 28.39 | 3.26E-08 | 23 | 0.931 | 3.04E-08 |
| 11 | 30 | 264 | 24.5 | 0.89 | 2.380E-05 | 28.20 | 2.06E-08 | 23 | 0.931 | 1.92E-08 |
| 17 | 4 | 334 | 24.3 | 0.90 | 1.881E-05 | 27.95 | 1.64E-08 | 23 | 0.931 | 1.53E-08 |
| 24 | 5 | 421 | 24.0 | 0.91 | 2.239E-05 | 27.51 | 1.98E-08 | 23 | 0.931 | 1.85E-08 |
| 30 | 55 | 410 | 23.8 | 0.92 | 1.532E-05 | 27.33 | 1.37E-08 | 23 | 0.931 | 1.27E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.64E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/11/2015 | DATE: | 9/14/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-160 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.088 | 10.38 | Height, in | 4.091 | 10.39 |
| Top Diameter, mm | 72.030 | | Top Diameter, mm | 72.2 | |
| Middle Diameter, mm | 72.140 | | Middle Diameter, mm | 72.29 | |
| Bottom Diameter, mm | 72.070 | | Bottom Diameter, mm | 72.18 | |
| Average Diameter, cm | 7.208 | | Average Diameter, cm | 7.222 | |
| Area, $cm^2$ | 40.81 | | Area, $cm^2$ | 40.97 | |
| Volume, $cm^3$ | 423.71 | | Volume, $cm^3$ | 425.70 | |
| Wet Mass, g | 834.9 | | Wet Mass, g | 843 | |
| Wt. tare, gm | 8.32 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 322.27 | | Wt. wet soil + tare, gm | 851.5 | |
| Wt. dry soil + tare, gm | 258.08 | | Wt. dry soil + tare, gm | 683.69 | |
| Moisture Content, % | 25.7% | | Moisture Content, % | 24.9% | |
| Dry Density, pcf | 97.8 | | Dry Density, pcf | 99.0 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.69 | | Void Ratio | 0.67 | |
| Saturation, % | 99% | | Saturation, % | 98% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.7

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.7 | 0.85 | | 28.85 | | 23 | 0.931 | |
| 1 | 18 | 78 | 24.4 | 0.86 | 1.208E-04 | 28.26 | 1.04E-07 | 23 | 0.931 | 9.72E-08 |
| 4 | 9 | 171 | 24.0 | 0.88 | 7.349E-05 | 27.69 | 6.48E-08 | 23 | 0.931 | 6.03E-08 |
| 8 | 46 | 277 | 23.6 | 0.90 | 4.537E-05 | 27.19 | 4.07E-08 | 23 | 0.931 | 3.79E-08 |
| 14 | 28 | 342 | 23.2 | 0.91 | 3.674E-05 | 26.69 | 3.36E-08 | 23 | 0.931 | 3.13E-08 |
| 18 | 15 | 227 | 23.0 | 0.92 | 2.768E-05 | 26.56 | 2.54E-08 | 23 | 0.931 | 2.37E-08 |
| 22 | 30 | 255 | 22.8 | 0.93 | 2.464E-05 | 26.31 | 2.29E-08 | 23 | 0.931 | 2.13E-08 |
| 26 | 57 | 267 | 22.6 | 0.94 | 2.353E-05 | 26.06 | 2.20E-08 | 23 | 0.931 | 2.05E-08 |
| 31 | 23 | 266 | 22.4 | 0.94 | 2.362E-05 | 25.81 | 2.23E-08 | 23 | 0.931 | 2.08E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.16E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/11/2015 | DATE: | 9/14/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-165 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.966 | 10.07 | Height, in | 3.997 | 10.15 |
| Top Diameter, mm | 72.140 | | Top Diameter, mm | 72.21 | |
| Middle Diameter, mm | 72.260 | | Middle Diameter, mm | 72.33 | |
| Bottom Diameter, mm | 72.170 | | Bottom Diameter, mm | 72.28 | |
| Average Diameter, cm | 7.219 | | Average Diameter, cm | 7.227 | |
| Area, $cm^2$ | 40.93 | | Area, $cm^2$ | 41.02 | |
| Volume, $cm^3$ | 412.32 | | Volume, $cm^3$ | 416.50 | |
| Wet Mass, g | 818.2 | | Wet Mass, g | 823.5 | |
| Wt. tare, gm | 8.13 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 283.16 | | Wt. wet soil + tare, gm | 831.9 | |
| Wt. dry soil + tare, gm | 233.82 | | Wt. dry soil + tare, gm | 672.97 | |
| Moisture Content, % | 21.9% | | Moisture Content, % | 23.9% | |
| Dry Density, pcf | 101.6 | | Dry Density, pcf | 99.6 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.63 | | Void Ratio | 0.66 | |
| Saturation, % | 92% | | Saturation, % | 96% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.4

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.4 | 0.85 | | 29.36 | | 23 | 0.931 | |
| 1 | 53 | 113 | 24.1 | 0.86 | 8.341E-05 | 28.55 | 7.12E-08 | 23 | 0.931 | 6.63E-08 |
| 7 | 1 | 308 | 23.8 | 0.87 | 3.060E-05 | 28.17 | 2.65E-08 | 23 | 0.931 | 2.47E-08 |
| 10 | 24 | 203 | 23.6 | 0.88 | 3.095E-05 | 27.98 | 2.70E-08 | 23 | 0.931 | 2.51E-08 |
| 16 | 16 | 352 | 23.4 | 0.89 | 1.785E-05 | 27.72 | 1.57E-08 | 23 | 0.931 | 1.46E-08 |
| 24 | 59 | 523 | 23.1 | 0.90 | 1.802E-05 | 27.27 | 1.61E-08 | 23 | 0.931 | 1.50E-08 |
| 30 | 36 | 337 | 22.9 | 0.91 | 1.864E-05 | 27.07 | 1.68E-08 | 23 | 0.931 | 1.56E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.76E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/11/2015 | DATE: | 9/14/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-170 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.993 | 10.14 | Height, in | 4.013 | 10.19 |
| Top Diameter, mm | 72.490 | | Top Diameter, mm | 72.6 | |
| Middle Diameter, mm | 72.530 | | Middle Diameter, mm | 72.55 | |
| Bottom Diameter, mm | 72.500 | | Bottom Diameter, mm | 72.59 | |
| Average Diameter, cm | 7.251 | | Average Diameter, cm | 7.258 | |
| Area, $cm^2$ | 41.29 | | Area, $cm^2$ | 41.37 | |
| Volume, $cm^3$ | 418.77 | | Volume, $cm^3$ | 421.72 | |
| Wet Mass, g | 805.4 | | Wet Mass, g | 807 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 349.70 | | Wt. wet soil + tare, gm | 815.3 | |
| Wt. dry soil + tare, gm | 281.03 | | Wt. dry soil + tare, gm | 640.67 | |
| Moisture Content, % | 25.2% | | Moisture Content, % | 27.6% | |
| Dry Density, pcf | 95.9 | | Dry Density, pcf | 93.6 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.72 | | Void Ratio | 0.77 | |
| Saturation, % | 92% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.0 | 0.85 | | 29.91 | | 23 | 0.931 | |
| 2 | 3 | 123 | 24.7 | 0.86 | 7.662E-05 | 29.18 | 6.35E-08 | 23 | 0.931 | 5.91E-08 |
| 6 | 4 | 241 | 24.4 | 0.87 | 3.911E-05 | 28.80 | 3.28E-08 | 23 | 0.931 | 3.06E-08 |
| 10 | 0 | 236 | 24.1 | 0.89 | 3.994E-05 | 28.41 | 3.40E-08 | 23 | 0.931 | 3.16E-08 |
| 16 | 10 | 370 | 23.8 | 0.90 | 2.547E-05 | 28.03 | 2.20E-08 | 23 | 0.931 | 2.05E-08 |
| 20 | 37 | 267 | 23.6 | 0.91 | 2.353E-05 | 27.83 | 2.04E-08 | 23 | 0.931 | 1.90E-08 |
| 28 | 26 | 469 | 23.3 | 0.92 | 2.010E-05 | 27.38 | 1.77E-08 | 23 | 0.931 | 1.65E-08 |
| 33 | 49 | 323 | 23.1 | 0.93 | 1.945E-05 | 27.19 | 1.73E-08 | 23 | 0.931 | 1.61E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.80E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/11/2015 | DATE: | 9/14/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-175 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.857 | 9.80 | Height, in | 3.847 | 9.77 |
| Top Diameter, mm | 72.310 | | Top Diameter, mm | 72.44 | |
| Middle Diameter, mm | 72.350 | | Middle Diameter, mm | 72.5 | |
| Bottom Diameter, mm | 72.300 | | Bottom Diameter, mm | 72.49 | |
| Average Diameter, cm | 7.232 | | Average Diameter, cm | 7.248 | |
| Area, $cm^2$ | 41.08 | | Area, $cm^2$ | 41.26 | |
| Volume, $cm^3$ | 402.43 | | Volume, $cm^3$ | 403.13 | |
| Wet Mass, g | 803.2 | | Wet Mass, g | 807.5 | |
| Wt. tare, gm | 9 | | Wt. tare, gm | 8.2 | |
| Wt. wet soil + tare, gm | 384.00 | | Wt. wet soil + tare, gm | 815.6 | |
| Wt. dry soil + tare, gm | 314.08 | | Wt. dry soil + tare, gm | 668.55 | |
| Moisture Content, % | 22.9% | | Moisture Content, % | 22.3% | |
| Dry Density, pcf | 101.3 | | Dry Density, pcf | 102.2 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.63 | | Void Ratio | 0.62 | |
| Saturation, % | 96% | | Saturation, % | 96% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.2

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.2 | 0.85 | | 29.94 | | 23 | 0.931 | |
| 1 | 15 | 75 | 24.0 | 0.86 | 8.378E-05 | 29.61 | 6.86E-08 | 23 | 0.931 | 6.39E-08 |
| 5 | 28 | 253 | 23.8 | 0.87 | 2.483E-05 | 29.34 | 2.05E-08 | 23 | 0.931 | 1.91E-08 |
| 10 | 54 | 326 | 23.5 | 0.88 | 2.891E-05 | 28.88 | 2.43E-08 | 23 | 0.931 | 2.26E-08 |
| 19 | 9 | 495 | 23.2 | 0.89 | 1.904E-05 | 28.47 | 1.62E-08 | 23 | 0.931 | 1.51E-08 |
| 25 | 48 | 399 | 23.0 | 0.90 | 1.575E-05 | 28.27 | 1.35E-08 | 23 | 0.931 | 1.26E-08 |
| 32 | 50 | 422 | 22.8 | 0.91 | 1.489E-05 | 28.01 | 1.29E-08 | 23 | 0.931 | 1.20E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **1.56E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/11/2015 | DATE: | 9/14/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-180 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.168 | 10.59 | Height, in | 4.142 | 10.52 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.79 | |
| Middle Diameter, mm | 72.450 | | Middle Diameter, mm | 72.83 | |
| Bottom Diameter, mm | 72.470 | | Bottom Diameter, mm | 72.88 | |
| Average Diameter, cm | 7.248 | | Average Diameter, cm | 7.283 | |
| Area, $cm^2$ | 41.26 | | Area, $cm^2$ | 41.66 | |
| Volume, $cm^3$ | 436.76 | | Volume, $cm^3$ | 438.32 | |
| Wet Mass, g | 840.2 | | Wet Mass, g | 840 | |
| Wt. tare, gm | 9 | | Wt. tare, gm | 8.2 | |
| Wt. wet soil + tare, gm | 321.70 | | Wt. wet soil + tare, gm | 848.1 | |
| Wt. dry soil + tare, gm | 256.87 | | Wt. dry soil + tare, gm | 668.79 | |
| Moisture Content, % | 26.2% | | Moisture Content, % | 27.1% | |
| Dry Density, pcf | 95.2 | | Dry Density, pcf | 94.1 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.74 | | Void Ratio | 0.76 | |
| Saturation, % | 94% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 29.84 | | 23 | 0.931 | |
| 2 | 14 | 134 | 25.7 | 0.86 | 7.033E-05 | 29.47 | 5.73E-08 | 23 | 0.931 | 5.33E-08 |
| 7 | 15 | 301 | 25.3 | 0.88 | 4.175E-05 | 28.91 | 3.47E-08 | 23 | 0.931 | 3.23E-08 |
| 12 | 31 | 316 | 25.0 | 0.89 | 2.983E-05 | 28.60 | 2.50E-08 | 23 | 0.931 | 2.33E-08 |
| 19 | 9 | 398 | 24.7 | 0.90 | 2.368E-05 | 28.22 | 2.01E-08 | 23 | 0.931 | 1.88E-08 |
| 24 | 4 | 295 | 24.5 | 0.91 | 2.130E-05 | 28.04 | 1.82E-08 | 23 | 0.931 | 1.70E-08 |
| 31 | 23 | 439 | 24.2 | 0.92 | 2.147E-05 | 27.60 | 1.87E-08 | 23 | 0.931 | 1.74E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.91E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/11/2015 | DATE: | 9/14/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-185 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.564 | 11.59 | Height, in | 4.548 | 11.55 |
| Top Diameter, mm | 72.240 | | Top Diameter, mm | 72.47 | |
| Middle Diameter, mm | 72.280 | | Middle Diameter, mm | 72.53 | |
| Bottom Diameter, mm | 72.230 | | Bottom Diameter, mm | 72.51 | |
| Average Diameter, cm | 7.225 | | Average Diameter, cm | 7.250 | |
| Area, $cm^2$ | 41.00 | | Area, $cm^2$ | 41.29 | |
| Volume, $cm^3$ | 475.27 | | Volume, $cm^3$ | 476.94 | |
| Wet Mass, g | 928.6 | | Wet Mass, g | 932.3 | |
| Wt. tare, gm | 8.5 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 294.50 | | Wt. wet soil + tare, gm | 940.6 | |
| Wt. dry soil + tare, gm | 239.69 | | Wt. dry soil + tare, gm | 755.06 | |
| Moisture Content, % | 23.7% | | Moisture Content, % | 24.8% | |
| Dry Density, pcf | 98.6 | | Dry Density, pcf | 97.7 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.68 | | Void Ratio | 0.69 | |
| Saturation, % | 93% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 27.8

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.8 | 0.85 | | 29.20 | | 23 | 0.931 | |
| 3 | 10 | 190 | 27.2 | 0.87 | 9.921E-05 | 28.28 | 8.50E-08 | 23 | 0.931 | 7.91E-08 |
| 6 | 47 | 217 | 26.9 | 0.89 | 4.343E-05 | 28.11 | 3.74E-08 | 23 | 0.931 | 3.48E-08 |
| 13 | 54 | 427 | 26.4 | 0.91 | 3.679E-05 | 27.43 | 3.25E-08 | 23 | 0.931 | 3.02E-08 |
| 19 | 37 | 343 | 26.1 | 0.92 | 2.748E-05 | 27.21 | 2.45E-08 | 23 | 0.931 | 2.28E-08 |
| 23 | 39 | 242 | 25.9 | 0.93 | 2.596E-05 | 27.04 | 2.33E-08 | 23 | 0.931 | 2.17E-08 |
| 29 | 53 | 374 | 25.6 | 0.94 | 2.520E-05 | 26.64 | 2.29E-08 | 23 | 0.931 | 2.13E-08 |
| 36 | 12 | 379 | 25.3 | 0.95 | 2.487E-05 | 26.30 | 2.29E-08 | 23 | 0.931 | 2.13E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.18E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/15/2015 | DATE: | 9/16/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-190 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.494 | 11.41 | Height, in | 4.49 | 11.40 |
| Top Diameter, mm | 67.450 | | Top Diameter, mm | 67.51 | |
| Middle Diameter, mm | 67.390 | | Middle Diameter, mm | 67.4 | |
| Bottom Diameter, mm | 67.200 | | Bottom Diameter, mm | 67.24 | |
| Average Diameter, cm | 6.735 | | Average Diameter, cm | 6.738 | |
| Area, $cm^2$ | 35.62 | | Area, $cm^2$ | 35.66 | |
| Volume, $cm^3$ | 406.62 | | Volume, $cm^3$ | 406.70 | |
| Wet Mass, g | 765.4 | | Wet Mass, g | 774 | |
| Wt. tare, gm | 8.4 | | Wt. tare, gm | 8.7 | |
| Wt. wet soil + tare, gm | 237.80 | | Wt. wet soil + tare, gm | 782.7 | |
| Wt. dry soil + tare, gm | 193.27 | | Wt. dry soil + tare, gm | 612.12 | |
| Moisture Content, % | 24.1% | | Moisture Content, % | 28.3% | |
| Dry Density, pcf | 94.7 | | Dry Density, pcf | 92.6 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.75 | | Void Ratio | 0.79 | |
| Saturation, % | 85% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 28.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 28.0 | 0.85 | | 29.87 | | 23 | 0.931 | |
| 2 | 12 | 132 | 27.6 | 0.87 | 9.520E-05 | 29.21 | 9.14E-08 | 23 | 0.931 | 8.51E-08 |
| 6 | 3 | 231 | 27.3 | 0.88 | 4.080E-05 | 28.93 | 3.96E-08 | 23 | 0.931 | 3.68E-08 |
| 11 | 35 | 332 | 27.0 | 0.89 | 2.839E-05 | 28.58 | 2.79E-08 | 23 | 0.931 | 2.59E-08 |
| 15 | 58 | 263 | 26.8 | 0.90 | 2.389E-05 | 28.41 | 2.36E-08 | 23 | 0.931 | 2.20E-08 |
| 29 | 27 | 809 | 26.4 | 0.92 | 1.553E-05 | 27.84 | 1.56E-08 | 23 | 0.931 | 1.46E-08 |
| 39 | 13 | 586 | 26.1 | 0.93 | 1.608E-05 | 27.55 | 1.64E-08 | 23 | 0.931 | 1.52E-08 |
| 46 | 4 | 411 | 25.9 | 0.94 | 1.529E-05 | 27.38 | 1.57E-08 | 23 | 0.931 | 1.46E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **1.66E-08 cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/15/2015 | DATE: | 9/16/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-195 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters |
|---|---|---|
| Height, in | 4.239 | 10.77 |
| Top Diameter, mm | 72.440 | |
| Middle Diameter, mm | 72.490 | |
| Bottom Diameter, mm | 72.510 | |
| Average Diameter, cm | 7.248 | |
| Area, $cm^2$ | 41.26 | |
| Volume, $cm^3$ | 444.25 | |
| Wet Mass, g | 869.4 | |
| Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 266.50 | |
| Wt. dry soil + tare, gm | 214.40 | |
| Moisture Content, % | 25.3% | |
| Dry Density, pcf | 97.5 | |
| Specific Gravity | 2.65 | Assumed |
| Void Ratio | 0.70 | |
| Saturation, % | 96% | |
| Effective Stress, psi | 10 | |

| **Sample Data, Final** | | centimeters |
|---|---|---|
| Height, in | 4.206 | 10.68 |
| Top Diameter, mm | 72.66 | |
| Middle Diameter, mm | 72.74 | |
| Bottom Diameter, mm | 72.68 | |
| Average Diameter, cm | 7.269 | |
| Area, $cm^2$ | 41.50 | |
| Volume, $cm^3$ | 443.39 | |
| Wet Mass, g | 871.6 | |
| Wt. tare, gm | 8.2 | |
| Wt. wet soil + tare, gm | 879.8 | |
| Wt. dry soil + tare, gm | 711.47 | |
| Moisture Content, % | 23.9% | |
| Dry Density, pcf | 99.0 | |
| Specific Gravity | 2.65 | |
| Void Ratio | 0.67 | |
| Saturation, % | 95% | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.1

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.1 | 0.85 | | 29.45 | | 23 | 0.931 | |
| 3 | 27 | 207 | 25.6 | 0.87 | 7.588E-05 | 28.77 | 6.36E-08 | 23 | 0.931 | 5.92E-08 |
| 8 | 28 | 301 | 25.3 | 0.88 | 3.131E-05 | 28.52 | 2.65E-08 | 23 | 0.931 | 2.46E-08 |
| 11 | 41 | 193 | 25.1 | 0.89 | 3.256E-05 | 28.34 | 2.77E-08 | 23 | 0.931 | 2.58E-08 |
| 17 | 48 | 367 | 24.8 | 0.90 | 2.568E-05 | 27.91 | 2.22E-08 | 23 | 0.931 | 2.06E-08 |
| 23 | 51 | 363 | 24.6 | 0.91 | 1.731E-05 | 27.73 | 1.50E-08 | 23 | 0.931 | 1.40E-08 |
| 29 | 26 | 335 | 24.4 | 0.92 | 1.876E-05 | 27.48 | 1.64E-08 | 23 | 0.931 | 1.53E-08 |
| 37 | 55 | 509 | 24.1 | 0.93 | 1.852E-05 | 27.05 | 1.65E-08 | 23 | 0.931 | 1.54E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.63E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/15/2015 | DATE: | 9/16/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-200 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.077 | 10.36 | Height, in | 4.07 | 10.34 |
| Top Diameter, mm | 72.340 | | Top Diameter, mm | 72.41 | |
| Middle Diameter, mm | 72.380 | | Middle Diameter, mm | 72.5 | |
| Bottom Diameter, mm | 72.370 | | Bottom Diameter, mm | 72.48 | |
| Average Diameter, cm | 7.236 | | Average Diameter, cm | 7.246 | |
| Area, $cm^2$ | 41.13 | | Area, $cm^2$ | 41.24 | |
| Volume, $cm^3$ | 425.89 | | Volume, $cm^3$ | 426.34 | |
| Wet Mass, g | 839.5 | | Wet Mass, g | 841.8 | |
| Wt. tare, gm | 8.4 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 335.10 | | Wt. wet soil + tare, gm | 850.1 | |
| Wt. dry soil + tare, gm | 272.05 | | Wt. dry soil + tare, gm | 686.95 | |
| Moisture Content, % | 23.9% | | Moisture Content, % | 24.0% | |
| Dry Density, pcf | 99.3 | | Dry Density, pcf | 99.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.67 | | Void Ratio | 0.66 | |
| Saturation, % | 95% | | Saturation, % | 96% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.5 | 0.85 | | 29.90 | | 23 | 0.931 | |
| 1 | 27 | 87 | 25.0 | 0.87 | 1.806E-04 | 29.00 | 1.51E-07 | 23 | 0.931 | 1.41E-07 |
| 2 | 50 | 83 | 24.7 | 0.88 | 1.136E-04 | 28.75 | 9.58E-08 | 23 | 0.931 | 8.92E-08 |
| 7 | 42 | 292 | 24.0 | 0.91 | 7.531E-05 | 27.61 | 6.61E-08 | 23 | 0.931 | 6.16E-08 |
| 13 | 37 | 355 | 23.4 | 0.94 | 5.310E-05 | 26.91 | 4.78E-08 | 23 | 0.931 | 4.45E-08 |
| 19 | 20 | 343 | 23.0 | 0.95 | 3.664E-05 | 26.53 | 3.35E-08 | 23 | 0.931 | 3.12E-08 |
| 23 | 45 | 265 | 22.7 | 0.96 | 3.557E-05 | 26.22 | 3.29E-08 | 23 | 0.931 | 3.06E-08 |
| 30 | 10 | 385 | 22.3 | 0.98 | 3.264E-05 | 25.65 | 3.09E-08 | 23 | 0.931 | 2.87E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **3.38E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/15/2015 | DATE: | 9/16/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-205 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.158 | 10.56 | Height, in | 4.179 | 10.61 |
| Top Diameter, mm | 72.390 | | Top Diameter, mm | 72.68 | |
| Middle Diameter, mm | 72.440 | | Middle Diameter, mm | 72.66 | |
| Bottom Diameter, mm | 72.450 | | Bottom Diameter, mm | 72.75 | |
| Average Diameter, cm | 7.243 | | Average Diameter, cm | 7.270 | |
| Area, $cm^2$ | 41.20 | | Area, $cm^2$ | 41.51 | |
| Volume, $cm^3$ | 435.12 | | Volume, $cm^3$ | 440.58 | |
| Wet Mass, g | 848.4 | | Wet Mass, g | 866.7 | |
| Wt. tare, gm | 8.2 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 270.90 | | Wt. wet soil + tare, gm | 875.2 | |
| Wt. dry soil + tare, gm | 225.13 | | Wt. dry soil + tare, gm | 706.48 | |
| Moisture Content, % | 21.1% | | Moisture Content, % | 24.2% | |
| Dry Density, pcf | 100.5 | | Dry Density, pcf | 98.9 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.65 | | Void Ratio | 0.67 | |
| Saturation, % | 87% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 29.91 | | 23 | 0.931 | |
| 2 | 1 | 121 | 25.0 | 0.89 | 2.596E-04 | 27.91 | 2.24E-07 | 23 | 0.931 | 2.09E-07 |
| 4 | 37 | 156 | 24.0 | 0.93 | 2.014E-04 | 26.68 | 1.82E-07 | 23 | 0.931 | 1.69E-07 |
| 8 | 48 | 251 | 23.0 | 0.97 | 1.252E-04 | 25.44 | 1.19E-07 | 23 | 0.931 | 1.10E-07 |
| 13 | 30 | 282 | 22.0 | 1.01 | 1.114E-04 | 24.21 | 1.11E-07 | 23 | 0.931 | 1.03E-07 |
| 18 | 42 | 312 | 21.0 | 1.05 | 1.007E-04 | 22.98 | 1.06E-07 | 23 | 0.931 | 9.83E-08 |
| 24 | 27 | 345 | 20.0 | 1.10 | 9.106E-05 | 21.75 | 1.01E-07 | 23 | 0.931 | 9.39E-08 |
| 29 | 51 | 324 | 19.1 | 1.13 | 8.727E-05 | 20.70 | 1.02E-07 | 23 | 0.931 | 9.46E-08 |
| 34 | 19 | 268 | 18.4 | 1.16 | 8.206E-05 | 19.96 | 9.90E-08 | 23 | 0.931 | 9.22E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **9.48E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/15/2015 | DATE: | 9/16/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-210 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.115 | 10.45 | Height, in | 4.098 | 10.41 |
| Top Diameter, mm | 72.710 | | Top Diameter, mm | 72.89 | |
| Middle Diameter, mm | 72.740 | | Middle Diameter, mm | 72.91 | |
| Bottom Diameter, mm | 72.670 | | Bottom Diameter, mm | 72.82 | |
| Average Diameter, cm | 7.271 | | Average Diameter, cm | 7.287 | |
| Area, $cm^2$ | 41.52 | | Area, $cm^2$ | 41.71 | |
| Volume, $cm^3$ | 433.95 | | Volume, $cm^3$ | 434.14 | |
| Wet Mass, g | 868.1 | | Wet Mass, g | 873.8 | |
| Wt. tare, gm | 9 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 333.60 | | Wt. wet soil + tare, gm | 882.1 | |
| Wt. dry soil + tare, gm | 273.08 | | Wt. dry soil + tare, gm | 717.13 | |
| Moisture Content, % | 22.9% | | Moisture Content, % | 23.3% | |
| Dry Density, pcf | 101.6 | | Dry Density, pcf | 101.9 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.63 | | Void Ratio | 0.62 | |
| Saturation, % | 97% | | Saturation, % | 99% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.5 | 0.85 | | 29.62 | | 23 | 0.931 | |
| 3 | 28 | 208 | 24.5 | 0.89 | 1.510E-04 | 27.86 | 1.30E-07 | 23 | 0.931 | 1.21E-07 |
| 6 | 22 | 174 | 23.8 | 0.92 | 1.264E-04 | 27.17 | 1.12E-07 | 23 | 0.931 | 1.04E-07 |
| 10 | 46 | 264 | 23.0 | 0.95 | 9.520E-05 | 26.10 | 8.75E-08 | 23 | 0.931 | 8.14E-08 |
| 15 | 40 | 294 | 22.1 | 0.99 | 9.617E-05 | 24.90 | 9.26E-08 | 23 | 0.931 | 8.62E-08 |
| 18 | 58 | 198 | 21.6 | 1.01 | 7.933E-05 | 24.53 | 7.75E-08 | 23 | 0.931 | 7.22E-08 |
| 25 | 1 | 363 | 20.7 | 1.05 | 7.789E-05 | 23.15 | 8.07E-08 | 23 | 0.931 | 7.51E-08 |
| 30 | 21 | 320 | 20.0 | 1.08 | 6.872E-05 | 22.39 | 7.36E-08 | 23 | 0.931 | 6.85E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **7.55E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | AGM |
| DATE: | 9/16/2015 | DATE: | 9/18/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-215 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.604 | 9.15 | Height, in | 3.667 | 9.31 |
| Top Diameter, mm | 71.900 | | Top Diameter, mm | 72.47 | |
| Middle Diameter, mm | 72.010 | | Middle Diameter, mm | 72.54 | |
| Bottom Diameter, mm | 71.980 | | Bottom Diameter, mm | 72.52 | |
| Average Diameter, cm | 7.196 | | Average Diameter, cm | 7.251 | |
| Area, $cm^2$ | 40.67 | | Area, $cm^2$ | 41.29 | |
| Volume, $cm^3$ | 372.33 | | Volume, $cm^3$ | 384.62 | |
| Wet Mass, g | 763.3 | | Wet Mass, g | 784.9 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 6.7 | |
| Wt. wet soil + tare, gm | 307.80 | | Wt. wet soil + tare, gm | 791.7 | |
| Wt. dry soil + tare, gm | 273.85 | | Wt. dry soil + tare, gm | 655.98 | |
| Moisture Content, % | 12.8% | | Moisture Content, % | 20.9% | |
| Dry Density, pcf | 113.4 | | Dry Density, pcf | 105.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.46 | | Void Ratio | 0.57 | |
| Saturation, % | 74% | | Saturation, % | 97% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 22.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 22.5 | 0.85 | | 29.70 | | 23 | 0.931 | |
| 2 | 10 | 130 | 22.0 | 0.87 | 1.208E-04 | 28.14 | 1.04E-07 | 23 | 0.931 | 9.68E-08 |
| 7 | 57 | 347 | 21.5 | 0.89 | 4.527E-05 | 27.44 | 4.00E-08 | 23 | 0.931 | 3.72E-08 |
| 11 | 50 | 233 | 21.3 | 0.90 | 2.697E-05 | 27.37 | 2.39E-08 | 23 | 0.931 | 2.22E-08 |
| 21 | 22 | 572 | 21.0 | 0.91 | 1.648E-05 | 26.88 | 1.48E-08 | 23 | 0.931 | 1.38E-08 |
| 29 | 13 | 471 | 20.8 | 0.92 | 1.334E-05 | 26.67 | 1.21E-08 | 23 | 0.931 | 1.13E-08 |
| 37 | 1 | 468 | 20.6 | 0.93 | 1.343E-05 | 26.39 | 1.23E-08 | 23 | 0.931 | 1.15E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **1.47E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | AGM |
| DATE: | 9/16/2015 | DATE: | 9/18/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-220 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.324 | 10.98 | Height, in | 4.302 | 10.93 |
| Top Diameter, mm | 72.240 | | Top Diameter, mm | 72.31 | |
| Middle Diameter, mm | 72.260 | | Middle Diameter, mm | 72.37 | |
| Bottom Diameter, mm | 72.190 | | Bottom Diameter, mm | 72.32 | |
| Average Diameter, cm | 7.223 | | Average Diameter, cm | 7.233 | |
| Area, $cm^2$ | 40.98 | | Area, $cm^2$ | 41.09 | |
| Volume, $cm^3$ | 450.03 | | Volume, $cm^3$ | 449.03 | |
| Wet Mass, g | 898.2 | | Wet Mass, g | 900.9 | |
| Wt. tare, gm | 9 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 314.50 | | Wt. wet soil + tare, gm | 909.2 | |
| Wt. dry soil + tare, gm | 256.46 | | Wt. dry soil + tare, gm | 734.96 | |
| Moisture Content, % | 23.5% | | Moisture Content, % | 24.0% | |
| Dry Density, pcf | 100.9 | | Dry Density, pcf | 101.0 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.64 | | Void Ratio | 0.64 | |
| Saturation, % | 97% | | Saturation, % | 100% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 27.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.0 | 0.85 | | 29.90 | | 23 | 0.931 | |
| 1 | 47 | 107 | 26.5 | 0.87 | 1.468E-04 | 29.16 | 1.23E-07 | 23 | 0.931 | 1.14E-07 |
| 4 | 44 | 177 | 26.1 | 0.89 | 7.100E-05 | 28.74 | 6.01E-08 | 23 | 0.931 | 5.60E-08 |
| 9 | 25 | 281 | 25.7 | 0.90 | 4.472E-05 | 28.26 | 3.85E-08 | 23 | 0.931 | 3.59E-08 |
| 14 | 19 | 294 | 25.4 | 0.92 | 3.206E-05 | 27.96 | 2.79E-08 | 23 | 0.931 | 2.60E-08 |
| 19 | 13 | 294 | 25.2 | 0.92 | 2.137E-05 | 27.78 | 1.87E-08 | 23 | 0.931 | 1.74E-08 |
| 25 | 55 | 402 | 24.9 | 0.94 | 2.344E-05 | 27.37 | 2.08E-08 | 23 | 0.931 | 1.94E-08 |
| 33 | 4 | 429 | 24.6 | 0.95 | 2.197E-05 | 27.01 | 1.98E-08 | 23 | 0.931 | 1.84E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **2.03E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | AGM |
| DATE: | 9/16/2015 | DATE: | 9/18/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-225 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.997 | 10.15 | Height, in | 4.023 | 10.22 |
| Top Diameter, mm | 72.390 | | Top Diameter, mm | 72.86 | |
| Middle Diameter, mm | 72.440 | | Middle Diameter, mm | 72.93 | |
| Bottom Diameter, mm | 72.380 | | Bottom Diameter, mm | 72.91 | |
| Average Diameter, cm | 7.240 | | Average Diameter, cm | 7.290 | |
| Area, $cm^2$ | 41.17 | | Area, $cm^2$ | 41.74 | |
| Volume, $cm^3$ | 418.00 | | Volume, $cm^3$ | 426.51 | |
| Wet Mass, g | 819.8 | | Wet Mass, g | 838.9 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 303.30 | | Wt. wet soil + tare, gm | 847.4 | |
| Wt. dry soil + tare, gm | 255.03 | | Wt. dry soil + tare, gm | 679.21 | |
| Moisture Content, % | 19.6% | | Moisture Content, % | 25.1% | |
| Dry Density, pcf | 102.4 | | Dry Density, pcf | 98.1 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.62 | | Void Ratio | 0.69 | |
| Saturation, % | 84% | | Saturation, % | 97% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.5 | 0.85 | | 29.26 | | 23 | 0.931 | |
| 1 | 7 | 67 | 24.0 | 0.87 | 2.344E-04 | 28.11 | 2.00E-07 | 23 | 0.931 | 1.86E-07 |
| 3 | 0 | 113 | 23.6 | 0.89 | 1.112E-04 | 27.66 | 9.63E-08 | 23 | 0.931 | 8.97E-08 |
| 5 | 15 | 135 | 23.2 | 0.90 | 9.308E-05 | 27.15 | 8.21E-08 | 23 | 0.931 | 7.65E-08 |
| 7 | 46 | 151 | 22.8 | 0.92 | 8.322E-05 | 26.64 | 7.49E-08 | 23 | 0.931 | 6.97E-08 |
| 12 | 27 | 281 | 22.1 | 0.95 | 7.826E-05 | 25.55 | 7.34E-08 | 23 | 0.931 | 6.83E-08 |
| 17 | 57 | 330 | 21.3 | 0.98 | 7.616E-05 | 24.46 | 7.46E-08 | 23 | 0.931 | 6.95E-08 |
| 22 | 41 | 284 | 20.6 | 1.01 | 7.743E-05 | 23.63 | 7.85E-08 | 23 | 0.931 | 7.31E-08 |
| 29 | 8 | 387 | 19.7 | 1.05 | 7.306E-05 | 22.35 | 7.83E-08 | 23 | 0.931 | 7.29E-08 |
| 32 | 47 | 219 | 19.2 | 1.07 | 7.173E-05 | 21.97 | 7.82E-08 | 23 | 0.931 | 7.28E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **7.21E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | AGM |
| DATE: | 9/16/2015 | DATE: | 9/18/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-230 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.371 | 8.56 | Height, in | 3.369 | 8.56 |
| Top Diameter, mm | 73.010 | | Top Diameter, mm | 73.09 | |
| Middle Diameter, mm | 73.070 | | Middle Diameter, mm | 73.16 | |
| Bottom Diameter, mm | 72.990 | | Bottom Diameter, mm | 73.13 | |
| Average Diameter, cm | 7.302 | | Average Diameter, cm | 7.313 | |
| Area, $cm^2$ | 41.88 | | Area, $cm^2$ | 42.00 | |
| Volume, $cm^3$ | 358.60 | | Volume, $cm^3$ | 359.40 | |
| Wet Mass, g | 700.8 | | Wet Mass, g | 703.4 | |
| Wt. tare, gm | 8.1 | | Wt. tare, gm | 8.6 | |
| Wt. wet soil + tare, gm | 313.10 | | Wt. wet soil + tare, gm | 711.7 | |
| Wt. dry soil + tare, gm | 259.09 | | Wt. dry soil + tare, gm | 572.41 | |
| Moisture Content, % | 21.5% | | Moisture Content, % | 24.7% | |
| Dry Density, pcf | 100.4 | | Dry Density, pcf | 97.9 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.65 | | Void Ratio | 0.69 | |
| Saturation, % | 88% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 21.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 21.0 | 0.85 | | 29.56 | | 23 | 0.931 | |
| 1 | 16 | 76 | 20.5 | 0.87 | 2.067E-04 | 28.43 | 1.73E-07 | 23 | 0.931 | 1.61E-07 |
| 2 | 36 | 80 | 20.2 | 0.88 | 1.178E-04 | 28.12 | 9.97E-08 | 23 | 0.931 | 9.29E-08 |
| 5 | 51 | 195 | 19.7 | 0.90 | 8.055E-05 | 27.21 | 7.05E-08 | 23 | 0.931 | 6.56E-08 |
| 12 | 33 | 402 | 18.9 | 0.94 | 6.252E-05 | 25.75 | 5.78E-08 | 23 | 0.931 | 5.38E-08 |
| 16 | 40 | 247 | 18.5 | 0.95 | 5.088E-05 | 25.45 | 4.76E-08 | 23 | 0.931 | 4.43E-08 |
| 21 | 43 | 303 | 18.0 | 0.97 | 5.184E-05 | 24.61 | 5.02E-08 | 23 | 0.931 | 4.67E-08 |
| 25 | 56 | 253 | 17.6 | 0.99 | 4.967E-05 | 24.07 | 4.91E-08 | 23 | 0.931 | 4.57E-08 |
| 30 | 21 | 265 | 17.2 | 1.01 | 4.742E-05 | 23.46 | 4.81E-08 | 23 | 0.931 | 4.48E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **4.54E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | AGM |
| DATE: | 9/16/2015 | DATE: | 9/18/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-235 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.112 | 10.44 | Height, in | 4.118 | 10.46 |
| Top Diameter, mm | 72.350 | | Top Diameter, mm | 72.97 | |
| Middle Diameter, mm | 72.410 | | Middle Diameter, mm | 73.03 | |
| Bottom Diameter, mm | 72.400 | | Bottom Diameter, mm | 72.96 | |
| Average Diameter, cm | 7.239 | | Average Diameter, cm | 7.299 | |
| Area, $cm^2$ | 41.15 | | Area, $cm^2$ | 41.84 | |
| Volume, $cm^3$ | 429.83 | | Volume, $cm^3$ | 437.62 | |
| Wet Mass, g | 850.9 | | Wet Mass, g | 862 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 245.50 | | Wt. wet soil + tare, gm | 870.5 | |
| Wt. dry soil + tare, gm | 205.88 | | Wt. dry soil + tare, gm | 703.94 | |
| Moisture Content, % | 20.1% | | Moisture Content, % | 24.0% | |
| Dry Density, pcf | 102.9 | | Dry Density, pcf | 99.2 | |
| Specific Gravity | 2.60 | Assumed | Specific Gravity | 2.6 | |
| Void Ratio | 0.58 | | Void Ratio | 0.64 | |
| Saturation, % | 90% | | Saturation, % | 98% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.4

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.4 | 0.85 | | 29.52 | | 23 | 0.931 | |
| 1 | 40 | 100 | 25.0 | 0.87 | 1.257E-04 | 28.73 | 1.05E-07 | 23 | 0.931 | 9.74E-08 |
| 5 | 14 | 214 | 24.6 | 0.88 | 5.872E-05 | 28.23 | 4.97E-08 | 23 | 0.931 | 4.63E-08 |
| 12 | 20 | 426 | 24.1 | 0.90 | 3.687E-05 | 27.54 | 3.20E-08 | 23 | 0.931 | 2.98E-08 |
| 18 | 44 | 384 | 23.8 | 0.92 | 2.454E-05 | 27.29 | 2.15E-08 | 23 | 0.931 | 2.00E-08 |
| 24 | 36 | 352 | 23.5 | 0.93 | 2.678E-05 | 26.92 | 2.38E-08 | 23 | 0.931 | 2.21E-08 |
| 32 | 10 | 454 | 23.2 | 0.94 | 2.076E-05 | 26.54 | 1.87E-08 | 23 | 0.931 | 1.74E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.23E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | HR |
| DATE: | 9/19/2015 | DATE: | 9/24/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-240 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.197 | 10.66 | Height, in | 4.17 | 10.59 |
| Top Diameter, mm | 72.550 | | Top Diameter, mm | 72.88 | |
| Middle Diameter, mm | 72.570 | | Middle Diameter, mm | 72.93 | |
| Bottom Diameter, mm | 72.490 | | Bottom Diameter, mm | 72.85 | |
| Average Diameter, cm | 7.254 | | Average Diameter, cm | 7.289 | |
| Area, $cm^2$ | 41.32 | | Area, $cm^2$ | 41.72 | |
| Volume, $cm^3$ | 440.53 | | Volume, $cm^3$ | 441.93 | |
| Wet Mass, g | 873.5 | | Wet Mass, g | 885.2 | |
| Wt. tare, gm | 6.9 | | Wt. tare, gm | 8.1 | |
| Wt. wet soil + tare, gm | 301.20 | | Wt. wet soil + tare, gm | 893.3 | |
| Wt. dry soil + tare, gm | 251.21 | | Wt. dry soil + tare, gm | 728.04 | |
| Moisture Content, % | 20.5% | | Moisture Content, % | 23.0% | |
| Dry Density, pcf | 102.7 | | Dry Density, pcf | 101.7 | |
| Specific Gravity | 2.60 | Assumed | Specific Gravity | 2.6 | |
| Void Ratio | 0.58 | | Void Ratio | 0.60 | |
| Saturation, % | 92% | | Saturation, % | 100% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.1

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.1 | 0.85 | | 29.75 | | 23 | 0.931 | |
| 2 | 19 | 139 | 25.4 | 0.88 | 1.582E-04 | 28.64 | 1.32E-07 | 23 | 0.931 | 1.23E-07 |
| 4 | 3 | 104 | 25.1 | 0.89 | 9.062E-05 | 28.52 | 7.62E-08 | 23 | 0.931 | 7.09E-08 |
| 8 | 48 | 285 | 24.5 | 0.92 | 6.614E-05 | 27.60 | 5.74E-08 | 23 | 0.931 | 5.35E-08 |
| 13 | 20 | 272 | 24.1 | 0.93 | 4.620E-05 | 27.23 | 4.07E-08 | 23 | 0.931 | 3.79E-08 |
| 20 | 1 | 401 | 23.6 | 0.95 | 3.917E-05 | 26.55 | 3.54E-08 | 23 | 0.931 | 3.29E-08 |
| 27 | 16 | 435 | 23.1 | 0.97 | 3.611E-05 | 25.93 | 3.34E-08 | 23 | 0.931 | 3.11E-08 |
| 33 | 11 | 355 | 22.7 | 0.99 | 3.540E-05 | 25.50 | 3.33E-08 | 23 | 0.931 | 3.10E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **3.32E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | HR |
| DATE: | 9/19/2015 | DATE: | 9/24/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-242 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.004 | 10.17 | Height, in | 3.99 | 10.13 |
| Top Diameter, mm | 72.160 | | Top Diameter, mm | 72.27 | |
| Middle Diameter, mm | 72.170 | | Middle Diameter, mm | 72.3 | |
| Bottom Diameter, mm | 72.220 | | Bottom Diameter, mm | 72.29 | |
| Average Diameter, cm | 7.218 | | Average Diameter, cm | 7.229 | |
| Area, $cm^2$ | 40.92 | | Area, $cm^2$ | 41.04 | |
| Volume, $cm^3$ | 416.19 | | Volume, $cm^3$ | 415.92 | |
| Wet Mass, g | 834.6 | | Wet Mass, g | 839.7 | |
| Wt. tare, gm | 9.9 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 298.60 | | Wt. wet soil + tare, gm | 848.3 | |
| Wt. dry soil + tare, gm | 249.55 | | Wt. dry soil + tare, gm | 696.29 | |
| Moisture Content, % | 20.5% | | Moisture Content, % | 22.1% | |
| Dry Density, pcf | 103.9 | | Dry Density, pcf | 103.2 | |
| Specific Gravity | 2.60 | Assumed | Specific Gravity | 2.6 | |
| Void Ratio | 0.56 | | Void Ratio | 0.57 | |
| Saturation, % | 95% | | Saturation, % | 100% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.8

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.8 | 0.85 | | 29.58 | | 23 | 0.931 | |
| 1 | 1 | 61 | 24.3 | 0.87 | 2.575E-04 | 28.71 | 2.19E-07 | 23 | 0.931 | 2.03E-07 |
| 3 | 54 | 173 | 23.7 | 0.90 | 1.090E-04 | 27.87 | 9.52E-08 | 23 | 0.931 | 8.87E-08 |
| 7 | 1 | 187 | 23.1 | 0.92 | 1.008E-04 | 27.10 | 9.06E-08 | 23 | 0.931 | 8.44E-08 |
| 9 | 56 | 175 | 22.6 | 0.94 | 8.976E-05 | 26.52 | 8.25E-08 | 23 | 0.931 | 7.68E-08 |
| 15 | 2 | 306 | 21.8 | 0.97 | 8.213E-05 | 25.29 | 7.91E-08 | 23 | 0.931 | 7.37E-08 |
| 17 | 38 | 156 | 21.4 | 0.99 | 8.055E-05 | 25.04 | 7.84E-08 | 23 | 0.931 | 7.30E-08 |
| 24 | 22 | 404 | 20.5 | 1.03 | 6.999E-05 | 23.55 | 7.24E-08 | 23 | 0.931 | 6.74E-08 |
| 30 | 48 | 386 | 19.7 | 1.06 | 6.511E-05 | 22.58 | 7.03E-08 | 23 | 0.931 | 6.54E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **6.99E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | HR |
| DATE: | 9/19/2015 | DATE: | 9/24/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-245 |
| LIFT NUMBER: | Lift 1 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| Sample Data, Initial | | centimeters | Sample Data, Final | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.979 | 10.11 | Height, in | 3.963 | 10.07 |
| Top Diameter, mm | 72.210 | | Top Diameter, mm | 72.48 | |
| Middle Diameter, mm | 72.250 | | Middle Diameter, mm | 72.55 | |
| Bottom Diameter, mm | 72.260 | | Bottom Diameter, mm | 72.53 | |
| Average Diameter, cm | 7.224 | | Average Diameter, cm | 7.252 | |
| Area, $cm^2$ | 40.99 | | Area, $cm^2$ | 41.31 | |
| Volume, $cm^3$ | 414.24 | | Volume, $cm^3$ | 415.78 | |
| Wet Mass, g | 823.0 | | Wet Mass, g | 826.9 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 288.50 | | Wt. wet soil + tare, gm | 835.2 | |
| Wt. dry soil + tare, gm | 232.79 | | Wt. dry soil + tare, gm | 665.51 | |
| Moisture Content, % | 24.8% | | Moisture Content, % | 25.8% | |
| Dry Density, pcf | 99.3 | | Dry Density, pcf | 98.6 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.66 | | Void Ratio | 0.68 | |
| Saturation, % | 99% | | Saturation, % | 101% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.5 | 0.85 | | 29.39 | | 23 | 0.931 | |
| 2 | 37 | 157 | 24.0 | 0.87 | 1.001E-04 | 28.53 | 8.49E-08 | 23 | 0.931 | 7.90E-08 |
| 10 | 28 | 471 | 23.3 | 0.90 | 4.669E-05 | 27.49 | 4.11E-08 | 23 | 0.931 | 3.83E-08 |
| 16 | 21 | 353 | 23.0 | 0.91 | 2.670E-05 | 27.37 | 2.36E-08 | 23 | 0.931 | 2.20E-08 |
| 24 | 6 | 465 | 22.6 | 0.93 | 2.702E-05 | 26.78 | 2.44E-08 | 23 | 0.931 | 2.27E-08 |
| 28 | 55 | 289 | 22.4 | 0.94 | 2.174E-05 | 26.65 | 1.97E-08 | 23 | 0.931 | 1.84E-08 |
| 34 | 4 | 309 | 22.2 | 0.94 | 2.033E-05 | 26.39 | 1.87E-08 | 23 | 0.931 | 1.74E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **2.01E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | AGM |
| DATE: | 9/23/2015 | DATE: | 9/24/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-250 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.157 | 10.56 | Height, in | 4.188 | 10.64 |
| Top Diameter, mm | 72.480 | | Top Diameter, mm | 72.66 | |
| Middle Diameter, mm | 72.530 | | Middle Diameter, mm | 72.71 | |
| Bottom Diameter, mm | 72.520 | | Bottom Diameter, mm | 72.72 | |
| Average Diameter, cm | 7.251 | | Average Diameter, cm | 7.270 | |
| Area, $cm^2$ | 41.29 | | Area, $cm^2$ | 41.51 | |
| Volume, $cm^3$ | 436.01 | | Volume, $cm^3$ | 441.53 | |
| Wet Mass, g | 884.3 | | Wet Mass, g | 898.6 | |
| Wt. tare, gm | 9 | | Wt. tare, gm | 9.9 | |
| Wt. wet soil + tare, gm | 264.60 | | Wt. wet soil + tare, gm | 908.5 | |
| Wt. dry soil + tare, gm | 222.19 | | Wt. dry soil + tare, gm | 752.43 | |
| Moisture Content, % | 19.9% | | Moisture Content, % | 21.0% | |
| Dry Density, pcf | 105.6 | | Dry Density, pcf | 104.9 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.57 | | Void Ratio | 0.58 | |
| Saturation, % | 93% | | Saturation, % | 97% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.5 | 0.85 | | 29.32 | | 23 | 0.931 | |
| 2 | 37 | 157 | 25.1 | 0.87 | 8.004E-05 | 28.37 | 6.80E-08 | 23 | 0.931 | 6.33E-08 |
| 5 | 4 | 147 | 24.9 | 0.87 | 4.274E-05 | 28.24 | 3.65E-08 | 23 | 0.931 | 3.39E-08 |
| 9 | 36 | 272 | 24.6 | 0.89 | 3.465E-05 | 27.81 | 3.00E-08 | 23 | 0.931 | 2.79E-08 |
| 20 | 21 | 645 | 24.2 | 0.90 | 1.948E-05 | 27.26 | 1.72E-08 | 23 | 0.931 | 1.60E-08 |
| 25 | 13 | 292 | 24.0 | 0.91 | 2.152E-05 | 27.14 | 1.91E-08 | 23 | 0.931 | 1.78E-08 |
| 31 | 5 | 352 | 23.8 | 0.92 | 1.785E-05 | 26.89 | 1.60E-08 | 23 | 0.931 | 1.49E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.92E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | AGM |
| DATE: | 9/23/2015 | DATE: | 9/24/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-255 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.049 | 10.28 | Height, in | 4.056 | 10.30 |
| Top Diameter, mm | 72.400 | | Top Diameter, mm | 72.51 | |
| Middle Diameter, mm | 72.370 | | Middle Diameter, mm | 72.55 | |
| Bottom Diameter, mm | 72.460 | | Bottom Diameter, mm | 72.49 | |
| Average Diameter, cm | 7.241 | | Average Diameter, cm | 7.252 | |
| Area, $cm^2$ | 41.18 | | Area, $cm^2$ | 41.30 | |
| Volume, $cm^3$ | 423.51 | | Volume, $cm^3$ | 425.50 | |
| Wet Mass, g | 861.3 | | Wet Mass, g | 869.6 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.7 | |
| Wt. wet soil + tare, gm | 241.30 | | Wt. wet soil + tare, gm | 878.4 | |
| Wt. dry soil + tare, gm | 198.42 | | Wt. dry soil + tare, gm | 714.37 | |
| Moisture Content, % | 22.6% | | Moisture Content, % | 23.2% | |
| Dry Density, pcf | 103.5 | | Dry Density, pcf | 103.5 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.60 | | Void Ratio | 0.60 | |
| Saturation, % | 100% | | Saturation, % | 103% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.0 | 0.85 | | 29.49 | | 23 | 0.931 | |
| 2 | 43 | 163 | 24.4 | 0.87 | 1.156E-04 | 28.30 | 9.89E-08 | 23 | 0.931 | 9.21E-08 |
| 6 | 50 | 247 | 23.9 | 0.90 | 6.360E-05 | 27.73 | 5.55E-08 | 23 | 0.931 | 5.17E-08 |
| 14 | 16 | 446 | 23.0 | 0.93 | 6.340E-05 | 26.33 | 5.83E-08 | 23 | 0.931 | 5.43E-08 |
| 20 | 1 | 345 | 22.4 | 0.96 | 5.464E-05 | 25.76 | 5.14E-08 | 23 | 0.931 | 4.78E-08 |
| 24 | 2 | 241 | 22.0 | 0.97 | 5.214E-05 | 25.38 | 4.97E-08 | 23 | 0.931 | 4.63E-08 |
| 29 | 24 | 322 | 21.5 | 0.99 | 4.878E-05 | 24.68 | 4.79E-08 | 23 | 0.931 | 4.46E-08 |
| 31 | 36 | 132 | 21.3 | 1.00 | 4.760E-05 | 24.62 | 4.68E-08 | 23 | 0.931 | 4.36E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **4.56E-08 cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/24/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-265 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.006 | 10.18 | Height, in | 3.992 | 10.14 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.74 | |
| Middle Diameter, mm | 72.500 | | Middle Diameter, mm | 72.77 | |
| Bottom Diameter, mm | 72.440 | | Bottom Diameter, mm | 72.75 | |
| Average Diameter, cm | 7.248 | | Average Diameter, cm | 7.275 | |
| Area, $cm^2$ | 41.26 | | Area, $cm^2$ | 41.57 | |
| Volume, $cm^3$ | 419.87 | | Volume, $cm^3$ | 421.52 | |
| Wet Mass, g | 834.6 | | Wet Mass, g | 843.7 | |
| Wt. tare, gm | 8.31 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 287.66 | | Wt. wet soil + tare, gm | 852.1 | |
| Wt. dry soil + tare, gm | 239.45 | | Wt. dry soil + tare, gm | 696.36 | |
| Moisture Content, % | 20.9% | | Moisture Content, % | 22.6% | |
| Dry Density, pcf | 102.6 | | Dry Density, pcf | 101.8 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.61 | | Void Ratio | 0.62 | |
| Saturation, % | 90% | | Saturation, % | 96% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.5 | 0.85 | | 29.19 | | 23 | 0.931 | |
| 1 | 59 | 119 | 24.0 | 0.87 | 1.320E-04 | 28.33 | 1.12E-07 | 23 | 0.931 | 1.04E-07 |
| 4 | 33 | 154 | 23.7 | 0.88 | 6.120E-05 | 28.07 | 5.24E-08 | 23 | 0.931 | 4.88E-08 |
| 9 | 21 | 288 | 23.4 | 0.90 | 3.273E-05 | 27.68 | 2.84E-08 | 23 | 0.931 | 2.65E-08 |
| 16 | 45 | 444 | 23.0 | 0.91 | 2.830E-05 | 27.10 | 2.51E-08 | 23 | 0.931 | 2.34E-08 |
| 27 | 24 | 639 | 22.6 | 0.93 | 1.967E-05 | 26.59 | 1.78E-08 | 23 | 0.931 | 1.66E-08 |
| 37 | 33 | 609 | 22.2 | 0.94 | 2.063E-05 | 26.07 | 1.90E-08 | 23 | 0.931 | 1.77E-08 |
| 43 | 16 | 343 | 22.0 | 0.95 | 1.832E-05 | 25.94 | 1.70E-08 | 23 | 0.931 | 1.58E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.84E-08 cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/24/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-270 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.061 | 10.31 | Height, in | 4.052 | 10.29 |
| Top Diameter, mm | 72.600 | | Top Diameter, mm | 72.71 | |
| Middle Diameter, mm | 72.510 | | Middle Diameter, mm | 72.74 | |
| Bottom Diameter, mm | 72.530 | | Bottom Diameter, mm | 72.75 | |
| Average Diameter, cm | 7.255 | | Average Diameter, cm | 7.273 | |
| Area, $cm^2$ | 41.34 | | Area, $cm^2$ | 41.55 | |
| Volume, $cm^3$ | 426.37 | | Volume, $cm^3$ | 427.62 | |
| Wet Mass, g | 834.2 | | Wet Mass, g | 840.6 | |
| Wt. tare, gm | 8.99 | | Wt. tare, gm | 9 | |
| Wt. wet soil + tare, gm | 319.64 | | Wt. wet soil + tare, gm | 850 | |
| Wt. dry soil + tare, gm | 260.97 | | Wt. dry soil + tare, gm | 687.1 | |
| Moisture Content, % | 23.3% | | Moisture Content, % | 24.0% | |
| Dry Density, pcf | 99.0 | | Dry Density, pcf | 98.9 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.67 | | Void Ratio | 0.67 | |
| Saturation, % | 92% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.0 | 0.85 | | 29.41 | | 23 | 0.931 | |
| 2 | 18 | 138 | 24.4 | 0.87 | 1.366E-04 | 28.33 | 1.16E-07 | 23 | 0.931 | 1.08E-07 |
| 8 | 17 | 359 | 23.7 | 0.90 | 6.126E-05 | 27.37 | 5.39E-08 | 23 | 0.931 | 5.02E-08 |
| 16 | 30 | 493 | 23.1 | 0.93 | 3.823E-05 | 26.68 | 3.45E-08 | 23 | 0.931 | 3.21E-08 |
| 22 | 11 | 341 | 22.8 | 0.94 | 2.764E-05 | 26.49 | 2.51E-08 | 23 | 0.931 | 2.34E-08 |
| 30 | 20 | 489 | 22.5 | 0.95 | 1.927E-05 | 26.10 | 1.78E-08 | 23 | 0.931 | 1.65E-08 |
| 36 | 3 | 343 | 22.3 | 0.96 | 1.832E-05 | 25.91 | 1.70E-08 | 23 | 0.931 | 1.58E-08 |
| 43 | 12 | 429 | 22.1 | 0.97 | 1.465E-05 | 25.66 | 1.37E-08 | 23 | 0.931 | 1.28E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.71E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/24/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-280 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.585 | 9.11 | Height, in | 3.608 | 9.16 |
| Top Diameter, mm | 72.340 | | Top Diameter, mm | 72.96 | |
| Middle Diameter, mm | 72.370 | | Middle Diameter, mm | 73.05 | |
| Bottom Diameter, mm | 72.340 | | Bottom Diameter, mm | 73.03 | |
| Average Diameter, cm | 7.235 | | Average Diameter, cm | 7.301 | |
| Area, $cm^2$ | 41.11 | | Area, $cm^2$ | 41.87 | |
| Volume, $cm^3$ | 374.36 | | Volume, $cm^3$ | 383.70 | |
| Wet Mass, g | 756.0 | | Wet Mass, g | 768.1 | |
| Wt. tare, gm | 8.49 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 241.36 | | Wt. wet soil + tare, gm | 776.5 | |
| Wt. dry soil + tare, gm | 200.79 | | Wt. dry soil + tare, gm | 631.37 | |
| Moisture Content, % | 21.1% | | Moisture Content, % | 23.3% | |
| Dry Density, pcf | 104.1 | | Dry Density, pcf | 101.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.59 | | Void Ratio | 0.63 | |
| Saturation, % | 95% | | Saturation, % | 98% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 22.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 22.5 | 0.85 | | 29.86 | | 23 | 0.931 | |
| 2 | 10 | 130 | 22.1 | 0.87 | 9.666E-05 | 28.82 | 8.01E-08 | 23 | 0.931 | 7.46E-08 |
| 8 | 51 | 401 | 21.6 | 0.89 | 3.917E-05 | 28.03 | 3.34E-08 | 23 | 0.931 | 3.11E-08 |
| 14 | 56 | 365 | 21.2 | 0.90 | 3.443E-05 | 27.53 | 2.99E-08 | 23 | 0.931 | 2.78E-08 |
| 24 | 18 | 562 | 20.6 | 0.93 | 3.354E-05 | 26.53 | 3.02E-08 | 23 | 0.931 | 2.81E-08 |
| 29 | 1 | 283 | 20.3 | 0.94 | 3.330E-05 | 26.32 | 3.02E-08 | 23 | 0.931 | 2.81E-08 |
| 35 | 12 | 371 | 20.0 | 0.95 | 2.540E-05 | 25.89 | 2.34E-08 | 23 | 0.931 | 2.18E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.65E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/24/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-285 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.168 | 10.59 | Height, in | 4.19 | 10.64 |
| Top Diameter, mm | 72.220 | | Top Diameter, mm | 72.51 | |
| Middle Diameter, mm | 72.300 | | Middle Diameter, mm | 72.46 | |
| Bottom Diameter, mm | 72.280 | | Bottom Diameter, mm | 72.52 | |
| Average Diameter, cm | 7.227 | | Average Diameter, cm | 7.250 | |
| Area, $cm^2$ | 41.02 | | Area, $cm^2$ | 41.28 | |
| Volume, $cm^3$ | 434.24 | | Volume, $cm^3$ | 439.31 | |
| Wet Mass, g | 855.5 | | Wet Mass, g | 868.6 | |
| Wt. tare, gm | 8.26 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 260.07 | | Wt. wet soil + tare, gm | 876.9 | |
| Wt. dry soil + tare, gm | 218.99 | | Wt. dry soil + tare, gm | 709.52 | |
| Moisture Content, % | 19.5% | | Moisture Content, % | 23.9% | |
| Dry Density, pcf | 102.9 | | Dry Density, pcf | 99.6 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.61 | | Void Ratio | 0.66 | |
| Saturation, % | 85% | | Saturation, % | 96% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.5 | 0.85 | | 29.24 | | 23 | 0.931 | |
| 1 | 40 | 100 | 24.8 | 0.88 | 2.199E-04 | 27.80 | 1.92E-07 | 23 | 0.931 | 1.78E-07 |
| 5 | 14 | 214 | 24.0 | 0.91 | 1.174E-04 | 26.75 | 1.06E-07 | 23 | 0.931 | 9.90E-08 |
| 8 | 3 | 169 | 23.5 | 0.93 | 9.295E-05 | 26.33 | 8.55E-08 | 23 | 0.931 | 7.96E-08 |
| 13 | 48 | 345 | 22.7 | 0.96 | 7.285E-05 | 25.16 | 7.02E-08 | 23 | 0.931 | 6.53E-08 |
| 21 | 24 | 456 | 21.9 | 1.00 | 5.512E-05 | 24.17 | 5.52E-08 | 23 | 0.931 | 5.14E-08 |
| 33 | 34 | 730 | 20.8 | 1.04 | 4.734E-05 | 22.63 | 5.07E-08 | 23 | 0.931 | 4.72E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **6.09E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/24/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-290 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.255 | 8.27 | Height, in | 3.235 | 8.22 |
| Top Diameter, mm | 70.720 | | Top Diameter, mm | 71.01 | |
| Middle Diameter, mm | 70.770 | | Middle Diameter, mm | 70.99 | |
| Bottom Diameter, mm | 70.780 | | Bottom Diameter, mm | 71.07 | |
| Average Diameter, cm | 7.076 | | Average Diameter, cm | 7.102 | |
| Area, $cm^2$ | 39.32 | | Area, $cm^2$ | 39.62 | |
| Volume, $cm^3$ | 325.09 | | Volume, $cm^3$ | 325.54 | |
| Wet Mass, g | 635.0 | | Wet Mass, g | 641.7 | |
| Wt. tare, gm | 8.38 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 256.90 | | Wt. wet soil + tare, gm | 650.2 | |
| Wt. dry soil + tare, gm | 213.52 | | Wt. dry soil + tare, gm | 526.7 | |
| Moisture Content, % | 21.1% | | Moisture Content, % | 23.8% | |
| Dry Density, pcf | 100.6 | | Dry Density, pcf | 99.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.64 | | Void Ratio | 0.66 | |
| Saturation, % | 87% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 20.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 20.0 | 0.85 | | 29.09 | | 23 | 0.931 | |
| 2 | 43 | 163 | 19.0 | 0.89 | 1.927E-04 | 26.88 | 1.81E-07 | 23 | 0.931 | 1.69E-07 |
| 4 | 16 | 93 | 18.5 | 0.91 | 1.689E-04 | 26.49 | 1.61E-07 | 23 | 0.931 | 1.50E-07 |
| 6 | 27 | 131 | 18.1 | 0.93 | 9.593E-05 | 25.93 | 9.34E-08 | 23 | 0.931 | 8.70E-08 |
| 10 | 4 | 217 | 17.5 | 0.95 | 8.686E-05 | 24.81 | 8.84E-08 | 23 | 0.931 | 8.23E-08 |
| 14 | 42 | 278 | 16.8 | 0.98 | 7.911E-05 | 23.62 | 8.45E-08 | 23 | 0.931 | 7.87E-08 |
| 23 | 43 | 541 | 15.6 | 1.03 | 6.968E-05 | 21.30 | 8.26E-08 | 23 | 0.931 | 7.69E-08 |
| 32 | 56 | 553 | 14.4 | 1.08 | 6.817E-05 | 19.39 | 8.87E-08 | 23 | 0.931 | 8.26E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **8.01E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/24/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-295 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.171 | 10.59 | Height, in | 4.196 | 10.66 |
| Top Diameter, mm | 72.680 | | Top Diameter, mm | 72.74 | |
| Middle Diameter, mm | 72.690 | | Middle Diameter, mm | 72.79 | |
| Bottom Diameter, mm | 72.740 | | Bottom Diameter, mm | 72.78 | |
| Average Diameter, cm | 7.270 | | Average Diameter, cm | 7.277 | |
| Area, $cm^2$ | 41.51 | | Area, $cm^2$ | 41.59 | |
| Volume, $cm^3$ | 439.82 | | Volume, $cm^3$ | 443.27 | |
| Wet Mass, g | 847.2 | | Wet Mass, g | 857.6 | |
| Wt. tare, gm | 8.33 | | Wt. tare, gm | 6.9 | |
| Wt. wet soil + tare, gm | 278.70 | | Wt. wet soil + tare, gm | 864.5 | |
| Wt. dry soil + tare, gm | 231.92 | | Wt. dry soil + tare, gm | 678.84 | |
| Moisture Content, % | 20.9% | | Moisture Content, % | 27.6% | |
| Dry Density, pcf | 99.4 | | Dry Density, pcf | 94.6 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.66 | | Void Ratio | 0.75 | |
| Saturation, % | 84% | | Saturation, % | 98% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.9

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.9 | 0.85 | | 29.70 | | 23 | 0.931 | |
| 1 | 49 | 109 | 25.4 | 0.87 | 1.441E-04 | 28.60 | 1.21E-07 | 23 | 0.931 | 1.13E-07 |
| 4 | 10 | 141 | 25.1 | 0.88 | 6.684E-05 | 28.36 | 5.67E-08 | 23 | 0.931 | 5.28E-08 |
| 9 | 19 | 309 | 24.7 | 0.90 | 4.067E-05 | 27.80 | 3.52E-08 | 23 | 0.931 | 3.27E-08 |
| 20 | 3 | 644 | 24.0 | 0.93 | 3.415E-05 | 26.76 | 3.07E-08 | 23 | 0.931 | 2.86E-08 |
| 28 | 58 | 535 | 23.6 | 0.94 | 2.349E-05 | 26.45 | 2.13E-08 | 23 | 0.931 | 1.99E-08 |
| 33 | 32 | 274 | 23.4 | 0.95 | 2.293E-05 | 26.33 | 2.09E-08 | 23 | 0.931 | 1.95E-08 |
| 41 | 5 | 453 | 23.1 | 0.96 | 2.081E-05 | 25.90 | 1.93E-08 | 23 | 0.931 | 1.80E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.15E-08** **cm/sec** |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/25/2015 | DATE: | 10/1/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-297 |
| LIFT NUMBER: | Lift 2 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.902 | 9.91 | Height, in | 3.889 | 9.88 |
| Top Diameter, mm | 72.710 | | Top Diameter, mm | 72.9 | |
| Middle Diameter, mm | 72.690 | | Middle Diameter, mm | 72.98 | |
| Bottom Diameter, mm | 72.750 | | Bottom Diameter, mm | 72.98 | |
| Average Diameter, cm | 7.272 | | Average Diameter, cm | 7.295 | |
| Area, $cm^2$ | 41.53 | | Area, $cm^2$ | 41.80 | |
| Volume, $cm^3$ | 411.60 | | Volume, $cm^3$ | 412.91 | |
| Wet Mass, g | 827.4 | | Wet Mass, g | 831.6 | |
| Wt. tare, gm | 6.89 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 331.72 | | Wt. wet soil + tare, gm | 839.9 | |
| Wt. dry soil + tare, gm | 277.56 | | Wt. dry soil + tare, gm | 693.22 | |
| Moisture Content, % | 20.0% | | Moisture Content, % | 21.4% | |
| Dry Density, pcf | 104.5 | | Dry Density, pcf | 103.5 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.58 | | Void Ratio | 0.60 | |
| Saturation, % | 91% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.5 | 0.85 | | 29.97 | | 23 | 0.931 | |
| 2 | 17 | 137 | 24.3 | 0.86 | 4.586E-05 | 29.67 | 3.70E-08 | 23 | 0.931 | 3.44E-08 |
| 9 | 58 | 461 | 23.9 | 0.87 | 2.726E-05 | 29.01 | 2.25E-08 | 23 | 0.931 | 2.09E-08 |
| 15 | 15 | 317 | 23.7 | 0.88 | 1.982E-05 | 28.88 | 1.64E-08 | 23 | 0.931 | 1.53E-08 |
| 28 | 20 | 785 | 23.2 | 0.90 | 2.001E-05 | 28.02 | 1.71E-08 | 23 | 0.931 | 1.59E-08 |
| 35 | 1 | 401 | 22.9 | 0.92 | 2.350E-05 | 27.75 | 2.03E-08 | 23 | 0.931 | 1.89E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.77E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/25/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-300 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.939 | 10.01 | Height, in | 3.93 | 9.98 |
| Top Diameter, mm | 72.710 | | Top Diameter, mm | 72.79 | |
| Middle Diameter, mm | 72.690 | | Middle Diameter, mm | 72.84 | |
| Bottom Diameter, mm | 72.760 | | Bottom Diameter, mm | 72.83 | |
| Average Diameter, cm | 7.272 | | Average Diameter, cm | 7.282 | |
| Area, $cm^2$ | 41.53 | | Area, $cm^2$ | 41.65 | |
| Volume, $cm^3$ | 415.54 | | Volume, $cm^3$ | 415.74 | |
| Wet Mass, g | 814.6 | | Wet Mass, g | 820.6 | |
| Wt. tare, gm | 6.9 | | Wt. tare, gm | 6.8 | |
| Wt. wet soil + tare, gm | 284.80 | | Wt. wet soil + tare, gm | 827.5 | |
| Wt. dry soil + tare, gm | 236.34 | | Wt. dry soil + tare, gm | 670.85 | |
| Moisture Content, % | 21.1% | | Moisture Content, % | 23.6% | |
| Dry Density, pcf | 101.0 | | Dry Density, pcf | 99.7 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.64 | | Void Ratio | 0.66 | |
| Saturation, % | 88% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.0 | 0.85 | | 29.06 | | 23 | 0.931 | |
| 1 | 31 | 91 | 23.3 | 0.88 | 2.417E-04 | 27.75 | 2.09E-07 | 23 | 0.931 | 1.95E-07 |
| 8 | 1 | 390 | 22.2 | 0.92 | 8.861E-05 | 26.04 | 8.17E-08 | 23 | 0.931 | 7.61E-08 |
| 11 | 27 | 206 | 21.7 | 0.94 | 7.625E-05 | 25.79 | 7.10E-08 | 23 | 0.931 | 6.61E-08 |
| 17 | 53 | 386 | 21.0 | 0.97 | 5.697E-05 | 24.74 | 5.53E-08 | 23 | 0.931 | 5.15E-08 |
| 23 | 42 | 349 | 20.4 | 1.00 | 5.401E-05 | 24.02 | 5.40E-08 | 23 | 0.931 | 5.03E-08 |
| 28 | 36 | 294 | 19.9 | 1.02 | 5.343E-05 | 23.43 | 5.48E-08 | 23 | 0.931 | 5.10E-08 |
| 32 | 43 | 247 | 19.5 | 1.03 | 5.088E-05 | 22.97 | 5.32E-08 | 23 | 0.931 | 4.95E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **5.06E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/25/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-305 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.018 | 10.21 | Height, in | 4.055 | 10.30 |
| Top Diameter, mm | 72.300 | | Top Diameter, mm | 72.56 | |
| Middle Diameter, mm | 72.390 | | Middle Diameter, mm | 72.64 | |
| Bottom Diameter, mm | 72.370 | | Bottom Diameter, mm | 72.63 | |
| Average Diameter, cm | 7.235 | | Average Diameter, cm | 7.261 | |
| Area, $cm^2$ | 41.12 | | Area, $cm^2$ | 41.41 | |
| Volume, $cm^3$ | 419.61 | | Volume, $cm^3$ | 426.49 | |
| Wet Mass, g | 781.1 | | Wet Mass, g | 799.5 | |
| Wt. tare, gm | 8.4 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 237.80 | | Wt. wet soil + tare, gm | 807.9 | |
| Wt. dry soil + tare, gm | 196.75 | | Wt. dry soil + tare, gm | 618.77 | |
| Moisture Content, % | 21.8% | | Moisture Content, % | 31.0% | |
| Dry Density, pcf | 95.4 | | Dry Density, pcf | 89.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.73 | | Void Ratio | 0.85 | |
| Saturation, % | 79% | | Saturation, % | 96% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.0 | 0.85 | | 29.72 | | 23 | 0.931 | |
| 2 | 4 | 124 | 24.5 | 0.87 | 1.267E-04 | 28.50 | 1.07E-07 | 23 | 0.931 | 1.00E-07 |
| 4 | 9 | 125 | 24.2 | 0.88 | 7.540E-05 | 28.24 | 6.45E-08 | 23 | 0.931 | 6.00E-08 |
| 6 | 20 | 131 | 24.0 | 0.89 | 4.796E-05 | 28.05 | 4.13E-08 | 23 | 0.931 | 3.84E-08 |
| 11 | 6 | 286 | 23.6 | 0.91 | 4.394E-05 | 27.42 | 3.87E-08 | 23 | 0.931 | 3.60E-08 |
| 18 | 57 | 471 | 23.2 | 0.92 | 2.668E-05 | 26.91 | 2.39E-08 | 23 | 0.931 | 2.23E-08 |
| 22 | 58 | 241 | 23.0 | 0.93 | 2.607E-05 | 26.78 | 2.35E-08 | 23 | 0.931 | 2.19E-08 |
| 31 | 27 | 509 | 22.6 | 0.95 | 2.469E-05 | 26.15 | 2.28E-08 | 23 | 0.931 | 2.12E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.54E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/25/2015 | DATE: | 10/1/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-310 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.136 | 10.51 | Height, in | 4.175 | 10.60 |
| Top Diameter, mm | 72.790 | | Top Diameter, mm | 73.19 | |
| Middle Diameter, mm | 72.830 | | Middle Diameter, mm | 73.25 | |
| Bottom Diameter, mm | 72.850 | | Bottom Diameter, mm | 73.23 | |
| Average Diameter, cm | 7.282 | | Average Diameter, cm | 7.322 | |
| Area, $cm^2$ | 41.65 | | Area, $cm^2$ | 42.11 | |
| Volume, $cm^3$ | 437.57 | | Volume, $cm^3$ | 446.56 | |
| Wet Mass, g | 846.8 | | Wet Mass, g | 862.3 | |
| Wt. tare, gm | 8.2 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 266.40 | | Wt. wet soil + tare, gm | 870.7 | |
| Wt. dry soil + tare, gm | 218.10 | | Wt. dry soil + tare, gm | 687.24 | |
| Moisture Content, % | 23.0% | | Moisture Content, % | 27.0% | |
| Dry Density, pcf | 98.2 | | Dry Density, pcf | 94.9 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.68 | | Void Ratio | 0.74 | |
| Saturation, % | 89% | | Saturation, % | 96% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.5 | 0.85 | | 29.47 | | 23 | 0.931 | |
| 2 | 33 | 153 | 24.5 | 0.89 | 2.053E-04 | 27.34 | 1.78E-07 | 23 | 0.931 | 1.66E-07 |
| 6 | 13 | 220 | 23.8 | 0.92 | 9.996E-05 | 26.67 | 8.90E-08 | 23 | 0.931 | 8.29E-08 |
| 12 | 13 | 360 | 22.9 | 0.96 | 7.854E-05 | 25.43 | 7.33E-08 | 23 | 0.931 | 6.83E-08 |
| 19 | 47 | 454 | 21.9 | 1.00 | 6.920E-05 | 24.14 | 6.81E-08 | 23 | 0.931 | 6.34E-08 |
| 25 | 21 | 334 | 21.2 | 1.03 | 6.584E-05 | 23.46 | 6.66E-08 | 23 | 0.931 | 6.21E-08 |
| 30 | 35 | 314 | 20.5 | 1.05 | 7.004E-05 | 22.60 | 7.36E-08 | 23 | 0.931 | 6.85E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **6.56E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/25/2015 | DATE: | 10/1/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-325 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.259 | 10.82 | Height, in | 4.251 | 10.80 |
| Top Diameter, mm | 72.710 | | Top Diameter, mm | 73.01 | |
| Middle Diameter, mm | 72.690 | | Middle Diameter, mm | 72.9 | |
| Bottom Diameter, mm | 72.770 | | Bottom Diameter, mm | 72.94 | |
| Average Diameter, cm | 7.272 | | Average Diameter, cm | 7.295 | |
| Area, $cm^2$ | 41.54 | | Area, $cm^2$ | 41.80 | |
| Volume, $cm^3$ | 449.34 | | Volume, $cm^3$ | 451.30 | |
| Wet Mass, g | 843.0 | | Wet Mass, g | 855.9 | |
| Wt. tare, gm | 7 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 217.40 | | Wt. wet soil + tare, gm | 864.2 | |
| Wt. dry soil + tare, gm | 173.39 | | Wt. dry soil + tare, gm | 666.98 | |
| Moisture Content, % | 26.4% | | Moisture Content, % | 29.9% | |
| Dry Density, pcf | 92.6 | | Dry Density, pcf | 91.1 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.79 | | Void Ratio | 0.82 | |
| Saturation, % | 89% | | Saturation, % | 97% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 29.20 | | 23 | 0.931 | |
| 2 | 13 | 133 | 25.8 | 0.86 | 4.724E-05 | 28.89 | 3.91E-08 | 23 | 0.931 | 3.64E-08 |
| 8 | 30 | 377 | 25.5 | 0.87 | 2.500E-05 | 28.47 | 2.10E-08 | 23 | 0.931 | 1.96E-08 |
| 15 | 39 | 429 | 25.0 | 0.89 | 3.662E-05 | 27.74 | 3.16E-08 | 23 | 0.931 | 2.94E-08 |
| 25 | 21 | 582 | 24.2 | 0.92 | 4.318E-05 | 26.59 | 3.89E-08 | 23 | 0.931 | 3.62E-08 |
| 33 | 53 | 512 | 23.5 | 0.95 | 4.295E-05 | 25.80 | 3.98E-08 | 23 | 0.931 | 3.71E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **3.06E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/26/2015 | DATE: | 10/1/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-330 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.165 | 10.58 | Height, in | 4.216 | 10.71 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.82 | |
| Middle Diameter, mm | 72.560 | | Middle Diameter, mm | 72.88 | |
| Bottom Diameter, mm | 72.490 | | Bottom Diameter, mm | 72.87 | |
| Average Diameter, cm | 7.252 | | Average Diameter, cm | 7.286 | |
| Area, $cm^2$ | 41.31 | | Area, $cm^2$ | 41.69 | |
| Volume, $cm^3$ | 436.97 | | Volume, $cm^3$ | 446.44 | |
| Wet Mass, g | 872.6 | | Wet Mass, g | 889.9 | |
| Wt. tare, gm | 8.1 | | Wt. tare, gm | 10.4 | |
| Wt. wet soil + tare, gm | 243.60 | | Wt. wet soil + tare, gm | 900.3 | |
| Wt. dry soil + tare, gm | 199.15 | | Wt. dry soil + tare, gm | 725.9 | |
| Moisture Content, % | 23.3% | | Moisture Content, % | 24.4% | |
| Dry Density, pcf | 101.1 | | Dry Density, pcf | 100.0 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.64 | | Void Ratio | 0.65 | |
| Saturation, % | 97% | | Saturation, % | 99% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 29.86 | | 23 | 0.931 | |
| 7 | 1 | 421 | 25.6 | 0.87 | 2.985E-05 | 28.76 | 2.49E-08 | 23 | 0.931 | 2.32E-08 |
| 12 | 44 | 343 | 25.2 | 0.88 | 3.664E-05 | 28.28 | 3.11E-08 | 23 | 0.931 | 2.89E-08 |
| 18 | 2 | 318 | 25.0 | 0.89 | 1.976E-05 | 28.15 | 1.68E-08 | 23 | 0.931 | 1.57E-08 |
| 22 | 32 | 270 | 24.8 | 0.90 | 2.327E-05 | 27.91 | 2.00E-08 | 23 | 0.931 | 1.86E-08 |
| 30 | 59 | 507 | 24.5 | 0.91 | 1.859E-05 | 27.48 | 1.62E-08 | 23 | 0.931 | 1.51E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.96E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/25/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-335 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.272 | 10.85 | Height, in | 4.296 | 10.91 |
| Top Diameter, mm | 73.120 | | Top Diameter, mm | 73.44 | |
| Middle Diameter, mm | 73.100 | | Middle Diameter, mm | 73.47 | |
| Bottom Diameter, mm | 73.170 | | Bottom Diameter, mm | 73.38 | |
| Average Diameter, cm | 7.313 | | Average Diameter, cm | 7.343 | |
| Area, $cm^2$ | 42.00 | | Area, $cm^2$ | 42.35 | |
| Volume, $cm^3$ | 455.77 | | Volume, $cm^3$ | 462.10 | |
| Wet Mass, g | 870.3 | | Wet Mass, g | 888.3 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 251.50 | | Wt. wet soil + tare, gm | 896.6 | |
| Wt. dry soil + tare, gm | 204.82 | | Wt. dry soil + tare, gm | 704.5 | |
| Moisture Content, % | 23.8% | | Moisture Content, % | 27.6% | |
| Dry Density, pcf | 96.3 | | Dry Density, pcf | 94.0 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.72 | | Void Ratio | 0.76 | |
| Saturation, % | 88% | | Saturation, % | 96% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 29.11 | | 23 | 0.931 | |
| 2 | 33 | 153 | 25.6 | 0.87 | 8.213E-05 | 28.23 | 6.87E-08 | 23 | 0.931 | 6.40E-08 |
| 6 | 54 | 261 | 25.2 | 0.88 | 4.815E-05 | 27.75 | 4.10E-08 | 23 | 0.931 | 3.82E-08 |
| 11 | 57 | 303 | 24.8 | 0.90 | 4.147E-05 | 27.27 | 3.59E-08 | 23 | 0.931 | 3.34E-08 |
| 18 | 9 | 372 | 24.4 | 0.92 | 3.378E-05 | 26.79 | 2.98E-08 | 23 | 0.931 | 2.77E-08 |
| 22 | 48 | 279 | 24.2 | 0.92 | 2.252E-05 | 26.67 | 1.99E-08 | 23 | 0.931 | 1.86E-08 |
| 27 | 32 | 284 | 24.0 | 0.93 | 2.212E-05 | 26.43 | 1.98E-08 | 23 | 0.931 | 1.84E-08 |
| 32 | 19 | 287 | 23.8 | 0.94 | 2.189E-05 | 26.19 | 1.97E-08 | 23 | 0.931 | 1.84E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.08E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/26/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-340 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.321 | 10.98 | Height, in | 4.34 | 11.02 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.97 | |
| Middle Diameter, mm | 72.540 | | Middle Diameter, mm | 73.06 | |
| Bottom Diameter, mm | 72.550 | | Bottom Diameter, mm | 73.04 | |
| Average Diameter, cm | 7.253 | | Average Diameter, cm | 7.302 | |
| Area, $cm^2$ | 41.32 | | Area, $cm^2$ | 41.88 | |
| Volume, $cm^3$ | 453.51 | | Volume, $cm^3$ | 461.67 | |
| Wet Mass, g | 872.3 | | Wet Mass, g | 880 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 242.40 | | Wt. wet soil + tare, gm | 888.3 | |
| Wt. dry soil + tare, gm | 194.29 | | Wt. dry soil + tare, gm | 691.15 | |
| Moisture Content, % | 25.9% | | Moisture Content, % | 28.9% | |
| Dry Density, pcf | 95.4 | | Dry Density, pcf | 92.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.73 | | Void Ratio | 0.79 | |
| Saturation, % | 93% | | Saturation, % | 97% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 27.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.0 | 0.85 | | 29.93 | | 23 | 0.931 | |
| 3 | 25 | 205 | 26.1 | 0.89 | 1.379E-04 | 28.19 | 1.17E-07 | 23 | 0.931 | 1.09E-07 |
| 7 | 52 | 267 | 25.4 | 0.92 | 8.236E-05 | 27.48 | 7.16E-08 | 23 | 0.931 | 6.66E-08 |
| 11 | 9 | 197 | 25.0 | 0.93 | 6.379E-05 | 27.18 | 5.60E-08 | 23 | 0.931 | 5.22E-08 |
| 17 | 1 | 352 | 24.4 | 0.96 | 5.355E-05 | 26.35 | 4.85E-08 | 23 | 0.931 | 4.52E-08 |
| 21 | 42 | 281 | 23.9 | 0.98 | 5.590E-05 | 25.82 | 5.17E-08 | 23 | 0.931 | 4.81E-08 |
| 27 | 24 | 342 | 23.4 | 1.00 | 4.593E-05 | 25.23 | 4.35E-08 | 23 | 0.931 | 4.05E-08 |
| 31 | 55 | 271 | 23.0 | 1.01 | 4.637E-05 | 24.81 | 4.46E-08 | 23 | 0.931 | 4.16E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **4.38E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/26/2015 | DATE: | 10/1/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-345 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.171 | 10.59 | Height, in | 4.179 | 10.61 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.91 | |
| Middle Diameter, mm | 72.560 | | Middle Diameter, mm | 73.03 | |
| Bottom Diameter, mm | 72.490 | | Bottom Diameter, mm | 72.99 | |
| Average Diameter, cm | 7.252 | | Average Diameter, cm | 7.298 | |
| Area, $cm^2$ | 41.31 | | Area, $cm^2$ | 41.83 | |
| Volume, $cm^3$ | 437.60 | | Volume, $cm^3$ | 443.98 | |
| Wet Mass, g | 836.4 | | Wet Mass, g | 845.9 | |
| Wt. tare, gm | 8.5 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 240.80 | | Wt. wet soil + tare, gm | 854.2 | |
| Wt. dry soil + tare, gm | 194.94 | | Wt. dry soil + tare, gm | 668.41 | |
| Moisture Content, % | 24.6% | | Moisture Content, % | 28.1% | |
| Dry Density, pcf | 95.7 | | Dry Density, pcf | 92.8 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.73 | | Void Ratio | 0.78 | |
| Saturation, % | 90% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 29.82 | | 23 | 0.931 | |
| 3 | 40 | 220 | 24.8 | 0.90 | 1.714E-04 | 27.54 | 1.49E-07 | 23 | 0.931 | 1.39E-07 |
| 6 | 6 | 146 | 24.3 | 0.92 | 1.076E-04 | 27.36 | 9.40E-08 | 23 | 0.931 | 8.76E-08 |
| 12 | 39 | 393 | 23.4 | 0.96 | 7.195E-05 | 26.00 | 6.62E-08 | 23 | 0.931 | 6.16E-08 |
| 20 | 38 | 479 | 22.5 | 0.99 | 5.903E-05 | 24.89 | 5.67E-08 | 23 | 0.931 | 5.28E-08 |
| 29 | 40 | 542 | 21.5 | 1.03 | 5.796E-05 | 23.60 | 5.87E-08 | 23 | 0.931 | 5.47E-08 |
| 35 | 26 | 346 | 20.9 | 1.06 | 5.448E-05 | 23.11 | 5.64E-08 | 23 | 0.931 | 5.25E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **5.54E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/26/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-347 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.262 | 10.83 | Height, in | 4.331 | 11.00 |
| Top Diameter, mm | 73.060 | | Top Diameter, mm | 73.49 | |
| Middle Diameter, mm | 73.090 | | Middle Diameter, mm | 73.55 | |
| Bottom Diameter, mm | 73.050 | | Bottom Diameter, mm | 73.56 | |
| Average Diameter, cm | 7.307 | | Average Diameter, cm | 7.353 | |
| Area, $cm^2$ | 41.93 | | Area, $cm^2$ | 42.47 | |
| Volume, $cm^3$ | 453.92 | | Volume, $cm^3$ | 467.18 | |
| Wet Mass, g | 894.1 | | Wet Mass, g | 917.6 | |
| Wt. tare, gm | 9 | | Wt. tare, gm | 7 | |
| Wt. wet soil + tare, gm | 224.30 | | Wt. wet soil + tare, gm | 924.5 | |
| Wt. dry soil + tare, gm | 182.99 | | Wt. dry soil + tare, gm | 735.94 | |
| Moisture Content, % | 23.7% | | Moisture Content, % | 25.9% | |
| Dry Density, pcf | 99.3 | | Dry Density, pcf | 97.4 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.66 | | Void Ratio | 0.70 | |
| Saturation, % | 95% | | Saturation, % | 98% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.0 | 0.85 | | 29.18 | | 23 | 0.931 | |
| 2 | 55 | 175 | 25.1 | 0.89 | 1.616E-04 | 27.11 | 1.40E-07 | 23 | 0.931 | 1.31E-07 |
| 6 | 14 | 199 | 24.3 | 0.92 | 1.263E-04 | 26.22 | 1.13E-07 | 23 | 0.931 | 1.06E-07 |
| 8 | 36 | 142 | 23.8 | 0.94 | 1.106E-04 | 25.80 | 1.01E-07 | 23 | 0.931 | 9.40E-08 |
| 11 | 13 | 157 | 23.3 | 0.96 | 1.001E-04 | 25.21 | 9.35E-08 | 23 | 0.931 | 8.70E-08 |
| 15 | 32 | 259 | 22.6 | 0.99 | 8.491E-05 | 24.26 | 8.24E-08 | 23 | 0.931 | 7.68E-08 |
| 18 | 46 | 194 | 22.1 | 1.01 | 8.097E-05 | 23.78 | 8.02E-08 | 23 | 0.931 | 7.47E-08 |
| 21 | 28 | 162 | 21.7 | 1.03 | 7.757E-05 | 23.37 | 7.82E-08 | 23 | 0.931 | 7.28E-08 |
| 24 | 56 | 208 | 21.2 | 1.05 | 7.552E-05 | 22.71 | 7.83E-08 | 23 | 0.931 | 7.29E-08 |
| 29 | 15 | 259 | 20.6 | 1.07 | 7.278E-05 | 21.94 | 7.81E-08 | 23 | 0.931 | 7.27E-08 |
| 33 | 3 | 228 | 20.1 | 1.09 | 6.889E-05 | 21.40 | 7.58E-08 | 23 | 0.931 | 7.06E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **7.23E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/26/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-350 |
| LIFT NUMBER: | Lift 3 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.336 | 11.01 | Height, in | 4.387 | 11.14 |
| Top Diameter, mm | 73.010 | | Top Diameter, mm | 73.51 | |
| Middle Diameter, mm | 72.970 | | Middle Diameter, mm | 73.44 | |
| Bottom Diameter, mm | 73.060 | | Bottom Diameter, mm | 73.47 | |
| Average Diameter, cm | 7.301 | | Average Diameter, cm | 7.347 | |
| Area, $cm^2$ | 41.87 | | Area, $cm^2$ | 42.40 | |
| Volume, $cm^3$ | 461.12 | | Volume, $cm^3$ | 472.44 | |
| Wet Mass, g | 919.5 | | Wet Mass, g | 952.8 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 218.90 | | Wt. wet soil + tare, gm | 961.1 | |
| Wt. dry soil + tare, gm | 183.46 | | Wt. dry soil + tare, gm | 768.19 | |
| Moisture Content, % | 20.2% | | Moisture Content, % | 25.4% | |
| Dry Density, pcf | 103.5 | | Dry Density, pcf | 100.4 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.60 | | Void Ratio | 0.65 | |
| Saturation, % | 90% | | Saturation, % | 104% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 27.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.0 | 0.85 | | 29.82 | | 23 | 0.931 | |
| 1 | 36 | 96 | 26.3 | 0.88 | 2.291E-04 | 28.24 | 1.91E-07 | 23 | 0.931 | 1.78E-07 |
| 4 | 2 | 146 | 25.8 | 0.90 | 1.076E-04 | 27.77 | 9.14E-08 | 23 | 0.931 | 8.51E-08 |
| 7 | 37 | 215 | 25.3 | 0.92 | 7.306E-05 | 27.19 | 6.34E-08 | 23 | 0.931 | 5.90E-08 |
| 15 | 16 | 459 | 24.4 | 0.96 | 6.160E-05 | 25.89 | 5.61E-08 | 23 | 0.931 | 5.22E-08 |
| 23 | 51 | 515 | 23.6 | 0.99 | 4.880E-05 | 25.01 | 4.60E-08 | 23 | 0.931 | 4.28E-08 |
| 29 | 22 | 331 | 23.1 | 1.01 | 4.746E-05 | 24.60 | 4.55E-08 | 23 | 0.931 | 4.24E-08 |
| 39 | 43 | 621 | 22.3 | 1.04 | 4.047E-05 | 23.49 | 4.06E-08 | 23 | 0.931 | 3.78E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **4.38E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/28/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-355 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.226 | 10.73 | Height, in | 4.229 | 10.74 |
| Top Diameter, mm | 72.100 | | Top Diameter, mm | 72.44 | |
| Middle Diameter, mm | 72.020 | | Middle Diameter, mm | 72.47 | |
| Bottom Diameter, mm | 72.040 | | Bottom Diameter, mm | 72.43 | |
| Average Diameter, cm | 7.205 | | Average Diameter, cm | 7.245 | |
| Area, $cm^2$ | 40.78 | | Area, $cm^2$ | 41.22 | |
| Volume, $cm^3$ | 437.68 | | Volume, $cm^3$ | 442.79 | |
| Wet Mass, g | 809.2 | | Wet Mass, g | 819 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 243.30 | | Wt. wet soil + tare, gm | 827.3 | |
| Wt. dry soil + tare, gm | 196.13 | | Wt. dry soil + tare, gm | 630.31 | |
| Moisture Content, % | 25.1% | | Moisture Content, % | 31.7% | |
| Dry Density, pcf | 92.2 | | Dry Density, pcf | 87.7 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.79 | | Void Ratio | 0.89 | |
| Saturation, % | 84% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.4

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.4 | 0.85 | | 29.90 | | 23 | 0.931 | |
| 1 | 19 | 79 | 26.0 | 0.87 | 1.591E-04 | 29.14 | 1.32E-07 | 23 | 0.931 | 1.23E-07 |
| 3 | 51 | 152 | 25.5 | 0.89 | 1.033E-04 | 28.47 | 8.80E-08 | 23 | 0.931 | 8.20E-08 |
| 7 | 2 | 191 | 24.9 | 0.91 | 9.869E-05 | 27.68 | 8.65E-08 | 23 | 0.931 | 8.05E-08 |
| 12 | 49 | 347 | 23.9 | 0.95 | 9.054E-05 | 26.22 | 8.38E-08 | 23 | 0.931 | 7.80E-08 |
| 17 | 23 | 274 | 23.2 | 0.98 | 8.026E-05 | 25.55 | 7.62E-08 | 23 | 0.931 | 7.10E-08 |
| 21 | 31 | 248 | 22.6 | 1.01 | 7.601E-05 | 24.88 | 7.41E-08 | 23 | 0.931 | 6.90E-08 |
| 25 | 28 | 237 | 22.1 | 1.03 | 6.628E-05 | 24.34 | 6.61E-08 | 23 | 0.931 | 6.15E-08 |
| 32 | 13 | 405 | 21.3 | 1.06 | 6.206E-05 | 23.18 | 6.50E-08 | 23 | 0.931 | 6.05E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **6.55E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/26/2015 | DATE: | 10/1/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-360 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| Sample Data, Initial | | centimeters | Sample Data, Final | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.054 | 10.30 | Height, in | 4.073 | 10.35 |
| Top Diameter, mm | 73.010 | | Top Diameter, mm | 73.48 | |
| Middle Diameter, mm | 73.050 | | Middle Diameter, mm | 73.55 | |
| Bottom Diameter, mm | 72.960 | | Bottom Diameter, mm | 73.4 | |
| Average Diameter, cm | 7.301 | | Average Diameter, cm | 7.348 | |
| Area, $cm^2$ | 41.86 | | Area, $cm^2$ | 42.40 | |
| Volume, $cm^3$ | 431.05 | | Volume, $cm^3$ | 438.67 | |
| Wet Mass, g | 818.2 | | Wet Mass, g | 829.4 | |
| Wt. tare, gm | 8.5 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 239.70 | | Wt. wet soil + tare, gm | 838 | |
| Wt. dry soil + tare, gm | 198.96 | | Wt. dry soil + tare, gm | 651.11 | |
| Moisture Content, % | 21.4% | | Moisture Content, % | 29.1% | |
| Dry Density, pcf | 97.6 | | Dry Density, pcf | 91.4 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.69 | | Void Ratio | 0.81 | |
| Saturation, % | 82% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.8

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.8 | 0.85 | | 29.21 | | 23 | 0.931 | |
| 1 | 32 | 92 | 24.4 | 0.87 | 1.366E-04 | 28.32 | 1.14E-07 | 23 | 0.931 | 1.06E-07 |
| 5 | 23 | 231 | 23.9 | 0.89 | 6.800E-05 | 27.62 | 5.81E-08 | 23 | 0.931 | 5.41E-08 |
| 10 | 33 | 310 | 23.4 | 0.91 | 5.067E-05 | 26.99 | 4.43E-08 | 23 | 0.931 | 4.12E-08 |
| 17 | 4 | 391 | 22.9 | 0.93 | 4.017E-05 | 26.36 | 3.59E-08 | 23 | 0.931 | 3.35E-08 |
| 22 | 15 | 311 | 22.5 | 0.94 | 4.041E-05 | 25.92 | 3.68E-08 | 23 | 0.931 | 3.42E-08 |
| 32 | 2 | 587 | 21.9 | 0.97 | 3.211E-05 | 25.03 | 3.03E-08 | 23 | 0.931 | 2.82E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **3.43E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/28/2015 | DATE: | 10/1/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-365 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.124 | 10.47 | Height, in | 4.153 | 10.55 |
| Top Diameter, mm | 72.860 | | Top Diameter, mm | 73.06 | |
| Middle Diameter, mm | 72.830 | | Middle Diameter, mm | 73.13 | |
| Bottom Diameter, mm | 72.810 | | Bottom Diameter, mm | 73.11 | |
| Average Diameter, cm | 7.283 | | Average Diameter, cm | 7.310 | |
| Area, $cm^2$ | 41.66 | | Area, $cm^2$ | 41.97 | |
| Volume, $cm^3$ | 436.42 | | Volume, $cm^3$ | 442.71 | |
| Wet Mass, g | 867.2 | | Wet Mass, g | 878.1 | |
| Wt. tare, gm | 8.2 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 237.30 | | Wt. wet soil + tare, gm | 886.5 | |
| Wt. dry soil + tare, gm | 197.26 | | Wt. dry soil + tare, gm | 720.44 | |
| Moisture Content, % | 21.2% | | Moisture Content, % | 23.3% | |
| Dry Density, pcf | 102.3 | | Dry Density, pcf | 100.4 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.62 | | Void Ratio | 0.65 | |
| Saturation, % | 91% | | Saturation, % | 95% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.5 | 0.85 | | 29.56 | | 23 | 0.931 | |
| 5 | 49 | 349 | 25.0 | 0.87 | 4.501E-05 | 28.42 | 3.77E-08 | 23 | 0.931 | 3.51E-08 |
| 12 | 9 | 380 | 24.7 | 0.88 | 2.480E-05 | 28.17 | 2.10E-08 | 23 | 0.931 | 1.95E-08 |
| 18 | 33 | 384 | 24.4 | 0.90 | 2.454E-05 | 27.80 | 2.10E-08 | 23 | 0.931 | 1.96E-08 |
| 25 | 16 | 403 | 24.1 | 0.91 | 2.339E-05 | 27.43 | 2.03E-08 | 23 | 0.931 | 1.89E-08 |
| 31 | 7 | 351 | 23.9 | 0.92 | 1.790E-05 | 27.24 | 1.57E-08 | 23 | 0.931 | 1.46E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.82E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/29/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-370 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.008 | 10.18 | Height, in | 4.035 | 10.25 |
| Top Diameter, mm | 72.920 | | Top Diameter, mm | 73.47 | |
| Middle Diameter, mm | 73.020 | | Middle Diameter, mm | 73.51 | |
| Bottom Diameter, mm | 72.980 | | Bottom Diameter, mm | 73.52 | |
| Average Diameter, cm | 7.297 | | Average Diameter, cm | 7.350 | |
| Area, $cm^2$ | 41.82 | | Area, $cm^2$ | 42.43 | |
| Volume, $cm^3$ | 425.77 | | Volume, $cm^3$ | 434.85 | |
| Wet Mass, g | 843.2 | | Wet Mass, g | 853.1 | |
| Wt. tare, gm | 10.2 | | Wt. tare, gm | 8.5 | |
| Wt. wet soil + tare, gm | 238.90 | | Wt. wet soil + tare, gm | 861.7 | |
| Wt. dry soil + tare, gm | 193.45 | | Wt. dry soil + tare, gm | 683.35 | |
| Moisture Content, % | 24.8% | | Moisture Content, % | 26.4% | |
| Dry Density, pcf | 99.0 | | Dry Density, pcf | 96.8 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.67 | | Void Ratio | 0.71 | |
| Saturation, % | 98% | | Saturation, % | 99% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.0 | 0.85 | | 29.80 | | 23 | 0.931 | |
| 1 | 48 | 108 | 24.2 | 0.88 | 2.327E-04 | 28.06 | 1.95E-07 | 23 | 0.931 | 1.82E-07 |
| 3 | 18 | 90 | 23.8 | 0.90 | 1.396E-04 | 27.81 | 1.18E-07 | 23 | 0.931 | 1.10E-07 |
| 5 | 29 | 131 | 23.2 | 0.92 | 1.439E-04 | 26.92 | 1.26E-07 | 23 | 0.931 | 1.17E-07 |
| 8 | 22 | 173 | 22.5 | 0.95 | 1.271E-04 | 25.96 | 1.15E-07 | 23 | 0.931 | 1.07E-07 |
| 11 | 1 | 159 | 21.9 | 0.98 | 1.186E-04 | 25.26 | 1.11E-07 | 23 | 0.931 | 1.03E-07 |
| 14 | 0 | 179 | 21.3 | 1.00 | 1.053E-04 | 24.49 | 1.01E-07 | 23 | 0.931 | 9.44E-08 |
| 17 | 18 | 198 | 20.7 | 1.03 | 9.520E-05 | 23.73 | 9.46E-08 | 23 | 0.931 | 8.81E-08 |
| 26 | 8 | 530 | 19.3 | 1.08 | 8.299E-05 | 21.42 | 9.13E-08 | 23 | 0.931 | 8.50E-08 |
| 28 | 37 | 149 | 18.9 | 1.10 | 8.434E-05 | 21.56 | 9.22E-08 | 23 | 0.931 | 8.59E-08 |
| 32 | 29 | 232 | 18.3 | 1.12 | 8.125E-05 | 20.66 | 9.27E-08 | 23 | 0.931 | 8.63E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **8.63E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/29/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-375 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.432 | 11.26 | Height, in | 4.472 | 11.36 |
| Top Diameter, mm | 73.120 | | Top Diameter, mm | 73.46 | |
| Middle Diameter, mm | 73.150 | | Middle Diameter, mm | 73.59 | |
| Bottom Diameter, mm | 73.070 | | Bottom Diameter, mm | 73.55 | |
| Average Diameter, cm | 7.311 | | Average Diameter, cm | 7.353 | |
| Area, $cm^2$ | 41.98 | | Area, $cm^2$ | 42.47 | |
| Volume, $cm^3$ | 472.62 | | Volume, $cm^3$ | 482.38 | |
| Wet Mass, g | 923.4 | | Wet Mass, g | 946.2 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.1 | |
| Wt. wet soil + tare, gm | 198.00 | | Wt. wet soil + tare, gm | 954.3 | |
| Wt. dry soil + tare, gm | 164.64 | | Wt. dry soil + tare, gm | 762.66 | |
| Moisture Content, % | 21.3% | | Moisture Content, % | 25.4% | |
| Dry Density, pcf | 100.5 | | Dry Density, pcf | 97.6 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.65 | | Void Ratio | 0.69 | |
| Saturation, % | 88% | | Saturation, % | 97% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^3$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 27.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.0 | 0.85 | | 29.18 | | 23 | 0.931 | |
| 3 | 8 | 188 | 26.0 | 0.89 | 1.671E-04 | 27.18 | 1.45E-07 | 23 | 0.931 | 1.35E-07 |
| 7 | 49 | 281 | 25.3 | 0.92 | 7.826E-05 | 26.55 | 6.94E-08 | 23 | 0.931 | 6.46E-08 |
| 11 | 56 | 247 | 24.7 | 0.94 | 7.631E-05 | 25.92 | 6.93E-08 | 23 | 0.931 | 6.46E-08 |
| 17 | 17 | 321 | 24.0 | 0.97 | 6.851E-05 | 25.06 | 6.44E-08 | 23 | 0.931 | 5.99E-08 |
| 24 | 41 | 444 | 23.1 | 1.01 | 6.368E-05 | 23.90 | 6.27E-08 | 23 | 0.931 | 5.84E-08 |
| 29 | 7 | 266 | 22.6 | 1.03 | 5.905E-05 | 23.56 | 5.90E-08 | 23 | 0.931 | 5.50E-08 |
| 34 | 42 | 335 | 22.0 | 1.05 | 5.627E-05 | 22.81 | 5.81E-08 | 23 | 0.931 | 5.41E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **5.68E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/29/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-380 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.913 | 9.94 | Height, in | 3.964 | 10.07 |
| Top Diameter, mm | 72.930 | | Top Diameter, mm | 73.51 | |
| Middle Diameter, mm | 72.900 | | Middle Diameter, mm | 73.57 | |
| Bottom Diameter, mm | 73.010 | | Bottom Diameter, mm | 73.49 | |
| Average Diameter, cm | 7.295 | | Average Diameter, cm | 7.352 | |
| Area, $cm^2$ | 41.79 | | Area, $cm^2$ | 42.46 | |
| Volume, $cm^3$ | 415.38 | | Volume, $cm^3$ | 427.47 | |
| Wet Mass, g | 822.7 | | Wet Mass, g | 849.4 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.4 | |
| Wt. wet soil + tare, gm | 245.80 | | Wt. wet soil + tare, gm | 857.8 | |
| Wt. dry soil + tare, gm | 200.91 | | Wt. dry soil + tare, gm | 688.1 | |
| Moisture Content, % | 23.3% | | Moisture Content, % | 25.0% | |
| Dry Density, pcf | 100.2 | | Dry Density, pcf | 99.2 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.65 | | Void Ratio | 0.67 | |
| Saturation, % | 95% | | Saturation, % | 99% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 24.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 24.0 | 0.85 | | 29.25 | | 23 | 0.931 | |
| 2 | 48 | 168 | 23.2 | 0.88 | 1.496E-04 | 27.32 | 1.29E-07 | 23 | 0.931 | 1.20E-07 |
| 7 | 8 | 260 | 22.4 | 0.92 | 9.666E-05 | 26.28 | 8.66E-08 | 23 | 0.931 | 8.07E-08 |
| 10 | 47 | 219 | 21.8 | 0.94 | 8.607E-05 | 25.63 | 7.91E-08 | 23 | 0.931 | 7.37E-08 |
| 16 | 33 | 346 | 21.0 | 0.97 | 7.264E-05 | 24.46 | 6.99E-08 | 23 | 0.931 | 6.51E-08 |
| 21 | 8 | 275 | 20.4 | 1.00 | 6.854E-05 | 23.81 | 6.78E-08 | 23 | 0.931 | 6.31E-08 |
| 25 | 12 | 244 | 19.9 | 1.02 | 6.438E-05 | 23.23 | 6.53E-08 | 23 | 0.931 | 6.08E-08 |
| 30 | 48 | 336 | 19.2 | 1.05 | 6.545E-05 | 22.19 | 6.95E-08 | 23 | 0.931 | 6.47E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **6.34E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/29/2015 | DATE: | 10/1/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-385 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| Sample Data, Initial | | centimeters | Sample Data, Final | | centimeters |
|---|---|---|---|---|---|
| Height, in | 2.539 | 6.45 | Height, in | 2.542 | 6.46 |
| Top Diameter, mm | 73.020 | | Top Diameter, mm | 73.49 | |
| Middle Diameter, mm | 72.900 | | Middle Diameter, mm | 73.58 | |
| Bottom Diameter, mm | 72.880 | | Bottom Diameter, mm | 73.43 | |
| Average Diameter, cm | 7.293 | | Average Diameter, cm | 7.350 | |
| Area, $cm^2$ | 41.78 | | Area, $cm^2$ | 42.43 | |
| Volume, $cm^3$ | 269.43 | | Volume, $cm^3$ | 273.95 | |
| Wet Mass, g | 498.7 | | Wet Mass, g | 508.8 | |
| Wt. tare, gm | 8.52 | | Wt. tare, gm | 7 | |
| Wt. wet soil + tare, gm | 296.80 | | Wt. wet soil + tare, gm | 515.7 | |
| Wt. dry soil + tare, gm | 255.18 | | Wt. dry soil + tare, gm | 403.33 | |
| Moisture Content, % | 16.9% | | Moisture Content, % | 28.4% | |
| Dry Density, pcf | 98.8 | | Dry Density, pcf | 90.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.67 | | Void Ratio | 0.83 | |
| Saturation, % | 66% | | Saturation, % | 90% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 16.2

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 16.2 | 0.85 | | 29.90 | | 23 | 0.931 | |
| 2 | 38 | 158 | 16.0 | 0.86 | 3.977E-05 | 29.25 | 3.20E-08 | 23 | 0.931 | 2.98E-08 |
| 8 | 23 | 345 | 15.6 | 0.87 | 3.642E-05 | 28.24 | 3.04E-08 | 23 | 0.931 | 2.83E-08 |
| 15 | 38 | 435 | 15.3 | 0.89 | 2.167E-05 | 27.73 | 1.84E-08 | 23 | 0.931 | 1.71E-08 |
| 24 | 55 | 557 | 14.9 | 0.90 | 2.256E-05 | 26.82 | 1.98E-08 | 23 | 0.931 | 1.85E-08 |
| 30 | 12 | 317 | 14.7 | 0.91 | 1.982E-05 | 26.62 | 1.75E-08 | 23 | 0.931 | 1.63E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **2.01E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/29/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-390 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.085 | 10.38 | Height, in | 4.159 | 10.56 |
| Top Diameter, mm | 73.010 | | Top Diameter, mm | 73.64 | |
| Middle Diameter, mm | 72.960 | | Middle Diameter, mm | 73.75 | |
| Bottom Diameter, mm | 72.980 | | Bottom Diameter, mm | 73.73 | |
| Average Diameter, cm | 7.298 | | Average Diameter, cm | 7.371 | |
| Area, $cm^2$ | 41.83 | | Area, $cm^2$ | 42.67 | |
| Volume, $cm^3$ | 434.07 | | Volume, $cm^3$ | 450.74 | |
| Wet Mass, g | 803.6 | | Wet Mass, g | 847.5 | |
| Wt. tare, gm | 8.5 | | Wt. tare, gm | 6.9 | |
| Wt. wet soil + tare, gm | 275.93 | | Wt. wet soil + tare, gm | 854.4 | |
| Wt. dry soil + tare, gm | 228.93 | | Wt. dry soil + tare, gm | 665.69 | |
| Moisture Content, % | 21.3% | | Moisture Content, % | 28.6% | |
| Dry Density, pcf | 95.2 | | Dry Density, pcf | 91.2 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.74 | | Void Ratio | 0.81 | |
| Saturation, % | 77% | | Saturation, % | 93% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.0 | 0.85 | | 29.23 | | 23 | 0.931 | |
| 1 | 20 | 80 | 24.4 | 0.87 | 2.356E-04 | 27.60 | 2.00E-07 | 23 | 0.931 | 1.86E-07 |
| 3 | 18 | 118 | 24.0 | 0.89 | 1.065E-04 | 27.23 | 9.17E-08 | 23 | 0.931 | 8.54E-08 |
| 5 | 59 | 161 | 23.6 | 0.91 | 7.805E-05 | 26.73 | 6.84E-08 | 23 | 0.931 | 6.37E-08 |
| 11 | 26 | 327 | 22.9 | 0.94 | 6.725E-05 | 25.68 | 6.14E-08 | 23 | 0.931 | 5.72E-08 |
| 16 | 27 | 301 | 22.3 | 0.96 | 6.262E-05 | 25.00 | 5.87E-08 | 23 | 0.931 | 5.47E-08 |
| 21 | 30 | 303 | 21.8 | 0.98 | 5.184E-05 | 24.44 | 4.97E-08 | 23 | 0.931 | 4.63E-08 |
| 26 | 39 | 309 | 21.3 | 1.00 | 5.083E-05 | 23.82 | 5.00E-08 | 23 | 0.931 | 4.66E-08 |
| 31 | 13 | 274 | 20.9 | 1.02 | 4.586E-05 | 23.39 | 4.60E-08 | 23 | 0.931 | 4.28E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **4.76E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/29/2015 | DATE: | 10/1/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-395 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.404 | 11.19 | Height, in | 4.412 | 11.21 |
| Top Diameter, mm | 72.830 | | Top Diameter, mm | 72.96 | |
| Middle Diameter, mm | 72.850 | | Middle Diameter, mm | 73.01 | |
| Bottom Diameter, mm | 72.790 | | Bottom Diameter, mm | 73 | |
| Average Diameter, cm | 7.282 | | Average Diameter, cm | 7.299 | |
| Area, $cm^2$ | 41.65 | | Area, $cm^2$ | 41.84 | |
| Volume, $cm^3$ | 465.92 | | Volume, $cm^3$ | 468.91 | |
| Wet Mass, g | 906.0 | | Wet Mass, g | 919.4 | |
| Wt. tare, gm | 8.2 | | Wt. tare, gm | 8.6 | |
| Wt. wet soil + tare, gm | 240.90 | | Wt. wet soil + tare, gm | 928 | |
| Wt. dry soil + tare, gm | 197.64 | | Wt. dry soil + tare, gm | 741.31 | |
| Moisture Content, % | 22.8% | | Moisture Content, % | 25.5% | |
| Dry Density, pcf | 98.8 | | Dry Density, pcf | 97.5 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.67 | | Void Ratio | 0.70 | |
| Saturation, % | 90% | | Saturation, % | 97% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 27.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.0 | 0.85 | | 29.36 | | 23 | 0.931 | |
| 2 | 14 | 134 | 26.5 | 0.87 | 1.172E-04 | 28.43 | 9.85E-08 | 23 | 0.931 | 9.18E-08 |
| 7 | 35 | 321 | 25.9 | 0.90 | 5.872E-05 | 27.67 | 5.07E-08 | 23 | 0.931 | 4.72E-08 |
| 13 | 16 | 341 | 25.4 | 0.92 | 4.606E-05 | 27.15 | 4.06E-08 | 23 | 0.931 | 3.78E-08 |
| 19 | 34 | 378 | 25.0 | 0.93 | 3.324E-05 | 26.74 | 2.97E-08 | 23 | 0.931 | 2.77E-08 |
| 25 | 5 | 331 | 24.7 | 0.94 | 2.847E-05 | 26.45 | 2.57E-08 | 23 | 0.931 | 2.40E-08 |
| 30 | 53 | 348 | 24.4 | 0.96 | 2.708E-05 | 26.10 | 2.48E-08 | 23 | 0.931 | 2.31E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.81E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/30/2015 | DATE: | 10/9/2015 |

**GEOTECHNICAL TESTING LABORATORY**
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**HOUSTON, TEXAS**

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-397 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.033 | 10.24 | Height, in | 4.041 | 10.26 |
| Top Diameter, mm | 72.510 | | Top Diameter, mm | 72.62 | |
| Middle Diameter, mm | 72.490 | | Middle Diameter, mm | 72.69 | |
| Bottom Diameter, mm | 72.550 | | Bottom Diameter, mm | 72.67 | |
| Average Diameter, cm | 7.252 | | Average Diameter, cm | 7.266 | |
| Area, $cm^2$ | 41.30 | | Area, $cm^2$ | 41.46 | |
| Volume, $cm^3$ | 423.08 | | Volume, $cm^3$ | 425.60 | |
| Wet Mass, g | 832.4 | | Wet Mass, g | 840.2 | |
| Wt. tare, gm | 6.8 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 290.20 | | Wt. wet soil + tare, gm | 848.6 | |
| Wt. dry soil + tare, gm | 232.38 | | Wt. dry soil + tare, gm | 673.05 | |
| Moisture Content, % | 25.6% | | Moisture Content, % | 26.4% | |
| Dry Density, pcf | 97.7 | | Dry Density, pcf | 97.5 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.69 | | Void Ratio | 0.70 | |
| Saturation, % | 98% | | Saturation, % | 100% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 25.3

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 25.3 | 0.85 | | 29.98 | | 23 | 0.931 | |
| 2 | 38 | 158 | 25.0 | 0.86 | 5.965E-05 | 29.35 | 4.90E-08 | 23 | 0.931 | 4.56E-08 |
| 11 | 8 | 510 | 24.5 | 0.88 | 3.080E-05 | 28.58 | 2.60E-08 | 23 | 0.931 | 2.42E-08 |
| 18 | 37 | 449 | 24.2 | 0.90 | 2.099E-05 | 28.33 | 1.79E-08 | 23 | 0.931 | 1.66E-08 |
| 25 | 32 | 415 | 23.9 | 0.91 | 2.271E-05 | 27.94 | 1.96E-08 | 23 | 0.931 | 1.83E-08 |
| 30 | 18 | 286 | 23.7 | 0.92 | 2.197E-05 | 27.75 | 1.91E-08 | 23 | 0.931 | 1.78E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **1.92E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/30/2015 | DATE: | 10/9/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-400 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 3.818 | 9.70 | Height, in | 3.835 | 9.74 |
| Top Diameter, mm | 72.140 | | Top Diameter, mm | 72.33 | |
| Middle Diameter, mm | 72.170 | | Middle Diameter, mm | 72.39 | |
| Bottom Diameter, mm | 72.130 | | Bottom Diameter, mm | 72.41 | |
| Average Diameter, cm | 7.215 | | Average Diameter, cm | 7.238 | |
| Area, $cm^2$ | 40.88 | | Area, $cm^2$ | 41.14 | |
| Volume, $cm^3$ | 396.45 | | Volume, $cm^3$ | 400.76 | |
| Wet Mass, g | 762.2 | | Wet Mass, g | 780 | |
| Wt. tare, gm | 8.4 | | Wt. tare, gm | 8.2 | |
| Wt. wet soil + tare, gm | 156.30 | | Wt. wet soil + tare, gm | 788.2 | |
| Wt. dry soil + tare, gm | 123.55 | | Wt. dry soil + tare, gm | 611.04 | |
| Moisture Content, % | 28.4% | | Moisture Content, % | 29.4% | |
| Dry Density, pcf | 93.4 | | Dry Density, pcf | 93.9 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.77 | | Void Ratio | 0.76 | |
| Saturation, % | 98% | | Saturation, % | 102% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 23.5

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 23.5 | 0.85 | | 29.34 | | 23 | 0.931 | |
| 1 | 27 | 87 | 23.2 | 0.86 | 1.083E-04 | 28.60 | 9.21E-08 | 23 | 0.931 | 8.57E-08 |
| 2 | 52 | 85 | 23.0 | 0.87 | 7.392E-05 | 28.40 | 6.33E-08 | 23 | 0.931 | 5.89E-08 |
| 9 | 35 | 403 | 22.4 | 0.90 | 4.677E-05 | 27.32 | 4.16E-08 | 23 | 0.931 | 3.87E-08 |
| 15 | 46 | 371 | 22.1 | 0.91 | 2.540E-05 | 27.12 | 2.28E-08 | 23 | 0.931 | 2.12E-08 |
| 22 | 17 | 391 | 21.8 | 0.92 | 2.410E-05 | 26.72 | 2.19E-08 | 23 | 0.931 | 2.04E-08 |
| 31 | 35 | 558 | 21.4 | 0.94 | 2.252E-05 | 26.12 | 2.10E-08 | 23 | 0.931 | 1.95E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **2.50E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/30/2015 | DATE: | 10/9/2015 |

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# FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-405 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.339 | 11.02 | Height, in | 4.362 | 11.08 |
| Top Diameter, mm | 72.050 | | Top Diameter, mm | 72.61 | |
| Middle Diameter, mm | 72.090 | | Middle Diameter, mm | 72.72 | |
| Bottom Diameter, mm | 72.050 | | Bottom Diameter, mm | 72.69 | |
| Average Diameter, cm | 7.206 | | Average Diameter, cm | 7.267 | |
| Area, $cm^2$ | 40.79 | | Area, $cm^2$ | 41.48 | |
| Volume, $cm^3$ | 449.51 | | Volume, $cm^3$ | 459.58 | |
| Wet Mass, g | 869.1 | | Wet Mass, g | 878.6 | |
| Wt. tare, gm | 8.3 | | Wt. tare, gm | 8.3 | |
| Wt. wet soil + tare, gm | 261.90 | | Wt. wet soil + tare, gm | 886.9 | |
| Wt. dry soil + tare, gm | 212.65 | | Wt. dry soil + tare, gm | 695.27 | |
| Moisture Content, % | 24.1% | | Moisture Content, % | 27.9% | |
| Dry Density, pcf | 97.2 | | Dry Density, pcf | 93.3 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.70 | | Void Ratio | 0.77 | |
| Saturation, % | 91% | | Saturation, % | 96% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 26.4

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3/s$) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 26.4 | 0.85 | | 29.12 | | 23 | 0.931 | |
| 1 | 31 | 91 | 25.8 | 0.87 | 2.071E-04 | 27.90 | 1.79E-07 | 23 | 0.931 | 1.67E-07 |
| 4 | 1 | 150 | 25.3 | 0.90 | 1.047E-04 | 27.37 | 9.22E-08 | 23 | 0.931 | 8.59E-08 |
| 7 | 32 | 211 | 24.7 | 0.92 | 8.933E-05 | 26.60 | 8.10E-08 | 23 | 0.931 | 7.54E-08 |
| 11 | 44 | 252 | 24.1 | 0.94 | 7.480E-05 | 25.89 | 6.96E-08 | 23 | 0.931 | 6.48E-08 |
| 18 | 55 | 431 | 23.2 | 0.98 | 6.560E-05 | 24.65 | 6.42E-08 | 23 | 0.931 | 5.97E-08 |
| 23 | 45 | 290 | 22.6 | 1.01 | 6.500E-05 | 24.12 | 6.50E-08 | 23 | 0.931 | 6.05E-08 |
| 28 | 49 | 304 | 22.0 | 1.03 | 6.201E-05 | 23.42 | 6.38E-08 | 23 | 0.931 | 5.94E-08 |
| 32 | 31 | 222 | 21.6 | 1.05 | 5.661E-05 | 23.06 | 5.92E-08 | 23 | 0.931 | 5.51E-08 |
| | | | | | | **HYDRAULIC CONDUCTIVITY REPORTED AS** | | | | **5.87E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/30/2015 | DATE: | 10/9/2015 |

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## FLEXIBLE WALL TRIAXIAL PERMEABILITY

ASTM D 5084 METHOD F, CONSTANT VOLUME - FALLING HEAD

| | |
|---|---|
| PROJECT TITLE: | Luminant |
| PROJECT NUMBER: | 1525714 |
| SAMPLE ID: | CL-410 |
| LIFT NUMBER: | Lift 4 |

| | | |
|---|---|---|
| Cell Pressure = | 80 | psi |
| Backwater Pressure = | 70 | psi |
| Run Number = | 1 | |
| Permeant Used= | De-Aired Water | |

| **Sample Data, Initial** | | centimeters | **Sample Data, Final** | | centimeters |
|---|---|---|---|---|---|
| Height, in | 4.319 | 10.97 | Height, in | 4.353 | 11.06 |
| Top Diameter, mm | 72.190 | | Top Diameter, mm | 72.34 | |
| Middle Diameter, mm | 72.270 | | Middle Diameter, mm | 72.35 | |
| Bottom Diameter, mm | 72.250 | | Bottom Diameter, mm | 72.4 | |
| Average Diameter, cm | 7.224 | | Average Diameter, cm | 7.236 | |
| Area, $cm^2$ | 40.98 | | Area, $cm^2$ | 41.13 | |
| Volume, $cm^3$ | 449.60 | | Volume, $cm^3$ | 454.73 | |
| Wet Mass, g | 905.8 | | Wet Mass, g | 915.6 | |
| Wt. tare, gm | 8.4 | | Wt. tare, gm | 9 | |
| Wt. wet soil + tare, gm | 274.10 | | Wt. wet soil + tare, gm | 924.6 | |
| Wt. dry soil + tare, gm | 228.91 | | Wt. dry soil + tare, gm | 750.89 | |
| Moisture Content, % | 20.5% | | Moisture Content, % | 23.4% | |
| Dry Density, pcf | 104.3 | | Dry Density, pcf | 101.8 | |
| Specific Gravity | 2.65 | Assumed | Specific Gravity | 2.65 | |
| Void Ratio | 0.58 | | Void Ratio | 0.62 | |
| Saturation, % | 93% | | Saturation, % | 99% | |
| Effective Stress, psi | 10 | | | | |

**Manometer Constants:**

$a_{annulus}$ = 0.76712 $cm^2$

$a_{center\ pipette}$ = 0.03142 $cm^3$

**Initial Manometer Readings**

Pipette = 27.0

Annulus = 0.85

| Minutes | Seconds | Δt (sec) | Pipette (cm) | Annulus (cm) | Flowrate ($cm^3$/s) | Gradient (i) | Hydraulic Conductivity (cm/sec) | Temp. °C | rt temp. corr. | Hydraulic Conductivity (cm/sec) @20°C |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 27.0 | 0.85 | | 29.94 | | 23 | 0.931 | |
| 6 | 44 | 404 | 26.0 | 0.89 | 7.776E-05 | 27.93 | 6.77E-08 | 23 | 0.931 | 6.30E-08 |
| 10 | 53 | 249 | 25.5 | 0.91 | 6.308E-05 | 27.64 | 5.55E-08 | 23 | 0.931 | 5.17E-08 |
| 14 | 23 | 210 | 25.1 | 0.93 | 5.984E-05 | 27.22 | 5.35E-08 | 23 | 0.931 | 4.98E-08 |
| 19 | 34 | 311 | 24.6 | 0.95 | 5.051E-05 | 26.57 | 4.62E-08 | 23 | 0.931 | 4.30E-08 |
| 23 | 45 | 251 | 24.2 | 0.96 | 5.007E-05 | 26.16 | 4.65E-08 | 23 | 0.931 | 4.33E-08 |
| 29 | 13 | 328 | 23.7 | 0.99 | 4.789E-05 | 25.51 | 4.57E-08 | 23 | 0.931 | 4.25E-08 |
| 33 | 42 | 269 | 23.3 | 1.00 | 4.672E-05 | 25.09 | 4.53E-08 | 23 | 0.931 | 4.22E-08 |
| | | | | | | HYDRAULIC CONDUCTIVITY REPORTED AS | | | | **4.28E-08** cm/sec |

| | | | |
|---|---|---|---|
| TECH: | PN | CHECKED: | VK |
| DATE: | 9/30/2015 | DATE: | 10/9/2015 |

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# APPENDIX C
# EMBANKMENT FILL FIELD MOISTURE/DENSITY TEST RESULTS

# EMBANKMENT FILL FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-001 | 07/12/15 | 4475 | 1890 | 1 | 99.8 | 17.4 | QCL-8 | 102.1 | 17.9 | 97.7 | -0.5 | PASS | JK |
| SF-002 | 07/12/15 | 4275 | 1875 | 1 | 101.9 | 17.9 | QCL-8 | 102.1 | 17.9 | 99.8 | 0.0 | PASS | JK |
| SF-003 | 07/12/15 | 4290 | 1700 | 1 | 96.4 | 16.5 | QCL-14-1 | 100.7 | 17.8 | 95.7 | -1.3 | PASS | JK |
| SF-004 | 07/12/15 | 4425 | 1930 | 2 | 97.7 | 15.8 | QCL-14-1 | 100.7 | 17.8 | 97.0 | -2.0 | PASS | JK |
| SF-005 | 07/12/15 | 4200 | 1790 | 2 | 98.9 | 16.6 | QCL-14-1 | 100.7 | 17.8 | 98.2 | -1.2 | PASS | JK |
| SF-006 | 07/12/15 | 4300 | 1840 | 3 | 100.3 | 17.0 | QCL-14-1 | 100.7 | 17.8 | 99.6 | -0.8 | PASS | JK |
| SF-007 | 07/12/15 | 4175 | 1625 | 3 | 94.0 | 21.0 | QCL-2-4 | 96.7 | 22.0 | 97.2 | -1.0 | PASS | JK |
| SF-008 | 07/13/15 | 5110 | 1375 | 1 | 92.3 | 21.1 | QCL-2-4 | 96.7 | 22.0 | 95.4 | -0.9 | PASS | JK |
| SF-009 | 07/13/15 | 5350 | 1440 | 1 | 96.2 | 19.9 | QCL-2-4 | 96.7 | 22.0 | 99.5 | -2.1 | PASS | JK |
| SF-010 | 07/13/15 | 4350 | 1875 | 5 | 100.0 | 19.6 | QCL-2-4 | 96.7 | 22.0 | 103.4 | -2.4 | PASS | JK |
| SF-011 | 07/13/15 | 5360 | 1860 | 1 | 101.5 | 12.3 | QCL-FGD-C-4 | 103.8 | 14.5 | 97.8 | -2.2 | PASS | JK |
| SF-012 | 07/13/15 | 4150 | 1650 | 7 | 97.0 | 20.4 | QCL-2-4 | 96.7 | 22.0 | 100.3 | -1.6 | PASS | JK |
| SF-013 | 07/14/15 | 5390 | 1525 | 2 | 99.9 | 15.6 | QCL-FGD-C-4 | 103.8 | 14.5 | 96.2 | 1.1 | PASS | JK |
| SF-014 | 07/14/15 | 4260 | 1810 | 8 | 95.7 | 21.0 | QCL-2-4 | 96.7 | 22.0 | 99.0 | -1.0 | PASS | JK |
| SF-015 | 07/14/15 | 5060 | 2020 | 2 | 100.2 | 18.2 | QCL-14-1 | 100.7 | 17.8 | 99.5 | 0.4 | PASS | JK |
| SF-016 | 07/14/15 | 4190 | 1750 | 9 | 92.0 | 22.7 | QCL-2-4 | 96.7 | 22.0 | 95.1 | 0.7 | PASS | JK |
| SF-017 | 07/14/15 | 4970 | 1360 | 3 | 101.3 | 13.4 | QCL-FGD-C-4 | 103.8 | 14.5 | 97.6 | -1.1 | PASS | JK |
| SF-018 | 07/15/15 | 5440 | 1560 | 3 | 101.4 | 13.7 | QCL-FGD-C-4 | 103.8 | 14.5 | 97.7 | -0.8 | PASS | JK |
| SF-019 | 07/15/15 | 5000 | 2090 | 3 | 99.0 | 14.3 | QCL-FGD-C-4 | 103.8 | 14.5 | 95.4 | -0.2 | PASS | JK |
| SF-020 | 07/15/15 | 4610 | 1450 | 1 | 103.7 | 17.3 | QCL-23 | 105.2 | 18.4 | 98.6 | -1.1 | PASS | JK |
| SF-021 | 07/17/15 | 5075 | 1410 | 4 | 101.0 | 19.2 | QCL-14-1 | 100.7 | 17.8 | 100.3 | 1.4 | PASS | JK |
| SF-022 | 07/17/15 | 5430 | 1510 | 4 | 98.8 | 16.2 | QCL-14-1 | 100.7 | 17.8 | 98.1 | -1.6 | PASS | JK |

# EMBANKMENT FILL FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-023 | 07/17/15 | 5240 | 1990 | 4 | 98.9 | 14.0 | QCL-FGD-C-4 | 103.8 | 14.5 | 95.3 | -0.5 | PASS | JK |
| SF-024 | 07/17/15 | 4240 | 1575 | 10 | 101.2 | 17.8 | QCL-14-1 | 100.7 | 17.8 | 100.5 | 0.0 | PASS | JK |
| SF-025 | 07/17/15 | 4640 | 1460 | 2 | 104.0 | 18.5 | QCL-23 | 105.2 | 18.4 | 98.9 | 0.1 | PASS | JK |
| SF-026 | 07/17/15 | | | 5 | 103.7 | 17.4 | QCL-23 | 105.2 | 18.4 | 98.6 | -1.0 | PASS | JK |
| SF-027 | 07/20/15 | 5000 | 1450 | 6 | 117.9 | 13.8 | QCL-3-04 | 110.3 | 14.4 | 106.9 | -0.6 | PASS | JK |
| SF-028 | 07/20/15 | 5500 | 1750 | 6 | 116.5 | 14.0 | QCL-3-04 | 110.3 | 14.4 | 105.6 | -0.4 | PASS | JK |
| SF-029 | 07/21/15 | 5200 | 1950 | 7 | 96.0 | 16.2 | QCL-14-1 | 100.7 | 17.8 | 95.3 | -1.6 | PASS | JK |
| SF-030 | 07/21/15 | 5500 | 1700 | 7 | 96.9 | 15.9 | QCL-14-1 | 100.7 | 17.8 | 96.2 | -1.9 | PASS | JK |
| SF-031 | 07/21/15 | 5200 | 1350 | 7 | 96.3 | 16.1 | QCL-14-1 | 100.7 | 17.8 | 95.6 | -1.7 | PASS | JK |
| SF-032 | 07/21/15 | 4950 | 1500 | 7 | 96.8 | 15.8 | QCL-14-1 | 100.7 | 17.8 | 96.1 | -2.0 | PASS | JK |
| SF-033 | 07/21/15 | 4450 | 1450 | 5 | 96.6 | 15.8 | QCL-14-1 | 100.7 | 17.8 | 95.9 | -2.0 | PASS | JK |
| SF-034 | 07/21/15 | 4550 | 1500 | 5 | 96.2 | 16.7 | QCL-14-1 | 100.7 | 17.8 | 95.5 | -1.1 | PASS | JK |
| SF-035 | 07/21/15 | 4650 | 1550 | 5 | 100.2 | 17.0 | QCL-14-1 | 100.7 | 17.8 | 99.5 | -0.8 | PASS | JK |
| SF-036 | 07/21/15 | 4550 | 1900 | 10 | 97.3 | 19.5 | QCL-14-1 | 100.7 | 17.8 | 96.6 | 1.7 | PASS | JK |
| SF-037 | 07/21/15 | 4450 | 1850 | 10 | 98.6 | 18.3 | QCL-14-1 | 100.7 | 17.8 | 97.9 | 0.5 | PASS | JK |
| SF-038 | 07/21/15 | 4250 | 1800 | 10 | 98.2 | 18.8 | QCL-14-1 | 100.7 | 17.8 | 97.5 | 1.0 | PASS | JK |
| SF-039 | 07/21/15 | 4200 | 1750 | 11 | 98.2 | 18.5 | QCL-14-1 | 100.7 | 17.8 | 97.5 | 0.7 | PASS | JK |
| SF-040 | 07/21/15 | 4250 | 1650 | 11 | 97.5 | 19.6 | QCL-14-1 | 100.7 | 17.8 | 96.8 | 1.8 | PASS | JK |
| SF-041 | 07/21/15 | 4300 | 1500 | 11 | 98.4 | 18.8 | QCL-14-1 | 100.7 | 17.8 | 97.7 | 1.0 | PASS | JK |
| SF-042 | 07/21/15 | 4350 | 1500 | 11 | 98.0 | 18.7 | QCL-14-1 | 100.7 | 17.8 | 97.3 | 0.9 | PASS | JK |
| SF-043 | 07/22/15 | 4750 | 1500 | 6 | 99.4 | 17.5 | QCL-14-1 | 100.7 | 17.8 | 98.7 | -0.3 | PASS | JK |
| SF-044 | 07/22/15 | 4550 | 1450 | 6 | 98.6 | 18.5 | QCL-14-1 | 100.7 | 17.8 | 97.9 | 0.7 | PASS | JK |

# EMBANKMENT FILL FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-045 | 07/22/15 | 4900 | 1500 | 8 | 100.2 | 17.3 | QCL-14-1 | 100.7 | 17.8 | 99.5 | -0.5 | PASS | JK |
| SF-046 | 07/22/15 | 5250 | 1350 | 8 | 98.7 | 18.4 | QCL-14-1 | 100.7 | 17.8 | 98.0 | 0.6 | PASS | JK |
| SF-047 | 07/22/15 | 5400 | 1850 | 8 | 99.2 | 18.3 | QCL-14-1 | 100.7 | 17.8 | 98.5 | 0.5 | PASS | JK |
| SF-048 | 07/22/15 | 4900 | 2100 | 8 | 99.4 | 17.7 | QCL-14-1 | 100.7 | 17.8 | 98.7 | -0.1 | PASS | JK |
| SF-049 | 07/22/15 | 4250 | 1800 | 12 | 99.2 | 18.2 | QCL-14-1 | 100.7 | 17.8 | 98.5 | 0.4 | PASS | JK |
| SF-050 | 07/23/15 | 5150 | 1350 | 9 | 99.2 | 18.4 | QCL-14-1 | 100.7 | 17.8 | 98.5 | 0.6 | PASS | JK |
| SF-051 | 07/23/15 | 5250 | 1950 | 9 | 99.6 | 18.3 | QCL-14-1 | 100.7 | 17.8 | 98.9 | 0.5 | PASS | JK |
| SF-052 | 07/23/15 | 4400 | 1900 | 11 | 99.4 | 18.1 | QCL-14-1 | 100.7 | 17.8 | 98.7 | 0.3 | PASS | JK |
| SF-053 | 07/23/15 | 4700 | 1500 | 7 | 98.0 | 19.3 | QCL-14-1 | 100.7 | 17.8 | 97.3 | 1.5 | PASS | JK |
| SF-054 | 07/23/15 | 5450 | 1600 | 10 | 96.0 | 18.9 | QCL-14-1 | 100.7 | 17.8 | 95.3 | 1.1 | PASS | JK |
| SF-055 | 07/23/15 | 5000 | 2100 | 10 | 96.8 | 17.8 | QCL-14-1 | 100.7 | 17.8 | 96.1 | 0.0 | PASS | JK |
| SF-056 | 07/23/15 | 5000 | 1400 | 10 | 96.6 | 18.8 | QCL-14-1 | 100.7 | 17.8 | 95.9 | 1.0 | PASS | JK |
| SF-057 | 07/24/15 | 4700 | 1500 | 8 | 96.9 | 18.5 | QCL-14-1 | 100.7 | 17.8 | 96.2 | 0.7 | PASS | JK |
| SF-058 | 07/24/15 | 4400 | 1900 | 12 | 96.4 | 18.6 | QCL-14-1 | 100.7 | 17.8 | 95.7 | 0.8 | PASS | JK |
| SF-059 | 07/24/15 | 5200 | 1300 | 11 | 96.6 | 17.9 | QCL-14-1 | 100.7 | 17.8 | 95.9 | 0.1 | PASS | JK |
| SF-060 | 07/24/15 | 5450 | 1850 | 11 | 97.6 | 18.0 | QCL-14-1 | 100.7 | 17.8 | 96.9 | 0.2 | PASS | JK |
| SF-061 | 07/24/15 | 4950 | 2100 | 11 | 97.1 | 17.8 | QCL-14-1 | 100.7 | 17.8 | 96.4 | 0.0 | PASS | JK |
| SF-062 | 07/24/15 | 4650 | 1450 | 9 | 96.5 | 18.1 | QCL-14-1 | 100.7 | 17.8 | 95.8 | 0.3 | PASS | JK |
| SF-063 | 07/24/15 | 4450 | 1900 | 13 | 96.6 | 17.9 | QCL-14-1 | 100.7 | 17.8 | 95.9 | 0.1 | PASS | JK |
| SF-064 | 07/27/15 | 5400 | 1550 | 12 | 96.4 | 18.6 | QCL-14-1 | 100.7 | 17.8 | 95.7 | 0.8 | PASS | JK |
| SF-065 | 07/27/15 | 5050 | 2050 | 12 | 97.6 | 17.2 | QCL-14-1 | 100.7 | 17.8 | 96.9 | -0.6 | PASS | JK |
| SF-066 | 07/27/15 | 1200 | 5050 | 1 | 97.7 | 17.6 | QCL-14-1 | 100.7 | 17.8 | 97.0 | -0.2 | PASS | JK |

# EMBANKMENT FILL FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-067 | 07/27/15 | 4650 | 1450 | 10 | 96.9 | 18.3 | QCL-14-1 | 100.7 | 17.8 | 96.2 | 0.5 | PASS | JK |
| SF-068 | 07/27/15 | 4850 | 1850 | 2 | 96.3 | 18.6 | QCL-14-1 | 100.7 | 17.8 | 95.6 | 0.8 | PASS | JK |
| SF-069 | 07/28/15 | 5000 | 1750 | 3 | 100.2 | 18.2 | QCL-14-1 | 100.7 | 17.8 | 99.5 | 0.4 | PASS | JK |
| SF-070 | 07/28/15 | 5500 | 1750 | 13 | 96.9 | 15.8 | QCL-14-1 | 100.7 | 17.8 | 96.2 | -2.0 | PASS | JK |
| SF-071 | 07/28/15 | 5200 | 1300 | 13 | 96.6 | 15.8 | QCL-14-1 | 100.7 | 17.8 | 95.9 | -2.0 | PASS | JK |
| SF-072 | 07/28/15 | 5050 | 2050 | 13 | 96.9 | 15.9 | QCL-14-1 | 100.7 | 17.8 | 96.2 | -1.9 | PASS | JK |
| SF-073 | 07/28/15 | 5150 | 1650 | 4 | 98.4 | 18.8 | QCL-14-1 | 100.7 | 17.8 | 97.7 | 1.0 | PASS | JK |
| SF-074 | 07/28/15 | 4200 | 1450 | 11 | 98.6 | 18.5 | QCL-14-1 | 100.7 | 17.8 | 97.9 | 0.7 | PASS | JK |
| SF-075 | 07/28/15 | 4250 | 1550 | 12 | 98.0 | 19.3 | QCL-14-1 | 100.7 | 17.8 | 97.3 | 1.5 | PASS | JK |
| SF-076 | 07/29/15 | 5050 | 1400 | 14 | 96.6 | 17.9 | QCL-14-1 | 100.7 | 17.8 | 95.9 | 0.1 | PASS | JK |
| SF-077 | 07/29/15 | 5500 | 1650 | 14 | 97.7 | 17.6 | QCL-14-1 | 100.7 | 17.8 | 97.0 | -0.2 | PASS | JK |
| SF-078 | 07/29/15 | 5250 | 2000 | 14 | 96.4 | 16.5 | QCL-14-1 | 100.7 | 17.8 | 95.7 | -1.3 | PASS | JK |
| SF-079 | 07/29/15 | 4350 | 1850 | 14 | 98.6 | 18.3 | QCL-14-1 | 100.7 | 17.8 | 97.9 | 0.5 | PASS | JK |
| SF-080 | 07/29/15 | 5100 | 1700 | 5 | 99.2 | 18.2 | QCL-14-1 | 100.7 | 17.8 | 98.5 | 0.4 | PASS | JK |
| SF-081 | 07/29/15 | 4700 | 1450 | 12 | 99.6 | 18.3 | QCL-14-1 | 100.7 | 17.8 | 98.9 | 0.5 | PASS | JK |
| SF-082 | 07/30/15 | 4625 | 1425 | 13 | 95.8 | 18.9 | QCL-14-1 | 100.7 | 17.8 | 95.1 | 1.1 | PASS | JPH |
| SF-083 | 07/30/15 | 5150 | 1325 | 15 | 103.7 | 15.8 | QCL-3-02 | 105.9 | 17.3 | 97.9 | -1.5 | PASS | JPH |
| SF-084 | 07/30/15 | 4260 | 1540 | 13 | 102.8 | 14.3 | QCL-3-02 | 105.9 | 17.3 | 97.1 | -3.0 | PASS | JPH |
| SF-085 | 07/31/15 | 4975 | 1760 | 6 | 104.7 | 16.2 | QCL-3-02 | 105.9 | 17.3 | 98.9 | -1.1 | PASS | JPH |
| SF-086 | 07/31/15 | 4225 | 1575 | 15 | 102.2 | 17.0 | QCL-3-02 | 105.9 | 17.3 | 96.5 | -0.3 | PASS | JPH |
| SF-087 | 07/31/15 | 5090 | 1710 | 7 | 102.2 | 16.5 | QCL-3-02 | 105.9 | 17.3 | 96.5 | -0.8 | PASS | JPH |
| SF-088 | 07/31/15 | 4775 | 1925 | 8 | 101.8 | 15.7 | QCL-3-02 | 105.9 | 17.3 | 96.1 | -1.6 | PASS | JPH |

# EMBANKMENT FILL FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-089 | 07/31/15 | 5175 | 1650 | 8 | 103.8 | 17.9 | QCL-3-02 | 105.9 | 17.3 | 98.0 | 0.6 | PASS | JPH |
| SF-090 | 08/03/15 | 5200 | 1650 | 9 | 101.4 | 16.9 | QCL-3-03 | 106.0 | 16.2 | 95.7 | 0.7 | PASS | JK |
| SF-091 | 08/03/15 | 4850 | 1850 | 9 | 101.1 | 17.4 | QCL-3-03 | 106.0 | 16.2 | 95.4 | 1.2 | PASS | JK |
| SF-092 | 08/03/15 | 5300 | 1300 | 16 | 101.4 | 16.5 | QCL-3-03 | 106.0 | 16.2 | 95.7 | 0.3 | PASS | JK |
| SF-093 | 08/03/15 | 5450 | 1850 | 16 | 101.8 | 17.3 | QCL-3-03 | 106.0 | 16.2 | 96.0 | 1.1 | PASS | JK |
| SF-094 | 08/03/15 | 9450 | 2100 | 16 | 102.4 | 16.4 | QCL-3-03 | 106.0 | 16.2 | 96.6 | 0.2 | PASS | JK |
| SF-095 | 08/04/15 | 4400 | 1900 | 15 | 101.0 | 17.3 | QCL-3-03 | 106.0 | 16.2 | 95.3 | 1.1 | PASS | JK |
| SF-096 | 08/04/15 | 4250 | 1600 | 16 | 101.3 | 16.9 | QCL-3-03 | 106.0 | 16.2 | 95.6 | 0.7 | PASS | JK |
| SF-097 | 08/04/15 | 5050 | 1750 | 10 | 102.8 | 16.3 | QCL-3-03 | 106.0 | 16.2 | 97.0 | 0.1 | PASS | JK |
| SF-098 | 08/04/15 | 5300 | 1300 | 17 | 101.9 | 16.9 | QCL-3-03 | 106.0 | 16.2 | 96.1 | 0.7 | PASS | JK |
| SF-099 | 08/04/15 | 5450 | 1850 | 17 | 101.2 | 17.4 | QCL-3-03 | 106.0 | 16.2 | 95.5 | 1.2 | PASS | JK |
| SF-100 | 08/05/15 | 5000 | 1450 | 18 | 101.2 | 16.7 | QCL-3-03 | 106.0 | 16.2 | 95.5 | 0.5 | PASS | JK |
| SF-101 | 08/05/15 | 5400 | 1500 | 18 | 101.9 | 16.3 | QCL-3-03 | 106.0 | 16.2 | 96.1 | 0.1 | PASS | JK |
| SF-102 | 08/05/15 | 5150 | 2000 | 18 | 101.9 | 16.6 | QCL-3-03 | 106.0 | 16.2 | 96.1 | 0.4 | PASS | JK |
| SF-103 | 08/05/15 | 5150 | 1650 | 11 | 101.1 | 17.4 | QCL-3-03 | 106.0 | 16.2 | 95.4 | 1.2 | PASS | JK |
| SF-104 | 08/05/15 | 4950 | 1800 | 11 | 101.9 | 17.2 | QCL-3-03 | 106.0 | 16.2 | 96.1 | 1.0 | PASS | JK |
| SF-105 | 08/06/15 | 5050 | 1400 | 19 | 101.4 | 16.9 | QCL-3-02 | 105.9 | 17.3 | 95.8 | -0.4 | PASS | JK |
| SF-106 | 08/06/15 | 5450 | 1600 | 19 | 100.6 | 17.2 | QCL-3-02 | 105.9 | 17.3 | 95.0 | -0.1 | PASS | JK |
| SF-107 | 08/06/15 | 5100 | 2050 | 19 | 102.9 | 15.9 | QCL-3-02 | 105.9 | 17.3 | 97.2 | -1.4 | PASS | JK |
| SF-108 | 08/06/15 | 5200 | 1650 | 12 | 101.4 | 16.7 | QCL-3-02 | 105.9 | 17.3 | 95.8 | -0.6 | PASS | JK |
| SF-109 | 08/06/15 | 4800 | 1900 | 12 | 102.8 | 16.2 | QCL-3-02 | 105.9 | 17.3 | 97.1 | -1.1 | PASS | JK |
| SF-110 | 08/07/15 | 4550 | 1400 | 14 | 102.0 | 16.6 | QCL-3-02 | 105.9 | 17.3 | 96.3 | -0.7 | PASS | JK |

# EMBANKMENT FILL FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-111 | 08/07/15 | 4700 | 1450 | 14 | 102.0 | 16.4 | QCL-3-02 | 105.9 | 17.3 | 96.3 | -0.9 | PASS | JK |
| SF-112 | 08/07/15 | 4300 | 1850 | 17 | 103.1 | 15.9 | QCL-3-02 | 105.9 | 17.3 | 97.4 | -1.4 | PASS | JK |
| SF-113 | 08/07/15 | 4200 | 1650 | 17 | 102.6 | 16.4 | QCL-3-02 | 105.9 | 17.3 | 96.9 | -0.9 | PASS | JK |
| SF-114 | 08/10/15 | 1950 | 4500 | 18 | 101.7 | 16.5 | QCL-3-02 | 105.9 | 17.3 | 96.0 | -0.8 | PASS | JK |
| SF-115 | 08/10/15 | 4200 | 1600 | 18 | 101.1 | 17.8 | QCL-3-02 | 105.9 | 17.3 | 95.5 | 0.5 | PASS | JK |
| SF-116 | 08/10/15 | 4600 | 1400 | 15 | 102.9 | 15.9 | QCL-3-02 | 105.9 | 17.3 | 97.2 | -1.4 | PASS | JK |
| SF-117 | 08/10/15 | 4800 | 1500 | 15 | 102.0 | 16.6 | QCL-3-02 | 105.9 | 17.3 | 96.3 | -0.7 | PASS | JK |
| SF-118 | 08/11/15 | 5100 | 1700 | 13 | 101.8 | 17.3 | QCL-3-03 | 106.0 | 16.2 | 96.0 | 1.1 | PASS | JK |
| SF-119 | 08/11/15 | 4800 | 1900 | 13 | 100.8 | 17.2 | QCL-3-03 | 106.0 | 16.2 | 95.1 | 1.0 | PASS | JK |
| SF-120 | 08/11/15 | 4250 | 1850 | 19 | 101.9 | 16.6 | QCL-3-03 | 106.0 | 16.2 | 96.1 | 0.4 | PASS | JK |
| SF-121 | 08/11/15 | 4250 | 1800 | 19 | 101.0 | 17.3 | QCL-3-03 | 106.0 | 16.2 | 95.3 | 1.1 | PASS | JK |
| SF-122 | 08/12/15 | 4525 | 1980 | 20 | 102.0 | 15.7 | QCL-3-03 | 106.0 | 16.2 | 96.2 | -0.5 | PASS | MBD |
| SF-123 | 08/12/15 | 4205 | 1560 | 20 | 102.4 | 16.0 | QCL-3-03 | 106.0 | 16.2 | 96.6 | -0.2 | PASS | MBD |
| SF-124 | 08/12/15 | 4925 | 1840 | 14 | 103.6 | 14.3 | QCL-3-03 | 106.0 | 16.2 | 97.7 | -1.9 | PASS | MBD |
| SF-125 | 08/13/15 | 4160 | 1660 | 21 | 98.5 | 18.0 | QCL-14-1 | 100.7 | 17.8 | 97.8 | 0.2 | PASS | MBD |
| SF-126 | 08/13/15 | 4435 | 1915 | 21 | 95.9 | 17.2 | QCL-14-1 | 100.7 | 17.8 | 95.2 | -0.6 | PASS | MBD |
| SF-127 | 08/13/15 | 4805 | 1905 | 15 | 97.3 | 16.8 | QCL-14-1 | 100.7 | 17.8 | 96.6 | -1.0 | PASS | MBD |
| SF-128 | 08/13/15 | 5025 | 1750 | 15 | 97.3 | 18.7 | QCL-14-1 | 100.7 | 17.8 | 96.6 | 0.9 | PASS | MBD |
| SF-129 | 08/13/15 | 4610 | 1440 | 16 | 97.6 | 16.1 | QCL-14-1 | 100.7 | 17.8 | 96.9 | -1.7 | PASS | MBD |
| SF-130 | 08/13/15 | 4455 | 1350 | 16 | 97.6 | 15.8 | QCL-14-1 | 100.7 | 17.8 | 96.9 | -2.0 | PASS | MBD |
| SF-131 | 08/14/15 | 4975 | 2090 | 1 | 96.6 | 14.9 | QCL-14-1 | 100.7 | 17.8 | 95.9 | -2.9 | PASS | MBD |
| SF-132 | 08/14/15 | 4680 | 2040 | 22 | 95.9 | 16.8 | QCL-14-1 | 100.7 | 17.8 | 95.2 | -1.0 | PASS | MBD |

# EMBANKMENT FILL FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-133 | 08/14/15 | 4360 | 1875 | 22 | 96.9 | 19.2 | QCL-14-1 | 100.7 | 17.8 | 96.2 | 1.4 | PASS | MBD |
| SF-134 | 08/14/15 | 4960 | 1790 | 16 | 96.7 | 16.6 | QCL-14-1 | 100.7 | 17.8 | 96.0 | -1.2 | PASS | MBD |
| SF-135 | 08/14/15 | 4760 | 1940 | 16 | 96.2 | 20.4 | QCL-14-1 | 100.7 | 17.8 | 95.5 | 2.6 | PASS | MBD |
| SF-136 | 08/14/15 | 4725 | 1490 | 16 | 99.1 | 15.0 | QCL-14-1 | 100.7 | 17.8 | 98.4 | -2.8 | PASS | MBD |
| SF-137 | 08/14/15 | 4535 | 1410 | 16 | 95.8 | 17.8 | QCL-14-1 | 100.7 | 17.8 | 95.1 | 0.0 | PASS | MBD |
| SF-138 | 08/17/15 | 4260 | 1500 | 23 | 102.1 | 12.7 | QCL-FGD-C-4 | 103.8 | 14.5 | 98.4 | -1.8 | PASS | MBD |
| SF-139 | 08/17/15 | 4175 | 1700 | 23 | 100.6 | 13.9 | QCL-FGD-C-4 | 103.8 | 14.5 | 96.9 | -0.6 | PASS | MBD |
| SF-140 | 08/17/15 | 4350 | 1860 | 23 | 99.9 | 11.9 | QCL-FGD-C-4 | 103.8 | 14.5 | 96.2 | -2.6 | PASS | MBD |
| SF-141 | 08/17/15 | 4600 | 1970 | 23 | 104.4 | 12.2 | QCL-FGD-C-4 | 103.8 | 14.5 | 100.6 | -2.3 | PASS | MBD |
| SF-142 | 08/17/15 | 4835 | 2065 | 2 | 101.4 | 15.2 | QCL-FGD-C-4 | 103.8 | 14.5 | 97.7 | 0.7 | PASS | MBD |
| SF-143 | 08/17/15 | 4565 | 1410 | 17 | 100.0 | 11.6 | QCL-FGD-C-4 | 103.8 | 14.5 | 96.3 | -2.9 | PASS | MBD |
| SF-144 | 08/17/15 | 4745 | 1480 | 17 | 105.8 | 12.1 | QCL-FGD-C-4 | 103.8 | 14.5 | 101.9 | -2.4 | PASS | MBD |
| SF-145 | 08/17/15 | 4725 | 1950 | 17 | 98.0 | 17.3 | QCL-14-1 | 100.7 | 17.8 | 97.3 | -0.5 | PASS | MBD |
| SF-146 | 08/17/15 | 4850 | 1860 | 17 | 95.8 | 16.6 | QCL-14-1 | 100.7 | 17.8 | 95.1 | -1.2 | PASS | MBD |
| SF-147 | 08/17/15 | 4275 | 1445 | 24 | 102.1 | 15.9 | QCL-FGD-C-4 | 103.8 | 14.5 | 98.4 | 1.4 | PASS | MBD |
| SF-148 | 08/17/15 | 4195 | 1625 | 24 | 105.0 | 15.7 | QCL-FGD-C-4 | 103.8 | 14.5 | 101.2 | 1.2 | PASS | MBD |
| SF-149 | 08/17/15 | 4260 | 1850 | 24 | 102.3 | 11.8 | QCL-FGD-C-4 | 103.8 | 14.5 | 98.6 | -2.7 | PASS | MBD |
| SF-150 | 08/17/15 | 4475 | 1945 | 24 | 99.1 | 11.7 | QCL-FGD-C-4 | 103.8 | 14.5 | 95.5 | -2.8 | PASS | MBD |
| SF-151 | 08/17/15 | 4835 | 2100 | 3 | 99.1 | 16.2 | QCL-FGD-C-4 | 103.8 | 14.5 | 95.5 | 1.7 | PASS | MBD |
| SF-152 | 08/18/15 | 4850 | 2075 | 4 | 96.7 | 20.8 | QCL-3-15 | 98.4 | 19.6 | 98.3 | 1.2 | PASS | MBD |
| SF-153 | 08/18/15 | 4525 | 1355 | 18 | 93.5 | 18.1 | QCL-3-15 | 98.4 | 19.6 | 95.0 | -1.5 | PASS | MBD |
| SF-154 | 08/18/15 | 4675 | 1455 | 18 | 94.5 | 17.3 | QCL-3-15 | 98.4 | 19.6 | 96.0 | -2.3 | PASS | MBD |

# EMBANKMENT FILL FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-155 | 08/18/15 | 4850 | 2065 | 5 | 97.0 | 20.3 | QCL-3-15 | 98.4 | 19.6 | 98.6 | 0.7 | PASS | MBD |
| SF-156 | 08/18/15 | 4890 | 1845 | 18 | 88.4 | 24.0 | QCL-2-1 | 93.1 | 24.5 | 95.0 | -0.5 | PASS | MBD |
| SF-157 | 08/18/15 | 4750 | 1925 | 18 | 88.5 | 25.0 | QCL-2-1 | 93.1 | 24.5 | 95.1 | 0.5 | PASS | MBD |
| SF-158 | 08/18/15 | 4855 | 2055 | 3 | 90.7 | 22.0 | QCL-2-1 | 93.1 | 24.5 | 97.4 | -2.5 | PASS | MBD |
| SF-159 | 08/18/15 | 4235 | 1555 | 25 | 97.2 | 16.7 | QCL-14-1 | 100.7 | 17.8 | 96.5 | -1.1 | PASS | MBD |
| SF-160 | 08/18/15 | 4160 | 1775 | 25 | 95.8 | 18.4 | QCL-14-1 | 100.7 | 17.8 | 95.1 | 0.6 | PASS | MBD |
| SF-161 | 08/18/15 | 4400 | 1900 | 25 | 96.7 | 17.8 | QCL-14-1 | 100.7 | 17.8 | 96.0 | 0.0 | PASS | MBD |
| SF-162 | 08/18/15 | 4550 | 1970 | 25 | 99.5 | 17.2 | QCL-14-1 | 100.7 | 17.8 | 98.8 | -0.6 | PASS | MBD |
| SF-163 | 08/18/15 | 4870 | 2070 | 7 | 98.0 | 19.9 | QCL-14-1 | 100.7 | 17.8 | 97.3 | 2.1 | PASS | MBD |
| SF-164 | 08/18/15 | 4790 | 1490 | 19 | 97.4 | 20.1 | QCL-14-1 | 100.7 | 17.8 | 96.7 | 2.3 | PASS | MBD |
| SF-165 | 08/18/15 | 4600 | 1400 | 19 | 98.7 | 18.4 | QCL-14-1 | 100.7 | 17.8 | 98.0 | 0.6 | PASS | MBD |
| SF-166 | 08/18/15 | 4950 | 1800 | 19 | 99.5 | 17.6 | QCL-14-1 | 100.7 | 17.8 | 98.8 | -0.2 | PASS | MBD |
| SF-167 | 08/18/15 | 4800 | 1900 | 19 | 95.7 | 17.9 | QCL-14-1 | 100.7 | 17.8 | 95.0 | 0.1 | PASS | MBD |
| SF-168 | 08/18/15 | 4800 | 2050 | 8 | 99.0 | 12.2 | QCL-FGD-C-4 | 103.8 | 14.5 | 95.4 | -2.3 | PASS | MBD |
| SF-169 | 08/19/15 | 4880 | 2090 | 9 | 101.7 | 15.5 | QCL-3-03 | 106.0 | 16.2 | 95.9 | -0.7 | PASS | MBD |
| SF-170 | 08/19/15 | 4820 | 2075 | 10 | 105.5 | 15.6 | QCL-3-03 | 106.0 | 16.2 | 99.5 | -0.6 | PASS | MBD |
| SF-171 | 08/19/15 | 4640 | 1985 | 26 | 106.7 | 14.9 | QCL-3-03 | 106.0 | 16.2 | 100.7 | -1.3 | PASS | MBD |
| SF-172 | 08/19/15 | 4300 | 1850 | 26 | 101.4 | 14.1 | QCL-3-03 | 106.0 | 16.2 | 95.7 | -2.1 | PASS | MBD |
| SF-173 | 08/19/15 | 4200 | 1650 | 26 | 105.1 | 15.5 | QCL-3-03 | 106.0 | 16.2 | 99.2 | -0.7 | PASS | MBD |
| SF-174 | 08/19/15 | 4260 | 1460 | 26 | 102.0 | 16.9 | QCL-3-03 | 106.0 | 16.2 | 96.2 | 0.7 | PASS | MBD |
| SF-175 | 08/19/15 | 4865 | 2080 | 11 | 98.8 | 16.1 | QCL-FGD-C-4 | 103.8 | 14.5 | 95.2 | 1.6 | PASS | MBD |
| SF-176 | 08/19/15 | 4825 | 2050 | 12 | 100.6 | 16.0 | QCL-FGD-C-4 | 103.8 | 14.5 | 96.9 | 1.5 | PASS | MBD |

# EMBANKMENT FILL FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SF-177 | 08/19/15 | 4915 | 1840 | 20 | 99.9 | 11.5 | QCL-FGD-C-4 | 103.8 | 14.5 | 96.2 | -3.0 | PASS | MBD |
| SF-178 | 08/19/15 | 4775 | 1930 | 20 | 100.2 | 15.3 | QCL-FGD-C-4 | 103.8 | 14.5 | 96.5 | 0.8 | PASS | MBD |
| SF-179 | 08/20/15 | 4835 | 2075 | 13 | 100.1 | 16.2 | QCL-14-1 | 100.7 | 17.8 | 99.4 | -1.6 | PASS | MBD |
| SF-180 | 08/20/15 | 4785 | 2040 | 14 | 97.8 | 15.0 | QCL-14-1 | 100.7 | 17.8 | 97.1 | -2.8 | PASS | MBD |
| SF-181 | 08/20/15 | 4980 | 2100 | 15 | 97.5 | 18.9 | QCL-3-15 | 98.4 | 19.6 | 99.1 | -0.7 | PASS | MBD |
| SF-182 | 08/20/15 | 4800 | 2025 | 16 | 94.5 | 18.0 | QCL-3-15 | 98.4 | 19.6 | 96.0 | -1.6 | PASS | MBD |

Notes:
1. In situ values determined by nuclear methods: ASTM D-2922 for density and D-3017 for moisture content.
2. "PASS" indicates both a percent compaction exceeding the minimum required compaction (95% Max Dry Density) and a moisture content of -3 to +3 of the optimum moisture content.

# APPENDIX D
# CLAY LINER FIELD MOISTURE/DENSITY TEST RESULTS

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-001 | 08/21/15 | 4410 | 1460 | 1 | 96.4 | 24.7 | QCL-3-15 | 98.4 | 19.6 | 98.0 | 5.1 | PASS | MBD |
| CL-002 | 08/21/15 | 4450 | 1525 | 1 | 91.9 | 24.9 | QCL-2-4 | 96.7 | 22.0 | 95.0 | 2.9 | PASS | MBD |
| CL-003 | 08/21/15 | 4545 | 1535 | 1 | 91.9 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 95.0 | 3.5 | PASS | MBD |
| CL-004 | 08/21/15 | 4495 | 1610 | 1 | 93.3 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 96.5 | 2.1 | PASS | MBD |
| CL-005 | 08/21/15 | 4380 | 1575 | 1 | 93.2 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 96.4 | 2.4 | PASS | MBD |
| CL-006 | 08/21/15 | 4295 | 1650 | 1 | 93.5 | 26.8 | QCL-2-4 | 96.7 | 22.0 | 96.7 | 4.8 | PASS | MBD |
| CL-007 | 08/21/15 | 4440 | 1700 | 1 | 92.6 | 25.2 | QCL-2-4 | 96.7 | 22.0 | 95.8 | 3.2 | PASS | MBD |
| CL-008 | 08/21/15 | 4340 | 1750 | 1 | 94.0 | 26.6 | QCL-2-4 | 96.7 | 22.0 | 97.2 | 4.6 | PASS | MBD |
| CL-009 | 08/21/15 | 4425 | 1765 | 1 | 93.3 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 96.5 | 2.3 | PASS | MBD |
| CL-010 | 08/21/15 | 4500 | 1820 | 1 | 89.1 | 26.7 | QCL-2-1 | 93.1 | 24.5 | 95.7 | 2.2 | PASS | MBD |
| CL-011 | 08/21/15 | 4505 | 1700 | 1 | 89.5 | 27.5 | QCL-2-1 | 93.1 | 24.5 | 96.1 | 3.0 | PASS | MBD |
| CL-012 | 08/21/15 | 4575 | 1750 | 1 | 88.7 | 27.3 | QCL-2-1 | 93.1 | 24.5 | 95.3 | 2.8 | PASS | MBD |
| CL-013 | 08/21/15 | 4625 | 1665 | 1 | 91.0 | 27.6 | QCL-2-1 | 93.1 | 24.5 | 97.7 | 3.1 | PASS | MBD |
| CL-014 | 08/21/15 | 4590 | 1585 | 1 | 88.5 | 27.4 | QCL-2-1 | 93.1 | 24.5 | 95.1 | 2.9 | PASS | MBD |
| CL-015 | 08/21/15 | 4685 | 1585 | 1 | 89.5 | 27.5 | QCL-2-1 | 93.1 | 24.5 | 96.1 | 3.0 | PASS | MBD |
| CL-016 | 08/21/15 | 4810 | 1640 | 1 | 88.9 | 27.0 | QCL-2-1 | 93.1 | 24.5 | 95.5 | 2.5 | PASS | MBD |
| CL-017 | 08/21/15 | 4650 | 1875 | 1 | 89.8 | 26.6 | QCL-2-1 | 93.1 | 24.5 | 96.5 | 2.1 | PASS | MBD |
| CL-018 | 08/21/15 | 4650 | 1800 | 1 | 88.5 | 26.7 | QCL-2-1 | 93.1 | 24.5 | 95.1 | 2.2 | PASS | MBD |
| CL-019 | 08/21/15 | 4725 | 1710 | 1 | 95.7 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 99.0 | 2.2 | PASS | MBD |
| CL-020 | 08/21/15 | 4730 | 1825 | 1 | 96.5 | 24.6 | QCL-2-4 | 96.7 | 22.0 | 99.8 | 2.6 | PASS | MBD |
| CL-021 | 08/24/15 | 4800 | 1750 | 1 | 93.3 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 96.5 | 3.7 | PASS | JK |
| CL-022 | 08/24/15 | 4900 | 1700 | 1 | 94.3 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 97.5 | 2.4 | PASS | JK |
| CL-023 | 08/24/15 | 5000 | 1650 | 1 | 94.2 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 97.4 | 2.7 | PASS | JK |
| CL-024 | 08/24/15 | 5150 | 1550 | 1 | 92.5 | 26.2 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 4.2 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-025 | 08/24/15 | 5200 | 1500 | 1 | 93.0 | 25.6 | QCL-2-4 | 96.7 | 22.0 | 96.2 | 3.6 | PASS | JK |
| CL-026 | 08/24/15 | 5150 | 1500 | 1 | 94.7 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 97.9 | 2.4 | PASS | JK |
| CL-027 | 08/24/15 | 5050 | 1550 | 1 | 93.9 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 97.1 | 2.4 | PASS | JK |
| CL-028 | 08/24/15 | 4900 | 1600 | 1 | 92.6 | 25.9 | QCL-2-4 | 96.7 | 22.0 | 95.8 | 3.9 | PASS | JK |
| CL-029 | 08/24/15 | 5300 | 1550 | 1 | 92.5 | 26.6 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 4.6 | PASS | JK |
| CL-030 | 08/24/15 | 5350 | 1600 | 1 | 93.3 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 96.5 | 2.7 | PASS | JK |
| CL-031 | 08/24/15 | 5400 | 1700 | 1 | 92.5 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 2.3 | PASS | JK |
| CL-032 | 08/24/15 | 5325 | 1725 | 1 | 93.8 | 24.8 | QCL-3-15 | 98.4 | 19.6 | 95.3 | 5.2 | PASS | JK |
| CL-033 | 08/24/15 | 5250 | 1850 | 1 | 93.7 | 25.4 | QCL-3-15 | 98.4 | 19.6 | 95.2 | 5.8 | PASS | JK |
| CL-034 | 08/24/15 | 5150 | 1900 | 1 | 94.2 | 24.9 | QCL-3-15 | 98.4 | 19.6 | 95.7 | 5.3 | PASS | JK |
| CL-035 | 08/24/15 | 5050 | 1950 | 1 | 93.9 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 97.1 | 3.7 | PASS | JK |
| CL-036 | 08/24/15 | 5000 | 2000 | 1 | 94.7 | 24.6 | QCL-3-15 | 98.4 | 19.6 | 96.2 | 5.0 | PASS | JK |
| CL-037 | 08/24/15 | 4950 | 2000 | 1 | 94.9 | 24.5 | QCL-3-15 | 98.4 | 19.6 | 96.4 | 4.9 | PASS | JK |
| CL-038 | 08/24/15 | 4950 | 1900 | 1 | 94.4 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 97.6 | 2.8 | PASS | JK |
| CL-039 | 08/24/15 | 5050 | 1850 | 1 | 92.5 | 27.5 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 5.5 | PASS | JK |
| CL-040 | 08/24/15 | 5150 | 1800 | 1 | 94.0 | 25.3 | QCL-3-15 | 98.4 | 19.6 | 95.5 | 5.7 | PASS | JK |
| CL-041 | 08/24/15 | 5200 | 1750 | 1 | 92.6 | 27.5 | QCL-2-4 | 96.7 | 22.0 | 95.8 | 5.5 | PASS | JK |
| CL-042 | 08/25/15 | 5300 | 1750 | 1 | 94.3 | 24.9 | QCL-3-15 | 98.4 | 19.6 | 95.8 | 5.3 | PASS | JK |
| CL-043 | 08/25/15 | 5350 | 1700 | 1 | 93.7 | 25.3 | QCL-3-15 | 98.4 | 19.6 | 95.2 | 5.7 | PASS | JK |
| CL-044 | 08/25/15 | 5200 | 1400 | 1 | 93.2 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 96.4 | 4.4 | PASS | JK |
| CL-045 | 08/25/15 | 5100 | 1450 | 1 | 94.3 | 25.3 | QCL-3-15 | 98.4 | 19.6 | 95.8 | 5.7 | PASS | JK |
| CL-046 | 08/25/15 | 5000 | 1550 | 1 | 94.9 | 25.3 | QCL-3-15 | 98.4 | 19.6 | 96.4 | 5.7 | PASS | JK |
| CL-047 | 08/25/15 | 4850 | 1600 | 1 | 94.6 | 24.7 | QCL-3-15 | 98.4 | 19.6 | 96.1 | 5.1 | PASS | JK |
| CL-048 | 08/25/15 | 4400 | 1450 | 2 | 95.0 | 24.0 | QCL-3-15 | 98.4 | 19.6 | 96.5 | 4.4 | PASS | JK |
| CL-049 | 08/25/15 | 4350 | 1550 | 2 | 93.8 | 25.4 | QCL-3-15 | 98.4 | 19.6 | 95.3 | 5.8 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-050 | 08/25/15 | 4300 | 1650 | 2 | 95.2 | 24.8 | QCL-3-15 | 98.4 | 19.6 | 96.7 | 5.2 | PASS | JK |
| CL-051 | 08/25/15 | 4250 | 1750 | 2 | 94.7 | 24.4 | QCL-3-15 | 98.4 | 19.6 | 96.2 | 4.8 | PASS | JK |
| CL-052 | 08/25/15 | 4400 | 1800 | 2 | 95.5 | 24.0 | QCL-3-15 | 98.4 | 19.6 | 97.1 | 4.4 | PASS | JK |
| CL-053 | 08/25/15 | 4400 | 1700 | 2 | 95.5 | 24.6 | QCL-3-15 | 98.4 | 19.6 | 97.1 | 5.0 | PASS | JK |
| CL-054 | 08/25/15 | 4450 | 1600 | 2 | 94.0 | 25.2 | QCL-3-15 | 98.4 | 19.6 | 95.5 | 5.6 | PASS | JK |
| CL-055 | 08/25/15 | 4500 | 1500 | 2 | 94.3 | 24.6 | QCL-3-15 | 98.4 | 19.6 | 95.8 | 5.0 | PASS | JK |
| CL-056 | 08/25/15 | 4650 | 1550 | 2 | 93.6 | 26.1 | QCL-2-4 | 96.7 | 22.0 | 96.8 | 4.1 | PASS | JK |
| CL-057 | 08/25/15 | 4600 | 1650 | 2 | 93.8 | 24.2 | QCL-3-15 | 98.4 | 19.6 | 95.3 | 4.6 | PASS | JK |
| CL-058 | 08/25/15 | 4550 | 1750 | 2 | 94.2 | 24.8 | QCL-3-15 | 98.4 | 19.6 | 95.7 | 5.2 | PASS | JK |
| CL-059 | 08/25/15 | 4500 | 1850 | 2 | 92.7 | 25.1 | QCL-2-4 | 96.7 | 22.0 | 95.9 | 3.1 | PASS | JK |
| CL-060 | 08/25/15 | 4650 | 1850 | 2 | 92.3 | 25.6 | QCL-2-4 | 96.7 | 22.0 | 95.4 | 3.6 | PASS | JK |
| CL-061 | 08/25/15 | 4700 | 1750 | 2 | 92.9 | 25.1 | QCL-2-4 | 96.7 | 22.0 | 96.1 | 3.1 | PASS | JK |
| CL-062 | 08/26/15 | 4750 | 1650 | 2 | 89.3 | 28.5 | QCL-2-1 | 93.1 | 24.5 | 95.9 | 4.0 | PASS | JK |
| CL-063 | 08/26/15 | 4800 | 1600 | 2 | 89.7 | 27.9 | QCL-2-1 | 93.1 | 24.5 | 96.3 | 3.4 | PASS | JK |
| CL-064 | 08/26/15 | 4750 | 1800 | 2 | 89.9 | 28.1 | QCL-2-1 | 93.1 | 24.5 | 96.6 | 3.6 | PASS | JK |
| CL-065 | 08/26/15 | 4850 | 1750 | 2 | 90.1 | 28.3 | QCL-2-1 | 93.1 | 24.5 | 96.8 | 3.8 | PASS | JK |
| CL-066 | 08/26/15 | 4950 | 1700 | 2 | 89.0 | 29.2 | QCL-2-1 | 93.1 | 24.5 | 95.6 | 4.7 | PASS | JK |
| CL-067 | 08/26/15 | 5050 | 1600 | 2 | 89.4 | 27.9 | QCL-2-1 | 93.1 | 24.5 | 96.0 | 3.4 | PASS | JK |
| CL-068 | 08/26/15 | 5150 | 1550 | 2 | 89.2 | 28.4 | QCL-2-1 | 93.1 | 24.5 | 95.8 | 3.9 | PASS | JK |
| CL-069 | 08/26/15 | 5250 | 1550 | 2 | 89.4 | 28.4 | QCL-2-1 | 93.1 | 24.5 | 96.0 | 3.9 | PASS | JK |
| CL-070 | 08/26/15 | 5200 | 1450 | 2 | 89.8 | 28.3 | QCL-2-1 | 93.1 | 24.5 | 96.5 | 3.8 | PASS | JK |
| CL-071 | 08/26/15 | 5100 | 1500 | 2 | 88.5 | 29.8 | QCL-2-1 | 93.1 | 24.5 | 95.1 | 5.3 | PASS | JK |
| CL-072 | 08/26/15 | 4950 | 1600 | 2 | 88.7 | 29.1 | QCL-2-1 | 93.1 | 24.5 | 95.3 | 4.6 | PASS | JK |
| CL-073 | 08/26/15 | 4850 | 1650 | 2 | 90.0 | 27.4 | QCL-2-1 | 93.1 | 24.5 | 96.7 | 2.9 | PASS | JK |
| CL-074 | 08/26/15 | 4750 | 1700 | 2 | 89.4 | 28.2 | QCL-2-1 | 93.1 | 24.5 | 96.0 | 3.7 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-075 | 08/26/15 | 5300 | 1500 | 2 | 88.6 | 30.4 | QCL-2-1 | 93.1 | 24.5 | 95.2 | 5.9 | PASS | JK |
| CL-076 | 08/26/15 | 5350 | 1600 | 2 | 89.1 | 28.5 | QCL-2-1 | 93.1 | 24.5 | 95.7 | 4.0 | PASS | JK |
| CL-077 | 08/26/15 | 5400 | 1700 | 2 | 89.6 | 27.8 | QCL-2-1 | 93.1 | 24.5 | 96.2 | 3.3 | PASS | JK |
| CL-078 | 08/26/15 | 5350 | 1750 | 2 | 89.2 | 28.4 | QCL-2-1 | 93.1 | 24.5 | 95.8 | 3.9 | PASS | JK |
| CL-079 | 08/26/15 | 5300 | 1700 | 2 | 89.9 | 27.7 | QCL-2-1 | 93.1 | 24.5 | 96.6 | 3.2 | PASS | JK |
| CL-080 | 08/26/15 | 5300 | 1600 | 2 | 88.8 | 28.5 | QCL-2-1 | 93.1 | 24.5 | 95.4 | 4.0 | PASS | JK |
| CL-081 | 08/26/15 | 5300 | 1800 | 2 | 88.5 | 28.9 | QCL-2-1 | 93.1 | 24.5 | 95.1 | 4.4 | PASS | JK |
| CL-082 | 08/26/15 | 5200 | 1850 | 2 | 88.5 | 29.1 | QCL-2-1 | 93.1 | 24.5 | 95.1 | 4.6 | PASS | JK |
| CL-083 | 08/26/15 | 5100 | 1900 | 2 | 89.0 | 29.1 | QCL-2-1 | 93.1 | 24.5 | 95.6 | 4.6 | PASS | JK |
| CL-084 | 08/26/15 | 5000 | 2000 | 2 | 89.8 | 27.4 | QCL-2-1 | 93.1 | 24.5 | 96.5 | 2.9 | PASS | JK |
| CL-085 | 08/26/15 | 4900 | 2000 | 2 | 88.5 | 29.0 | QCL-2-1 | 93.1 | 24.5 | 95.1 | 4.5 | PASS | JK |
| CL-086 | 08/26/15 | 4900 | 1950 | 2 | 89.6 | 28.2 | QCL-2-1 | 93.1 | 24.5 | 96.2 | 3.7 | PASS | JK |
| CL-087 | 08/26/15 | 5000 | 1900 | 2 | 89.7 | 28.1 | QCL-2-1 | 93.1 | 24.5 | 96.3 | 3.6 | PASS | JK |
| CL-088 | 08/26/15 | 5100 | 1850 | 2 | 90.3 | 26.7 | QCL-2-1 | 93.1 | 24.5 | 97.0 | 2.2 | PASS | JK |
| CL-089 | 08/26/15 | 5200 | 1800 | 2 | 89.0 | 29.2 | QCL-2-1 | 93.1 | 24.5 | 95.6 | 4.7 | PASS | JK |
| CL-090 | 08/27/15 | 5250 | 1750 | 2 | 88.5 | 28.1 | QCL-2-1 | 93.1 | 24.5 | 95.1 | 3.6 | PASS | JK |
| CL-091 | 08/27/15 | 5250 | 1450 | 2 | 93.5 | 25.9 | QCL-2-4 | 96.7 | 22.0 | 96.7 | 3.9 | PASS | JK |
| CL-092 | 08/27/15 | 5150 | 1450 | 2 | 93.0 | 27.2 | QCL-2-4 | 96.7 | 22.0 | 96.2 | 5.2 | PASS | JK |
| CL-093 | 08/27/15 | 5000 | 1550 | 2 | 93.4 | 25.3 | QCL-2-4 | 96.7 | 22.0 | 96.6 | 3.3 | PASS | JK |
| CL-094 | 08/27/15 | 4900 | 1600 | 2 | 93.9 | 25.8 | QCL-2-4 | 96.7 | 22.0 | 97.1 | 3.8 | PASS | JK |
| CL-095 | 08/27/15 | 4750 | 1600 | 2 | 92.4 | 26.9 | QCL-2-4 | 96.7 | 22.0 | 95.6 | 4.9 | PASS | JK |
| CL-096 | 08/27/15 | 4600 | 1500 | 2 | 93.2 | 27.1 | QCL-2-4 | 96.7 | 22.0 | 96.4 | 5.1 | PASS | JK |
| CL-097 | 08/27/15 | 4400 | 1450 | 3 | 92.9 | 26.5 | QCL-2-4 | 96.7 | 22.0 | 96.1 | 4.5 | PASS | JK |
| CL-098 | 08/27/15 | 4350 | 1550 | 3 | 93.2 | 26.3 | QCL-2-4 | 96.7 | 22.0 | 96.4 | 4.3 | PASS | JK |
| CL-099 | 08/27/15 | 4300 | 1650 | 3 | 95.0 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 98.2 | 2.1 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-100 | 08/27/15 | 4300 | 1750 | 3 | 92.2 | 27.8 | QCL-2-4 | 96.7 | 22.0 | 95.3 | 5.8 | PASS | JK |
| CL-101 | 08/27/15 | 4400 | 1800 | 3 | 93.6 | 25.4 | QCL-2-4 | 96.7 | 22.0 | 96.8 | 3.4 | PASS | JK |
| CL-102 | 08/27/15 | 4450 | 1700 | 3 | 94.3 | 24.5 | QCL-2-4 | 96.7 | 22.0 | 97.5 | 2.5 | PASS | JK |
| CL-103 | 08/27/15 | 4500 | 1600 | 3 | 93.3 | 26.0 | QCL-2-4 | 96.7 | 22.0 | 96.5 | 4.0 | PASS | JK |
| CL-104 | 08/27/15 | 4500 | 1500 | 3 | 93.2 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 96.4 | 4.4 | PASS | JK |
| CL-105 | 08/27/15 | 4600 | 1550 | 3 | 94.1 | 24.6 | QCL-2-4 | 96.7 | 22.0 | 97.3 | 2.6 | PASS | JK |
| CL-106 | 08/27/15 | 4600 | 1650 | 3 | 92.2 | 26.1 | QCL-2-4 | 96.7 | 22.0 | 95.3 | 4.1 | PASS | JK |
| CL-107 | 08/27/15 | 4550 | 1750 | 3 | 94.5 | 24.5 | QCL-2-4 | 96.7 | 22.0 | 97.7 | 2.5 | PASS | JK |
| CL-108 | 08/27/15 | 4500 | 1850 | 3 | 92.8 | 26.1 | QCL-2-4 | 96.7 | 22.0 | 96.0 | 4.1 | PASS | JK |
| CL-109 | 08/27/15 | 4600 | 1900 | 3 | 93.4 | 26.1 | QCL-2-4 | 96.7 | 22.0 | 96.6 | 4.1 | PASS | JK |
| CL-110 | 08/27/15 | 4650 | 1800 | 3 | 93.2 | 26.6 | QCL-2-4 | 96.7 | 22.0 | 96.4 | 4.6 | PASS | JK |
| CL-111 | 08/27/15 | 4650 | 1700 | 3 | 93.8 | 26.0 | QCL-2-4 | 96.7 | 22.0 | 97.0 | 4.0 | PASS | JK |
| CL-112 | 08/27/15 | 4700 | 1600 | 3 | 93.9 | 26.0 | QCL-2-4 | 96.7 | 22.0 | 97.1 | 4.0 | PASS | JK |
| CL-113 | 08/27/15 | 4800 | 1600 | 3 | 93.6 | 26.3 | QCL-2-4 | 96.7 | 22.0 | 96.8 | 4.3 | PASS | JK |
| CL-114 | 08/27/15 | 4750 | 1700 | 3 | 94.0 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 97.2 | 3.5 | PASS | JK |
| CL-115 | 08/27/15 | 4750 | 1800 | 3 | 93.8 | 25.1 | QCL-2-4 | 96.7 | 22.0 | 97.0 | 3.1 | PASS | JK |
| CL-116 | 08/27/15 | 4850 | 1750 | 3 | 92.1 | 27.1 | QCL-2-4 | 96.7 | 22.0 | 95.2 | 5.1 | PASS | JK |
| CL-117 | 08/27/15 | 4950 | 1700 | 3 | 93.0 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 96.2 | 3.7 | PASS | JK |
| CL-118 | 08/28/15 | 5050 | 1600 | 3 | 91.7 | 27.0 | QCL-2-1 | 93.1 | 24.5 | 98.5 | 2.5 | PASS | JK |
| CL-119 | 08/28/15 | 5150 | 1550 | 3 | 91.0 | 27.1 | QCL-2-1 | 93.1 | 24.5 | 97.7 | 2.6 | PASS | JK |
| CL-120 | 08/28/15 | 5250 | 1500 | 3 | 90.2 | 27.7 | QCL-2-1 | 93.1 | 24.5 | 96.9 | 3.2 | PASS | JK |
| CL-121 | 08/28/15 | 5200 | 1400 | 3 | 90.0 | 27.6 | QCL-2-1 | 93.1 | 24.5 | 96.7 | 3.1 | PASS | JK |
| CL-122 | 08/28/15 | 5150 | 1400 | 3 | 91.2 | 26.9 | QCL-2-1 | 93.1 | 24.5 | 98.0 | 2.4 | PASS | JK |
| CL-123 | 08/28/15 | 5050 | 1500 | 3 | 91.2 | 26.5 | QCL-2-1 | 93.1 | 24.5 | 98.0 | 2.0 | PASS | JK |
| CL-124 | 08/28/15 | 4950 | 1600 | 3 | 91.2 | 26.5 | QCL-2-1 | 93.1 | 24.5 | 98.0 | 2.0 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-125 | 08/28/15 | 4850 | 1650 | 3 | 90.1 | 27.2 | QCL-2-1 | 93.1 | 24.5 | 96.8 | 2.7 | PASS | JK |
| CL-126 | 08/28/15 | 5300 | 1600 | 3 | 90.3 | 28.0 | QCL-2-1 | 93.1 | 24.5 | 97.0 | 3.5 | PASS | JK |
| CL-127 | 08/28/15 | 5300 | 1700 | 3 | 90.1 | 27.4 | QCL-2-1 | 93.1 | 24.5 | 96.8 | 2.9 | PASS | JK |
| CL-128 | 08/28/15 | 5200 | 1750 | 3 | 89.6 | 28.6 | QCL-2-1 | 93.1 | 24.5 | 96.2 | 4.1 | PASS | JK |
| CL-129 | 08/28/15 | 5100 | 1800 | 3 | 91.4 | 26.6 | QCL-2-1 | 93.1 | 24.5 | 98.2 | 2.1 | PASS | JK |
| CL-130 | 08/28/15 | 5000 | 1900 | 3 | 91.4 | 26.5 | QCL-2-1 | 93.1 | 24.5 | 98.2 | 2.0 | PASS | JK |
| CL-131 | 08/28/15 | 4900 | 1950 | 3 | 89.9 | 28.2 | QCL-2-1 | 93.1 | 24.5 | 96.6 | 3.7 | PASS | JK |
| CL-132 | 08/28/15 | 4900 | 2000 | 3 | 93.5 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 96.7 | 2.7 | PASS | JK |
| CL-133 | 08/28/15 | 5000 | 2000 | 3 | 92.5 | 25.0 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 3.0 | PASS | JK |
| CL-134 | 08/28/15 | 5100 | 1950 | 3 | 92.4 | 25.6 | QCL-2-4 | 96.7 | 22.0 | 95.6 | 3.6 | PASS | JK |
| CL-135 | 08/28/15 | 5200 | 1850 | 3 | 92.1 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 95.2 | 3.5 | PASS | JK |
| CL-136 | 08/28/15 | 5300 | 1800 | 3 | 92.5 | 25.2 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 3.2 | PASS | JK |
| CL-137 | 08/28/15 | 5400 | 1750 | 3 | 92.1 | 25.3 | QCL-2-4 | 96.7 | 22.0 | 95.2 | 3.3 | PASS | JK |
| CL-138 | 08/28/15 | 5350 | 1650 | 3 | 93.3 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 96.5 | 2.4 | PASS | JK |
| CL-139 | 08/28/15 | 5300 | 1550 | 3 | 89.1 | 28.5 | QCL-2-1 | 93.1 | 24.5 | 95.7 | 4.0 | PASS | JK |
| CL-140 | 08/28/15 | 5250 | 1450 | 3 | 92.4 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 95.6 | 4.4 | PASS | JK |
| CL-141 | 08/28/15 | 5100 | 1450 | 3 | 90.5 | 27.7 | QCL-2-1 | 93.1 | 24.5 | 97.2 | 3.2 | PASS | JK |
| CL-142 | 08/28/15 | 4950 | 1550 | 3 | 91.6 | 26.7 | QCL-2-1 | 93.1 | 24.5 | 98.4 | 2.2 | PASS | JK |
| CL-143 | 08/28/15 | 4850 | 1600 | 3 | 90.8 | 27.2 | QCL-2-1 | 93.1 | 24.5 | 97.5 | 2.7 | PASS | JK |
| CL-144 | 08/28/15 | 4700 | 1600 | 3 | 92.7 | 25.8 | QCL-2-4 | 96.7 | 22.0 | 95.9 | 3.8 | PASS | JK |
| CL-145 | 08/28/15 | 4550 | 1500 | 3 | 90.1 | 28.3 | QCL-2-1 | 93.1 | 24.5 | 96.8 | 3.8 | PASS | JK |
| CL-146 | 08/31/15 | 4400 | 1450 | 4 | 93.0 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 96.2 | 2.3 | PASS | JK |
| CL-147 | 08/31/15 | 4350 | 1550 | 4 | 92.1 | 26.3 | QCL-2-4 | 96.7 | 22.0 | 95.2 | 4.3 | PASS | JK |
| CL-148 | 08/31/15 | 4250 | 1650 | 4 | 90.7 | 26.6 | QCL-2-1 | 93.1 | 24.5 | 97.4 | 2.1 | PASS | JK |
| CL-149 | 08/31/15 | 4250 | 1750 | 4 | 93.2 | 24.5 | QCL-2-4 | 96.7 | 22.0 | 96.4 | 2.5 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-150 | 08/31/15 | 4350 | 1800 | 4 | 91.9 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 95.0 | 4.4 | PASS | JK |
| CL-151 | 08/31/15 | 4400 | 1750 | 4 | 91.9 | 26.3 | QCL-2-4 | 96.7 | 22.0 | 95.0 | 4.3 | PASS | JK |
| CL-152 | 08/31/15 | 4450 | 1650 | 4 | 91.4 | 26.5 | QCL-2-1 | 93.1 | 24.5 | 98.2 | 2.0 | PASS | JK |
| CL-153 | 08/31/15 | 4500 | 1550 | 4 | 93.9 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 97.1 | 2.7 | PASS | JK |
| CL-154 | 08/31/15 | 4600 | 1550 | 4 | 90.9 | 26.8 | QCL-2-1 | 93.1 | 24.5 | 97.6 | 2.3 | PASS | JK |
| CL-155 | 08/31/15 | 4550 | 1650 | 4 | 89.3 | 28.6 | QCL-2-1 | 93.1 | 24.5 | 95.9 | 4.1 | PASS | JK |
| CL-156 | 08/31/15 | 4500 | 1750 | 4 | 92.4 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 95.6 | 2.7 | PASS | JK |
| CL-157 | 08/31/15 | 4500 | 1850 | 4 | 90.2 | 26.6 | QCL-2-1 | 93.1 | 24.5 | 96.9 | 2.1 | PASS | JK |
| CL-158 | 08/31/15 | 4600 | 1900 | 4 | 92.9 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 96.1 | 2.3 | PASS | JK |
| CL-159 | 08/31/15 | 4600 | 1800 | 4 | 90.1 | 27.1 | QCL-2-1 | 93.1 | 24.5 | 96.8 | 2.6 | PASS | JK |
| CL-160 | 08/31/15 | 4650 | 1700 | 4 | 91.4 | 26.6 | QCL-2-1 | 93.1 | 24.5 | 98.2 | 2.1 | PASS | JK |
| CL-161 | 08/31/15 | 4700 | 1600 | 4 | 92.6 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 95.8 | 2.7 | PASS | JK |
| CL-162 | 08/31/15 | 4750 | 1650 | 4 | 92.9 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 96.1 | 2.4 | PASS | JK |
| CL-163 | 08/31/15 | 4700 | 1750 | 4 | 92.7 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 95.9 | 2.3 | PASS | JK |
| CL-164 | 08/31/15 | 4700 | 1850 | 4 | 91.9 | 25.6 | QCL-2-4 | 96.7 | 22.0 | 95.0 | 3.6 | PASS | JK |
| CL-165 | 08/31/15 | 4800 | 1750 | 4 | 92.4 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 95.6 | 3.7 | PASS | JK |
| CL-166 | 08/31/15 | 4900 | 1700 | 4 | 92.3 | 25.4 | QCL-2-4 | 96.7 | 22.0 | 95.4 | 3.4 | PASS | JK |
| CL-167 | 08/31/15 | 5000 | 1650 | 4 | 90.2 | 28.0 | QCL-2-1 | 93.1 | 24.5 | 96.9 | 3.5 | PASS | JK |
| CL-168 | 08/31/15 | 5100 | 1600 | 4 | 91.9 | 26.2 | QCL-2-4 | 96.7 | 22.0 | 95.0 | 4.2 | PASS | JK |
| CL-169 | 08/31/15 | 5200 | 1500 | 4 | 92.0 | 25.9 | QCL-2-4 | 96.7 | 22.0 | 95.1 | 3.9 | PASS | JK |
| CL-170 | 08/31/15 | 5100 | 1500 | 4 | 92.5 | 25.2 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 3.2 | PASS | JK |
| CL-171 | 08/31/15 | 5000 | 1550 | 4 | 91.4 | 26.5 | QCL-2-1 | 93.1 | 24.5 | 98.2 | 2.0 | PASS | JK |
| CL-172 | 08/31/15 | 4900 | 1600 | 4 | 91.8 | 26.5 | QCL-2-1 | 93.1 | 24.5 | 98.6 | 2.0 | PASS | JK |
| CL-173 | 08/31/15 | 4800 | 1650 | 4 | 92.8 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 96.0 | 2.8 | PASS | JK |
| CL-174 | 09/02/15 | 5250 | 1550 | 4 | 100.2 | 20.2 | QCL-14-1 | 100.7 | 17.8 | 99.5 | 2.4 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-175 | 09/02/15 | 5300 | 1600 | 4 | 88.5 | 27.3 | QCL-2-1 | 93.1 | 24.5 | 95.1 | 2.8 | PASS | JK |
| CL-176 | 09/02/15 | 5300 | 1700 | 4 | 105.9 | 20.3 | QCL-3-06 | 106.1 | 17.0 | 99.8 | 3.3 | PASS | JK |
| CL-177 | 09/02/15 | 5250 | 1750 | 4 | 107.1 | 18.9 | QCL-3-10 | 109.7 | 15.7 | 97.6 | 3.2 | PASS | JK |
| CL-178 | 09/02/15 | 5150 | 1800 | 4 | 106.5 | 19.7 | QCL-3-10 | 109.7 | 15.7 | 97.1 | 4.0 | PASS | JK |
| CL-179 | 09/02/15 | 5100 | 1800 | 4 | 105.6 | 20.3 | QCL-3-10 | 109.7 | 15.7 | 96.3 | 4.6 | PASS | JK |
| CL-180 | 09/02/15 | 5050 | 1850 | 4 | 105.7 | 19.4 | QCL-3-10 | 109.7 | 15.7 | 96.4 | 3.7 | PASS | JK |
| CL-181 | 09/02/15 | 5000 | 1900 | 4 | 106.5 | 19.6 | QCL-3-10 | 109.7 | 15.7 | 97.1 | 3.9 | PASS | JK |
| CL-182 | 09/02/15 | 4950 | 1900 | 4 | 106.9 | 19.4 | QCL-3-10 | 109.7 | 15.7 | 97.4 | 3.7 | PASS | JK |
| CL-183 | 09/02/15 | 4900 | 1950 | 4 | 106.9 | 18.9 | QCL-3-10 | 109.7 | 15.7 | 97.4 | 3.2 | PASS | JK |
| CL-184 | 09/02/15 | 4900 | 2000 | 4 | 106.2 | 18.5 | QCL-3-10 | 109.7 | 15.7 | 96.8 | 2.8 | PASS | JK |
| CL-185 | 09/02/15 | 5000 | 2000 | 4 | 106.5 | 18.5 | QCL-3-10 | 109.7 | 15.7 | 97.1 | 2.8 | PASS | JK |
| CL-186 | 09/02/15 | 5050 | 1950 | 4 | 108.4 | 18.6 | QCL-3-10 | 109.7 | 15.7 | 98.8 | 2.9 | PASS | JK |
| CL-187 | 09/02/15 | 5150 | 1900 | 4 | 107.4 | 18.3 | QCL-3-10 | 109.7 | 15.7 | 97.9 | 2.6 | PASS | JK |
| CL-188 | 09/02/15 | 5200 | 1850 | 4 | 108.0 | 18.6 | QCL-3-10 | 109.7 | 15.7 | 98.5 | 2.9 | PASS | JK |
| CL-189 | 09/02/15 | 5300 | 1800 | 4 | 105.8 | 19.6 | QCL-3-10 | 109.7 | 15.7 | 96.4 | 3.9 | PASS | JK |
| CL-190 | 09/02/15 | 5350 | 1750 | 4 | 107.1 | 18.7 | QCL-3-10 | 109.7 | 15.7 | 97.6 | 3.0 | PASS | JK |
| CL-191 | 09/02/15 | 5400 | 1700 | 4 | 107.4 | 18.8 | QCL-3-10 | 109.7 | 15.7 | 97.9 | 3.1 | PASS | JK |
| CL-192 | 09/02/15 | 5350 | 1600 | 4 | 106.1 | 20.3 | QCL-3-10 | 109.7 | 15.7 | 96.7 | 4.6 | PASS | JK |
| CL-193 | 09/02/15 | 5300 | 1500 | 4 | 108.0 | 17.9 | QCL-3-10 | 109.7 | 15.7 | 98.5 | 2.2 | PASS | JK |
| CL-194 | 09/02/15 | 5250 | 1450 | 4 | 106.0 | 19.4 | QCL-3-10 | 109.7 | 15.7 | 96.6 | 3.7 | PASS | JK |
| CL-195 | 09/02/15 | 5200 | 1400 | 4 | 106.0 | 19.1 | QCL-3-10 | 109.7 | 15.7 | 96.6 | 3.4 | PASS | JK |
| CL-196 | 09/02/15 | 5150 | 1450 | 4 | 106.1 | 19.5 | QCL-3-10 | 109.7 | 15.7 | 96.7 | 3.8 | PASS | JK |
| CL-197 | 09/02/15 | 5050 | 1500 | 4 | 106.6 | 19.0 | QCL-3-10 | 109.7 | 15.7 | 97.2 | 3.3 | PASS | JK |
| CL-198 | 09/02/15 | 4950 | 1550 | 4 | 105.4 | 19.9 | QCL-3-10 | 109.7 | 15.7 | 96.1 | 4.2 | PASS | JK |
| CL-199 | 09/02/15 | 4850 | 1600 | 4 | 107.0 | 18.7 | QCL-3-10 | 109.7 | 15.7 | 97.5 | 3.0 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-200 | 09/02/15 | 4950 | 1550 | 1 | 107.4 | 19.1 | QCL-3-10 | 109.7 | 15.7 | 97.9 | 3.4 | PASS | JK |
| CL-201 | 09/03/15 | 4544 | 1425 | 1 | 92.7 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 95.9 | 3.5 | PASS | JK |
| CL-202 | 09/03/15 | 4966 | 1470 | 1 | 91.3 | 27.3 | QCL-2-1 | 93.1 | 24.5 | 98.1 | 2.8 | PASS | JK |
| CL-203 | 09/03/15 | 4785 | 1558 | 1 | 91.6 | 27.7 | QCL-2-1 | 93.1 | 24.5 | 98.4 | 3.2 | PASS | JK |
| CL-204 | 09/03/15 | 5050 | 1400 | 1 | 93.7 | 25.1 | QCL-2-4 | 96.7 | 22.0 | 96.9 | 3.1 | PASS | JK |
| CL-205 | 09/03/15 | 5100 | 1400 | 1 | 91.9 | 26.6 | QCL-2-4 | 96.7 | 22.0 | 95.0 | 4.6 | PASS | JK |
| CL-206 | 09/03/15 | 5150 | 1350 | 1 | 92.5 | 26.5 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 4.5 | PASS | JK |
| CL-207 | 09/03/15 | 5200 | 1350 | 1 | 90.9 | 28.1 | QCL-2-1 | 93.1 | 24.5 | 97.6 | 3.6 | PASS | JK |
| CL-208 | 09/03/15 | 5200 | 1300 | 1 | 101.6 | 20.5 | QCL-3-07 | 104.5 | 17.4 | 97.2 | 3.1 | PASS | JK |
| CL-209 | 09/03/15 | 5250 | 1300 | 1 | 100.8 | 21.1 | QCL-3-07 | 104.5 | 17.4 | 96.5 | 3.7 | PASS | JK |
| CL-210 | 09/03/15 | 5250 | 1400 | 1 | 100.9 | 21.2 | QCL-3-07 | 104.5 | 17.4 | 96.6 | 3.8 | PASS | JK |
| CL-211 | 09/03/15 | 5300 | 1400 | 1 | 100.8 | 21.1 | QCL-3-07 | 104.5 | 17.4 | 96.5 | 3.7 | PASS | JK |
| CL-212 | 09/03/15 | 5300 | 1500 | 1 | 101.1 | 21.5 | QCL-3-07 | 104.5 | 17.4 | 96.7 | 4.1 | PASS | JK |
| CL-213 | 09/03/15 | 5400 | 1550 | 1 | 100.5 | 21.2 | QCL-3-07 | 104.5 | 17.4 | 96.2 | 3.8 | PASS | JK |
| CL-214 | 09/03/15 | 5400 | 1650 | 1 | 100.4 | 21.3 | QCL-3-07 | 104.5 | 17.4 | 96.1 | 3.9 | PASS | JK |
| CL-215 | 09/03/15 | 5500 | 1700 | 1 | 101.9 | 19.6 | QCL-3-07 | 104.5 | 17.4 | 97.5 | 2.2 | PASS | JK |
| CL-216 | 09/03/15 | 5450 | 1750 | 1 | 100.8 | 21.2 | QCL-3-07 | 104.5 | 17.4 | 96.5 | 3.8 | PASS | JK |
| CL-217 | 09/03/15 | 5400 | 1850 | 1 | 102.2 | 21.5 | QCL-3-07 | 104.5 | 17.4 | 97.8 | 4.1 | PASS | JK |
| CL-218 | 09/03/15 | 5300 | 1850 | 1 | 102.2 | 20.5 | QCL-3-07 | 104.5 | 17.4 | 97.8 | 3.1 | PASS | JK |
| CL-219 | 09/03/15 | 5250 | 1950 | 1 | 100.8 | 21.2 | QCL-3-07 | 104.5 | 17.4 | 96.5 | 3.8 | PASS | JK |
| CL-220 | 09/03/15 | 5150 | 1950 | 1 | 101.4 | 20.2 | QCL-3-07 | 104.5 | 17.4 | 97.0 | 2.8 | PASS | JK |
| CL-221 | 09/03/15 | 5100 | 2050 | 1 | 100.4 | 21.4 | QCL-3-07 | 104.5 | 17.4 | 96.1 | 4.0 | PASS | JK |
| CL-222 | 09/03/15 | 4900 | 2100 | 1 | 100.1 | 21.5 | QCL-3-07 | 104.5 | 17.4 | 95.8 | 4.1 | PASS | JK |
| CL-223 | 09/03/15 | 4300 | 1450 | 1 | 100.5 | 21.9 | QCL-3-07 | 104.5 | 17.4 | 96.2 | 4.5 | PASS | JK |
| CL-224 | 09/03/15 | 4300 | 1550 | 1 | 100.3 | 22.0 | QCL-3-07 | 104.5 | 17.4 | 96.0 | 4.6 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-225 | 09/03/15 | 4200 | 1600 | 1 | 99.9 | 21.9 | QCL-3-07 | 104.5 | 17.4 | 95.6 | 4.5 | PASS | JK |
| CL-226 | 09/03/15 | 4250 | 1700 | 1 | 102.6 | 19.6 | QCL-3-07 | 104.5 | 17.4 | 98.2 | 2.2 | PASS | JK |
| CL-227 | 09/03/15 | 4150 | 1750 | 1 | 101.5 | 20.0 | QCL-3-07 | 104.5 | 17.4 | 97.1 | 2.6 | PASS | JK |
| CL-228 | 09/03/15 | 4250 | 1800 | 1 | 100.0 | 21.7 | QCL-3-07 | 104.5 | 17.4 | 95.7 | 4.3 | PASS | JK |
| CL-229 | 09/09/15 | 4300 | 1850 | 1 | 90.1 | 27.7 | QCL-2-1 | 93.1 | 24.5 | 96.8 | 3.2 | PASS | JK |
| CL-230 | 09/09/15 | 4400 | 1850 | 1 | 92.4 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 95.6 | 3.7 | PASS | JK |
| CL-231 | 09/09/15 | 4450 | 1900 | 1 | 92.0 | 27.4 | QCL-2-1 | 93.1 | 24.5 | 98.8 | 2.9 | PASS | JK |
| CL-232 | 09/09/15 | 4500 | 1950 | 1 | 92.4 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 95.6 | 4.4 | PASS | JK |
| CL-233 | 09/09/15 | 4550 | 1900 | 1 | 93.4 | 26.2 | QCL-2-4 | 96.7 | 22.0 | 96.6 | 4.2 | PASS | JK |
| CL-234 | 09/09/15 | 4600 | 1950 | 1 | 92.1 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 95.2 | 4.4 | PASS | JK |
| CL-235 | 09/09/15 | 4650 | 1950 | 1 | 91.6 | 26.9 | QCL-2-1 | 93.1 | 24.5 | 98.4 | 2.4 | PASS | JK |
| CL-236 | 09/09/15 | 4850 | 2050 | 1 | 91.3 | 28.4 | QCL-2-1 | 93.1 | 24.5 | 98.1 | 3.9 | PASS | JK |
| CL-237 | 09/09/15 | 4750 | 1900 | 1 | 92.1 | 27.1 | QCL-2-1 | 93.1 | 24.5 | 98.9 | 2.6 | PASS | JK |
| CL-238 | 09/09/15 | 4800 | 1850 | 1 | 92.8 | 25.2 | QCL-2-4 | 96.7 | 22.0 | 96.0 | 3.2 | PASS | JK |
| CL-239 | 09/09/15 | 4900 | 1800 | 1 | 92.8 | 26.1 | QCL-2-4 | 96.7 | 22.0 | 96.0 | 4.1 | PASS | JK |
| CL-240 | 09/09/15 | 4950 | 1750 | 1 | 90.6 | 27.9 | QCL-2-1 | 93.1 | 24.5 | 97.3 | 3.4 | PASS | JK |
| CL-241 | 09/09/15 | 5000 | 1700 | 1 | 91.5 | 28.0 | QCL-2-1 | 93.1 | 24.5 | 98.3 | 3.5 | PASS | JK |
| CL-242 | 09/09/15 | 5100 | 1650 | 1 | 91.7 | 27.2 | QCL-2-1 | 93.1 | 24.5 | 98.5 | 2.7 | PASS | JK |
| CL-243 | 09/09/15 | 5200 | 1600 | 1 | 92.2 | 26.5 | QCL-2-4 | 96.7 | 22.0 | 95.3 | 4.5 | PASS | JK |
| CL-244 | 09/09/15 | 5200 | 1700 | 1 | 92.1 | 26.7 | QCL-2-1 | 93.1 | 24.5 | 98.9 | 2.2 | PASS | JK |
| CL-245 | 09/09/15 | 5100 | 1750 | 1 | 92.1 | 26.6 | QCL-2-4 | 96.7 | 22.0 | 95.2 | 4.6 | PASS | JK |
| CL-246 | 09/09/15 | 5050 | 1800 | 1 | 91.3 | 27.6 | QCL-2-1 | 93.1 | 24.5 | 98.1 | 3.1 | PASS | JK |
| CL-247 | 09/09/15 | 4950 | 1850 | 1 | 91.2 | 28.0 | QCL-2-1 | 93.1 | 24.5 | 98.0 | 3.5 | PASS | JK |
| CL-248 | 09/09/15 | 4850 | 1900 | 1 | 91.4 | 26.8 | QCL-2-1 | 93.1 | 24.5 | 98.2 | 2.3 | PASS | JK |
| CL-249 | 09/09/15 | 4750 | 2000 | 1 | 92.6 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 95.8 | 4.4 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-250 | 09/09/15 | 4700 | 1500 | 2 | 93.8 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 97.0 | 2.4 | PASS | JK |
| CL-251 | 09/09/15 | 4800 | 1550 | 2 | 92.5 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 3.5 | PASS | JK |
| CL-252 | 09/09/15 | 4850 | 1550 | 2 | 91.6 | 27.5 | QCL-2-1 | 93.1 | 24.5 | 98.4 | 3.0 | PASS | JK |
| CL-253 | 09/09/15 | 4950 | 1500 | 2 | 90.1 | 28.3 | QCL-2-1 | 93.1 | 24.5 | 96.8 | 3.8 | PASS | JK |
| CL-254 | 09/09/15 | 5000 | 1450 | 2 | 92.0 | 26.6 | QCL-2-1 | 93.1 | 24.5 | 98.8 | 2.1 | PASS | JK |
| CL-255 | 09/09/15 | 5100 | 1400 | 2 | 92.3 | 26.6 | QCL-2-4 | 96.7 | 22.0 | 95.4 | 4.6 | PASS | JK |
| CL-256 | 09/09/15 | 5150 | 1350 | 2 | 92.0 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 95.1 | 4.4 | PASS | JK |
| CL-257 | 09/10/15 | 5250 | 1350 | 2 | 91.7 | 26.9 | QCL-2-1 | 93.1 | 24.5 | 98.5 | 2.4 | PASS | JK |
| CL-258 | 09/10/15 | 5300 | 1450 | 2 | 91.9 | 26.9 | QCL-2-1 | 93.1 | 24.5 | 98.7 | 2.4 | PASS | JK |
| CL-259 | 09/10/15 | 5350 | 1500 | 2 | 92.5 | 26.7 | QCL-2-1 | 93.1 | 24.5 | 99.4 | 2.2 | PASS | JK |
| CL-260 | 09/10/15 | 5450 | 1600 | 2 | 90.4 | 28.9 | QCL-2-1 | 93.1 | 24.5 | 97.1 | 4.4 | PASS | JK |
| CL-261 | 09/10/15 | 5500 | 1700 | 2 | 91.8 | 26.7 | QCL-2-1 | 93.1 | 24.5 | 98.6 | 2.2 | PASS | JK |
| CL-262 | 09/10/15 | 5500 | 1750 | 2 | 91.6 | 27.5 | QCL-2-1 | 93.1 | 24.5 | 98.4 | 3.0 | PASS | JK |
| CL-263 | 09/10/15 | 5450 | 1800 | 2 | 91.2 | 27.5 | QCL-2-1 | 93.1 | 24.5 | 98.0 | 3.0 | PASS | JK |
| CL-264 | 09/10/15 | 5300 | 1850 | 2 | 91.4 | 26.9 | QCL-2-1 | 93.1 | 24.5 | 98.2 | 2.4 | PASS | JK |
| CL-265 | 09/10/15 | 5200 | 1900 | 2 | 90.9 | 27.9 | QCL-2-1 | 93.1 | 24.5 | 97.6 | 3.4 | PASS | JK |
| CL-266 | 09/10/15 | 5200 | 1950 | 2 | 92.3 | 26.2 | QCL-2-4 | 96.7 | 22.0 | 95.4 | 4.2 | PASS | JK |
| CL-267 | 09/10/15 | 5100 | 2000 | 2 | 92.2 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 95.3 | 4.4 | PASS | JK |
| CL-268 | 09/10/15 | 5050 | 2050 | 2 | 92.5 | 26.7 | QCL-2-1 | 93.1 | 24.5 | 99.4 | 2.2 | PASS | JK |
| CL-269 | 09/10/15 | 4950 | 2100 | 2 | 93.9 | 25.2 | QCL-2-4 | 96.7 | 22.0 | 97.1 | 3.2 | PASS | JK |
| CL-270 | 09/10/15 | 4850 | 2050 | 2 | 91.2 | 27.4 | QCL-2-1 | 93.1 | 24.5 | 98.0 | 2.9 | PASS | JK |
| CL-271 | 09/15/15 | 4750 | 2050 | 2 | 107.2 | 19.8 | QCL-3-10 | 109.7 | 15.7 | 97.7 | 4.1 | PASS | JK |
| CL-272 | 09/15/15 | 4750 | 1950 | 2 | 105.7 | 20.5 | QCL-3-06 | 106.1 | 17.0 | 99.6 | 3.5 | PASS | JK |
| CL-273 | 09/15/15 | 4850 | 1900 | 2 | 105.8 | 21.0 | QCL-3-10 | 109.7 | 15.7 | 96.4 | 5.3 | PASS | JK |
| CL-274 | 09/15/15 | 4950 | 1850 | 2 | 104.5 | 22.1 | QCL-3-06 | 106.1 | 17.0 | 98.5 | 5.1 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-275 | 09/15/15 | 5000 | 1800 | 2 | 106.5 | 20.4 | QCL-3-10 | 109.7 | 15.7 | 97.1 | 4.7 | PASS | JK |
| CL-276 | 09/15/15 | 5100 | 1750 | 2 | 106.3 | 20.8 | QCL-3-10 | 109.7 | 15.7 | 96.9 | 5.1 | PASS | JK |
| CL-277 | 09/15/15 | 5150 | 1700 | 2 | 104.5 | 22.3 | QCL-3-06 | 106.1 | 17.0 | 98.5 | 5.3 | PASS | JK |
| CL-278 | 09/15/15 | 5250 | 1650 | 2 | 104.9 | 21.4 | QCL-3-06 | 106.1 | 17.0 | 98.9 | 4.4 | PASS | JK |
| CL-279 | 09/15/15 | 5200 | 1600 | 2 | 105.8 | 21.3 | QCL-3-06 | 106.1 | 17.0 | 99.7 | 4.3 | PASS | JK |
| CL-280 | 09/15/15 | 5100 | 1650 | 2 | 106.3 | 21.0 | QCL-3-06 | 106.1 | 17.0 | 100.2 | 4.0 | PASS | JK |
| CL-281 | 09/15/15 | 5000 | 1700 | 2 | 104.7 | 22.8 | QCL-3-06 | 106.1 | 17.0 | 98.7 | 5.8 | PASS | JK |
| CL-282 | 09/15/15 | 4900 | 1800 | 2 | 107.0 | 20.1 | QCL-3-10 | 109.7 | 15.7 | 97.5 | 4.4 | PASS | JK |
| CL-283 | 09/15/15 | 4800 | 1850 | 2 | 106.8 | 20.1 | QCL-3-10 | 109.7 | 15.7 | 97.4 | 4.4 | PASS | JK |
| CL-284 | 09/15/15 | 4700 | 1900 | 2 | 105.5 | 21.1 | QCL-3-06 | 106.1 | 17.0 | 99.4 | 4.1 | PASS | JK |
| CL-285 | 09/15/15 | 4600 | 1950 | 2 | 105.6 | 21.6 | QCL-3-06 | 106.1 | 17.0 | 99.5 | 4.6 | PASS | JK |
| CL-286 | 09/15/15 | 4500 | 1900 | 2 | 104.6 | 21.7 | QCL-3-06 | 106.1 | 17.0 | 98.6 | 4.7 | PASS | JK |
| CL-287 | 09/15/15 | 4400 | 1900 | 2 | 105.5 | 21.0 | QCL-3-06 | 106.1 | 17.0 | 99.4 | 4.0 | PASS | JK |
| CL-288 | 09/15/15 | 4350 | 1850 | 2 | 106.4 | 20.6 | QCL-3-10 | 109.7 | 15.7 | 97.0 | 4.9 | PASS | JK |
| CL-289 | 09/15/15 | 4250 | 1800 | 2 | 105.1 | 22.2 | QCL-3-06 | 106.1 | 17.0 | 99.1 | 5.2 | PASS | JK |
| CL-290 | 09/15/15 | 4200 | 1750 | 2 | 103.9 | 22.9 | QCL-3-06 | 106.1 | 17.0 | 97.9 | 5.9 | PASS | JK |
| CL-291 | 09/15/15 | 4200 | 1650 | 2 | 106.0 | 20.4 | QCL-3-06 | 106.1 | 17.0 | 99.9 | 3.4 | PASS | JK |
| CL-292 | 09/15/15 | 4250 | 1550 | 2 | 104.6 | 21.2 | QCL-3-06 | 106.1 | 17.0 | 98.6 | 4.2 | PASS | JK |
| CL-293 | 09/15/15 | 4300 | 1500 | 2 | 104.8 | 22.3 | QCL-3-06 | 106.1 | 17.0 | 98.8 | 5.3 | PASS | JK |
| CL-294 | 09/15/15 | 4300 | 1400 | 2 | 104.6 | 22.6 | QCL-3-06 | 106.1 | 17.0 | 98.6 | 5.6 | PASS | JK |
| CL-295 | 09/15/15 | 4400 | 1400 | 2 | 107.2 | 20.1 | QCL-3-10 | 109.7 | 15.7 | 97.7 | 4.4 | PASS | JK |
| CL-296 | 09/15/15 | 4500 | 1450 | 2 | 105.6 | 21.1 | QCL-3-06 | 106.1 | 17.0 | 99.5 | 4.1 | PASS | JK |
| CL-297 | 09/15/15 | 4550 | 1400 | 2 | 105.2 | 22.2 | QCL-3-06 | 106.1 | 17.0 | 99.2 | 5.2 | PASS | JK |
| CL-298 | 09/15/15 | 4600 | 1450 | 2 | 106.1 | 20.6 | QCL-3-06 | 106.1 | 17.0 | 100.0 | 3.6 | PASS | JK |
| CL-299 | 09/15/15 | 4650 | 1450 | 3 | 106.5 | 19.8 | QCL-3-10 | 109.7 | 15.7 | 97.1 | 4.1 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-300 | 09/15/15 | 4600 | 1500 | 3 | 104.4 | 22.3 | QCL-3-06 | 106.1 | 17.0 | 98.4 | 5.3 | PASS | JK |
| CL-301 | 09/15/15 | 4750 | 1550 | 3 | 104.8 | 21.3 | QCL-3-06 | 106.1 | 17.0 | 98.8 | 4.3 | PASS | JK |
| CL-302 | 09/15/15 | 4860 | 1500 | 3 | 106.7 | 20.2 | QCL-3-10 | 109.7 | 15.7 | 97.3 | 4.5 | PASS | JK |
| CL-303 | 09/15/15 | 4850 | 1550 | 3 | 106.7 | 21.0 | QCL-3-10 | 109.7 | 15.7 | 97.3 | 5.3 | PASS | JK |
| CL-304 | 09/15/15 | 4900 | 1500 | 3 | 105.5 | 21.0 | QCL-3-06 | 106.1 | 17.0 | 99.4 | 4.0 | PASS | JK |
| CL-305 | 09/15/15 | 5000 | 1500 | 3 | 105.5 | 20.9 | QCL-3-06 | 106.1 | 17.0 | 99.4 | 3.9 | PASS | JK |
| CL-306 | 09/15/15 | 5050 | 1400 | 3 | 107.6 | 19.7 | QCL-3-10 | 109.7 | 15.7 | 98.1 | 4.0 | PASS | JK |
| CL-307 | 09/15/15 | 5100 | 1400 | 3 | 105.6 | 21.3 | QCL-3-06 | 106.1 | 17.0 | 99.5 | 4.3 | PASS | JK |
| CL-308 | 09/15/15 | 5150 | 1400 | 3 | 107.8 | 19.6 | QCL-3-10 | 109.7 | 15.7 | 98.3 | 3.9 | PASS | JK |
| CL-309 | 09/15/15 | 5200 | 1350 | 3 | 105.1 | 22.0 | QCL-3-06 | 106.1 | 17.0 | 99.1 | 5.0 | PASS | JK |
| CL-310 | 09/15/15 | 5050 | 1450 | 3 | 105.5 | 20.9 | QCL-3-06 | 106.1 | 17.0 | 99.4 | 3.9 | PASS | JK |
| CL-311 | 09/15/15 | 5300 | 1400 | 3 | 105.4 | 20.9 | QCL-3-06 | 106.1 | 17.0 | 99.3 | 3.9 | PASS | JK |
| CL-312 | 09/15/15 | 5350 | 1500 | 3 | 107.7 | 20.0 | QCL-3-10 | 109.7 | 15.7 | 98.2 | 4.3 | PASS | JK |
| CL-313 | 09/16/15 | 5400 | 1550 | 3 | 93.4 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 96.6 | 2.8 | PASS | JK |
| CL-314 | 09/16/15 | 5450 | 1650 | 3 | 92.9 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 96.1 | 3.5 | PASS | JK |
| CL-315 | 09/16/15 | 5500 | 17000 | 3 | 95.3 | 22.8 | QCL-3-18 | 100.0 | 20.5 | 95.3 | 2.3 | PASS | JK |
| CL-316 | 09/16/15 | 5450 | 1750 | 3 | 92.7 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 95.9 | 3.7 | PASS | JK |
| CL-317 | 09/16/15 | 5400 | 1800 | 3 | 92.5 | 25.6 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 3.6 | PASS | JK |
| CL-318 | 09/16/15 | 5350 | 1850 | 3 | 93.1 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 96.3 | 2.8 | PASS | JK |
| CL-319 | 09/16/15 | 5300 | 1900 | 3 | 94.2 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 97.4 | 2.4 | PASS | JK |
| CL-320 | 09/16/15 | 5200 | 1900 | 3 | 93.2 | 25.4 | QCL-2-4 | 96.7 | 22.0 | 96.4 | 3.4 | PASS | JK |
| CL-321 | 09/16/15 | 5150 | 2000 | 3 | 93.5 | 24.6 | QCL-2-4 | 96.7 | 22.0 | 96.7 | 2.6 | PASS | JK |
| CL-322 | 09/16/15 | 5050 | 2050 | 3 | 93.4 | 25.2 | QCL-2-4 | 96.7 | 22.0 | 96.6 | 3.2 | PASS | JK |
| CL-323 | 09/16/15 | 4950 | 2050 | 3 | 94.1 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 97.3 | 2.4 | PASS | JK |
| CL-324 | 09/16/15 | 4850 | 2050 | 3 | 94.0 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 97.2 | 2.4 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-325 | 09/16/15 | 4750 | 1750 | 3 | 95.3 | 23.1 | QCL-3-18 | 100.0 | 20.5 | 95.3 | 2.6 | PASS | JK |
| CL-326 | 09/16/15 | 4850 | 1900 | 3 | 94.2 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 97.4 | 2.7 | PASS | JK |
| CL-327 | 09/16/15 | 4950 | 1850 | 3 | 93.1 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 96.3 | 2.8 | PASS | JK |
| CL-328 | 09/16/15 | 5050 | 1800 | 3 | 93.7 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 96.9 | 2.1 | PASS | JK |
| CL-329 | 09/16/15 | 5150 | 1750 | 3 | 94.1 | 24.5 | QCL-2-4 | 96.7 | 22.0 | 97.3 | 2.5 | PASS | JK |
| CL-330 | 09/16/15 | 5240 | 1750 | 3 | 93.9 | 24.6 | QCL-2-4 | 96.7 | 22.0 | 97.1 | 2.6 | PASS | JK |
| CL-331 | 09/16/15 | 5250 | 1600 | 3 | 94.5 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 97.7 | 2.1 | PASS | JK |
| CL-332 | 09/16/15 | 5150 | 1600 | 3 | 95.4 | 22.5 | QCL-3-18 | 100.0 | 20.5 | 95.4 | 2.0 | PASS | JK |
| CL-333 | 09/16/15 | 5050 | 1700 | 3 | 94.1 | 23.7 | QCL-3-15 | 98.4 | 19.6 | 95.6 | 4.1 | PASS | JK |
| CL-334 | 09/16/15 | 4950 | 1750 | 3 | 95.5 | 22.6 | QCL-3-15 | 98.4 | 19.6 | 97.1 | 3.0 | PASS | JK |
| CL-335 | 09/16/15 | 1800 | 4850 | 3 | 94.3 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 97.5 | 2.2 | PASS | JK |
| CL-336 | 09/16/15 | 4750 | 1900 | 3 | 95.4 | 23.0 | QCL-3-15 | 98.4 | 19.6 | 97.0 | 3.4 | PASS | JK |
| CL-337 | 09/16/15 | 4650 | 1950 | 3 | 93.7 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 96.9 | 2.2 | PASS | JK |
| CL-338 | 09/16/15 | 4550 | 1950 | 3 | 93.3 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 96.5 | 2.1 | PASS | JK |
| CL-339 | 09/16/15 | 4450 | 1900 | 3 | 95.3 | 23.0 | QCL-3-15 | 98.4 | 19.6 | 96.8 | 3.4 | PASS | JK |
| CL-340 | 09/16/15 | 4350 | 1850 | 3 | 91.9 | 26.7 | QCL-2-4 | 96.7 | 22.0 | 95.0 | 4.7 | PASS | JK |
| CL-341 | 09/16/15 | 4250 | 1800 | 3 | 95.2 | 23.2 | QCL-3-15 | 98.4 | 19.6 | 96.7 | 3.6 | PASS | JK |
| CL-342 | 09/16/15 | 4200 | 1750 | 3 | 93.0 | 24.9 | QCL-2-4 | 96.7 | 22.0 | 96.2 | 2.9 | PASS | JK |
| CL-343 | 09/16/15 | 4200 | 1650 | 3 | 94.3 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 97.5 | 2.4 | PASS | JK |
| CL-344 | 09/16/15 | 4250 | 1600 | 3 | 95.3 | 22.3 | QCL-3-15 | 98.4 | 19.6 | 96.8 | 2.7 | PASS | JK |
| CL-345 | 09/16/15 | 4250 | 1550 | 3 | 94.9 | 23.0 | QCL-3-15 | 98.4 | 19.6 | 96.4 | 3.4 | PASS | JK |
| CL-346 | 09/16/15 | 4300 | 1500 | 3 | 95.4 | 21.9 | QCL-3-15 | 98.4 | 19.6 | 97.0 | 2.3 | PASS | JK |
| CL-347 | 09/16/15 | 4300 | 1400 | 3 | 94.7 | 23.6 | QCL-3-15 | 98.4 | 19.6 | 96.2 | 4.0 | PASS | JK |
| CL-348 | 09/17/15 | 4400 | 1350 | 3 | 91.9 | 26.8 | QCL-2-4 | 96.7 | 22.0 | 95.0 | 4.8 | PASS | JK |
| CL-349 | 09/17/15 | 4450 | 1400 | 3 | 92.4 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 95.6 | 3.7 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-350 | 09/17/15 | 4600 | 1450 | 3 | 93.6 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 96.8 | 2.1 | PASS | JK |
| CL-351 | 09/17/15 | 4600 | 1450 | 4 | 94.0 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 97.2 | 2.3 | PASS | JK |
| CL-352 | 09/17/15 | 4650 | 1500 | 4 | 94.6 | 23.7 | QCL-3-15 | 98.4 | 19.6 | 96.1 | 4.1 | PASS | JK |
| CL-353 | 09/17/15 | 4750 | 1500 | 4 | 92.5 | 25.2 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 3.2 | PASS | JK |
| CL-354 | 09/17/15 | 4800 | 1550 | 4 | 92.8 | 25.1 | QCL-2-4 | 96.7 | 22.0 | 96.0 | 3.1 | PASS | JK |
| CL-355 | 09/17/15 | 4850 | 1550 | 4 | 94.2 | 23.7 | QCL-3-15 | 98.4 | 19.6 | 95.7 | 4.1 | PASS | JK |
| CL-356 | 09/17/15 | 4900 | 1500 | 4 | 94.1 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 97.3 | 2.3 | PASS | JK |
| CL-357 | 09/17/15 | 5000 | 1500 | 4 | 93.4 | 25.1 | QCL-2-4 | 96.7 | 22.0 | 96.6 | 3.1 | PASS | JK |
| CL-358 | 09/17/15 | 5050 | 1450 | 4 | 92.4 | 26.2 | QCL-2-4 | 96.7 | 22.0 | 95.6 | 4.2 | PASS | JK |
| CL-359 | 09/17/15 | 5150 | 1350 | 4 | 93.9 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 97.1 | 2.7 | PASS | JK |
| CL-360 | 09/17/15 | 5900 | 1800 | 4 | 94.4 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 97.6 | 2.0 | PASS | JK |
| CL-361 | 09/17/15 | 5250 | 1400 | 4 | 94.5 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 97.7 | 2.2 | PASS | JK |
| CL-362 | 09/17/15 | 5300 | 1450 | 4 | 94.1 | 23.8 | QCL-3-15 | 98.4 | 19.6 | 95.6 | 4.2 | PASS | JK |
| CL-363 | 09/17/15 | 5350 | 1500 | 4 | 94.5 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 97.7 | 2.2 | PASS | JK |
| CL-364 | 09/17/15 | 5400 | 1550 | 4 | 94.9 | 22.9 | QCL-3-15 | 98.4 | 19.6 | 96.4 | 3.3 | PASS | JK |
| CL-365 | 09/17/15 | 4750 | 1900 | 4 | 94.2 | 23.7 | QCL-3-15 | 98.4 | 19.6 | 95.7 | 4.1 | PASS | JK |
| CL-366 | 09/17/15 | 5450 | 1650 | 4 | 94.0 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 97.2 | 2.4 | PASS | JK |
| CL-367 | 09/17/15 | 5500 | 1700 | 4 | 95.1 | 23.1 | QCL-3-15 | 98.4 | 19.6 | 96.6 | 3.5 | PASS | JK |
| CL-368 | 09/17/15 | 5500 | 1750 | 4 | 96.0 | 22.0 | QCL-3-15 | 98.4 | 19.6 | 97.6 | 2.4 | PASS | JK |
| CL-369 | 09/17/15 | 5450 | 1800 | 4 | 94.2 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 97.4 | 2.2 | PASS | JK |
| CL-370 | 09/17/15 | 4750 | 1900 | 4 | 93.6 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 96.8 | 2.4 | PASS | JK |
| CL-371 | 09/17/15 | 5300 | 1900 | 4 | 95.2 | 22.8 | QCL-3-15 | 98.4 | 19.6 | 96.7 | 3.2 | PASS | JK |
| CL-372 | 09/17/15 | 5200 | 1950 | 4 | 92.7 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 95.9 | 3.5 | PASS | JK |
| CL-373 | 09/17/15 | 5150 | 2000 | 4 | 93.6 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 96.8 | 2.7 | PASS | JK |
| CL-374 | 09/17/15 | 5050 | 2050 | 4 | 93.7 | 24.9 | QCL-2-4 | 96.7 | 22.0 | 96.9 | 2.9 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-375 | 09/17/15 | 4750 | 1700 | 4 | 93.1 | 24.9 | QCL-2-4 | 96.7 | 22.0 | 96.3 | 2.9 | PASS | JK |
| CL-376 | 09/17/15 | 4850 | 2050 | 4 | 93.1 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 96.3 | 2.8 | PASS | JK |
| CL-377 | 09/17/15 | 4750 | 2050 | 4 | 92.5 | 25.1 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 3.1 | PASS | JK |
| CL-378 | 09/17/15 | 4750 | 2000 | 4 | 94.1 | 24.5 | QCL-2-4 | 96.7 | 22.0 | 97.3 | 2.5 | PASS | JK |
| CL-379 | 09/17/15 | 4800 | 1950 | 4 | 94.5 | 23.3 | QCL-3-15 | 98.4 | 19.6 | 96.0 | 3.7 | PASS | JK |
| CL-380 | 09/17/15 | 4250 | 1650 | 4 | 94.7 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 97.9 | 2.3 | PASS | JK |
| CL-381 | 09/17/15 | 4950 | 1850 | 4 | 93.8 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 97.0 | 2.2 | PASS | JK |
| CL-382 | 09/17/15 | 5000 | 1800 | 4 | 93.4 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 96.6 | 2.1 | PASS | JK |
| CL-383 | 09/17/15 | 5100 | 1750 | 4 | 94.0 | 23.8 | QCL-3-15 | 98.4 | 19.6 | 95.5 | 4.2 | PASS | JK |
| CL-384 | 09/17/15 | 5150 | 1750 | 4 | 93.6 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 96.8 | 2.4 | PASS | JK |
| CL-385 | 09/17/15 | 4300 | 1400 | 4 | 94.9 | 22.9 | QCL-3-15 | 98.4 | 19.6 | 96.4 | 3.3 | PASS | JK |
| CL-386 | 09/17/15 | 5250 | 1650 | 4 | 92.3 | 25.8 | QCL-2-4 | 96.7 | 22.0 | 95.4 | 3.8 | PASS | JK |
| CL-387 | 09/17/15 | 5200 | 1600 | 4 | 93.8 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 97.0 | 2.4 | PASS | JK |
| CL-388 | 09/17/15 | 5150 | 1650 | 4 | 93.1 | 24.8 | QCL-2-4 | 96.7 | 22.0 | 96.3 | 2.8 | PASS | JK |
| CL-389 | 09/17/15 | 5050 | 1700 | 4 | 94.2 | 23.4 | QCL-3-15 | 98.4 | 19.6 | 95.7 | 3.8 | PASS | JK |
| CL-390 | 09/16/15 | 5000 | 1750 | 4 | 93.3 | 25.0 | QCL-2-4 | 96.7 | 22.0 | 96.5 | 3.0 | PASS | JK |
| CL-391 | 09/16/15 | 4900 | 1800 | 4 | 93.9 | 23.7 | QCL-3-15 | 98.4 | 19.6 | 95.4 | 4.1 | PASS | JK |
| CL-392 | 09/16/15 | 4800 | 1850 | 4 | 93.7 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 96.9 | 2.2 | PASS | JK |
| CL-393 | 09/16/15 | 4750 | 1900 | 4 | 94.3 | 23.8 | QCL-3-15 | 98.4 | 19.6 | 95.8 | 4.2 | PASS | JK |
| CL-394 | 09/16/15 | 4650 | 1950 | 4 | 94.8 | 24.0 | QCL-2-4 | 96.7 | 22.0 | 98.0 | 2.0 | PASS | JK |
| CL-395 | 09/16/15 | 4550 | 1950 | 4 | 95.5 | 22.4 | QCL-3-15 | 98.4 | 19.6 | 97.1 | 2.8 | PASS | JK |
| CL-396 | 09/16/15 | 4500 | 1900 | 4 | 92.5 | 26.4 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 4.4 | PASS | JK |
| CL-397 | 09/17/15 | 4450 | 1850 | 4 | 94.8 | 23.8 | QCL-3-15 | 98.4 | 19.6 | 96.3 | 4.2 | PASS | JK |
| CL-398 | 09/17/15 | 4350 | 1850 | 4 | 91.4 | 27.5 | QCL-2-1 | 93.1 | 24.5 | 98.2 | 3.0 | PASS | JK |
| CL-399 | 09/17/15 | 4300 | 1800 | 4 | 92.8 | 25.7 | QCL-2-4 | 96.7 | 22.0 | 96.0 | 3.7 | PASS | JK |

# CLAY LINER FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| CL-400 | 09/17/15 | 4200 | 1800 | 4 | 93.7 | 24.7 | QCL-2-4 | 96.7 | 22.0 | 96.9 | 2.7 | PASS | JK |
| CL-401 | 09/17/15 | 4200 | 1750 | 4 | 94.6 | 23.5 | QCL-3-15 | 98.4 | 19.6 | 96.1 | 3.9 | PASS | JK |
| CL-402 | 09/17/15 | 4200 | 1700 | 4 | 94.2 | 24.1 | QCL-2-4 | 96.7 | 22.0 | 97.4 | 2.1 | PASS | JK |
| CL-403 | 09/17/15 | 4250 | 1650 | 4 | 93.3 | 24.2 | QCL-2-4 | 96.7 | 22.0 | 96.5 | 2.2 | PASS | JK |
| CL-404 | 09/17/15 | 4250 | 1600 | 4 | 93.4 | 25.0 | QCL-2-4 | 96.7 | 22.0 | 96.6 | 3.0 | PASS | JK |
| CL-405 | 09/17/15 | 4250 | 1550 | 4 | 94.9 | 23.0 | QCL-3-15 | 98.4 | 19.6 | 96.4 | 3.4 | PASS | JK |
| CL-406 | 09/17/15 | 4300 | 1500 | 4 | 94.8 | 24.4 | QCL-2-4 | 96.7 | 22.0 | 98.0 | 2.4 | PASS | JK |
| CL-407 | 09/17/15 | 4300 | 1450 | 4 | 94.2 | 24.3 | QCL-2-4 | 96.7 | 22.0 | 97.4 | 2.3 | PASS | JK |
| CL-408 | 09/17/15 | 4350 | 1400 | 4 | 94.4 | 22.9 | QCL-3-15 | 98.4 | 19.6 | 95.9 | 3.3 | PASS | JK |
| CL-409 | 09/17/15 | 4400 | 1400 | 4 | 92.5 | 25.5 | QCL-2-4 | 96.7 | 22.0 | 95.7 | 3.5 | PASS | JK |
| CL-410 | 09/17/15 | 4450 | 1400 | 4 | 92.3 | 25.9 | QCL-2-4 | 96.7 | 22.0 | 95.4 | 3.9 | PASS | JK |

Notes:
1. In situ values determined by nuclear methods: ASTM D-2922 for density and D-3017 for moisture content.
2. "PASS" indicates both a percent compaction exceeding the minimum required compaction (95% Max Dry Density) and a moisture content of +2 to +6 of the optimum moisture content.

# DRIVE CYLINDER AND NUCLEAR GUAGE COMPARISON

## DRIVE CYLINDER AND NUCLEAR GAUGE COMPARISON

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-005 | Test Number: | CL-005 |
| Wet Density: | 115.9 | Wet Density: | 121.7 |
| Water Content: | 24.4 | Water Content: | 25.3 |
| Dry Density: | 93.2 | Dry Density: | 97.1 |

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-055 | Test Number: | CL-055 |
| Wet Density: | 118.9 | Wet Density: | 125.1 |
| Water Content: | 26.1 | Water Content: | 26.5 |
| Dry Density: | 94.3 | Dry Density: | 98.9 |

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-175 | Test Number: | CL-175 |
| Wet Density: | 112.7 | Wet Density: | 124.5 |
| Water Content: | 27.3 | Water Content: | 22.9 |
| Dry Density: | 88.5 | Dry Density: | 101.3 |

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-280 | Test Number: | CL-280 |
| Wet Density: | 128.6 | Wet Density: | 126.1 |
| Water Content: | 21 | Water Content: | 21.1 |
| Dry Density: | 106.3 | Dry Density: | 104.1 |

| DRIVE CYLINDER CORRELATION | | NUCLEAR GUAGE CORRELATION | |
|---|---|---|---|
| Test Number: | CL-397 | Test Number: | CL-397 |
| Wet Density: | 117.4 | Wet Density: | 122.7 |
| Water Content: | 23.8 | Water Content: | 25.6 |
| Dry Density: | 94.8 | Dry Density: | 97.7 |

# CLAY LINER SUBGRADE FIELD DENSITY TEST RESULTS

## CLAY LINER SUBGRADE FIELD DENSITY TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| Test Number | Date | Location | | Lift | In Situ Values (1) | | Reference Values | | | Criteria | | | CQA Monitor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | E | | Dry Density (pcf) | Moisture Content (%) | Proctor Curve No. | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Insitu Percent Compaction | Difference from O.M.C. | Pass/ Fail (2) | |
| SG-001 | 08/19/15 | 4295 | 1725 | GRADE | 96.2 | 17.2 | QCL-14-1 | 100.7 | 17.8 | 95.5 | -0.6 | PASS | MBD |
| SG-002 | 08/19/15 | 4400 | 1500 | GRADE | 96.2 | 15.4 | QCL-14-1 | 100.7 | 17.8 | 95.5 | -2.4 | PASS | MBD |
| SG-003 | 08/19/15 | 4525 | 1530 | GRADE | 98.0 | 15.4 | QCL-14-1 | 100.7 | 17.8 | 97.3 | -2.4 | PASS | MBD |
| SG-004 | 08/19/15 | 4445 | 1665 | GRADE | 97.4 | 15.5 | QCL-14-1 | 100.7 | 17.8 | 96.7 | -2.3 | PASS | MBD |
| SG-005 | 08/19/15 | 4495 | 1820 | GRADE | 95.8 | 15.3 | QCL-14-1 | 100.7 | 17.8 | 95.1 | -2.5 | PASS | MBD |
| SG-006 | 08/19/15 | 4650 | 1835 | GRADE | 97.2 | 16.8 | QCL-14-1 | 100.7 | 17.8 | 96.5 | -1.0 | PASS | MBD |
| SG-007 | 08/19/15 | 4595 | 1700 | GRADE | 99.1 | 15.8 | QCL-14-1 | 100.7 | 17.8 | 98.4 | -2.0 | PASS | MBD |
| SG-008 | 08/19/15 | 4640 | 1575 | GRADE | 101.6 | 17.6 | QCL-14-1 | 100.7 | 17.8 | 100.9 | -0.2 | PASS | MBD |
| SG-009 | 08/19/15 | 4800 | 1610 | GRADE | 99.1 | 12.4 | QCL-FGD-C4 | 103.8 | 14.5 | 95.5 | -2.1 | PASS | MBD |
| SG-010 | 08/19/15 | 4790 | 1750 | GRADE | 100.7 | 13.3 | QCL-FGD-C4 | 103.8 | 14.5 | 97.0 | -1.2 | PASS | MBD |
| SG-011 | 08/21/15 | 4990 | 1610 | GRADE | 101.9 | 11.5 | QCL-FGD-C4 | 103.8 | 14.5 | 98.2 | -3.0 | PASS | MBD |
| SG-012 | 08/21/15 | 5200 | 1500 | GRADE | 101.6 | 12.7 | QCL-FGD-C4 | 103.8 | 14.5 | 97.9 | -1.8 | PASS | MBD |
| SG-013 | 08/21/15 | 5350 | 1690 | GRADE | 99.8 | 11.5 | QCL-FGD-C4 | 103.8 | 14.5 | 96.1 | -3.0 | PASS | MBD |
| SG-014 | 08/21/15 | 5200 | 1825 | GRADE | 100.0 | 12.3 | QCL-FGD-C4 | 103.8 | 14.5 | 96.3 | -2.2 | PASS | MBD |
| SG-015 | 08/21/15 | 5000 | 1950 | GRADE | 103.6 | 12.5 | QCL-FGD-C4 | 103.8 | 14.5 | 99.8 | -2.0 | PASS | MBD |

Notes:
1. In situ values determined by nuclear methods: ASTM D-2922 for density and D-3017 for moisture content.
2. "PASS" indicates both a percent compaction exceeding the minimum required compaction (95% Max Dry Density) and a moisture content of -3 to +3 of the optimum moisture content.

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# SUMMARY OF LABORATORY RESULTS



**CLIENT** Luminant Power **PROJECT NAME** Luminant / OGSES FGD-C Pond CQA

**PROJECT NUMBER** 1525714 **PROJECT LOCATION**

| Borehole | Depth | Liquid Limit | Plastic Limit | Plasticity Index | Maximum Size (mm) | %<#200 Sieve | Class-ification | Water Content (%) | Dry Density (pcf) | Wet Density (pcf) | Specific Gravity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SG-03 | 0.0 | | | | | | | 17.9 | 103.5 | 122.0 | |
| SG-014 | 0.0 | | | | | | | 10.6 | 95.2 | 105.3 | |

UNIT WEIGHT LUMINANT.GPJ - 1525714 - GINT STD US LAB.GDT - 10/31/16 09:21 - L:\15 - 2015 FILE FOLDER\1525714_LUMINANT\1525714_LUMINANT.GPJ

# APPENDIX E
# CLAY LINER MOISTURE CONTENTS

## LABORATORY AND FIELD MOISTURE CONTENT COMPARISON

| TEST NO. | LABORATORY MOISTURE CONTENT (%) | FIELD MOISTURE CONTENT (%) | DIFFERENCE |
|---|---|---|---|
| CL-022 | 16.8 | 24.4 | -7.6 |
| CL-050 | 21.4 | 24.8 | -3.4 |
| CL-080 | 23.2 | 28.5 | -5.3 |
| CL-115 | 21.8 | 25.1 | -3.3 |
| CL-150 | 19.4 | 26.6 | -7.2 |
| CL-205 | 21.1 | 26.6 | -5.5 |
| CL-240 | 20.0 | 27.9 | -7.9 |
| CL-270 | 23.3 | 25.2 | -1.9 |
| CL-310 | 23.0 | 20.9 | 2.1 |
| CL-365 | 21.2 | 23.7 | -2.5 |

# APPENDIX F
# GEOMEMBRANE MATERIAL INVENTORY

# GSE Roll Allocation

**Order** SO-076398
**Customer** Lone Star Lining Company
**Project Name** LSL Oak Grove Station

| Roll# | Resin Lot | Product Code | Mfg Date | Length |
|---|---|---|---|---|
| 108183348 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183349 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183350 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183351 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183352 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183353 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183354 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183355 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183356 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183357 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183358 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183359 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/10/2015 | 520 |
| 108183361 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183362 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183363 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183364 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |

# GSE Roll Allocation

**Order** SO-076398
**Customer** Lone Star Lining Company
**Project Name** LSL Oak Grove Station

| Roll# | Resin Lot | Product Code | Mfg Date | Length |
|---|---|---|---|---|
| 108183402 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183403 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183404 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183405 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183406 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183407 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183408 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183409 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183410 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183411 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183412 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183413 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183414 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183415 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183416 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183417 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/14/2015 | 520 |

# GSE Roll Allocation

**Order** SO-076398
**Customer** Lone Star Lining Company
**Project Name** LSL Oak Grove Station

| Roll# | Resin Lot | Product Code | Mfg Date | Length |
|---|---|---|---|---|
| 108183384 | HFG820860 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183385 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183386 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183387 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183388 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183389 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183390 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183391 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183392 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183393 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183394 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183395 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183396 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183397 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183398 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183399 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183400 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |
| 108183401 | HFG821000 | HDT-060GE-BBB-B-W0 | 8/13/2015 | 520 |

# GSE Roll Allocation

**Order** SO-076398
**Customer** Lone Star Lining Company
**Project Name** LSL Oak Grove Station

| Roll# | Resin Lot | Product Code | Mfg Date | Length |
|---|---|---|---|---|
| 108183365 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183366 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183367 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183368 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183369 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183370 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183371 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183372 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183373 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183374 | HFG820880 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183375 | HFG820860 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183376 | HFG820860 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183377 | HFG820860 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183378 | HFG820860 | HDT-060GE-BBB-B-W0 | 8/11/2015 | 520 |
| 108183379 | HFG820860 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183380 | HFG820860 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183381 | HFG820860 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183382 | HFG820860 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |
| 108183383 | HFG820860 | HDT-060GE-BBB-B-W0 | 8/12/2015 | 520 |

# APPENDIX G
# GEOMEMBRANE RESIN AND ROLL QUALITY CONTROL DOCUMENTS

GSE Environmental, LLC

ENVIRONMENTAL™

# ROLL TEST DATA REPORT

GSE QC APPROVED

*Report Date:* Aug/11/2015

APPENDIX E-Revision 1 November 21, 2022

| *Sales Order No.* | *Customer Name* | *Project Location* | *Product Name* | *BOL Number* |
|---|---|---|---|---|
| SO-076398 | Lone Star Lining Company | Franklin TX US | HDT-060GE-BBB-B-W0 | |

| Roll Number | Average Thickness ASTM D5994 (mils) | Minimum Thickness ASTM D5994 (mils) | Yield Strength ASTM D6693 (ppi) MD | Yield Strength ASTM D6693 (ppi) TD | Yield Elongation ASTM D6693 (%) MD | Yield Elongation ASTM D6693 (%) TD | Break Strength ASTM D6693 (ppi) MD | Break Strength ASTM D6693 (ppi) TD | Break Elongation ASTM D6693 (%) MD | Break Elongation ASTM D6693 (%) TD | Tear Resistance ASTM D1004 (lbs) MD | Tear Resistance ASTM D1004 (lbs) TD | Puncture Resistance ASTM D4833 (lbs) | Density ASTM D1505 (g/cc) | Carbon Black Content ASTM D4218 (%) | Carbon Black Dispersion ASTM D5596 (Views in Cat1-Cat2) | Asperity Height ASTM D7466 (mils) A Side | Asperity Height ASTM D7466 (mils) B Side |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 108183347 | 62 | 57 | 176 | 182 | 16 | 16 | 195 | 176 | 472 | 442 | 61 | 56 | 163 | 0.945 | 2.6 | 10 | 22 | 20 |
| 108183348 | 62 | 57 | 176 | 182 | 16 | 16 | 195 | 176 | 472 | 442 | 61 | 56 | 163 | 0.945 | 2.6 | 10 | 22 | 20 |
| 108183349 | 62 | 59 | 173 | 181 | 16 | 16 | 218 | 198 | 568 | 548 | 64 | 62 | 158 | 0.946 | 2.6 | 10 | 28 | 20 |
| 108183350 | 62 | 59 | 173 | 181 | 16 | 16 | 218 | 198 | 568 | 548 | 64 | 62 | 158 | 0.946 | 2.6 | 10 | 28 | 20 |
| 108183351 | 63 | 59 | 173 | 181 | 16 | 16 | 218 | 198 | 568 | 548 | 64 | 62 | 158 | 0.946 | 2.6 | 10 | 28 | 20 |
| 108183352 | 62 | 60 | 173 | 181 | 16 | 16 | 218 | 198 | 568 | 548 | 64 | 62 | 158 | 0.946 | 2.6 | 10 | 28 | 20 |
| 108183353 | 62 | 57 | 168 | 180 | 16 | 16 | 191 | 190 | 475 | 466 | 63 | 58 | 163 | 0.946 | 2.5 | 10 | 24 | 20 |
| 108183354 | 61 | 56 | 168 | 180 | 16 | 16 | 191 | 190 | 475 | 466 | 63 | 58 | 163 | 0.946 | 2.5 | 10 | 24 | 20 |
| 108183355 | 61 | 57 | 168 | 180 | 16 | 16 | 191 | 190 | 475 | 466 | 63 | 58 | 163 | 0.946 | 2.5 | 10 | 21 | 23 |
| 108183356 | 61 | 59 | 168 | 180 | 16 | 16 | 191 | 190 | 475 | 466 | 63 | 58 | 163 | 0.946 | 2.5 | 10 | 21 | 23 |
| 108183357 | 61 | 59 | 169 | 168 | 17 | 16 | 230 | 205 | 587 | 566 | 60 | 57 | 159 | 0.946 | 2.3 | 10 | 22 | 21 |
| 108183358 | 61 | 58 | 169 | 168 | 17 | 16 | 230 | 205 | 587 | 566 | 60 | 57 | 159 | 0.946 | 2.3 | 10 | 22 | 21 |
| 108183359 | 61 | 58 | 169 | 168 | 17 | 16 | 230 | 205 | 587 | 566 | 60 | 57 | 159 | 0.946 | 2.3 | 10 | 22 | 22 |
| 108183361 | 61 | 59 | 169 | 168 | 17 | 16 | 230 | 205 | 587 | 566 | 60 | 57 | 159 | 0.946 | 2.3 | 10 | 22 | 22 |
| 108183362 | 61 | 59 | 164 | 177 | 17 | 16 | 210 | 199 | 551 | 534 | 59 | 57 | 156 | 0.945 | 2.5 | 10 | 21 | 22 |
| 108183363 | 60 | 59 | 164 | 177 | 17 | 16 | 210 | 199 | 551 | 534 | 59 | 57 | 156 | 0.945 | 2.5 | 10 | 21 | 22 |
| 108183364 | 61 | 59 | 164 | 177 | 17 | 16 | 210 | 199 | 551 | 534 | 59 | 57 | 156 | 0.945 | 2.5 | 10 | 22 | 22 |

**Laboratory Manager** _____

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CoA Date: 07/24/2015

# Certificate of Analysis

Shipped To: GSE ENVIRONMENTAL, LLC
19103 GUNDLE ROAD
HOUSTON TX 77073
USA

Recipient: Phouangsavanh
Fax:

Delivery #: 89095845
PO #: 03-503802
Weight: 180000 LB
Ship Date: 07/24/2015
Package: BULK
Mode: Hopper Car
Car #: GPLX076898
Seal No: 33344

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: HFG820880

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.1 | g/10mi |
| Density | D1505 or D4883 | 0.937 | g/cm3 |
| Production Date | | 07/15/2015 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at 800-231-1212

Report Date
8/11/2015

# Quality Assurance Laboratory Test Results

**Job Name:** LSL Oak Grove Station
**Sales Order:** 76398

**Required Testing:** ASTM D 3895 -- Standard Test Method for Oxidative Induction Time of Polyolefins by Differential Scanning Calorimetry
ASTM D 5397 -- Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test

**Specification:** D 3895 - > 100 Minutes
D 5397 - > 300 Hours

| Product Code | Resin Lot Number | Test Results |
|---|---|---|
| HDT-060GE-BBB-B-W0 | HFG820880 | PASS |

| | |
|---|---|
| Approved By: | Debra Gortemiller |
| Date Approved: | August 11, 2015 |

*The above stated data shall not be reproduced except in full, without the written approval of the laboratory.*

Report Date
8/11/2015

GSE ENVIRONMENTAL

# Quality Assurance Laboratory Test Results

**Job Name:** LSL Oak Grove Station
**SO Number:** 76398

The table below summarizes additive performance of GSE Houston products as perceived by OIT retention after UV and Oven Aging per GRI Test Method GM13:

| | | Oven Aging @ 85° C (ASTM D 5721) | | | | UV Resistance per GRI GM11 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 90 days per ASTM D 5885 | | | | 1600 hours UV Aging per ASTM D 5885 | | | |
| **Product Type** | **Formulation** | Initial HP OIT (min) | Final HP OIT (min) | Retained (%) | GRI Criteria (%) | Initial HP OIT (min) | Final HP OIT (min) | Retained (%) | GRI Criteria (%) |
| HDPE Geomembrane | Chevron Phillips Marlex® K306 + Carbon Black | 697 | 661 | 94 | 80 | 697 | 565 | 81 | 50 |

Approved By: Debra Gortemiller
Date: August 11, 2015

*The above stated data shall not be reproduced except in full, without the written approval of the laboratory.*

# GSE Roll Allocation

**Order** SO-076398
**Customer** Lone Star Lining Company
**Project Name** LSL Oak Grove Station

| Roll# | Resin Lot | Product Code | Mfg Date | Length |
|---|---|---|---|---|
| 102177421 | HFG820900 | HDT-060GE-BBB-B-W0 | 8/25/2015 | 520 |

GSE Environmental, LLC

ENVIRONMENTAL™

# ROLL TEST DATA REPORT

GSE QC APPROVED



**Report Date:** Aug/26/2015

| Sales Order No. | Customer Name | Project Location | Product Name | BOL Number |
|---|---|---|---|---|
| SO-076398 | Lone Star Lining Company | Franklin TX US | HDT-060GE-BBB-B-W0 | |

| Roll Number | Average Thickness ASTM D5994 (mils) | Minimum Thickness ASTM D5994 (mils) | Yield Strength ASTM D6693 (ppi) MD | Yield Strength ASTM D6693 (ppi) TD | Yield Elongation ASTM D6693 (%) MD | Yield Elongation ASTM D6693 (%) TD | Break Strength ASTM D6693 (ppi) MD | Break Strength ASTM D6693 (ppi) TD | Break Elongation ASTM D6693 (%) MD | Break Elongation ASTM D6693 (%) TD | Tear Resistance ASTM D1004 (lbs) MD | Tear Resistance ASTM D1004 (lbs) TD | Puncture Resistance ASTM D4833 (lbs) | Density ASTM D1505 (g/cc) | Carbon Black Content ASTM D4218 (%) | Carbon Black Dispersion ASTM D5596 (Views in Cat1-Cat2) | Asperity Height ASTM D7466 (mils) A Side | Asperity Height ASTM D7466 (mils) B Side |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 102177421 | 58 | 53 | 166 | 173 | 16 | 16 | 192 | 166 | 447 | 381 | 60 | 58 | 156 | 0.945 | 2.7 | 10 | 26 | 29 |

**Laboratory Manager** _____

This test report shall not be reproduced, except in full, without written approval of the laboratory.

CoA Date: 07/29/2015

# Certificate of Analysis

Shipped To: GSE ENVIRONMENTAL, LLC
19103 GUNDLE ROAD
HOUSTON TX 77073
USA

Recipient: Phouangsavanh
Fax:

Delivery #: 89097964
PO #: 03-503802
Weight: 183800 LB
Ship Date: 07/29/2015
Package: BULK
Mode: Hopper Car
Car #: CEFX054160
Seal No: 33269

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: HFG820900

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.9 | g/10mi |
| Density | D1505 or D4883 | 0.937 | g/cm3 |
| Production Date | | 07/16/2015 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at 800-231-1212

GSE ENVIRONMENTAL

Report Date
8/26/2015

# Quality Assurance Laboratory Test Results

**Job Name:** LSL Oak Grove Station
**Sales Order:** 76398

**Required Testing:** ASTM D 3895 -- Standard Test Method for Oxidative Induction Time of Polyolefins by Differential Scanning Calorimetry
ASTM D 5397 -- Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test

**Specification:** D 3895 - > 100 Minutes
D 5397 - > 300 Hours

| Product Code | Resin Lot Number | Test Results |
|---|---|---|
| HDT-060GE-BBB-B-W0 | HFG820880 | PASS |
| HDT-060GE-BBB-B-W0 | HFG820860 | PASS |
| HDT-060GE-BBB-B-W0 | HFG821000 | PASS |
| HDT-060GE-BBB-B-W0 | HFG820900 | PASS |

| | |
|---|---|
| Approved By: | Debra Gortemiller |
| Date Approved: | August 26, 2015 |

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Report Date
8/26/2015

GSE ENVIRONMENTAL

# Quality Assurance Laboratory Test Results

**Job Name:** LSL Oak Grove Station
**SO Number:** 76398

The table below summarizes additive performance of GSE Houston products as perceived by OIT retention after UV and Oven Aging per GRI Test Method GM13:

| | | Oven Aging @ 85° C (ASTM D 5721) | | | | UV Resistance per GRI GM11 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 90 days per ASTM D 5885 | | | | 1600 hours UV Aging per ASTM D 5885 | | | |
| **Product Type** | **Formulation** | Initial HP OIT (min) | Final HP OIT (min) | Retained (%) | GRI Criteria (%) | Initial HP OIT (min) | Final HP OIT (min) | Retained (%) | GRI Criteria (%) |
| HDPE Geomembrane | Chevron Phillips Marlex® K306 + Carbon Black | 697 | 661 | 94 | 80 | 697 | 565 | 81 | 50 |

Approved By: Debra Gortemiller
Date: August 11, 2015

*The above stated data shall not be reproduced except in full, without the written approval of the laboratory.*

GSE Environmental, LLC

ENVIRONMENTAL

# ROLL TEST DATA REPORT

GSE QC APPROVED



*Report Date:* Aug/14/2015

| *Sales Order No.* | *Customer Name* | *Project Location* | *Product Name* | *BOL Number* |
|---|---|---|---|---|
| SO-076398 | Lone Star Lining Company | Franklin TX US | HDT-060GE-BBB-B-W0 | |

| Roll Number | Average Thickness ASTM D5994 (mils) | Minimum Thickness ASTM D5994 (mils) | Yield Strength ASTM D6693 (ppi) MD | Yield Strength ASTM D6693 (ppi) TD | Yield Elongation ASTM D6693 (%) MD | Yield Elongation ASTM D6693 (%) TD | Break Strength ASTM D6693 (ppi) MD | Break Strength ASTM D6693 (ppi) TD | Break Elongation ASTM D6693 (%) MD | Break Elongation ASTM D6693 (%) TD | Tear Resistance ASTM D1004 (lbs) MD | Tear Resistance ASTM D1004 (lbs) TD | Puncture Resistance ASTM D4833 (lbs) | Density ASTM D1505 (g/cc) | Carbon Black Content ASTM D4218 (%) | Carbon Black Dispersion ASTM D5596 (Views in Cat1-Cat2) | Asperity Height ASTM D7466 (mils) A Side | Asperity Height ASTM D7466 (mils) B Side |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 108183402 | 60 | 55 | 159 | 166 | 17 | 16 | 199 | 193 | 519 | 540 | 59 | 57 | 153 | 0.944 | 2.5 | 10 | 23 | 23 |
| 108183403 | 59 | 54 | 159 | 166 | 17 | 16 | 199 | 193 | 519 | 540 | 59 | 57 | 153 | 0.944 | 2.5 | 10 | 23 | 23 |
| 108183404 | 59 | 55 | 159 | 166 | 17 | 16 | 199 | 193 | 519 | 540 | 59 | 57 | 153 | 0.944 | 2.5 | 10 | 22 | 25 |
| 108183405 | 61 | 57 | 159 | 166 | 17 | 16 | 199 | 193 | 519 | 540 | 59 | 57 | 153 | 0.944 | 2.5 | 10 | 22 | 25 |
| 108183406 | 60 | 56 | 162 | 172 | 17 | 16 | 216 | 198 | 549 | 542 | 60 | 57 | 156 | 0.944 | 2.4 | 10 | 23 | 25 |
| 108183407 | 60 | 57 | 162 | 172 | 17 | 16 | 216 | 198 | 549 | 542 | 60 | 57 | 156 | 0.944 | 2.4 | 10 | 23 | 25 |
| 108183408 | 61 | 56 | 162 | 172 | 17 | 16 | 216 | 198 | 549 | 542 | 60 | 57 | 156 | 0.944 | 2.4 | 10 | 23 | 25 |
| 108183409 | 60 | 57 | 162 | 172 | 17 | 16 | 216 | 198 | 549 | 542 | 60 | 57 | 156 | 0.944 | 2.4 | 10 | 23 | 25 |
| 108183410 | 60 | 56 | 157 | 165 | 16 | 16 | 207 | 187 | 532 | 508 | 60 | 59 | 155 | 0.944 | 2.5 | 10 | 24 | 25 |
| 108183411 | 61 | 57 | 157 | 165 | 16 | 16 | 207 | 187 | 532 | 508 | 60 | 59 | 155 | 0.944 | 2.5 | 10 | 24 | 25 |
| 108183412 | 60 | 56 | 157 | 165 | 16 | 16 | 207 | 187 | 532 | 508 | 60 | 59 | 155 | 0.944 | 2.5 | 10 | 24 | 26 |
| 108183413 | 62 | 58 | 157 | 165 | 16 | 16 | 207 | 187 | 532 | 508 | 60 | 59 | 155 | 0.944 | 2.5 | 10 | 24 | 26 |
| 108183414 | 62 | 58 | 162 | 167 | 16 | 16 | 202 | 201 | 517 | 564 | 64 | 56 | 155 | 0.944 | 2.4 | 10 | 21 | 22 |
| 108183415 | 62 | 58 | 162 | 167 | 16 | 16 | 202 | 201 | 517 | 564 | 64 | 56 | 155 | 0.944 | 2.4 | 10 | 21 | 22 |
| 108183416 | 62 | 58 | 162 | 167 | 16 | 16 | 202 | 201 | 517 | 564 | 64 | 56 | 155 | 0.944 | 2.4 | 10 | 22 | 21 |
| 108183417 | 62 | 58 | 162 | 167 | 16 | 16 | 202 | 201 | 517 | 564 | 64 | 56 | 155 | 0.944 | 2.4 | 10 | 22 | 21 |

**Laboratory Manager** _____

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CoA Date: 07/24/2015

# Certificate of Analysis

Shipped To: GSE ENVIRONMENTAL, LLC
19103 GUNDLE ROAD
HOUSTON TX 77073
USA

Recipient: Phouangsavanh
Fax:

Delivery #: 89095841
PO #: 03-503802
Weight: 179800 LB
Ship Date: 07/24/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX896588
Seal No: 35619

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: HFG821000

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.6 | g/10mi |
| sity | D1505 or D4883 | 0.937 | g/cm3 |
| duction Date | | 07/17/2015 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at 800-231-1212

GSE ENVIRONMENTAL

Report Date
8/14/2015

# Quality Assurance Laboratory Test Results

**Job Name:** LSL Oak Grove Station
**Sales Order:** 76398

**Required Testing:** ASTM D 3895 -- Standard Test Method for Oxidative Induction Time of Polyolefins by Differential Scanning Calorimetry
ASTM D 5397 -- Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test

**Specification:** D 3895 - > 100 Minutes
D 5397 - > 300 Hours

| Product Code | Resin Lot Number | Test Results |
|---|---|---|
| HDT-060GE-BBB-B-W0 | HFG820880 | PASS |
| HDT-060GE-BBB-B-W0 | HFG820860 | PASS |
| HDT-060GE-BBB-B-W0 | HFG821000 | PASS |

| | |
|---|---|
| Approved By: | Debra Gortemiller |
| Date Approved: | August 13, 2015 |

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Report Date
8/14/2015

GSE ENVIRONMENTAL

# Quality Assurance Laboratory Test Results

**Job Name:** LSL Oak Grove Station
**SO Number:** 76398

The table below summarizes additive performance of GSE Houston products as perceived by OIT retention after UV and Oven Aging per GRI Test Method GM13:

| | | Oven Aging @ 85° C (ASTM D 5721) | | | | UV Resistance per GRI GM11 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 90 days per ASTM D 5885 | | | | 1600 hours UV Aging per ASTM D 5885 | | | |
| **Product Type** | **Formulation** | Initial HP OIT (min) | Final HP OIT (min) | Retained (%) | GRI Criteria (%) | Initial HP OIT (min) | Final HP OIT (min) | Retained (%) | GRI Criteria (%) |
| HDPE Geomembrane | Chevron Phillips Marlex® K306 + Carbon Black | 697 | 661 | 94 | 80 | 697 | 565 | 81 | 50 |

Approved By: Debra Gortemiller
Date: August 11, 2015

*The above stated data shall not be reproduced except in full, without the written approval of the laboratory.*

GSE Environmental, LLC

ENVIRONMENTAL

# ROLL TEST DATA REPORT

GSE QC APPROVED



*Report Date:* Aug/13/2015

| *Sales Order No.* | *Customer Name* | *Project Location* | *Product Name* | *BOL Number* |
|---|---|---|---|---|
| SO-076398 | Lone Star Lining Company | Franklin TX US | HDT-060GE-BBB-B-W0 | |

| Roll Number | Average Thickness ASTM D5994 (mils) | Minimum Thickness ASTM D5994 (mils) | Yield Strength ASTM D6693 (ppi) MD | Yield Strength ASTM D6693 (ppi) TD | Yield Elongation ASTM D6693 (%) MD | Yield Elongation ASTM D6693 (%) TD | Break Strength ASTM D6693 (ppi) MD | Break Strength ASTM D6693 (ppi) TD | Break Elongation ASTM D6693 (%) MD | Break Elongation ASTM D6693 (%) TD | Tear Resistance ASTM D1004 (lbs) MD | Tear Resistance ASTM D1004 (lbs) TD | Puncture Resistance ASTM D4833 (lbs) | Density ASTM D1505 (g/cc) | Carbon Black Content ASTM D4218 (%) | Carbon Black Dispersion ASTM D5596 (Views in Cat1-Cat2) | Asperity Height ASTM D7466 (mils) A Side | Asperity Height ASTM D7466 (mils) B Side |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 108183384 | 60 | 57 | 165 | 172 | 16 | 16 | 217 | 181 | 558 | 463 | 58 | 60 | 156 | 0.945 | 2.5 | 10 | 23 | 23 |
| 108183385 | 61 | 55 | 165 | 172 | 16 | 16 | 217 | 181 | 558 | 463 | 58 | 60 | 156 | 0.945 | 2.5 | 10 | 23 | 23 |
| 108183386 | 61 | 55 | 166 | 178 | 17 | 16 | 216 | 194 | 559 | 507 | 61 | 56 | 160 | 0.945 | 2.3 | 10 | 23 | 23 |
| 108183387 | 62 | 57 | 166 | 178 | 17 | 16 | 216 | 194 | 559 | 507 | 61 | 56 | 160 | 0.945 | 2.3 | 10 | 23 | 23 |
| 108183388 | 62 | 59 | 166 | 178 | 17 | 16 | 216 | 194 | 559 | 507 | 61 | 56 | 160 | 0.945 | 2.3 | 10 | 23 | 21 |
| 108183389 | 61 | 57 | 166 | 178 | 17 | 16 | 216 | 194 | 559 | 507 | 61 | 56 | 160 | 0.945 | 2.3 | 10 | 23 | 21 |
| 108183390 | 61 | 56 | 164 | 173 | 16 | 16 | 219 | 185 | 566 | 504 | 59 | 56 | 152 | 0.945 | 2.4 | 10 | 23 | 22 |
| 108183391 | 61 | 55 | 164 | 173 | 16 | 16 | 219 | 185 | 566 | 504 | 59 | 56 | 152 | 0.945 | 2.4 | 10 | 23 | 22 |
| 108183392 | 62 | 57 | 164 | 173 | 16 | 16 | 219 | 185 | 566 | 504 | 59 | 56 | 152 | 0.945 | 2.4 | 10 | 22 | 22 |
| 108183393 | 62 | 53 | 164 | 173 | 16 | 16 | 219 | 185 | 566 | 504 | 59 | 56 | 152 | 0.945 | 2.4 | 10 | 22 | 22 |
| 108183394 | 60 | 55 | 163 | 163 | 16 | 16 | 211 | 188 | 557 | 550 | 59 | 57 | 156 | 0.944 | 2.4 | 10 | 21 | 21 |
| 108183395 | 60 | 55 | 163 | 163 | 16 | 16 | 211 | 188 | 557 | 550 | 59 | 57 | 156 | 0.944 | 2.4 | 10 | 21 | 21 |
| 108183396 | 61 | 59 | 163 | 163 | 16 | 16 | 211 | 188 | 557 | 550 | 59 | 57 | 156 | 0.944 | 2.4 | 10 | 22 | 20 |
| 108183397 | 59 | 57 | 163 | 163 | 16 | 16 | 211 | 188 | 557 | 550 | 59 | 57 | 156 | 0.944 | 2.4 | 10 | 22 | 20 |
| 108183398 | 60 | 57 | 159 | 168 | 16 | 16 | 204 | 202 | 522 | 558 | 59 | 56 | 159 | 0.944 | 2.4 | 10 | 22 | 22 |
| 108183399 | 59 | 55 | 159 | 168 | 16 | 16 | 204 | 202 | 522 | 558 | 59 | 56 | 159 | 0.944 | 2.4 | 10 | 22 | 22 |
| 108183400 | 60 | 54 | 159 | 168 | 16 | 16 | 204 | 202 | 522 | 558 | 59 | 56 | 159 | 0.944 | 2.4 | 10 | 21 | 20 |
| 108183401 | 59 | 55 | 159 | 168 | 16 | 16 | 204 | 202 | 522 | 558 | 59 | 56 | 159 | 0.944 | 2.4 | 10 | 21 | 20 |

**Laboratory Manager** _____

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CoA Date: 07/24/2015

# Certificate of Analysis

Shipped To: GSE ENVIRONMENTAL, LLC
19103 GUNDLE ROAD
HOUSTON TX 77073
USA

Recipient: Phouangsavanh
Fax:

Delivery #: 89095848
PO #: 03-503802
Weight: 177800 LB
Ship Date: 07/24/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX898057
Seal No: 33159

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: HFG820860

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.7 | g/10mi |
| Density | D1505 or D4883 | 0.937 | g/cm3 |
| Production Date | | 07/15/2015 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at 800-231-1212

CoA Date: 07/24/2015

# Certificate of Analysis

Shipped To: GSE ENVIRONMENTAL, LLC
19103 GUNDLE ROAD
HOUSTON TX 77073
USA

Recipient: Phouangsavanh
Fax:

Delivery #: 89095841
PO #: 03-503802
Weight: 179800 LB
Ship Date: 07/24/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX896588
Seal No: 35619

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: HFG821000

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.6 | g/10mi |
| Density | D1505 or D4883 | 0.937 | g/cm3 |
| Production Date | | 07/17/2015 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at 800-231-1212

GSE ENVIRONMENTAL

Report Date
8/13/2015

# Quality Assurance Laboratory Test Results

**Job Name:** LSL Oak Grove Station
**Sales Order:** 76398

**Required Testing:** ASTM D 3895 -- Standard Test Method for Oxidative Induction Time of Polyolefins by Differential Scanning Calorimetry
ASTM D 5397 -- Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test

**Specification:** D 3895 - > 100 Minutes
D 5397 - > 300 Hours

| Product Code | Resin Lot Number | Test Results |
|---|---|---|
| HDT-060GE-BBB-B-W0 | HFG820880 | PASS |
| HDT-060GE-BBB-B-W0 | HFG820860 | PASS |
| HDT-060GE-BBB-B-W0 | HFG821000 | PASS |

| | |
|---|---|
| Approved By: | Debra Gortemiller |
| Date Approved: | August 13, 2015 |

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Report Date
8/13/2015

GSE ENVIRONMENTAL

# Quality Assurance Laboratory Test Results

**Job Name:** LSL Oak Grove Station
**SO Number:** 76398

The table below summarizes additive performance of GSE Houston products as perceived by OIT retention after UV and Oven Aging per GRI Test Method GM13:

| | | Oven Aging @ 85° C (ASTM D 5721) | | | | UV Resistance per GRI GM11 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 90 days per ASTM D 5885 | | | | 1600 hours UV Aging per ASTM D 5885 | | | |
| **Product Type** | **Formulation** | Initial HP OIT (min) | Final HP OIT (min) | Retained (%) | GRI Criteria (%) | Initial HP OIT (min) | Final HP OIT (min) | Retained (%) | GRI Criteria (%) |
| HDPE Geomembrane | Chevron Phillips Marlex® K306 + Carbon Black | 697 | 661 | 94 | 80 | 697 | 565 | 81 | 50 |

Approved By: Debra Gortemiller
Date: August 11, 2015

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GSE Environmental, LLC

ENVIRONMENTAL™

# ROLL TEST DATA REPORT

GSE QC APPROVED



*Report Date:* Aug/12/2015

| *Sales Order No.* | *Customer Name* | *Project Location* | *Product Name* | *BOL Number* |
|---|---|---|---|---|
| SO-076398 | Lone Star Lining Company | Franklin TX US | HDT-060GE-BBB-B-W0 | |

| Roll Number | Average Thickness ASTM D5994 (mils) | Minimum Thickness ASTM D5994 (mils) | Yield Strength ASTM D6693 (ppi) MD | Yield Strength ASTM D6693 (ppi) TD | Yield Elongation ASTM D6693 (%) MD | Yield Elongation ASTM D6693 (%) TD | Break Strength ASTM D6693 (ppi) MD | Break Strength ASTM D6693 (ppi) TD | Break Elongation ASTM D6693 (%) MD | Break Elongation ASTM D6693 (%) TD | Tear Resistance ASTM D1004 (lbs) MD | Tear Resistance ASTM D1004 (lbs) TD | Puncture Resistance ASTM D4833 (lbs) | Density ASTM D1505 (g/cc) | Carbon Black Content ASTM D4218 (%) | Carbon Black Dispersion ASTM D5596 (Views in Cat1-Cat2) | Asperity Height ASTM D7466 (mils) A Side | Asperity Height ASTM D7466 (mils) B Side |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 108183365 | 63 | 59 | 164 | 177 | 17 | 16 | 210 | 199 | 551 | 534 | 59 | 57 | 156 | 0.945 | 2.5 | 10 | 22 | 22 |
| 108183366 | 62 | 56 | 169 | 168 | 16 | 16 | 209 | 176 | 539 | 478 | 60 | 57 | 151 | 0.945 | 2.3 | 10 | 21 | 21 |
| 108183367 | 61 | 55 | 169 | 168 | 16 | 16 | 209 | 176 | 539 | 478 | 60 | 57 | 151 | 0.945 | 2.3 | 10 | 21 | 21 |
| 108183368 | 62 | 58 | 169 | 168 | 16 | 16 | 209 | 176 | 539 | 478 | 60 | 57 | 151 | 0.945 | 2.3 | 10 | 21 | 21 |
| 108183369 | 61 | 52 | 169 | 168 | 16 | 16 | 209 | 176 | 539 | 478 | 60 | 57 | 151 | 0.945 | 2.3 | 10 | 21 | 21 |
| 108183370 | 62 | 58 | 173 | 178 | 16 | 16 | 207 | 189 | 528 | 515 | 60 | 56 | 155 | 0.945 | 2.4 | 10 | 21 | 21 |
| 108183371 | 61 | 57 | 173 | 178 | 16 | 16 | 207 | 189 | 528 | 515 | 60 | 56 | 155 | 0.945 | 2.4 | 10 | 21 | 21 |
| 108183372 | 61 | 58 | 173 | 178 | 16 | 16 | 207 | 189 | 528 | 515 | 60 | 56 | 155 | 0.945 | 2.4 | 10 | 22 | 22 |
| 108183373 | 61 | 56 | 173 | 178 | 16 | 16 | 207 | 189 | 528 | 515 | 60 | 56 | 155 | 0.945 | 2.4 | 10 | 22 | 22 |
| 108183374 | 61 | 58 | 164 | 166 | 17 | 16 | 194 | 191 | 535 | 540 | 57 | 58 | 152 | 0.945 | 2.3 | 10 | 21 | 22 |
| 108183375 | 58 | 52 | 164 | 166 | 17 | 16 | 194 | 191 | 535 | 540 | 57 | 58 | 152 | 0.945 | 2.3 | 10 | 21 | 22 |
| 108183376 | 59 | 55 | 164 | 166 | 17 | 16 | 194 | 191 | 535 | 540 | 57 | 58 | 152 | 0.945 | 2.3 | 10 | 21 | 22 |
| 108183377 | 60 | 57 | 164 | 166 | 17 | 16 | 194 | 191 | 535 | 540 | 57 | 58 | 152 | 0.945 | 2.3 | 10 | 21 | 22 |
| 108183378 | 59 | 53 | 164 | 173 | 16 | 16 | 218 | 185 | 587 | 478 | 58 | 55 | 154 | 0.945 | 2.6 | 10 | 22 | 22 |
| 108183379 | 60 | 56 | 164 | 173 | 16 | 16 | 218 | 185 | 587 | 478 | 58 | 55 | 154 | 0.945 | 2.6 | 10 | 22 | 22 |
| 108183380 | 60 | 58 | 164 | 173 | 16 | 16 | 218 | 185 | 587 | 478 | 58 | 55 | 154 | 0.945 | 2.6 | 10 | 22 | 22 |
| 108183381 | 60 | 56 | 164 | 173 | 16 | 16 | 218 | 185 | 587 | 478 | 58 | 55 | 154 | 0.945 | 2.6 | 10 | 22 | 22 |
| 108183382 | 60 | 57 | 165 | 172 | 16 | 16 | 217 | 181 | 558 | 463 | 58 | 60 | 156 | 0.945 | 2.5 | 10 | 22 | 23 |
| 108183383 | 60 | 53 | 165 | 172 | 16 | 16 | 217 | 181 | 558 | 463 | 58 | 60 | 156 | 0.945 | 2.5 | 10 | 22 | 23 |

**Laboratory Manager** _____

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CoA Date: 07/24/2015

# Certificate of Analysis

Shipped To: GSE ENVIRONMENTAL, LLC
19103 GUNDLE ROAD
HOUSTON TX 77073
USA

Recipient: Phouangsavanh
Fax:

Delivery #: 89095848
PO #: 03-503802
Weight: 177800 LB
Ship Date: 07/24/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX898057
Seal No: 33159

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: HFG820860

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.7 | g/10mi |
| Density | D1505 or D4883 | 0.937 | g/cm3 |
| Production Date | | 07/15/2015 | |

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at 800-231-1212

CoA Date: 07/24/2015

# Certificate of Analysis

Shipped To: GSE ENVIRONMENTAL, LLC
19103 GUNDLE ROAD
HOUSTON TX 77073
USA

Recipient: Phouangsavanh
Fax:

Delivery #: 89095845
PO #: 03-503802
Weight: 180000 LB
Ship Date: 07/24/2015
Package: BULK
Mode: Hopper Car
Car #: GPLX076898
Seal No: 33344

Product:
MARLEX POLYETHYLENE K306 BULK

Lot Number: HFG820880

| Property | Test Method | Value | Unit |
|---|---|---|---|
| Melt Index | ASTM D1238 | 0.1 | g/10mi |
| HLMI Flow Rate | ASTM D1238 | 12.1 | g/10mi |
| Density | D1505 or D4883 | 0.937 | g/cm3 |
| Production Date | | 07/15/2015 | |

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Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at 800-231-1212

Report Date
8/12/2015

# Quality Assurance Laboratory Test Results

**Job Name:** LSL Oak Grove Station
**Sales Order:** 76398

**Required Testing:** ASTM D 3895 -- Standard Test Method for Oxidative Induction Time of Polyolefins by Differential Scanning Calorimetry
ASTM D 5397 -- Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test

**Specification:** D 3895 - > 100 Minutes
D 5397 - > 300 Hours

| Product Code | Resin Lot Number | Test Results |
|---|---|---|
| HDT-060GE-BBB-B-W0 | HFG820880 | PASS |
| HDT-060GE-BBB-B-W0 | HFG820860 | PASS |

| | |
|---|---|
| Approved By: | Debra Gortemiller |
| Date Approved: | August 12, 2015 |

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Report Date
8/12/2015

GSE ENVIRONMENTAL

# Quality Assurance Laboratory Test Results

**Job Name:** LSL Oak Grove Station
**SO Number:** 76398

The table below summarizes additive performance of GSE Houston products as perceived by OIT retention after UV and Oven Aging per GRI Test Method GM13:

| | | Oven Aging @ 85° C (ASTM D 5721) | | | | UV Resistance per GRI GM11 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 90 days per ASTM D 5885 | | | | 1600 hours UV Aging per ASTM D 5885 | | | |
| **Product Type** | **Formulation** | Initial HP OIT (min) | Final HP OIT (min) | Retained (%) | GRI Criteria (%) | Initial HP OIT (min) | Final HP OIT (min) | Retained (%) | GRI Criteria (%) |
| HDPE Geomembrane | Chevron Phillips Marlex® K306 + Carbon Black | 697 | 661 | 94 | 80 | 697 | 565 | 81 | 50 |

Approved By: Debra Gortemiller
Date: August 11, 2015

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# SUMMARY OF CONFORMANCE TESTING

AUGUST 2015

1525714

**SUMMARY OF TEXTURED GEOMEMBRANE CONFORMANCE TEST RESULTS**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| ROLL DESIGNATION | Reference Value | 10818-3355 | 10818-3364 | 10818-3372 | 10818-3380 | 10818-3388 | 10818-3396 | 10818-3404 | 10818-3412 | 10818-3348 | 10217-7421 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| THICKNESS (mils) ASTM D5994 | >=57 | 60 | 61 | 57 | 58 | 57 | 57 | 59 | 59 | 64 | 64 |
| DENSITY (g/cc) ASTM D792 | >=0.940 | 0.947 | 0.947 | 0.948 | 0.948 | 0.947 | 0.948 | 0.947 | 0.948 | 0.946 | 0.946 |
| CARBON BLACK CONTENT (%) ASTM D1603 | 2.0-3.0 | 2.29 | 2.27 | 2.31 | 2.35 | 2.20 | 2.34 | 2.23 | 2.31 | 2.33 | 2.64 |
| CARBON BLACK DISPERSION (category) | 1 or 2 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| (µm) ASTM D5596 | - | 23 | 47 | 40 | 37 | 47 | 40 | 30 | 35 | 27 | 36 |
| STRENGTH AT YIELD (ppi) | >=126 | 175.8 | 178.6 | 180.6 | 177.7 | 182.8 | 181.9 | 180.5 | 182.3 | 179.2 | 170.1 |
| MD/TD (1) ASTM D6693 | >=126 | 178.4 | 185.0 | 183.7 | 184.9 | 181.1 | 188.0 | 182.1 | 187.0 | 183.0 | 180.8 |
| STRENGTH AT BREAK (ppi) | >=90 | 195.8 | 202.1 | 194.2 | 202.2 | 220.7 | 209.2 | 215.3 | 196.9 | 210.6 | 189.7 |
| MD/TD (1) ASTM D6693 | >=90 | 172.2 | 176.3 | 163.5 | 168.9 | 181.0 | 171.5 | 164.3 | 170.3 | 153.2 | 154.5 |
| ELONGATION AT YIELD (%) | >=12 | 15.3 | 16.0 | 15.6 | 13.9 | 15.0 | 14.9 | 14.5 | 14.9 | 15.6 | 14.6 |
| MD/TD (1) ASTM D6693 | >=12 | 14.6 | 14.0 | 13.7 | 13.8 | 13.9 | 14.1 | 13.6 | 14.5 | 14.5 | 14.0 |
| ELONGATION AT BREAK (%) | >=100 | 454 | 471 | 435 | 460 | 520 | 488 | 509 | 446 | 478 | 432 |
| MD/TD (1) ASTM D6693 | >=100 | 379 | 381 | 360 | 425 | 454 | 382 | 351 | 362 | 308 | 357 |

(1) MD/TD corresponds to Machine Direction / Transverse Direction.

SEPTEMBER 2015 1525714

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** LUMINANT/OGSES FGD-C POND CQA/TX
**SAMPLE NUMBER:** 108183348

| | THICKNESS (mils) | DENSITY (g/cc) | CARBON BLACK CONTENT (%) | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 64.7 | 0.946 | 2.30 | 1 | 15 |
| 2. | 60.3 | 0.947 | 2.36 | 1 | 30 |
| 3. | 62.0 | 0.946 | | 1 | 30 |
| 4. | 66.4 | | | 1 | 20 |
| 5. | 68.5 | | | 1 | 20 |
| 6. | 67.4 | | | 1 | 25 |
| 7. | 64.2 | | | 2 | 50 |
| 8. | 61.1 | | | 1 | 25 |
| 9. | 59.4 | | | 1 | 30 |
| 10. | 68.3 | | | 1 | 20 |
| AVG | 64 | 0.946 | 2.33 | 1 | 27 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 165.2 | 175.3 | 15.4 | 13.3 | 179.7 | 127.8 | 424.5 | 69.8 |
| 2. | 192.0 | 186.8 | 15.9 | 14.4 | 192.8 | 176.7 | 404.2 | 442.8 |
| 3. | 174.8 | 183.2 | 15.9 | 14.9 | 230.7 | 171.0 | 554.7 | 434.7 |
| 4. | 182.6 | 182.4 | 14.6 | 14.1 | 229.1 | 142.8 | 516.8 | 287.2 |
| 5. | 181.3 | 187.4 | 16.4 | 15.6 | 220.9 | 147.7 | 491.7 | 305.7 |
| AVG | 179.2 | 183.0 | 15.6 | 14.5 | 210.6 | 153.2 | 478 | 308 |

AUGUST 2015 1525714

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** LUMINANT/OGSES FGD-C POND CQA/TX
**SAMPLE NUMBER:** 108183355

| | THICKNESS (mils) | DENSITY (g/cc) | CARBON BLACK CONTENT (%) | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 59.7 | 0.945 | 2.29 | 1 | 25 |
| 2. | 59.5 | 0.948 | 2.28 | 1 | 20 |
| 3. | 59.6 | 0.947 | | 1 | 30 |
| 4. | 59.1 | | | 1 | 30 |
| 5. | 61.6 | | | 1 | 20 |
| 6. | 60.0 | | | 1 | 30 |
| 7. | 59.8 | | | 1 | 20 |
| 8. | 61.1 | | | 1 | 30 |
| 9. | 60.8 | | | 1 | 10 |
| 10. | 59.1 | | | 1 | 10 |
| AVG | 60 | 0.947 | 2.29 | 1 | 23 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 170.3 | 172.0 | 15.9 | 14.6 | 199.6 | 136.1 | 500.8 | 240.8 |
| 2. | 183.4 | 185.9 | 16.2 | 14.4 | 162.9 | 151.2 | 351.8 | 208.8 |
| 3. | 178.3 | 183.5 | 14.1 | 14.6 | 200.6 | 153.1 | 460.3 | 402.0 |
| 4. | 176.6 | 175.2 | 16.4 | 14.9 | 212.2 | 216.4 | 495.7 | 552.5 |
| 5. | 170.6 | 175.3 | 14.1 | 14.6 | 203.5 | 204.1 | 460.3 | 491.0 |
| AVG | 175.8 | 178.4 | 15.3 | 14.6 | 195.8 | 172.2 | 454 | 379 |

AUGUST 2015 1525714

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** LUMINANT/OGSES FGD-C POND CQA/TX
**SAMPLE NUMBER:** 108183364

| | THICKNESS (mils) | DENSITY (g/cc) | CARBON BLACK CONTENT (%) | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 58.4 | 0.948 | 2.27 | 1 | 30 |
| 2. | 59.4 | 0.946 | 2.27 | 1 | 30 |
| 3. | 61.3 | 0.947 | | 3 | 120 |
| 4. | 61.8 | | | 1 | 30 |
| 5. | 59.1 | | | 1 | 20 |
| 6. | 64.5 | | | 2 | 60 |
| 7. | 60.9 | | | 1 | 25 |
| 8. | 62.5 | | | 2 | 60 |
| 9. | 62.5 | | | 2 | 60 |
| 10. | 59.8 | | | 1 | 30 |
| AVG | 61 | 0.947 | 2.27 | 2 | 47 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 173.2 | 179.2 | 15.4 | 12.8 | 164.0 | 137.9 | 367.7 | 256.0 |
| 2. | 178.6 | 189.7 | 17.2 | 13.9 | 209.1 | 155.1 | 511.5 | 214.0 |
| 3. | 177.8 | 181.2 | 13.9 | 13.9 | 205.5 | 189.5 | 479.5 | 481.3 |
| 4. | 178.8 | 183.4 | 16.9 | 14.9 | 218.8 | 186.2 | 527.5 | 450.5 |
| 5. | 184.8 | 191.3 | 16.4 | 14.4 | 213.0 | 212.8 | 468.8 | 501.8 |
| AVG | 178.6 | 185.0 | 16.0 | 14.0 | 202.1 | 176.3 | 471 | 381 |

AUGUST 2015 1525714

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** LUMINANT/OGSES FGD-C POND CQA/TX
**SAMPLE NUMBER:** 108183372

| | THICKNESS (mils) | DENSITY (g/cc) | CARBON BLACK CONTENT (%) | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 54.0 | 0.948 | 2.31 | 1 | 25 |
| 2. | 56.9 | 0.947 | 2.31 | 2 | 40 |
| 3. | 59.2 | 0.948 | | 1 | 20 |
| 4. | 53.0 | | | 2 | 45 |
| 5. | 56.7 | | | 1 | 30 |
| 6. | 57.6 | | | 2 | 45 |
| 7. | 55.9 | | | 2 | 50 |
| 8. | 56.6 | | | 2 | 65 |
| 9. | 58.9 | | | 2 | 35 |
| 10. | 56.7 | | | 2 | 40 |
| AVG | 57 | 0.948 | 2.31 | 2 | 40 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 171.7 | 181.0 | 16.4 | 13.9 | 207.7 | 131.5 | 529.8 | 154.2 |
| 2. | 188.7 | 182.1 | 14.6 | 12.6 | 211.2 | 141.8 | 481.7 | 245.3 |
| 3. | 188.3 | 184.3 | 15.1 | 13.6 | 158.7 | 150.0 | 224.0 | 404.8 |
| 4. | 173.8 | 185.0 | 15.9 | 14.6 | 186.5 | 199.5 | 444.2 | 519.8 |
| 5. | 180.4 | 186.2 | 15.9 | 13.6 | 207.0 | 194.5 | 497.7 | 477.8 |
| AVG | 180.6 | 183.7 | 15.6 | 13.7 | 194.2 | 163.5 | 435 | 360 |

AUGUST 2015 1525714

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** LUMINANT/OGSES FGD-C POND CQA/TX
**SAMPLE NUMBER:** 108183380

| | THICKNESS (mils) | DENSITY (g/cc) | CARBON BLACK CONTENT (%) | CARBON BLACK DISPERSION (category) | (µm) |
|---|---|---|---|---|---|
| 1. | 57.5 | 0.949 | 2.33 | 2 | 45 |
| 2. | 54.9 | 0.948 | 2.36 | 1 | 30 |
| 3. | 58.9 | 0.947 | | 2 | 40 |
| 4. | 59.5 | | | 2 | 45 |
| 5. | 58.4 | | | 1 | 30 |
| 6. | 57.6 | | | 2 | 35 |
| 7. | 58.8 | | | 2 | 40 |
| 8. | 59.1 | | | 2 | 40 |
| 9. | 55.8 | | | 2 | 40 |
| 10. | 62.4 | | | 1 | 25 |
| AVG | 58 | 0.948 | 2.35 | 2 | 37 |

| | YIELD STRENGTH (lb/in. width) MD | TD | ELONGATION AT YIELD (%) MD | TD | BREAK STRENGTH (lb/in. width) MD | TD | ELONGATION AT BREAK (%) MD | TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 167.5 | 163.9 | 14.4 | 11.3 | 180.6 | 178.4 | 418.7 | 502.2 |
| 2. | 186.8 | 185.0 | 15.1 | 13.9 | 224.0 | 195.8 | 518.2 | 518.0 |
| 3. | 175.0 | 198.3 | 13.3 | 15.1 | 201.0 | 146.9 | 455.3 | 363.7 |
| 4. | 176.8 | 186.7 | 13.6 | 15.1 | 190.6 | 142.9 | 423.8 | 277.5 |
| 5. | 182.2 | 190.6 | 13.3 | 13.6 | 215.0 | 180.7 | 481.5 | 461.8 |
| AVG | 177.7 | 184.9 | 13.9 | 13.8 | 202.2 | 168.9 | 460 | 425 |

AUGUST 2015 1525714

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** LUMINANT/OGSES FGD-C POND CQA/TX
**SAMPLE NUMBER:** 108183388

| | THICKNESS (mils) | DENSITY (g/cc) | CARBON BLACK CONTENT (%) | CARBON BLACK DISPERSION (category) | (µm) |
|---|---|---|---|---|---|
| 1. | 55.2 | 0.948 | 2.20 | 2 | 45 |
| 2. | 58.0 | 0.946 | 2.20 | 2 | 55 |
| 3. | 58.9 | 0.946 | | 1 | 30 |
| 4. | 59.6 | | | 3 | 140 |
| 5. | 55.1 | | | 2 | 45 |
| 6. | 58.2 | | | 1 | 10 |
| 7. | 51.1 | | | 1 | 30 |
| 8. | 58.7 | | | 2 | 50 |
| 9. | 58.4 | | | 2 | 35 |
| 10. | 58.8 | | | 1 | 30 |
| AVG | 57 | 0.947 | 2.20 | 2 | 47 |

| | YIELD STRENGTH (lb/in. width) MD | TD | ELONGATION AT YIELD (%) MD | TD | BREAK STRENGTH (lb/in. width) MD | TD | ELONGATION AT BREAK (%) MD | TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 171.9 | 171.2 | 14.9 | 13.1 | 184.0 | 184.5 | 440.8 | 483.8 |
| 2. | 188.6 | 180.3 | 15.4 | 13.9 | 225.7 | 195.1 | 526.7 | 489.0 |
| 3. | 180.2 | 183.9 | 15.1 | 12.8 | 218.2 | 151.8 | 526.7 | 370.5 |
| 4. | 188.4 | 178.7 | 15.9 | 14.6 | 229.7 | 160.8 | 543.8 | 407.7 |
| 5. | 184.7 | 191.5 | 13.6 | 15.1 | 245.7 | 213.0 | 561.0 | 520.5 |
| AVG | 182.8 | 181.1 | 15.0 | 13.9 | 220.7 | 181.0 | 520 | 454 |

AUGUST 2015 1525714

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** LUMINANT/OGSES FGD-C POND CQA/TX
**SAMPLE NUMBER:** 108183396

| | THICKNESS (mils) | DENSITY (g/cc) | CARBON BLACK CONTENT (%) | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 57.3 | 0.948 | 2.33 | 2 | 40 |
| 2. | 57.4 | 0.948 | 2.34 | 2 | 60 |
| 3. | 55.8 | 0.948 | | 2 | 50 |
| 4. | 57.2 | | | 1 | 20 |
| 5. | 55.8 | | | 2 | 50 |
| 6. | 55.9 | | | 1 | 10 |
| 7. | 57.5 | | | 2 | 40 |
| 8. | 55.3 | | | 1 | 20 |
| 9. | 59.0 | | | 2 | 45 |
| 10. | 59.0 | | | 2 | 60 |
| AVG | 57 | 0.948 | 2.34 | 2 | 40 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 165.7 | 175.9 | 13.3 | 13.1 | 195.0 | 133.8 | 486.7 | 106.5 |
| 2. | 182.4 | 194.5 | 15.6 | 12.8 | 198.9 | 209.9 | 453.5 | 523.2 |
| 3. | 179.9 | 188.7 | 15.1 | 14.9 | 189.6 | 147.8 | 436.8 | 380.3 |
| 4. | 184.9 | 186.2 | 15.1 | 15.1 | 229.5 | 181.2 | 542.0 | 459.5 |
| 5. | 196.6 | 194.5 | 15.4 | 14.6 | 232.9 | 184.7 | 519.8 | 440.2 |
| AVG | 181.9 | 188.0 | 14.9 | 14.1 | 209.2 | 171.5 | 488 | 382 |

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# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** LUMINANT/OGSES FGD-C POND CQA/TX
**SAMPLE NUMBER:** 108183404

| | THICKNESS (mils) | DENSITY (g/cc) | CARBON BLACK CONTENT (%) | CARBON BLACK DISPERSION (category) | (µm) |
|---|---|---|---|---|---|
| 1. | 62.8 | 0.946 | 2.23 | 1 | 10 |
| 2. | 59.0 | 0.947 | 2.22 | 1 | 25 |
| 3. | 57.9 | 0.948 | | 2 | 40 |
| 4. | 58.2 | | | 2 | 60 |
| 5. | 59.2 | | | 1 | 30 |
| 6. | 58.2 | | | 1 | 10 |
| 7. | 60.4 | | | 2 | 60 |
| 8. | 58.9 | | | 1 | 10 |
| 9. | 58.3 | | | 2 | 40 |
| 10. | 57.2 | | | 1 | 10 |
| AVG | 59 | 0.947 | 2.23 | 1 | 30 |

| | YIELD STRENGTH (lb/in. width) MD | TD | ELONGATION AT YIELD (%) MD | TD | BREAK STRENGTH (lb/in. width) MD | TD | ELONGATION AT BREAK (%) MD | TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 181.7 | 179.7 | 14.4 | 13.3 | 205.2 | 157.9 | 484.0 | 391.2 |
| 2. | 178.5 | 177.1 | 15.1 | 12.6 | 210.8 | 195.8 | 510.5 | 510.3 |
| 3. | 182.2 | 190.0 | 14.1 | 14.4 | 215.1 | 176.8 | 515.8 | 429.2 |
| 4. | 187.1 | 189.6 | 13.3 | 13.9 | 230.1 | 136.1 | 510.5 | 39.7 |
| 5. | 172.9 | 174.3 | 15.6 | 13.6 | 215.2 | 154.8 | 526.5 | 385.2 |
| AVG | 180.5 | 182.1 | 14.5 | 13.6 | 215.3 | 164.3 | 509 | 351 |

AUGUST 2015 1525714

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** LUMINANT/OGSES FGD-C POND CQA/TX
**SAMPLE NUMBER:** 108183412

| | THICKNESS (mils) | DENSITY (g/cc) | CARBON BLACK CONTENT (%) | CARBON BLACK DISPERSION (category) | CARBON BLACK DISPERSION (µm) |
|---|---|---|---|---|---|
| 1. | 59.5 | 0.948 | 2.28 | 1 | 30 |
| 2. | 60.2 | 0.948 | 2.33 | 1 | 10 |
| 3. | 60.3 | 0.948 | | 2 | 60 |
| 4. | 59.9 | | | 1 | 30 |
| 5. | 58.4 | | | 1 | 30 |
| 6. | 55.5 | | | 1 | 15 |
| 7. | 59.9 | | | 2 | 40 |
| 8. | 58.2 | | | 1 | 20 |
| 9. | 58.3 | | | 2 | 45 |
| 10. | 58.5 | | | 2 | 70 |
| AVG | 59 | 0.948 | 2.31 | 1 | 35 |

| | YIELD STRENGTH (lb/in. width) MD | YIELD STRENGTH (lb/in. width) TD | ELONGATION AT YIELD (%) MD | ELONGATION AT YIELD (%) TD | BREAK STRENGTH (lb/in. width) MD | BREAK STRENGTH (lb/in. width) TD | ELONGATION AT BREAK (%) MD | ELONGATION AT BREAK (%) TD |
|---|---|---|---|---|---|---|---|---|
| 1. | 181.3 | 192.6 | 14.4 | 15.1 | 150.8 | 138.8 | 319.7 | 228.7 |
| 2. | 181.6 | 183.3 | 14.6 | 13.3 | 225.3 | 185.4 | 528.5 | 466.2 |
| 3. | 184.3 | 194.1 | 15.9 | 13.9 | 223.9 | 141.9 | 528.5 | 129.8 |
| 4. | 185.8 | 186.2 | 14.6 | 15.1 | 193.3 | 192.0 | 426.0 | 476.5 |
| 5. | 178.4 | 178.6 | 14.9 | 15.1 | 191.4 | 193.3 | 426.0 | 507.2 |
| AVG | 182.3 | 187.0 | 14.9 | 14.5 | 196.9 | 170.3 | 446 | 362 |

SEPTEMBER 2015 1525714

# GEOMEMBRANE TEST RESULTS

**PROJECT NAME:** LUMINANT/OGSES FGD-C POND CQA/TX
**SAMPLE NUMBER:** 102177421

| | THICKNESS (mils) | DENSITY (g/cc) | CARBON BLACK CONTENT (%) | CARBON BLACK DISPERSION (category) | (µm) |
|---|---|---|---|---|---|
| 1. | 67.1 | 0.946 | 2.63 | 2 | 50 |
| 2. | 60.7 | 0.946 | 2.64 | 2 | 35 |
| 3. | 61.4 | 0.946 | | 1 | 30 |
| 4. | 65.6 | | | 1 | 10 |
| 5. | 62.2 | | | 1 | 30 |
| 6. | 62.7 | | | 2 | 50 |
| 7. | 68.8 | | | 1 | 20 |
| 8. | 67.8 | | | 1 | 30 |
| 9. | 60.2 | | | 1 | 10 |
| 10. | 63.9 | | | 3 | 90 |
| AVG | 64 | 0.946 | 2.64 | 2 | 36 |

| | YIELD STRENGTH (lb/in. width) | | ELONGATION AT YIELD (%) | | BREAK STRENGTH (lb/in. width) | | ELONGATION AT BREAK (%) | |
|---|---|---|---|---|---|---|---|---|
| | MD | TD | MD | TD | MD | TD | MD | TD |
| 1. | 157.9 | 180.1 | 11.3 | 13.3 | 134.8 | 126.9 | 203.2 | 169.5 |
| 2. | 168.4 | 177.2 | 13.6 | 14.6 | 213.2 | 183.7 | 525.2 | 493.3 |
| 3. | 177.9 | 177.2 | 15.1 | 13.3 | 199.1 | 137.3 | 471.3 | 336.8 |
| 4. | 174.2 | 187.6 | 16.9 | 14.6 | 195.0 | 145.0 | 466.3 | 352.8 |
| 5. | 171.9 | 182.0 | 16.2 | 14.4 | 206.5 | 179.7 | 495.8 | 434.7 |
| AVG | 170.1 | 180.8 | 14.6 | 14.0 | 189.7 | 154.5 | 432 | 357 |

# APPENDIX H
# SUBGRADE ACCEPTANCE CERTIFICATES

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

**COMPANY** LONE STAR LINERS
**ADDRESS**

**PROJECT**

**LOCATION** Robertson County, Texas
**PROJECT** 1525714
**OWNER** Luminant Inc.

**I, the Undersigned, the duly authorized representative of** LONE STAR LINERS

**do hereby accept the area of soil surface bounded by** Panels P1 to P31 ~~on the North slope~~

**and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Gaviano Tello M.T. | | Supervisor | 09-21-15 |

**CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| VARENYA KUMAR | | ENGINEER/GEOMEMBRANE QC LEAD | 9/21/2015 |

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

**COMPANY** LONE STAR LINERS LINING CO.
**ADDRESS**

**PROJECT**

**LOCATION** Robertson County, Texas
**PROJECT** 1525714
**OWNER** Luminant Inc.

**I, the Undersigned, the duly authorized representative of** LONE STAR ~~LINERS~~ LINING CO.
**do hereby accept the area of soil surface bounded by** panels P32 to P60

**and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Mariano Tello | Mariano Tello | Supervisor | 9-22-15 |

**CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| VARENYA KUMAR | | ENGINEER/LINER QC LEAD | 9/22/15 |

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

**COMPANY** LONE STAR LINING CO
**ADDRESS**

**PROJECT**

**LOCATION** Robertson County, Texas
**PROJECT** 1525714
**OWNER** Luminant Inc.

**I, the Undersigned, the duly authorized representative of** LONE STAR LINING INC.

**do hereby accept the area of soil surface bounded by** panels P61 to P102

**and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Mariano Tello | Mariano Tello | Supervisor | 9/23/15 |

**CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| VARENYA KUMAR | | ENGINEER/GEOMEMBRANE QC LEAD | 9/23/15 |

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

**COMPANY** LONE STAR LINING CO.
**ADDRESS**

**PROJECT**

**LOCATION** Robertson County, Texas
**PROJECT** 1525714
**OWNER** Luminant Inc.

**I, the Undersigned, the duly authorized representative of** LONE STAR LINING CO.

**do hereby accept the area of soil surface bounded by** P103 to 115 panels.

**and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Mariano Tello | Mariano Tello | Supervisor | 9-24-15 |

**CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| VARENYA KUMAR | | ENGINEER/GEOMEMBRANE LEAD | 9/24/15 |

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

**COMPANY** LONE STAR LINING CO.
**ADDRESS**

**PROJECT**

**LOCATION** Robertson County, Texas
**PROJECT** 1525714
**OWNER** Luminant Inc.

**I, the Undersigned, the duly authorized representative of** LONE STAR LINING CO.

**do hereby accept the area of soil surface bounded by** panels P116 to 133

**and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Mariano Tello | Mariano Tello | Supervisor | 9-24-15 |

**CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| VARENYA KUMAR | | ENGINEER/Geomembrane QC Lead | 9/25/15 |

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

**COMPANY** LONE STAR LINING CO.
**ADDRESS**

**PROJECT**

**LOCATION** Robertson County, Texas
**PROJECT** 1525714
**OWNER** Luminant Inc.

**I, the Undersigned, the duly authorized representative of** LONE STAR LINING CO.

**do hereby accept the area of soil surface bounded by** panels P134 to P165

**and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| MAHONO TELLO | | SUPERVISOR | 9-26-15 |

**CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| VARENYA KUMAR | | ENGINEER/GEOMEMBRANE QA | 9/26/2015 |

***GOLDER ASSOCIATES INC.***

q:/fldfrms/geosyn/g4.xls

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

COMPANY Lone Star Lining Co
ADDRESS

**PROJECT**

LOCATION Robertson County, Texas
PROJECT 1525714
OWNER Luminant Inc.

I, the Undersigned, the duly authorized representative of Lone Star Lining Co

do hereby accept the area of soil surface bounded by P-166 to P 183

and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| KENT JETT | | Project Manager | 9/28/15 |

CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| VARENYA KUMAR | | QA MANAGER | 9/28/2015 |

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

**COMPANY** Lone Star Liners
**ADDRESS**

**PROJECT**

**LOCATION** Robertson County, Texas
**PROJECT** 1525714
**OWNER** Luminant Inc.

**I, the Undersigned, the duly authorized representative of** Lone Star Lining Co.

**do hereby accept the area of soil surface bounded by** Panels 184 - 197

**and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Mariano Tello | Mariano Tello | Supervisor | 9.29.15 |

**CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Alexandra Morales | | Engineer/QA Lead | 9/29 |

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

COMPANY _____

ADDRESS _____

_____

_____

**PROJECT**

LOCATION Robertson County, Texas

PROJECT 1525714

OWNER Luminant Inc.

I, the Undersigned, the duly authorized representative of _____

_____

do hereby accept the area of soil surface bounded by Panels 198-229

_____

_____

_____

_____

and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Mariano Tello | Mariano Tello | Supervisor. | 9/30/15 |

CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Alexandra Morales | | Civil Engineer / QA Lead | 9-30 |

***GOLDER ASSOCIATES INC.***

q:/fldfrms/geosyn/g4.xls

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

COMPANY _____

ADDRESS _____

_____

_____

**PROJECT**

LOCATION Robertson County, Texas

PROJECT 1525714

OWNER Luminant Inc.

I, the Undersigned, the duly authorized representative of _____

_____

do hereby accept the area of soil surface bounded by Panels 230-243

_____

_____

_____

_____

and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Mariano Tello | Mariano Tello | Supervisor | 10-01-2015 |

**CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER**

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Alexandra Morales | | Engineer/QA Lead | 10/1/2015 |

# CERTIFICATE OF ACCEPTANCE OF SOIL SURFACE

**GEOSYNTHETIC INSTALLER**

COMPANY _____

ADDRESS _____

_____

_____

**PROJECT**

LOCATION Robertson County, Texas

PROJECT 1525714

OWNER Luminant Inc.

I, the Undersigned, the duly authorized representative of _____

_____

do hereby accept the area of soil surface bounded by panels 244-271

_____

_____

_____

_____

and shall be responsible for maintaining its integrity and suitability in accordance with the project specifications from this date to the completion of the installation.

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Mariano Tello | Mariano Tello | Supervisor | 10.02.2015 |

CERTIFICATE OF ACCEPTANCE RECEIVED BY QA / QC MANAGER

| NAME | SIGNATURE | TITLE | DATE |
|---|---|---|---|
| Alexandra Morales | | Engineer / QA lead | 10/2/2015 |

# APPENDIX I
# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| PANEL NUMBER | DATE DEPLOYED | ROLL NUMBER | VISUAL PANEL CONDITION | MINIMUM OVERLAP (inches) | REMARKS |
|---|---|---|---|---|---|
| P-01 | 09/21/15 | 3396 | O.K. | 6 | |
| P-02 | 09/21/15 | 3396 | O.K. | 6 | |
| P-03 | 09/21/15 | 3396 | O.K. | 6 | |
| P-04 | 09/21/15 | 3396 | O.K. | 6 | |
| P-05 | 09/21/15 | 3396 | O.K. | 6 | |
| P-06 | 09/21/15 | 3396 | O.K. | 6 | |
| P-07 | 09/21/15 | 3413 | O.K. | 6 | |
| P-08 | 09/21/15 | 3413 | O.K. | 6 | |
| P-09 | 09/21/15 | 3413 | O.K. | 6 | |
| P-10 | 09/21/15 | 3413 | O.K. | 6 | |
| P-11 | 09/21/15 | 3413 | O.K. | 6 | |
| P-12 | 09/21/15 | 3413 | O.K. | 6 | |
| P-13 | 09/21/15 | 3353 | O.K. | 6 | |
| P-14 | 09/21/15 | 3353 | O.K. | 6 | |
| P-15 | 09/21/15 | 3353 | O.K. | 6 | |
| P-16 | 09/21/15 | 3353 | O.K. | 6 | |
| P-17 | 09/21/15 | 3353 | O.K. | 6 | |
| P-18 | 09/21/15 | 3353 | O.K. | 6 | |
| P-19 | 09/21/15 | 3404 | O.K. | 6 | |
| P-20 | 09/21/15 | 3404 | O.K. | 6 | |
| P-21 | 09/21/15 | 3404 | O.K. | 6 | |
| P-22 | 09/21/15 | 3404 | O.K. | 6 | |
| P-23 | 09/21/15 | 3404 | O.K. | 6 | |
| P-24 | 09/21/15 | 3404 | O.K. | 6 | |
| P-25 | 09/21/15 | 3404 | O.K. | 6 | |
| P-26 | 09/21/15 | 3404 | O.K. | 6 | |
| P-27 | 09/21/15 | 3404 | O.K. | 6 | |
| P-28 | 09/21/15 | 3349 | O.K. | 6 | |
| P-29 | 09/21/15 | 3349 | O.K. | 6 | |
| P-30 | 09/21/15 | 3349 | O.K. | 6 | |
| P-31 | 09/21/15 | 3349 | O.K. | 6 | |
| P-32 | 09/22/15 | 3394 | O.K. | 6 | |
| P-33 | 09/22/15 | 3395 | O.K. | 6 | |
| P-34 | 09/22/15 | 3396 | O.K. | 6 | |
| P-35 | 09/22/15 | 3349 | O.K. | 6 | |
| P-36 | 09/22/15 | 3349 | O.K. | 6 | |
| P-37 | 09/22/15 | 3349 | O.K. | 6 | |
| P-38 | 09/22/15 | 3352 | O.K. | 6 | |
| P-39 | 09/22/15 | 3352 | O.K. | 6 | |
| P-40 | 09/22/15 | 3352 | O.K. | 6 | |
| P-41 | 09/22/15 | 3348 | O.K. | 6 | |
| P-42 | 09/22/15 | 3348 | O.K. | 6 | |
| P-43 | 09/22/15 | 3348 | O.K. | 6 | |
| P-44 | 09/22/15 | 3351 | O.K. | 6 | |
| P-45 | 09/22/15 | 3351 | O.K. | 6 | |
| P-46 | 09/22/15 | 3351 | O.K. | 6 | |
| P-47 | 09/22/15 | 3402 | O.K. | 6 | |
| P-48 | 09/22/15 | 3402 | O.K. | 6 | |
| P-49 | 09/22/15 | 3402 | O.K. | 6 | |
| P-50 | 09/22/15 | 7421 | O.K. | 6 | |
| P-51 | 09/22/15 | 7421 | O.K. | 6 | |
| P-52 | 09/22/15 | 7421 | O.K. | 6 | |
| P-53 | 09/22/15 | 3362 | O.K. | 6 | |
| P-54 | 09/22/15 | 3362 | O.K. | 6 | |
| P-55 | 09/22/15 | 3362 | O.K. | 6 | |
| P-56 | 09/22/15 | 3362 | O.K. | 6 | |
| P-57 | 09/22/15 | 3365 | O.K. | 6 | |
| P-58 | 09/22/15 | 3365 | O.K. | 6 | |
| P-59 | 09/22/15 | 3365 | O.K. | 6 | |

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| PANEL NUMBER | DATE DEPLOYED | ROLL NUMBER | VISUAL PANEL CONDITION | MINIMUM OVERLAP (inches) | REMARKS |
|---|---|---|---|---|---|
| P-60 | 09/22/15 | 3375 | O.K. | 6 | |
| P-61 | 09/23/15 | 3375 | O.K. | 6 | |
| P-62 | 09/23/15 | 3375 | O.K. | 6 | |
| P-63 | 09/23/15 | 3367 | O.K. | 6 | |
| P-64 | 09/23/15 | 3367 | O.K. | 6 | |
| P-65 | 09/23/15 | 3367 | O.K. | 6 | |
| P-66 | 09/23/15 | 3363 | O.K. | 6 | |
| P-67 | 09/23/15 | 3363 | O.K. | 6 | |
| P-68 | 09/23/15 | 3363 | O.K. | 6 | |
| P-69 | 09/23/15 | 3363 | O.K. | 6 | |
| P-70 | 09/23/15 | 3363 | O.K. | 6 | |
| P-71 | 09/23/15 | 3363 | O.K. | 6 | |
| P-72 | 09/23/15 | 3363 | O.K. | 6 | |
| P-73 | 09/23/15 | 3359 | O.K. | 6 | |
| P-74 | 09/23/15 | 3359 | O.K. | 6 | |
| P-75 | 09/23/15 | 3359 | O.K. | 6 | |
| P-76 | 09/23/15 | 3359 | O.K. | 6 | |
| P-77 | 09/23/15 | 3359 | O.K. | 6 | |
| P-78 | 09/23/15 | 3359 | O.K. | 6 | |
| P-79 | 09/23/15 | 3417 | O.K. | 6 | |
| P-80 | 09/23/15 | 3417 | O.K. | 6 | |
| P-81 | 09/23/15 | 3417 | O.K. | 6 | |
| P-82 | 09/23/15 | 3417 | O.K. | 6 | |
| P-83 | 09/23/15 | 3417 | O.K. | 6 | |
| P-84 | 09/23/15 | 3417 | O.K. | 6 | |
| P-85 | 09/23/15 | 3417 | O.K. | 6 | |
| P-86 | 09/23/15 | 3411 | O.K. | 6 | |
| P-87 | 09/23/15 | 3411 | O.K. | 6 | |
| P-88 | 09/23/15 | 3411 | O.K. | 6 | |
| P-89 | 09/23/15 | 3411 | O.K. | 6 | |
| P-90 | 09/23/15 | 3411 | O.K. | 6 | |
| P-91 | 09/23/15 | 3411 | O.K. | 6 | |
| P-92 | 09/23/15 | 3411 | O.K. | 6 | |
| P-93 | 09/23/15 | 3411 | O.K. | 6 | |
| P-94 | 09/23/15 | 3411 | O.K. | 6 | |
| P-95 | 09/23/15 | 3354 | O.K. | 6 | |
| P-96 | 09/23/15 | 3354 | O.K. | 6 | |
| P-97 | 09/23/15 | 3354 | O.K. | 6 | |
| P-98 | 09/23/15 | 3354 | O.K. | 6 | |
| P-99 | 09/23/15 | 3354 | O.K. | 6 | |
| P-100 | 09/23/15 | 3354 | O.K. | 6 | |
| P-101 | 09/23/15 | 3354 | O.K. | 6 | |
| P-102 | 09/23/15 | 3354 | O.K. | 6 | |
| P-103 | 09/24/15 | 3361 | O.K. | 6 | |
| P-104 | 09/24/15 | 3361 | O.K. | 6 | |
| P-105 | 09/24/15 | 3361 | O.K. | 6 | |
| P-106 | 09/24/15 | 3361 | O.K. | 6 | |
| P-107 | 09/24/15 | 3361 | O.K. | 6 | |
| P-108 | 09/24/15 | 3361 | O.K. | 6 | |
| P-109 | 09/24/15 | 3361 | O.K. | 6 | |
| P-110 | 09/24/15 | 3361 | O.K. | 6 | |
| P-111 | 09/24/15 | 3408 | O.K. | 6 | |
| P-112 | 09/24/15 | 3408 | O.K. | 6 | |
| P-113 | 09/24/15 | 3408 | O.K. | 6 | |
| P-114 | 09/24/15 | 3408 | O.K. | 6 | |
| P-115 | 09/24/15 | 3408 | O.K. | 6 | |
| P-116 | 09/25/15 | 3414 | O.K. | 6 | |
| P-117 | 09/25/15 | 3414 | O.K. | 6 | |
| P-118 | 09/25/15 | 3414 | O.K. | 6 | |

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| PANEL NUMBER | DATE DEPLOYED | ROLL NUMBER | VISUAL PANEL CONDITION | MINIMUM OVERLAP (inches) | REMARKS |
|---|---|---|---|---|---|
| P-119 | 09/25/15 | 3414 | O.K. | 6 | |
| P-120 | 09/25/15 | 3410 | O.K. | 6 | |
| P-121 | 09/25/15 | 3410 | O.K. | 6 | |
| P-122 | 09/25/15 | 3410 | O.K. | 6 | |
| P-123 | 09/25/15 | 3410 | O.K. | 6 | |
| P-124 | 09/25/15 | 3411 | O.K. | 6 | |
| P-125 | 09/25/15 | 3415 | O.K. | 6 | |
| P-126 | 09/25/15 | 3415 | O.K. | 6 | |
| P-127 | 09/25/15 | 3415 | O.K. | 6 | |
| P-128 | 09/25/15 | 3415 | O.K. | 6 | |
| P-129 | 09/25/15 | 3416 | O.K. | 6 | |
| P-130 | 09/25/15 | 3416 | O.K. | 6 | |
| P-131 | 09/25/15 | 3416 | O.K. | 6 | |
| P-132 | 09/25/15 | 3366 | O.K. | 6 | |
| P-133 | 09/26/15 | 3366 | O.K. | 6 | |
| P-134 | 09/26/15 | 3304 | O.K. | 6 | |
| P-135 | 09/26/15 | 3393 | O.K. | 6 | |
| P-136 | 09/26/15 | 3393 | O.K. | 6 | |
| P-137 | 09/26/15 | 3393 | O.K. | 6 | |
| P-138 | 09/26/15 | 3393 | O.K. | 6 | |
| P-139 | 09/26/15 | 3393 | O.K. | 6 | |
| P-140 | 09/26/15 | 3358 | O.K. | 6 | |
| P-141 | 09/26/15 | 3358 | O.K. | 6 | |
| P-142 | 09/26/15 | 3358 | O.K. | 6 | |
| P-143 | 09/26/15 | 3358 | O.K. | 6 | |
| P-144 | 09/26/15 | 3358 | O.K. | 6 | |
| P-145 | 09/26/15 | 3358 | O.K. | 6 | |
| P-146 | 09/26/15 | 3407 | O.K. | 6 | |
| P-147 | 09/26/15 | 3407 | O.K. | 6 | |
| P-148 | 09/26/15 | 3358 | O.K. | 6 | |
| P-149 | 09/26/15 | 3358 | O.K. | 6 | |
| P-150 | 09/26/15 | 3407 | O.K. | 6 | |
| P-151 | 09/26/15 | 3407 | O.K. | 6 | |
| P-152 | 09/26/15 | 3412 | O.K. | 6 | |
| P-153 | 09/26/15 | 3412 | O.K. | 6 | |
| P-154 | 09/26/15 | 3412 | O.K. | 6 | |
| P-155 | 09/26/15 | 3412 | O.K. | 6 | |
| P-156 | 09/26/15 | 3380 | O.K. | 6 | |
| P-157 | 09/26/15 | 3380 | O.K. | 6 | |
| P-158 | 09/26/15 | 3380 | O.K. | 6 | |
| P-159 | 09/26/15 | 3380 | O.K. | 6 | |
| P-160 | 09/26/15 | 3409 | O.K. | 6 | |
| P-161 | 09/26/15 | 3409 | O.K. | 6 | |
| P-162 | 09/26/15 | 3409 | O.K. | 6 | |
| P-163 | 09/26/15 | 3409 | O.K. | 6 | |
| P-164 | 09/26/15 | 3409 | O.K. | 6 | |
| P-165 | 09/26/15 | 3409 | O.K. | 6 | |
| P-166 | 09/28/15 | 3369 | O.K. | 6 | |
| P-167 | 09/28/15 | 3369 | O.K. | 6 | |
| P-168 | 09/28/15 | 3369 | O.K. | 6 | |
| P-169 | 09/28/15 | 3390 | O.K. | 6 | |
| P-170 | 09/28/15 | 3390 | O.K. | 6 | |
| P-171 | 09/28/15 | 3390 | O.K. | 6 | |
| P-172 | 09/28/15 | 3364 | O.K. | 6 | |
| P-173 | 09/28/15 | 3364 | O.K. | 6 | |
| P-174 | 09/28/15 | 3374 | O.K. | 6 | |
| P-175 | 09/28/15 | 3356 | O.K. | 6 | |
| P-176 | 09/28/15 | 3356 | O.K. | 6 | |
| P-177 | 09/28/15 | 3356 | O.K. | 6 | |

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| PANEL NUMBER | DATE DEPLOYED | ROLL NUMBER | VISUAL PANEL CONDITION | MINIMUM OVERLAP (inches) | REMARKS |
|---|---|---|---|---|---|
| P-178 | 09/28/15 | 3355 | O.K. | 6 | |
| P-179 | 09/28/15 | 3355 | O.K. | 6 | |
| P-180 | 09/28/15 | 3368 | O.K. | 6 | |
| P-181 | 09/28/15 | 3368 | O.K. | 6 | |
| P-182 | 09/28/15 | 3368 | O.K. | 6 | |
| P-183 | 09/28/15 | 3368 | O.K. | 6 | |
| P-184 | 09/29/15 | 3387 | O.K. | 6 | |
| P-185 | 09/29/15 | 3387 | O.K. | 6 | |
| P-186 | 09/29/15 | 3379 | O.K. | 6 | |
| P-187 | 09/29/15 | 3379 | O.K. | 6 | |
| P-188 | 09/29/15 | 3385 | O.K. | 6 | |
| P-189 | 09/29/15 | 3385 | O.K. | 6 | |
| P-190 | 09/29/15 | 3385 | O.K. | 6 | |
| P-191 | 09/29/15 | 3368 | O.K. | 6 | |
| P-192 | 09/29/15 | 3374 | O.K. | 6 | |
| P-193 | 09/29/15 | 3374 | O.K. | 6 | |
| P-194 | 09/29/15 | 3356 | O.K. | 6 | |
| P-195 | 09/29/15 | 3356 | O.K. | 6 | |
| P-196 | 09/29/15 | 3356 | O.K. | 6 | |
| P-197 | 09/29/15 | 3356 | O.K. | 6 | |
| P-198 | 09/30/15 | 3356 | O.K. | 6 | |
| P-199 | 09/30/15 | 3356 | O.K. | 6 | |
| P-200 | 09/30/15 | 3371 | O.K. | 6 | |
| P-201 | 09/30/15 | 3371 | O.K. | 6 | |
| P-202 | 09/30/15 | 3371 | O.K. | 6 | |
| P-203 | 09/30/15 | 3371 | O.K. | 6 | |
| P-204 | 09/30/15 | 3371 | O.K. | 6 | |
| P-205 | 09/30/15 | 3381 | O.K. | 6 | |
| P-206 | 09/30/15 | 3381 | O.K. | 6 | |
| P-207 | 09/30/15 | 3381 | O.K. | 6 | |
| P-208 | 09/30/15 | 3381 | O.K. | 6 | |
| P-209 | 09/30/15 | 3381 | O.K. | 6 | |
| P-210 | 09/30/15 | 3381 | O.K. | 6 | |
| P-211 | 09/30/15 | 3378 | O.K. | 6 | |
| P-212 | 09/30/15 | 3378 | O.K. | 6 | |
| P-213 | 09/30/15 | 3378 | O.K. | 6 | |
| P-214 | 09/30/15 | 3378 | O.K. | 6 | |
| P-215 | 09/30/15 | 3378 | O.K. | 6 | |
| P-216 | 09/30/15 | 3378 | O.K. | 6 | |
| P-217 | 09/30/15 | 3354 | O.K. | 6 | |
| P-218 | 09/30/15 | 3405 | O.K. | 6 | |
| P-219 | 09/30/15 | 3387 | O.K. | 6 | |
| P-220 | 09/30/15 | 3405 | O.K. | 6 | |
| P-221 | 09/30/15 | 3387 | O.K. | 6 | |
| P-222 | 09/30/15 | 3387 | O.K. | 6 | |
| P-223 | 09/30/15 | 3390 | O.K. | 6 | |
| P-224 | 09/30/15 | 3382 | O.K. | 6 | |
| P-225 | 09/30/15 | 3409 | O.K. | 6 | |
| P-226 | 09/30/15 | 3390 | O.K. | 6 | |
| P-227 | 09/30/15 | 3390 | O.K. | 6 | |
| P-228 | 09/30/15 | 3357 | O.K. | 6 | |
| P-229 | 09/30/15 | 3370 | O.K. | 6 | |
| P-230 | 10/01/15 | 3384 | O.K. | 6 | |
| P-231 | 10/01/15 | 3377 | O.K. | 6 | |
| P-232 | 10/01/15 | 3376 | O.K. | 6 | |
| P-233 | 10/01/15 | 3398 | O.K. | 6 | |
| P-234 | 10/01/15 | 3392 | O.K. | 6 | |
| P-235 | 10/01/15 | 3386 | O.K. | 6 | |
| P-236 | 10/01/15 | 3383 | O.K. | 6 | |

# GEOMEMBRANE PANEL DEPLOYMENT SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| PANEL NUMBER | DATE DEPLOYED | ROLL NUMBER | VISUAL PANEL CONDITION | MINIMUM OVERLAP (inches) | REMARKS |
|---|---|---|---|---|---|
| P-237 | 10/01/15 | 3401 | O.K. | 6 | |
| P-238 | 10/01/15 | 3350 | O.K. | 6 | |
| P-239 | 10/01/15 | 3388 | O.K. | 6 | |
| P-240 | 10/01/15 | 3400 | O.K. | 6 | |
| P-241 | 10/01/15 | 3403 | O.K. | 6 | |
| P-242 | 10/01/15 | 3379 | O.K. | 6 | |
| P-243 | 10/01/15 | 3379 | O.K. | 6 | |
| P-244 | 10/02/15 | 3405 | O.K. | 6 | |
| P-245 | 10/02/15 | 3371 | O.K. | 6 | |
| P-246 | 10/02/15 | 3355 | O.K. | 6 | |
| P-247 | 10/02/15 | 3369 | O.K. | 6 | |
| P-248 | 10/02/15 | 3399 | O.K. | 6 | |
| P-249 | 10/02/15 | 3399 | O.K. | 6 | |
| P-250 | 10/02/15 | 3399 | O.K. | 6 | |
| P-251 | 10/02/15 | 3399 | O.K. | 6 | |
| P-252 | 10/02/15 | 3399 | O.K. | 6 | |
| P-253 | 10/02/15 | 3389 | O.K. | 6 | |
| P-254 | 10/02/15 | 3389 | O.K. | 6 | |
| P-255 | 10/02/15 | 3389 | O.K. | 6 | |
| P-256 | 10/02/15 | 3389 | O.K. | 6 | |
| P-257 | 10/02/15 | 3389 | O.K. | 6 | |
| P-258 | 10/02/15 | 3372 | O.K. | 6 | |
| P-259 | 10/02/15 | 3372 | O.K. | 6 | |
| P-260 | 10/02/15 | 3372 | O.K. | 6 | |
| P-261 | 10/02/15 | 3372 | O.K. | 6 | |
| P-262 | 10/02/15 | 3389 | O.K. | 6 | |
| P-263 | 10/02/15 | 3397 | O.K. | 6 | |
| P-264 | 10/02/15 | 3397 | O.K. | 6 | |
| P-265 | 10/02/15 | 3372 | O.K. | 6 | |
| P-266 | 10/02/15 | 3397 | O.K. | 6 | |
| P-267 | 10/02/15 | 3399 | O.K. | 6 | |
| P-268 | 10/02/15 | 3397 | O.K. | 6 | |
| P-269 | 10/02/15 | 3397 | O.K. | 6 | |
| P-270 | 10/02/15 | 3399 | O.K. | 6 | |
| P-271 | 10/02/15 | 3399 | O.K. | 6 | |

# APPENDIX J
# GEOMEMBRANE TRIAL SEAM SUMMARIES

# FUSION

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SAMPLE NUMBER | WELD DATE | WELD TIME | WELDING MACHINE NUMBER | WELD TECH. | AMBIENT AIR TEMP. (F) | MACHINE SPEED feet per minute | WEDGE TEMPERATURE | TEST RESULTS (1) | | | PASS/ FAIL | QA MON. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | INSIDE PEEL MODE STRENGTH | OUTSIDE PEEL MODE STRENGTH | SHEAR MODE STRENGTH | | |
| TF-01 | 10/03/15 | 0745 | 3781 | MA | 85 | 3.5 | | SE1/SE1/SE1 120/117/110 | SE1/SE1/SE1 114/122/113 | BRK/BRK 169/174/176 | PASS | MO |
| TF-03 | 10/03/15 | 0747 | 3781 | MA | 85 | 4 | | SE1/SE1/SE1 112/116/113 | SE1/SE1/SE1 116/109/114 | BRK/BRK 160/155/171 | PASS | MO |
| TF-01 | 10/02/15 | 0748 | 88 | VT | 65 | 3 | | SE1/SE1/SE1 122/119/127 | SE1/SE1/SE1 130/121/132 | BRK/BRK 170/161/166 | PASS | MO |
| TF-02 | 10/02/15 | 0751 | 3781 | MA | 65 | 4 | | SE1/SE1/SE1 116/120/120 | SE1/SE1/SE1 124/117/126 | BRK/BRK 162/171/161 | PASS | MO |
| TF-03 | 10/02/15 | 1037 | 3781 | MA | 70 | 4.5 | | SE1/SE1/SE1 110/114/109 | SE1/SE1/SE1 120/108/1183 | BRK/BRK 158/162/155 | PASS | MO |
| TF-04 | 10/02/15 | 1040 | 88 | VT | 70 | 4.5 | | SE1/SE1/SE1 116/110/116 | SE1/SE1/SE1 119/106/118 | BRK/BRK 161/160/157 | PASS | MO |
| TF-06 | 10/02/15 | 1320 | 3781 | MA | 78 | 4.5 | | SE1/SE1/SE1 110/103/117 | SE1/SE1/SE1 106/115/114 | BRK/BRK 141/149/142 | PASS | MO |
| TF-07 | 10/02/15 | 1323 | 88 | VT | 78 | 4.5 | | SE1/SE1/SE1 109/114/112 | SE1/SE1/SE1 117/111/107 | BRK/BRK 147/158/150 | PASS | MO |
| TF-01 | 09/29/15 | 1030 | 88 | VT | 85 | 3.5 | | SE1/SE1/SE1 102/118/111 | SE1/SE1/SE1 110/114/116 | BRK/BRK 160/155/141 | PASS | MO |
| TF-02 | 09/29/15 | 1033 | 368 | GZ | 85 | 4 | | SE1/SE1/SE1 106/114/108 | SE1/SE1/SE1 115/113/101 | BRK/BRK 155/150/148 | PASS | MO |
| TF-03 | 09/29/15 | 1351 | 3781 | MA | 85 | 5 | | SE1/SE1/SE1 133/119/120 | SE1/SE1/SE1 124/122/118 | BRK/BRK 151/144/156 | PASS | MO |
| TF-04 | 09/29/15 | 1359 | 88 | VT | 85 | 4.5 | | SE1/SE1/SE1 122/120/118 | SE1/SE1/SE1 118/114/122 | BRK/BRK 147/146/148 | PASS | MO |
| TF-05 | 09/29/15 | 1403 | 368 | GZ | 85 | 5 | | SE1/SE1/SE1 112/112/114 | SE1/SE1/SE1 108/118/147 | BRK/BRK 140/152/140 | PASS | MO |
| TF-01 | 09/30/15 | 0730 | 88 | VT | 68 | 3.5 | | SE1/SE1/SE1 110/109/104 | SE1/SE1/SE1 104/101/108 | BRK/BRK 151/157/158 | PASS | MO |
| TF-02 | 09/30/15 | 0733 | 368 | GZ | 68 | 4 | | SE1/SE1/SE1 109/121/118 | SE1/SE1/SE1 116/114/122 | BRK/BRK 164/155/152 | PASS | MO |
| TF-03 | 09/30/15 | 0751 | 3781 | MA | 68 | 4.5 | | SE1/SE1/SE1 122/120/122 | SE1/SE1/SE1 124/117/121 | BRK/BRK 168/171/170 | PASS | MO |
| TF-04 | 09/30/15 | 0842 | 88 | VT | 68 | 5 | | SE1/SE1/SE1 114/117/111 | SE1/SE1/SE1 108/121/108 | BRK/BRK 150/149/162 | PASS | MO |

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SAMPLE NUMBER | WELD DATE | WELD TIME | WELDING MACHINE NUMBER | WELD TECH. | AMBIENT AIR TEMP. (F) | MACHINE SPEED feet per minute | WEDGE TEMPERATURE | TEST RESULTS (1) | | | PASS/ FAIL | QA MON. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | INSIDE PEEL MODE STRENGTH | OUTSIDE PEEL MODE STRENGTH | SHEAR MODE STRENGTH | | |
| TF-05 | 09/30/15 | 0914 | 368 | GZ | 68 | 5 | | SE1/SE1/SE1 122/111/121 | SE1/SE1/SE1 114/118/124 | BRK/BRK 149/139/162 | PASS | MO |
| TF-06 | 09/30/15 | 1303 | 3781 | MA | 89 | 5 | | SE1/SE1/SE1 114/109/104 | SE1/SE1/SE1 106/112/120 | BRK/BRK 140/137/144 | PASS | MO |
| TF-07 | 09/30/15 | 1305 | 368 | GZ | 89 | 5 | | SE1/SE1/SE1 110/108/106 | SE1/SE1/SE1 105/111/103 | BRK/BRK 137/151/140 | PASS | MO |
| TF-08 | 09/30/15 | 1312 | 88 | VT | 89 | 5 | | SE1/SE1/SE1 102/109/105 | SE1/SE1/SE1 100/110/102 | BRK/BRK 141/138/146 | PASS | MO |
| TF-09 | 09/30/15 | 1426 | 368 | GZ | 89 | 5 | | SE1/SE1/SE1 110/120/119 | SE1/SE1/SE1 122/112/130 | BRK/BRK 112/160/147/155 | PASS | MO |
| TF-10 | 09/30/15 | 1720 | 88 | VT | 86 | 3.5 | | SE1/SE1/SE1 112/104/108 | SE1/SE1/SE1 106/109/114 | BRK/BRK 150/158/161 | PASS | MO |
| TF-01 | 10/01/15 | 0743 | 3781 | MA | 67 | 4.5 | | SE1/SE1/SE1 118/113/109 | SE1/SE1/SE1 120/111/117 | BRK/BRK 168/171/160 | PASS | MO |
| TF-02 | 10/01/15 | 0746 | 88 | VT | 67 | 3 | | SE1/SE1/SE1 114/101/116 | SE1/SE1/SE1 108/109/113 | BRK/BRK 155/164/158 | PASS | MO |
| TF-03 | 10/01/15 | 0802 | 68 | GZ | 67 | 3.5 | | SE1/SE1/SE1 120/114/130 | SE1/SE1/SE1 114/132/129 | BRK/BRK 168/178/165 | PASS | MO |
| TF-04 | 10/01/15 | 0935 | 68 | GZ | 72 | 5 | | SE1/SE1/SE1 126/124/121 | SE1/SE1/SE1 130/131/118 | BRK/BRK 170/166/174 | PASS | MO |
| TF-05 | 10/01/15 | 1003 | 88 | VT | 72 | 4.5 | | SE1/SE1/SE1 120/107/122 | SE1/SE1/SE1 116/115/113 | BRK/BRK 155/148/160 | PASS | MO |
| TF-06 | 10/01/15 | 1305 | 88 | VT | 90 | 4.5 | | SE1/SE1/SE1 120/112/118 | SE1/SE1/SE1 110/107/114 | BRK/BRK 155/166/160 | PASS | MO |
| TF-07 | 10/01/15 | 1308 | 368 | GZ | 90 | 5 | | SE1/SE1/SE1 104/106/115 | SE1/SE1/SE1 117/112/113 | BRK/BRK 149/155/164 | PASS | MO |
| TF-08 | 10/01/15 | 1313 | 3781 | MA | 90 | 5 | | SE1/SE1/SE1 114/106/113 | SE1/SE1/SE1 118/102/111 | BRK/BRK 160/150/145 | PASS | MO |
| TF-01 | 09/21/15 | 1357 | 206 | VT | 92 | 5 | | SE1/SE1/SE1 135/136/138 | SE1/SE1/SE1 139/130/132 | BRK/BRK 143/145/145 | PASS | VK |
| TF-02 | 09/21/15 | 1402 | 597 | MA | 92 | 5 | | SE1/SE1/SE1 126/115/135 | SE1/SE1/SE1 129/132/134 | BRK/BRK 141/144/141 | PASS | MO |
| TF-03 | 09/21/15 | 1434 | 088 | GZ | 92 | 5 | | SE1/SE1/SE1 118/131/124 | SE1/SE1/SE1 128/123/133 | BRK/BRK 156/150/155 | PASS | MO |

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SAMPLE NUMBER | WELD DATE | WELD TIME | WELDING MACHINE NUMBER | WELD TECH. | AMBIENT AIR TEMP. (F) | MACHINE SPEED feet per minute | WEDGE TEMPERATURE | TEST RESULTS (1) | | | PASS/ FAIL | QA MON. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | INSIDE PEEL MODE STRENGTH | OUTSIDE PEEL MODE STRENGTH | SHEAR MODE STRENGTH | | |
| TF-04 | 09/21/15 | 1600 | 206 | VT | 92 | 3.5 | | SE1/SE1/SE1 130/120/126 | SE1/SE1/SE1 124/117/123 | BRK/BRK 148/152/144 | PASS | MO |
| TF-05 | 09/21/15 | 1651 | 3781 | MA | 92 | 5 | | SE1/SE1/SE1 135/121/123 | SE1/SE1/SE1 122/133/127 | BRK/BRK 136/143/143 | PASS | MO |
| TF-01 | 09/22/15 | 0758 | 3781 | MA | 75 | 5 | | SE1/SE1/SE1 136/130/137 | SE1/SE1/SE1 128/131/124 | BRK/BRK 168/174/160 | PASS | MO |
| TF-02 | 09/22/15 | 0801 | 368 | GZ | 75 | 5 | | SE1/SE1/SE1 118/128/128 | SE1/SE1/SE1 123/124/121 | BRK/BRK 180/171/176 | PASS | MO |
| TF-03 | 09/22/15 | 0803 | 206 | VT | 75 | 3.5 | | SE1/SE1/SE1 144/145/122 | SE1/SE1/SE1 119/118/151 | BRK/BRK 174/177/174 | PASS | MO |
| TF-04 | 09/22/15 | 0802 | 206 | VT | 75 | 5 | | SE1/SE1/SE1 130/130/130 | SE1/SE1/SE1 141/135/128 | BRK/BRK 168/169/172 | PASS | MO |
| TF-05 | 09/22/15 | 1005 | 206 | VT | 80 | 3.5 | | SE1/SE1/SE1 126/121/131 | SE1/SE1/SE1 120/117/128 | BRK/BRK 151/160/157 | PASS | VK |
| TF-06 | 09/22/15 | 1310 | 206 | VT | 91 | 3.5 | | SE1/SE1/SE1 130/134/121 | SE1/SE1/SE1 121/120/119 | BRK/BRK 141/147/146 | PASS | VK |
| TF-07 | 09/22/15 | 1311 | 206 | VT | 91 | 5 | | SE1/SE1/SE1 129/119/136 | SE1/SE1/SE1 131/121/131 | BRK/BRK 164/156/150 | PASS | VK |
| TF-08 | 09/22/15 | 1318 | 3781 | MA | 91 | 5.5 | | SE1/SE1/SE1 123/131/120 | SE1/SE1/SE1 119/127/119 | BRK/BRK 151/163/154 | PASS | VK |
| TF-09 | 09/22/15 | 1323 | 368 | GZ | 91 | 5 | | SE1/SE1/SE1 131/119/127 | SE1/SE1/SE1 121/126/119 | BRK/BRK 150/150/156 | PASS | VK |
| TF-01 | 09/23/15 | 0803 | 3781 | MA | 70 | 5 | | SE1/SE1/SE1 127/131/130 | SE1/SE1/SE1 123/134/134 | BRK/BRK 179/163/171 | PASS | VK |
| TF-02 | 09/23/15 | 0805 | 368 | GZ | 70 | 5 | | SE1/SE1/SE1 141/136/137 | SE1/SE1/SE1 149/141/147 | BRK/BRK 169/171/163 | PASS | VK |
| TF-03 | 09/23/15 | 0817 | 206 | VT | 70 | 5 | | SE1/SE1/SE1 134/126/131 | SE1/SE1/SE1 124/129/135 | BRK/BRK 167/159/170 | PASS | VK |
| TF-04 | 09/23/15 | 0820 | 206 | VT | 70 | 3.5 | | SE1/SE1/SE1 146/145/141 | SE1/SE1/SE1 139/151/146 | BRK/BRK 174/164/171 | PASS | VK |
| TF-05 | 09/23/15 | 0930 | 206 | VT | 70 | 3.5 | | SE1/SE1/SE1 112/121/110 | SE1/SE1/SE1 118/113/113 | BRK/BRK 166/158/161 | PASS | VK |
| TF-06 | 09/23/15 | 1315 | 3781 | MA | 93 | 5.5 | | SE1/SE1/SE1 130/128/129 | SE1/SE1/SE1 126/131/121 | BRK/BRK 161/155/149 | PASS | VK |

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SAMPLE NUMBER | WELD DATE | WELD TIME | WELDING MACHINE NUMBER | WELD TECH. | AMBIENT AIR TEMP. (F) | MACHINE SPEED feet per minute | WEDGE TEMPERATURE | TEST RESULTS (1) | | | PASS/ FAIL | QA MON. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | INSIDE PEEL MODE STRENGTH | OUTSIDE PEEL MODE STRENGTH | SHEAR MODE STRENGTH | | |
| TF-07 | 09/23/15 | 1317 | 206 | VT | 93 | 4 | | SE1/SE1/SE1 136/137/141 | SE1/SE1/SE1 141/145/146 | BRK/BRK 174/164/171 | PASS | VK |
| TF-08 | 09/23/15 | 1320 | 368 | GZ | 93 | 5 | | SE1/SE1/SE1 121/127/131 | SE1/SE1/SE1 119/126/127 | BRK/BRK 159/161/120 | PASS | VK |
| TF-09 | 09/23/15 | 1325 | 206 | VT | 93 | 3.5 | | SE1/SE1/SE1 139/141/130 | SE1/SE1/SE1 135/129/127 | BRK/BRK 163/159/149 | PASS | VK |
| TF-10 | 09/23/15 | 1330 | 206 | VT | 93 | 5 | | SE1/SE1/SE1 129/119/123 | SE1/SE1/SE1 121/117/120 | BRK/BRK 141/139/140 | PASS | VK |
| TF-11 | 09/23/15 | 16040 | 368 | GZ | 88 | 4 | | SE1/SE1/SE1 118/116/127 | SE1/SE1/SE1 110/121/114 | BRK/BRK 168/160/155 | PASS | VK |
| TF-12 | 09/23/15 | 1648 | 3781 | MA | 88 | 4 | | SE1/SE1/SE1 115/121/116 | SE1/SE1/SE1 124/126/117 | BRK/BRK 161/158/166 | PASS | VK |
| TF-01 | 09/24/15 | 0735 | 206 | VT | 68 | 3 | | SE1/SE1/SE1 133/129/125 | SE1/SE1/SE1 144/134/131 | BRK/BRK 161/159/157 | PASS | VK |
| TF-02 | 09/24/15 | 0740 | 206 | VT | 68 | 4 | | SE1/SE1/SE1 129/123/121 | SE1/SE1/SE1 131/127/129 | BRK/BRK 169/171/163 | PASS | VK |
| TF-03 | 09/24/15 | 0745 | 206 | VT | 68 | 4.5 | | SE1/SE1/SE1 127/133/134 | SE1/SE1/SE1 125/123/126 | BRK/BRK 156/157/161 | PASS | VK |
| TF-04 | 09/24/15 | 0757 | 368 | GZ | 68 | 4 | | SE1/SE1/SE1 131/121/128 | SE1/SE1/SE1 127/130/127 | BRK/BRK 143/159/167 | PASS | VK |
| TF-05 | 09/24/15 | 0804 | 368 | GZ | 68 | 5 | | SE1/SE1/SE1 126/139/123 | SE1/SE1/SE1 129/120/120 | BRK/BRK 160/171/164 | PASS | VK |
| TF-06 | 09/24/15 | 0806 | 3781 | MA | 68 | 5 | | SE1/SE1/SE1 136/129/121 | SE1/SE1/SE1 131/127/125 | BRK/BRK 174/167/159 | PASS | VK |
| TF-07 | 09/24/15 | 0810 | 3781 | MA | 68 | 5 | | SE1/SE1/SE1 127/131/121 | SE1/SE1/SE1 127/136/135 | BRK/BRK 169/171/168 | PASS | VK |
| TF-01 | 09/25/15 | 0730 | 206 | VT | 69 | 3.5 | | SE1/SE1/SE1 123/117/124 | SE1/SE1/SE1 120/118/115 | BRK/BRK 160/158/166 | PASS | MO |
| TF-02 | 09/25/15 | 1126 | 206 | VT | 67 | 3.5 | | SE1/SE1/SE1 118/113/124 | SE1/SE1/SE1 110/120/116 | BRK/BRK 168/157/161 | PASS | MO |
| TF-03 | 09/25/15 | 1325 | 206 | VT | 67 | 5 | | SE1/SE1/SE1 110/113/106 | SE1/SE1/SE1 106/109/114 | BRK/BRK 158/151/164 | PASS | MO |
| TF-04 | 09/25/15 | 1326 | 206 | VT | 67 | 3.5 | | SE1/SE1/SE1 104/118/113 | SE1/SE1/SE1 124/116/121 | BRK/BRK 149/160/155 | PASS | MO |

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SAMPLE NUMBER | WELD DATE | WELD TIME | WELDING MACHINE NUMBER | WELD TECH. | AMBIENT AIR TEMP. (F) | MACHINE SPEED feet per minute | WEDGE TEMPERATURE | TEST RESULTS (1) | | | PASS/ FAIL | QA MON. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | INSIDE PEEL MODE STRENGTH | OUTSIDE PEEL MODE STRENGTH | SHEAR MODE STRENGTH | | |
| TF-05 | 09/25/15 | 1327 | 378 | MA | 67 | 5 | | SE1/SE1/SE1 118/112/108 | SE1/SE1/SE1 113/107/115 | BRK/BRK 159/161/158 | PASS | MO |
| TF-06 | 09/25/15 | 1328 | 368 | GZ | 67 | 5 | | SE1/SE1/SE1 103/104/104 | SE1/SE1/SE1 109/110/118 | BRK/BRK 143/151/159 | PASS | MO |
| TF-01 | 09/26/15 | 0800 | 3781 | MA | 70 | 4.8 | | SE1/SE1/SE1 141/131/129 | SE1/SE1/SE1 137/146/136 | BRK/BRK 163/149/156 | PASS | MO |
| TF-02 | 09/26/15 | 0800 | 368 | GZ | 70 | 5 | | SE1/SE1/SE1 136/137/130 | SE1/SE1/SE1 141/149/130 | BRK/BRK 159/163/157 | PASS | MO |
| TF-03 | 09/26/15 | 0802 | 206 | VT | 70 | 3.5 | | SE1/SE1/SE1 146/139/137 | SE1/SE1/SE1 141/140/136 | BRK/BRK 175/185/170 | PASS | MO |
| TF-04 | 09/26/15 | 0802 | 206 | VT | 70 | 5 | | SE1/SE1/SE1 143/135/136 | SE1/SE1/SE1 140/129/149 | BRK/BRK 176/162/159 | PASS | MO |
| TF-05 | 09/26/15 | 0807 | 206 | VT | 80 | 5 | | SE1/SE1/SE1 143/135/136 | SE1/SE1/SE1 140/129/144 | BRK/BRK 176/167/159 | PASS | MO |
| TF-06 | 09/26/15 | 0845 | 206 | VT | 80 | 3.5 | | SE1/SE1/SE1 137/129/131 | SE1/SE1/SE1 131/126/123 | BRK/BRK 159/163/157 | PASS | MO |
| TF-07 | 09/26/15 | 0922 | 3781 | MA | 80 | 4.3 | | SE1/SE1/SE1 126/131/121 | SE1/SE1/SE1 125/119/124 | BRK/BRK 161/150/153 | PASS | MO |
| TF-08 | 09/26/15 | 0930 | 368 | GZ | 80 | 4 | | SE1/SE1/SE1 130/121/121 | SE1/SE1/SE1 127/119/117 | BRK/BRK 149/156/151 | PASS | MO |
| TF-09 | 09/26/15 | 1317 | 3781 | MA | 90 | 4.8 | | SE1/SE1/SE1 130/121/121 | SE1/SE1/SE1 127/119/117 | BRK/BRK 149/156/151 | PASS | MO |
| TF-10 | 09/26/15 | 1320 | 368 | GZ | 90 | 5 | | SE1/SE1/SE1 135/119/131 | SE1/SE1/SE1 121/127/117 | BRK/BRK 156/170/150 | PASS | MO |
| TF-11 | 09/26/15 | 1323 | 206 | VT | 90 | 4 | | SE1/SE1/SE1 136/131/120 | SE1/SE1/SE1 130/126/123 | BRK/BRK 149/160/151 | PASS | MO |
| TF-12 | 09/26/15 | 1327 | 206 | VT | 90 | 5 | | SE1/SE1/SE1 129/129/119 | SE1/SE1/SE1 121/137/124 | BRK/BRK 157/157/140 | PASS | MO |
| TF-01 | 09/28/15 | 0757 | 206 | VT | 66 | 3.5 | | SE1/SE1/SE1 126/139/130 | SE1/SE1/SE1 136/141/129 | BRK/BRK 178/177/167 | PASS | MO |
| TF-02 | 09/28/15 | 1252 | 206 | VT | 80 | 4.5 | | SE1/SE1/SE1 120/117/104 | SE1/SE1/SE1 125/112/118 | BRK/BRK 168/154/157 | PASS | MO |
| TF-03 | 09/28/15 | 1248 | 206 | VT | 80 | 3.5 | | SE1/SE1/SE1 114/122/130 | SE1/SE1/SE1 112/128/134 | BRK/BRK 151/158/162 | PASS | MO |

# GEOMEMBRANE FUSION TRIAL SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SAMPLE NUMBER | WELD DATE | WELD TIME | WELDING MACHINE NUMBER | WELD TECH. | AMBIENT AIR TEMP. (F) | MACHINE SPEED feet per minute | WEDGE TEMPERATURE | TEST RESULTS (1) | | | PASS/ FAIL | QA MON. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | INSIDE PEEL MODE STRENGTH | OUTSIDE PEEL MODE STRENGTH | SHEAR MODE STRENGTH | | |
| TF-04 | 09/28/15 | 1250 | 3781 | MA | 80 | 4.8 | | SE1/SE1/SE1 123/134/135 | SE1/SE1/SE1 128/130/127 | BRK/BRK 170/162/172 | PASS | MO |
| TF-05 | 09/28/15 | 1242 | 368 | GZ | 80 | 5 | | SE1/SE1/SE1 118/113/109 | SE1/SE1/SE1 120/111/118 | BRK/BRK 160/155/161 | PASS | MO |
| TF-06 | 09/28/15 | 1300 | 206 | VT | 80 | 3.5 | | SE1/SE1/SE1 110/116/110 | SE1/SE1/SE1 114/118/107 | BRK/BRK 155/148/151 | PASS | MO |
| TF-07 | 09/28/15 | 1303 | 206 | VT | 80 | 5 | | SE1/SE1/SE1 112/114/102 | SE1/SE1/SE1 113/109/106 | BRK/BRK 154/161/140 | PASS | MO |
| TF-08 | 09/28/15 | 1304 | 368 | GZ | 80 | 4.5 | | SE1/SE1/SE1 100/118/109 | SE1/SE1/SE1 103/104/113 | BRK/BRK 140/148/142 | PASS | MO |

NOTES: (1) Modes are illustrated on Figure 20, strengths are in pounds per inch.

# EXTRUSION

# GEOMEMBRANE EXTRUSION TRIAL SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SAMPLE NUMBER | WELD DATE | WELD TIME | WELDING MACHINE NUMBER | WELD TECHNICIAN | AMBIENT AIR TEMP. (F) | EXTRUDER TEMP. OR PREHEAT SETTING | NOZZLE TEMPERATURE | TEST RESULTS (1) | | PASS/ FAIL | QA MON. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | INSIDE PEEL MODE STRENGTH | SHEAR MODE STRENGTH | | |
| TX-01 | 10/04/15 | 0710 | 197 | DL | 60 | 550 | | SE3/SE3/SE3 130/125/133 | BRK1/BRK1 178/182/170 | PASS | MO |
| TX-02 | 10/04/15 | 0712 | 131 | VT | 60 | 550 | | SE3/SE3/SE3 141/130/126 | BRK1/BRK1 169/181/177 | PASS | MO |
| TX-03 | 10/04/15 | 1300 | 197 | DL | 75 | 550 | | SE3/SE3/SE3 130/120/121 | BRK1/BRK1 150/170/158 | PASS | MO |
| TX-04 | 10/04/15 | 1306 | 131 | DL | 75 | 550 | | SE3/SE3/SE3 122/128/130 | BRK1/BRK1 160/152/158 | PASS | MO |
| TX-02 | 10/03/15 | 0748 | 197 | DL | 58 | 550 | | SE3/SE3/SE3 114/111/118 | BRK1/BRK1 171/162/166 | PASS | MO |
| TX-04 | 10/03/15 | 0835 | 131 | VT | 58 | 550 | | SE3/SE3/SE3 102/115/120 | BRK1/BRK1 169/171/177 | PASS | MO |
| TX-05 | 10/03/15 | 1306 | 131 | DL | 79 | 550 | | SE3/SE3/SE3 119/126/122 | BRK1/BRK1 167/174/160 | PASS | MO |
| TX-06 | 10/03/15 | 1308 | 197 | DL | 79 | 550 | | SE3/SE3/SE3 121/114/125 | BRK1/BRK1 155/149/162 | PASS | MO |
| TX-05 | 10/02/15 | 1100 | 197 | DL | 78 | 550 | | SE3/SE3/SE3 113/104/106 | BRK1/BRK1 135/149/162 | PASS | MO |
| TX-08 | 10/02/15 | 1330 | 197 | DL | 78 | 550 | | SE3/SE3/SE3 113/104/106 | BRK1/BRK1 135/140/133 | PASS | MO |
| TX-01 | 09/24/15 | 1349 | 197 | VT | 95 | 550 | | SE3/SE3/SE3 130/125/120 | BRK1/BRK1 156/155/149 | PASS | VK |
| TX-02 | 09/24/15 | 1350 | 131 | MT | 95 | 550 | | SE3/SE3/SE3 121/132/121 | BRK1/BRK1 169/156/159 | PASS | VK |
| TX-01 | 09/25/15 | 0735 | 197 | VT | 92 | 550 | | SE3/SE3/SE3 119/130/121 | BRK1/BRK1 174/162/168 | PASS | MO |
| TX-02 | 09/25/15 | 0809 | 131 | MA | 92 | 550 | | SE3/SE3/SE3 115/110/119 | BRK1/BRK1 168/161/160 | PASS | MO |
| TX-01 | 09/26/15 | 1528 | 197 | VT | 93 | 500 | | SE3/SE3/SE3 130/127/119 | BRK1/BRK1 149/151/143 | PASS | VK |
| TX-02 | 09/26/15 | 1535 | 131 | MA | 93 | 500 | | SE3/SE3/SE3 127/121/123 | BRK1/BRK1 153/141/143 | PASS | VK |
| TX-01 | 09/28/15 | 1029 | 197 | DL | 85 | 550 | | SE3/SE3/SE3 116/121/112 | BRK1/BRK1 148/144/150 | PASS | MO |

NOTES: (1) Modes are illustrated on Figure 20, strengths are in pounds per inch.

# APPENDIX K
# GEOMEMBRANE SEAM AND NON-DESTRUCTIVE TEST SUMMARIES

# FUSION SEAMING SUMMARY

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P001 \ P002 | 09/21/15 | WEOS TO EEOS | 1407 | 90 | VT | VK | 206 | 87 | P | 09/22/15 | VK | DS-01 | |
| P003 \ P004 | 09/21/15 | WEOS TO EEOS | 1423 | 90 | VT | VK | 206 | 87 | P | 09/22/15 | VK | | |
| P005 \ P006 | 09/21/15 | WEOS TO EEOS | 1443 | 90 | VT | VK | 206 | 87 | P | 09/22/15 | VK | | |
| P009 \ P010 | 09/21/15 | WEOS TO EEOS | 1457 | 90 | VT | VK | 206 | 88 | P | 09/22/15 | VK | | |
| P011 \ P012 | 09/21/15 | WEOS TO EEOS | 1517 | 90 | VT | VK | 206 | 85 | P | 09/22/15 | VK | | |
| P013 \ P014 | 09/21/15 | WEOS TO EEOS | 1536 | 90 | VT | VK | 206 | 87 | P | 09/22/15 | VK | DS-04 | |
| P017 \ P018 | 09/21/15 | WEOS TO EEOS | 1557 | 90 | VT | VK | 206 | 88 | P | 09/22/15 | VK | | |
| P012 \ P032 | 09/21/15 | SEOS TO NEOS | 1615 | 90 | VT | VK | 206 | 23 | P | 09/22/15 | VK | | |
| P021 \ P022 | 09/21/15 | WEOS TO EEOS | 1629 | 90 | VT | VK | 206 | 62 | P | 09/22/15 | VK | | |
| P025 \ P024 | 09/21/15 | SEOS TO NEOS | 1638 | 90 | VT | VK | 206 | 57 | P | 09/22/15 | VK | | |
| P026 \ P025 | 09/21/15 | SEOS TO NEOS | 1655 | 90 | VT | VK | 206 | 27 | P | 09/22/15 | VK | | |
| P026 \ P023 | 09/21/15 | SEOS TO NEOS | 1710 | 90 | VT | VK | 206 | 32 | P | 09/22/15 | VK | | |
| P025 \ P022 | 09/21/15 | SEOS TO NEOS | 1720 | 90 | VT | VK | 206 | 31 | P | 09/22/15 | VK | | |
| P021 \ P024 | 09/21/15 | SEOS TO NEOS | 1730 | 90 | VT | VK | 206 | 27 | P | 09/22/15 | VK | | |
| P028 \ P031 | 09/21/15 | WEOS TO EEOS | 1752 | 90 | VT | VK | 206 | 20 | P | 09/22/15 | VK | | |
| P028 \ P030 | 09/21/15 | WEOS TO EEOS | 1755 | 85 | VT | VK | 206 | 6 | P | 09/22/15 | VK | | |
| P027 \ P030 | 09/21/15 | WEOS TO EEOS | 1756 | 85 | VT | VK | 206 | 34 | P | 09/22/15 | VK | | |
| P027 \ P029 | 09/21/15 | WEOS TO EEOS | 1805 | 85 | VT | VK | 206 | 8 | P | 09/22/15 | VK | | |
| P001 \ P029 | 09/21/15 | WEOS TO EEOS | 1808 | 85 | VT | VK | 206 | 21 | P | 09/22/15 | VK | | |
| P002 \ P003 | 09/21/15 | WEOS TO EEOS | 1417 | 90 | MA | VK | 591 | 87 | P | 09/22/15 | VK | DS-02 | |
| P004 \ P005 | 09/21/15 | WEOS TO EEOS | 1434 | 90 | MA | VK | 591 | 87 | P | 09/22/15 | VK | | |
| P007 \ P008 | 09/21/15 | WEOS TO EEOS | 1459 | 90 | MA | VK | 591 | 87 | P | 09/22/15 | VK | | |
| P010 \ P011 | 09/21/15 | WEOS TO EEOS | 1516 | 90 | MA | VK | 591 | 87 | P | 09/22/15 | VK | | |
| P015 \ P016 | 09/21/15 | WEOS TO EEOS | 1537 | 90 | MA | VK | 591 | 88 | P | 09/22/15 | VK | | |
| P016 \ P017 | 09/21/15 | WEOS TO EEOS | 1553 | 90 | MA | VK | 591 | 87 | P | 09/22/15 | VK | DS-05 | |
| P019 \ P020 | 09/21/15 | WEOS TO EEOS | 1609 | 90 | MA | VK | 591 | 87 | P | 09/22/15 | VK | | |
| P006 \ P007 | 09/21/15 | WEOS TO EEOS | 1444 | 90 | GZ | VK | 088 | 88 | P | 09/22/15 | VK | DS-03 | |
| P008 \ P009 | 09/21/15 | WEOS TO EEOS | 1459 | 90 | GZ | VK | 088 | 87 | P | 09/22/15 | VK | | |
| P012 \ P013 | 09/21/15 | WEOS TO EEOS | 1522 | 90 | GZ | VK | 088 | 87 | P | 09/22/15 | VK | | |
| P014 \ P015 | 09/21/15 | WEOS TO EEOS | 1540 | 90 | GZ | VK | 088 | 87 | P | 09/22/15 | VK | | |
| P018 \ P019 | 09/21/15 | WEOS TO EEOS | 1601 | 90 | GZ | VK | 088 | 87 | P | 09/22/15 | VK | | |
| P020 \ P021 | 09/21/15 | WEOS TO EEOS | 1627 | 90 | GZ | VK | 088 | 87 | P | 09/22/15 | VK | DS-06 | |
| P022 \ P023 | 09/21/15 | WEOS TO EEOS | 1653 | 90 | GZ | VK | 088 | 32 | P | 09/22/15 | VK | | |
| P027 \ P001 | 09/21/15 | EEOS TO WEOS | 1725 | 90 | GZ | VK | 088 | 63 | P | 09/22/15 | VK | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P031 \ P030 | 09/21/15 | SEOS TO NEOS | 1750 | 90 | GZ | VK | 088 | 27 | | P | 09/22/15 | VK | | |
| P027 \ P028 | 09/21/15 | EEOS TO WEOS | 1735 | 90 | MA | VK | 3781 | 30 | | P | 09/22/15 | VK | | |
| P030 \ P029 | 09/21/15 | SEOS TO NEOS | 1749 | 90 | MA | VK | 3781 | 57 | | P | 09/22/15 | VK | | |
| P029 \ P032 | 09/22/15 | NEOS TO SEOS | 0820 | 72 | VT | VK | 206 | 89 | | P | 09/22/15 | VK | | |
| P001 \ P032 | 09/22/15 | NEOS TO SEOS | 0829 | 72 | VT | VK | 206 | 6 | | P | 09/22/15 | VK | | |
| P002 \ P032 | 09/22/15 | NEOS TO SEOS | 0832 | 72 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | DS-07 | |
| P003 \ P032 | 09/22/15 | NEOS TO SEOS | 0833 | 75 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P004 \ P032 | 09/22/15 | NEOS TO SEOS | 0836 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P005 \ P032 | 09/22/15 | NEOS TO SEOS | 0840 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P006 \ P032 | 09/22/15 | NEOS TO SEOS | 0843 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P007 \ P032 | 09/22/15 | NEOS TO SEOS | 0846 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P008 \ P032 | 09/22/15 | NEOS TO SEOS | 0850 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P009 \ P032 | 09/22/15 | NEOS TO SEOS | 0853 | | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P010 \ P032 | 09/22/15 | NEOS TO SEOS | 0856 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P011 \ P032 | 09/22/15 | NEOS TO SEOS | 0900 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P012 \ P032 | 09/22/15 | NEOS TO SEOS | 0904 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P013 \ P032 | 09/22/15 | NEOS TO SEOS | 0907 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P014 \ P032 | 09/22/15 | NEOS TO SEOS | 0911 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P015 \ P032 | 09/22/15 | NEOS TO SEOS | 0914 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P016 \ P032 | 09/22/15 | NEOS TO SEOS | 0917 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P017 \ P032 | 09/22/15 | NEOS TO SEOS | 0921 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P018 \ P032 | 09/22/15 | NEOS TO SEOS | 0924 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P019 \ P032 | 09/22/15 | NEOS TO SEOS | 0928 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P020 \ P032 | 09/22/15 | NEOS TO SEOS | 0932 | 80 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P024 \ P035 | 09/22/15 | NEOS TO SEOS | 0934 | 80 | VT | VK | 206 | 87 | | P | 09/22/15 | VK | DS-10 | |
| P035 \ P032 | 09/22/15 | WEOS TO EEOS | 1019 | 85 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P036 \ P033 | 09/22/15 | WEOS TO EEOS | 1023 | 85 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P037 \ P034 | 09/22/15 | WEOS TO EEOS | 1026 | 85 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P039 \ P041 | 09/22/15 | NEOS TO SEOS | 1047 | 90 | VT | VK | 206 | 191 | | P | 09/22/15 | VK | | |
| P041 \ P040 | 09/22/15 | WEOS TO EEOS | 1056 | 90 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P039 \ P040 | 09/22/15 | NEOS TO SEOS | 1115 | 90 | VT | VK | 206 | 30 | | P | 09/22/15 | VK | | |
| P043 \ P044 | 09/22/15 | EEOS TO WEOS | 1127 | 90 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P044 \ P045 | 09/22/15 | NEOS TO SEOS | 1330 | 95 | VT | VK | 206 | 85 | | P | 09/22/15 | VK | | |
| P043 \ P045 | 09/22/15 | NEOS TO SEOS | 1343 | 95 | VT | VK | 206 | 115 | | P | 09/22/15 | VK | DS-14 | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P047 \ P048 | 09/22/15 | NEOS TO SEOS | 1410 | 95 | VT | VK | 206 | 215 | | P | 09/22/15 | VK | | |
| P049 \ P050 | 09/22/15 | NEOS TO SEOS | 1439 | 95 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P051 \ P052 | 09/22/15 | NEOS TO SEOS | 1459 | 95 | VT | VK | 206 | 181 | | P | 09/22/15 | VK | DS-17 | |
| P051 \ P053 | 09/22/15 | NEOS TO SEOS | 1510 | 95 | VT | VK | 206 | 33 | | P | 09/22/15 | VK | | |
| P052 \ P053 | 09/22/15 | WEOS TO EEOS | 1525 | 95 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P056 \ P057 | 09/22/15 | WEOS TO EEOS | 1639 | 90 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P058 \ P059 | 09/22/15 | NEOS TO SEOS | 1653 | 90 | VT | VK | 206 | 145 | | P | 09/22/15 | VK | | |
| P059 \ P060 | 09/22/15 | WEOS TO EEOS | 1723 | 85 | VT | VK | 206 | 22 | | P | 09/22/15 | VK | | |
| P058 \ P060 | 09/22/15 | NEOS TO SEOS | 1727 | 85 | VT | VK | 206 | 70 | | P | 09/22/15 | VK | | |
| P033 \ P034 | 09/22/15 | NEOS TO SEOS | 0837 | 80 | GZ | VK | 368 | 513 | | P | 09/22/15 | VK | DS-09 | |
| P036 \ P037 | 09/22/15 | SEOS TO NEOS | 1000 | 85 | GZ | VK | 368 | 87 | | P | 09/22/15 | VK | DS-11 | |
| P038 \ P039 | 09/22/15 | NEOS TO SEOS | 1044 | 90 | GZ | VK | 368 | 244 | | P | 09/22/15 | VK | | |
| P042 \ P044 | 09/22/15 | NEOS TO SEOS | 1134 | 90 | GZ | VK | 368 | 85 | | P | 09/22/15 | VK | | |
| P042 \ P043 | 09/22/15 | NEOS TO SEOS | 1145 | 90 | GZ | VK | 368 | 115 | | P | 09/22/15 | VK | DS-13 | |
| P046 \ P047 | 09/22/15 | NEOS TO SEOS | 1350 | 95 | GZ | VK | 368 | 211 | | P | 09/22/15 | VK | | |
| P049 \ P051 | 09/22/15 | NEOS TO SEOS | 1439 | 95 | GZ | VK | 368 | 89 | | P | 09/22/15 | VK | | |
| P050 \ P051 | 09/22/15 | NEOS TO SEOS | 1450 | 95 | GZ | VK | 368 | 126 | | P | 09/22/15 | VK | DS-16 | |
| P052 \ P054 | 09/22/15 | NEOS TO SEOS | 1534 | 95 | GZ | VK | 368 | 182 | | P | 09/22/15 | VK | | |
| P053 \ P054 | 09/22/15 | NEOS TO SEOS | 1540 | 95 | GZ | VK | 368 | 33 | | P | 09/22/15 | VK | | |
| P057 \ P058 | 09/22/15 | NEOS TO SEOS | 1646 | 90 | GZ | VK | 368 | 159 | | P | 09/22/15 | VK | | |
| P056 \ P058 | 09/22/15 | NEOS TO SEOS | 1708 | 85 | GZ | VK | 368 | 56 | | P | 09/22/15 | VK | | |
| P032 \ P033 | 09/22/15 | NEOS TO SEOS | 0822 | 80 | MA | VK | 3781 | 510 | | P | 09/22/15 | VK | DS-08 | |
| P035 \ P036 | 09/22/15 | SEOS TO NEOS | 0951 | 80 | MA | VK | 3781 | 87 | | P | 09/22/15 | VK | | |
| P034 \ P038 | 09/22/15 | NEOS TO SEOS | 1032 | 85 | MA | VK | 3781 | 256 | | P | 09/22/15 | VK | DS-12 | |
| P041 \ P042 | 09/22/15 | NEOS TO SEOS | 1132 | 90 | MA | VK | 3781 | 191 | | P | 09/22/15 | VK | | |
| P040 \ P042 | 09/22/15 | NEOS TO SEOS | 1202 | 90 | MA | VK | 3781 | 16 | | P | 09/22/15 | VK | | |
| P045 \ P046 | 09/22/15 | NEOS TO SEOS | 1336 | 900 | MA | VK | 3781 | 211 | | P | 09/22/15 | VK | DS-15 | |
| P048 \ P049 | 09/22/15 | NEOS TO SEOS | 1432 | 95 | MA | VK | 3781 | 89 | | P | 09/22/15 | VK | | |
| P048 \ P050 | 09/22/15 | NEOS TO SEOS | 1449 | 95 | MA | VK | 3781 | 126 | | P | 09/22/15 | VK | | |
| P054 \ P055 | 09/22/15 | NEOS TO SEOS | 1546 | 95 | MA | VK | 3781 | 214 | | P | 09/22/15 | VK | DS-18 | |
| P057 \ P055 | 09/22/15 | NEOS TO SEOS | 1641 | 90 | MA | VK | 3781 | 159 | | P | 09/22/15 | VK | | |
| P055 \ P056 | 09/22/15 | NEOS TO SEOS | 1707 | 85 | MA | VK | 3781 | 56 | | P | 09/22/15 | VK | | |
| P059 \ P061 | 09/23/15 | NEOS TO SEOS | 0814 | 80 | MA | VK | 3781 | 140 | | P | 09/23/15 | VK | DS-19 | |
| P060 \ P061 | 09/23/15 | NEOS TO SEOS | 0830 | 80 | MA | VK | 3781 | 75 | | P | 09/23/15 | VK | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P064 \ P065 | 09/23/15 | NEOS TO SEOS | 0909 | 80 | MA | VK | 3781 | 91 | | P | 09/23/15 | VK | | |
| P064 \ P066 | 09/23/15 | NEOS TO SEOS | 0925 | 80 | MA | VK | 3781 | 117 | | P | 09/23/15 | VK | | |
| P068 \ P069 | 09/23/15 | NEOS TO SEOS | 1020 | 85 | MA | VK | 3781 | 83 | | P | 09/23/15 | VK | | |
| P072 \ P074 | 09/23/15 | NEOS TO SEOS | 1102 | 85 | MA | VK | 3781 | 33 | | P | 09/23/15 | VK | | |
| P074 \ P073 | 09/23/15 | NEOS TO SEOS | 1108 | 85 | MA | VK | 3781 | 78 | | P | 09/23/15 | VK | DS-23 | |
| P074 \ P078 | 09/23/15 | NEOS TO SEOS | 1146 | 85 | MA | VK | 3781 | 57 | | P | 09/23/15 | VK | | |
| P074 \ P079 | 09/23/15 | NEOS TO SEOS | 1157 | 85 | MA | VK | 3781 | 52 | | P | 09/23/15 | VK | | |
| P081 \ P082 | 09/23/15 | SEOS TO NEOS | 1338 | 90 | MA | VK | 3781 | 86 | | P | 09/23/15 | VK | | |
| P084 \ P085 | 09/23/15 | SEOS TO NEOS | 1406 | 90 | MA | VK | 3781 | 80 | | P | 09/23/15 | VK | | |
| P078 \ P090 | 09/23/15 | NEOS TO SEOS | 1454 | 90 | MA | VK | 3781 | 42 | | P | 09/23/15 | VK | | |
| P079 \ P090 | 09/23/15 | NEOS TO SEOS | 1504 | 90 | MA | VK | 3781 | 40 | | P | 09/23/15 | VK | | |
| P094 \ P095 | 09/23/15 | NEOS TO SEOS | 1630 | 90 | MA | VK | 3781 | 99 | | P | 09/23/15 | VK | | |
| P098 \ P099 | 09/23/15 | NEOS TO SEOS | 1711 | 85 | MA | VK | 3781 | 105 | | P | 09/23/15 | VK | DS-27 | |
| P101 \ P102 | 09/23/15 | NEOS TO SEOS | 1735 | 85 | MA | VK | 3781 | 108 | | P | 09/23/15 | VK | | |
| P061 \ P062 | 09/23/15 | NEOS TO SEOS | 0817 | 80 | GZ | VK | 368 | 215 | | P | 09/23/15 | VK | DS-20 | |
| P063 \ P064 | 09/23/15 | NEOS TO SEOS | 0901 | 80 | GZ | VK | 368 | 212 | | P | 09/23/15 | VK | | |
| P069 \ P070 | 09/23/15 | NEOS TO SEOS | 1024 | 85 | GZ | VK | 368 | 84 | | P | 09/23/15 | VK | DS-22 | |
| P066 \ P072 | 09/23/15 | NEOS TO SEOS | 1053 | 85 | GZ | VK | 368 | 36 | | P | 09/23/15 | VK | | |
| P066 \ P073 | 09/23/15 | NEOS TO SEOS | 1059 | 85 | GZ | VK | 368 | 77 | | P | 09/23/15 | VK | | |
| P076 \ P077 | 09/23/15 | NEOS TO SEOS | 1137 | 85 | GZ | VK | 368 | 88 | | P | 09/23/15 | VK | | |
| P077 \ P080 | 09/23/15 | NEOS TO SEOS | 1329 | 90 | GZ | VK | 368 | 89 | | P | 09/23/15 | VK | | |
| P082 \ P083 | 09/23/15 | SEOS TO NEOS | 1348 | 90 | GZ | VK | 368 | 85 | | P | 09/23/15 | VK | | |
| P085 \ P086 | 09/23/15 | SEOS TO NEOS | 1427 | 90 | GZ | VK | 368 | 65 | | P | 09/23/15 | VK | | |
| P087 \ P088 | 09/23/15 | SEOS TO NEOS | 1439 | 90 | GZ | VK | 368 | 46 | | P | 09/23/15 | VK | DS-25 | |
| P088 \ P089 | 09/23/15 | SEOS TO NEOS | 1450 | 90 | GZ | VK | 368 | 34 | | P | 09/23/15 | VK | | |
| P091 \ P092 | 09/23/15 | NEOS TO SEOS | 1515 | 90 | GZ | VK | 368 | 40 | | P | 09/23/15 | VK | | |
| P092 \ P093 | 09/23/15 | NEOS TO SEOS | 1523 | 90 | GZ | VK | 368 | 7 | | P | 09/23/15 | VK | | |
| P097 \ P098 | 09/23/15 | NEOS TO SEOS | 1657 | 85 | GZ | VK | 368 | 102 | | P | 09/24/15 | VK | | |
| P100 \ P101 | 09/23/15 | NEOS TO SEOS | 1724 | 85 | GZ | VK | 368 | 100 | | P | 09/24/15 | VK | | |
| P062 \ P063 | 09/23/15 | NEOS TO SEOS | 0842 | 80 | VT | VK | 206 | 213 | | P | 09/23/15 | VK | DS-21 | |
| P065 P066 | 09/23/15 | NEOS TO SEOS | 0912 | 80 | VT | VK | 206 | 22 | | P | 09/23/15 | VK | | |
| P065 \ P067 | 09/23/15 | NEOS TO SEOS | 0947 | 80 | VT | VK | 206 | 87 | | P | 09/23/15 | VK | | |
| P067 \ P068 | 09/23/15 | NEOS TO SEOS | 1005 | 80 | VT | VK | 206 | 83 | | P | 09/23/15 | VK | | |
| P070 \ P071 | 09/23/15 | NEOS TO SEOS | 1029 | 85 | VT | VK | 206 | 86 | | P | 09/23/15 | VK | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AMBIENT | | | WELDING | LENGTH | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | | DATE | LOCATION | START TIME | TEMP. (F) | WELDING TECH. | QA MON. | MACHINE NUMBER | WELDED (FT) | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P072 | P073 | 09/23/15 | WEOS TO EEOS | 1043 | 85 | VT | VK | 206 | 22 | P | 09/23/15 | VK | | |
| P071 | P075 | 09/23/15 | NEOS TO SEOS | 1059 | 85 | VT | VK | 206 | 87 | P | 09/23/15 | VK | | |
| P075 | P076 | 09/23/15 | NEOS TO SEOS | 1124 | 85 | VT | VK | 206 | 88 | P | 09/23/15 | VK | DS-24 | |
| P078 | P079 | 09/23/15 | WEOS TO EEOS | 1146 | 85 | VT | VK | 206 | 23 | P | 09/23/15 | VK | | |
| P080 | P081 | 09/23/15 | NEOS TO SEOS | 1335 | 90 | VT | VK | 206 | 89 | P | 09/23/15 | VK | | |
| P083 | P084 | 09/23/15 | SEOS TO NEOS | 1353 | 90 | VT | VK | 206 | 90 | P | 09/23/15 | VK | | |
| P086 | P087 | 09/23/15 | SEOS TO NEOS | 1428 | 90 | VT | VK | 206 | 55 | P | 09/23/15 | VK | | |
| P090 | P091 | 09/23/15 | NEOS TO SEOS | 1456 | 90 | VT | VK | 206 | 63 | P | 09/23/15 | VK | | |
| P095 | P096 | 09/23/15 | NEOS TO SEOS | 1627 | 90 | VT | VK | 206 | 104 | P | 09/24/15 | VK | DS-26 | |
| P096 | P097 | 09/23/15 | NEOS TO SEOS | 1649 | 85 | VT | VK | 206 | 105 | P | 09/24/15 | VK | | |
| P099 | P100 | 09/23/15 | NEOS TO SEOS | 1716 | 80 | VT | VK | 206 | 102 | P | 09/24/15 | VK | | |
| P102 | P103 | 09/24/15 | WEOS TO EEOS | 0830 | 80 | MA | VK | 3781 | 112 | P | 09/24/15 | VK | | |
| P105 | P106 | 09/24/15 | WEOS TO EEOS | 912 | 80 | MA | VK | 3781 | 114 | P | 09/24/15 | VK | | |
| P110 | P111 | 09/24/15 | SEOS TO NEOS | 1050 | 85 | MA | VK | 3781 | 99 | P | 09/24/15 | VK | DS-30 | |
| P113 | P114 | 09/24/15 | SEOS TO NEOS | 1120 | 85 | MA | VK | 3781 | 95 | P | 09/24/15 | VK | | |
| P102 | P038 | 09/24/15 | WEOS TO EEOS | 0822 | 80 | GZ | VK | 368 | 18 | P | 09/24/15 | VK | | |
| P101 | P038 | 09/24/15 | WEOS TO EEOS | 0825 | 80 | GZ | VK | 368 | 6 | P | 09/24/15 | VK | | |
| P101 | P039 | 09/24/15 | WEOS TO EEOS | 0827 | 80 | GZ | VK | 368 | 15 | P | 09/24/15 | VK | | |
| P100 | P039 | 09/24/15 | WEOS TO EEOS | 0830 | 80 | GZ | VK | 368 | 19 | P | 09/24/15 | VK | | |
| P099 | P040 | 09/24/15 | WEOS TO EEOS | 0833 | 80 | GZ | VK | 368 | 20 | P | 09/24/15 | VK | | |
| P098 | P040 | 09/24/15 | WEOS TO EEOS | 0837 | 80 | GZ | VK | 368 | 6 | P | 09/24/15 | VK | | |
| P098 | P042 | 09/24/15 | WEOS TO EEOS | 0839 | 80 | GZ | VK | 368 | 10 | P | 09/24/15 | VK | | |
| P097 | P042 | 09/24/15 | WEOS TO EEOS | 0841 | 80 | GZ | VK | 368 | 13 | P | 09/24/15 | VK | | |
| P097 | P043 | 09/24/15 | WEOS TO EEOS | 0842 | 80 | GZ | VK | 368 | 6 | P | 09/24/15 | VK | | |
| P096 | P043 | 09/24/15 | WEOS TO EEOS | 0844 | 80 | GZ | VK | 368 | 15 | P | 09/24/15 | VK | | |
| P096 | P045 | 09/24/15 | WEOS TO EEOS | 0850 | 80 | GZ | VK | 368 | 2 | P | 09/24/15 | VK | | |
| P095 | P045 | 09/24/15 | WEOS TO EEOS | 0852 | 80 | GZ | VK | 368 | 21 | P | 09/24/15 | VK | | |
| P094 | P046 | 09/24/15 | WEOS TO EEOS | 0854 | 80 | GZ | VK | 368 | 23 | P | 09/24/15 | VK | | |
| P104 | P105 | 09/24/15 | WEOS TO EEOS | 0916 | 80 | GZ | VK | 368 | 113 | P | 09/24/15 | VK | DS-29 | |
| P109 | P110 | 09/24/15 | WEOS TO EEOS | 1025 | 85 | GZ | VK | 368 | 100 | P | 09/24/15 | VK | | |
| P112 | P113 | 09/24/15 | SEOS TO NEOS | 1107 | 85 | GZ | VK | 368 | 95 | P | 09/24/15 | VK | | |
| P082 | P092 | 09/24/15 | EEOS TO WEOS | 0807 | 80 | VT | VK | 206 | 9 | P | 09/24/15 | VK | | |
| P080 | P092 | 09/24/15 | EEOS TO WEOS | 0810 | 80 | VT | VK | 206 | 6 | P | 09/24/15 | VK | | |
| P080 | P091 | 09/24/15 | EEOS TO WEOS | 0811 | 80 | VT | VK | 206 | 17 | P | 09/24/15 | VK | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P091 \ P077 | 09/24/15 | EEOS TO WEOS | 0813 | 80 | VT | VK | 206 | 15 | P | 09/24/15 | VK | | |
| P077 \ P090 | 09/24/15 | EEOS TO WEOS | 0816 | 80 | VT | VK | 206 | 8 | P | 09/24/15 | VK | | |
| P076 \ P090 | 09/24/15 | EEOS TO WEOS | 0817 | 80 | VT | VK | 206 | 9 | P | 09/24/15 | VK | | |
| P075 \ P090 | 09/24/15 | EEOS TO WEOS | 0818 | 80 | VT | VK | 206 | 14 | P | 09/24/15 | VK | | |
| P075 \ P078 | 09/24/15 | EEOS TO WEOS | 0821 | 80 | VT | VK | 206 | 10 | P | 09/24/15 | VK | | |
| P071 \ P078 | 09/24/15 | EEOS TO WEOS | 0822 | 80 | VT | VK | 206 | 18 | P | 09/24/15 | VK | | |
| P071 \ P074 | 09/24/15 | EEOS TO WEOS | 0826 | 80 | VT | VK | 206 | 4 | P | 09/24/15 | VK | | |
| P070 \ P074 | 09/24/15 | EEOS TO WEOS | 0827 | 80 | VT | VK | 206 | 20 | P | 09/24/15 | VK | | |
| P069 \ P072 | 09/24/15 | EEOS TO WEOS | 0830 | 80 | VT | VK | 206 | 22 | P | 09/24/15 | VK | | |
| P103 \ P104 | 09/24/15 | WEOS TO EEOS | 0847 | 80 | VT | VK | 206 | 113 | P | 09/24/15 | VK | DS-28 | |
| P106 \ P107 | 09/24/15 | WEOS TO EEOS | 0912 | 80 | VT | VK | 206 | 115 | P | 09/24/15 | VK | | |
| P107 \ P108 | 09/24/15 | WEOS TO EEOS | 0931 | 80 | VT | VK | 206 | 99 | P | 09/24/15 | VK | | |
| P108 \ P109 | 09/24/15 | WEOS TO EEOS | 1027 | 85 | VT | VK | 206 | 100 | P | 09/24/15 | VK | | |
| P111 \ P112 | 09/24/15 | SEOS TO NEOS | 1057 | 85 | VT | VK | 206 | 100 | P | 09/24/15 | VK | | |
| P114 \ P115 | 09/24/15 | SEOS TO NEOS | 1127 | 90 | VT | VK | 206 | 94 | P | 09/24/15 | VK | DS-31 | |
| P106 \ P034 | 09/25/15 | 7I TO 7H | 0802 | 70 | VT | VK | 206 | 16 | P | 09/25/15 | MO | | |
| P034 \ P105 | 09/25/15 | 7H TO 7G | 0805 | 70 | VT | VK | 206 | 20 | P | 09/25/15 | MO | | |
| P034 \ P104 | 09/25/15 | 7G TO 7F | 0808 | 70 | VT | VK | 206 | 20 | P | 09/25/15 | MO | | |
| P034 \ P103 | 09/25/15 | 7F TO 7E | 0811 | 70 | VT | VK | 206 | 22 | P | 09/25/15 | MO | | |
| P034 \ P102 | 09/25/15 | 7E TO 6G | 0816 | 70 | VT | VK | 206 | 8 | P | 09/25/15 | MO | | |
| P094 \ P115 | 09/25/15 | 8J TO 8M | 0837 | 75 | VT | VK | 206 | 20 | P | 09/25/15 | VK | | |
| P083 \ P093 | 09/25/15 | 8P TO 6B | 1117 | 85 | VT | VK | 206 | 10 | P | 09/25/15 | VK | | |
| P083 \ P092 | 09/25/15 | 6B TO 6A | 1118 | 85 | VT | VK | 206 | 8 | P | 09/25/15 | VK | | |
| P116 \ P117 | 09/25/15 | WEOS TO EEOS | 1342 | 75 | VT | VK | 206 | 23 | P | 09/25/15 | VK | | |
| P118 \ P119 | 09/25/15 | SEOS TO NEOS | 1352 | 75 | VT | VK | 206 | 251 | P | 09/25/15 | VK | | |
| P123 \ P122 | 09/25/15 | WEOS TO EEOS | 1432 | 75 | VT | VK | 206 | 23 | P | 09/25/15 | VK | | |
| P123 \ P124 | 09/25/15 | WEOS TO EEOS | 1440 | 75 | VT | VK | 206 | 23 | P | 09/25/15 | VK | | |
| P121 \ P122 | 09/25/15 | SEOS TO NEOS | 1449 | 75 | VT | VK | 206 | 102 | P | 09/25/15 | VK | DS-33 | |
| P121 \ P123 | 09/25/15 | SEOS TO NEOS | 1500 | 75 | VT | VK | 206 | 70 | P | 09/25/15 | VK | | |
| P121 \ P124 | 09/25/15 | SEOS TO NEOS | 1510 | 75 | VT | VK | 206 | 30 | P | 09/25/15 | VK | | |
| P113 \ P124 | 09/25/15 | EEOS TO WEOS | 1526 | 75 | VT | VK | 206 | 14 | P | 09/25/15 | VK | | |
| P112 \ P124 | 09/25/15 | EEOS TO WEOS | 1528 | 75 | VT | VK | 206 | 6 | P | 09/25/15 | VK | | |
| P112 \ P121 | 09/25/15 | EEOS TO WEOS | 1529 | 75 | VT | VK | 206 | 10 | P | 09/25/15 | VK | | |
| P111 \ P121 | 09/25/15 | EEOS TO WEOS | 1532 | 75 | VT | VK | 206 | 8 | P | 09/25/15 | VK | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P111 \ P120 | 09/25/15 | EEOS TO WEOS | 1533 | 75 | VT | VK | 206 | 10 | P | 09/25/15 | VK | | |
| P110 \ P120 | 09/25/15 | EEOS TO WEOS | 1535 | 75 | VT | VK | 206 | 12 | P | 09/25/15 | VK | | |
| P110 \ P119 | 09/25/15 | EEOS TO WEOS | 1537 | 75 | VT | VK | 206 | 16 | P | 09/25/15 | VK | | |
| P109 \ P119 | 09/25/15 | EEOS TO WEOS | 1539 | 75 | VT | VK | 206 | 18 | P | 09/25/15 | VK | | |
| P109 \ P118 | 09/25/15 | EEOS TO WEOS | 1542 | 75 | VT | VK | 206 | 2 | P | 09/25/15 | VK | | |
| P108 \ P118 | 09/25/15 | EEOS TO WEOS | 1542 | 75 | VT | VK | 206 | 22 | P | 09/25/15 | VK | | |
| P107 \ P118 | 09/25/15 | EEOS TO WEOS | 1545 | 75 | VT | VK | 206 | 7 | P | 09/25/15 | VK | | |
| P107 \ P117 | 09/25/15 | SEOS TO NEOS | 1548 | 75 | VT | VK | 206 | 8 | P | 09/25/15 | VK | | |
| P115 \ P126 | 09/25/15 | EEOS TO WEOS | 1605 | 75 | VT | VK | 206 | 9 | P | 09/25/15 | VK | | |
| P115 \ P125 | 09/25/15 | EEOS TO WEOS | 1607 | 75 | VT | VK | 206 | 6 | P | 09/25/15 | VK | | |
| P114 \ P125 | 09/25/15 | EEOS TO WEOS | 1607 | 75 | VT | VK | 206 | 14 | P | 09/25/15 | VK | | |
| P113 \ P124 | 09/25/15 | EEOS TO WEOS | 1611 | 75 | VT | VK | 206 | 3 | P | 09/25/15 | VK | | |
| P128 \ P129 | 09/25/15 | WEOS TO EEOS | 1629 | 75 | VT | VK | 206 | 23 | P | 09/25/15 | VK | | |
| P127 \ P128 | 09/25/15 | WEOS TO EEOS | 1620 | 75 | VT | VK | 206 | 22 | P | 09/25/15 | VK | | |
| P130 \ P131 | 09/25/15 | SEOS TO NEOS | 1652 | 75 | VT | VK | 206 | 218 | P | 09/25/15 | VK | | |
| P037 \ P116 | 09/25/15 | SEOS TO 8R | 1343 | 85 | GZ | VK | 368 | 87 | P | 09/25/15 | MO | | |
| P034 \ P116 | 09/25/15 | SEOS TO NEOS | 1356 | 86 | GZ | VK | 369 | 130 | P | 09/25/15 | MO | | |
| P034 \ P117 | 09/25/15 | 8R TO 7I | 1414 | 85 | GZ | VK | 368 | 33 | P | 09/25/15 | MO | DS-32 | |
| P119 \ P120 | 09/25/15 | SEOS TO 8S | 1432 | 85 | GZ | VK | 368 | 220 | P | 09/25/15 | VK | | |
| P122 \ P125 | 09/25/15 | SEOS TO NEOS | 1508 | 85 | GZ | VK | 368 | 102 | P | 09/25/15 | VK | | |
| P123 \ P125 | 09/25/15 | SEOS TO NEOS | 1523 | 75 | GZ | VK | 368 | 75 | P | 09/25/15 | VK | | |
| P124 \ P125 | 09/25/15 | SEOS TO NEOS | 1532 | 75 | GZ | VK | 368 | 33 | P | 09/25/15 | VK | | |
| P126 \ P127 | 09/25/15 | SEOS TO NEOS | 1624 | 75 | GZ | VK | 368 | 90 | P | 09/25/15 | | DS-35 | |
| P126 \ P128 | 09/25/15 | SEOS TO NEOS | 1637 | 75 | GZ | VK | 368 | 75 | P | 09/25/15 | VK | | |
| P126 \ P129 | 09/25/15 | SEOS TO NEOS | 1658 | 75 | GZ | VK | 368 | 50 | P | 09/25/15 | VK | | |
| P131 \ P132 | 09/25/15 | SEOS TO NEOS | 1705 | 75 | GZ | VK | 368 | 218 | P | 09/25/15 | VK | | |
| P116 \ P118 | 09/25/15 | SEOS TO 8Q | 1344 | 85 | MA | VK | 3781 | 186 | P | 09/25/15 | MO | | |
| P117 \ P118 | 09/25/15 | 8Q TO NEOS | 1418 | 84 | MA | VK | 3781 | 31 | P | 09/25/15 | MO | | |
| P120 \ P121 | 09/25/15 | SEOS TO NEOS | 1435 | 85 | MA | VK | 3781 | 203 | P | 09/25/15 | MO | DS-34 | |
| P125 \ P126 | 09/25/15 | SEOS TO NEOS | 1526 | 85 | MA | VK | 3781 | 218 | P | 09/25/15 | VK | | |
| P127 \ P130 | 09/25/15 | SEOS TO NEOS | 1644 | 75 | MA | VK | 3781 | 90 | P | 09/25/15 | VK | | |
| P128 \ P130 | 09/25/15 | SEOS TO NEOS | 1700 | 75 | MA | VK | 3781 | 75 | P | 09/25/15 | VK | | |
| P129 \ P130 | 09/25/15 | SEOS TO NEOS | 1712 | 75 | MA | VK | 3781 | 50 | P | 09/25/15 | VK | | |
| P134 \ P135 | 09/26/15 | WEOS TO EEOS | 0822 | 75 | VT | VK | 206 | 23 | P | 09/26/15 | VK | DS-38 | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P134 \ P136 | 09/26/15 | SEOS TO NEOS | 0830 | 75 | VT | VK | 206 | 88 | P | 09/26/15 | VK | | |
| P137 \ P135 | 09/26/15 | SEOS TO NEOS | 0847 | 80 | VT | VK | 206 | 135 | P | 09/26/15 | VK | | |
| P136 \ P138 | 09/26/15 | SEOS TO NEOS | 0917 | 80 | VT | VK | 206 | 89 | P | 09/26/15 | VK | | |
| P138 \ P140 | 09/26/15 | SEOS TO NEOS | 0948 | 80 | VT | VK | 206 | 90 | P | 09/26/15 | VK | | |
| P144 \ P145 | 09/26/15 | WEOS TO EEOS | 1009 | 80 | VT | VK | 206 | 90 | P | 09/26/15 | VK | DS-39 | |
| P149 \ P148 | 09/26/15 | WEOS TO EEOS | 1052 | 80 | VT | VK | 206 | 23 | P | 09/26/15 | VK | | |
| P150 \ P148 | 09/26/15 | SEOS TO NEOS | 1102 | 80 | VT | VK | 206 | 78 | P | 09/26/15 | VK | | |
| P150 \ P149 | 09/26/15 | SEOS TO NEOS | 1112 | 80 | VT | VK | 206 | 87 | P | 09/26/15 | VK | | |
| P151 \ P152 | 09/26/15 | WEOS TO EEOS | 1125 | 80 | VT | VK | 206 | 23 | P | 09/26/15 | VK | | |
| P153 \ P154 | 09/26/15 | SEOS TO NEOS | 1136 | 80 | VT | VK | 206 | 179 | P | 09/26/15 | VK | | |
| P156 \ P155 | 09/26/15 | WEOS TO EEOS | 1335 | 85 | VT | VK | 206 | 23 | P | 09/26/15 | VK | | |
| P157 \ P158 | 09/26/15 | SEOS TO NEOS | 1344 | 85 | VT | VK | 206 | 135 | P | 09/26/15 | VK | | |
| P159 \ P160 | 09/26/15 | SEOS TO NEOS | 1407 | 85 | VT | VK | 206 | 118 | P | 09/26/15 | VK | DS-43 | |
| P163 \ P164 | 09/26/15 | SEOS TO NEOS | 1445 | 85 | VT | VK | 206 | 63 | P | 09/26/15 | VK | | |
| P164 \ P165 | 09/26/15 | SEOS TO NEOS | 1456 | 85 | VT | VK | 206 | 52 | P | 09/26/15 | VK | | |
| P132 \ P133 | 09/26/15 | SEOS TO NEOS | 0809 | 75 | MA | VK | 3781 | 218 | P | 09/26/15 | VK | DS-36 | |
| P140 \ P141 | 09/26/15 | SEOS TO NEOS | 0903 | 80 | MA | VK | 3781 | 90 | P | 09/26/15 | VK | | |
| P141 \ P142 | 09/26/15 | SEOS TO NEOS | 0953 | 80 | MA | VK | 3781 | 90 | P | 09/26/15 | VK | | |
| P145 \ P146 | 09/26/15 | SEOS TO NEOS | 1023 | 80 | MA | VK | 3781 | 90 | P | 09/26/15 | VK | | |
| P150 \ P151 | 09/26/15 | SEOS TO NEOS | 1128 | 80 | MA | VK | 3781 | 67 | P | 09/26/15 | VK | DS-42 | |
| P152 \ P150 | 09/26/15 | SEOS TO NEOS | 1139 | 80 | MA | VK | 3781 | 126 | P | 09/26/15 | VK | | |
| P154 \ P156 | 09/26/15 | SEOS TO NEOS | 1337 | 85 | MA | VK | 3781 | 162 | P | 09/26/15 | VK | | |
| P154 \ P155 | 09/26/15 | SEOS TO NEOS | 1355 | 85 | MA | VK | 3781 | 50 | P | 09/26/15 | VK | | |
| P160 \ P161 | 09/26/15 | SEOS TO NEOS | 1413 | 85 | MA | VK | 3781 | 92 | P | 09/26/15 | VK | | |
| P133 \ P134 | 09/26/15 | SEOS TO NEOS | 0818 | 75 | GZ | VK | 368 | 89 | P | 09/26/15 | VK | | |
| P133 \ P135 | 09/26/15 | SEOS TO NEOS | 0830 | 75 | GZ | VK | 368 | 135 | P | 09/26/15 | VK | DS-37 | |
| P137 \ P139 | 09/26/15 | SEOS TO NEOS | 0848 | 80 | GZ | VK | 368 | 136 | P | 09/26/15 | VK | | |
| P142 \ P143 | 09/26/15 | SEOS TO NEOS | 0951 | 80 | GZ | VK | 368 | 90 | P | 09/26/15 | VK | | |
| P143 \ P144 | 09/26/15 | SEOS TO NEOS | 1011 | 80 | GZ | VK | 368 | 90 | P | 09/26/15 | VK | | |
| P146 \ P147 | 09/26/15 | WEOS TO EEOS | 1030 | 80 | GZ | VK | 368 | 88 | P | 09/26/15 | VK | DS-40 | |
| P139 \ P148 | 09/26/15 | SEOS TO NEOS | 1100 | 80 | GZ | VK | 368 | 78 | P | 09/26/15 | VK | | |
| P139 \ P149 | 09/26/15 | SEOS TO NEOS | 1110 | 80 | GZ | VK | 368 | 147 | P | 09/26/15 | VK | | |
| P151 \ P153 | 09/26/15 | SEOS TO NEOS | 1136 | 80 | GZ | VK | 368 | 67 | P | 09/26/15 | VK | | |
| P152 \ P153 | 09/26/15 | SEOS TO NEOS | 1145 | 80 | GZ | VK | 368 | 126 | P | 09/26/15 | VK | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P156 \ P157 | 09/26/15 | SEOS TO NEOS | 1335 | 85 | GZ | VK | 368 | 100 | | P | 09/26/15 | VK | | |
| P157 \ P155 | 09/26/15 | SEOS TO NEOS | 1355 | 85 | GZ | VK | 368 | 50 | | P | 09/26/15 | VK | | |
| P158 \ P159 | 09/26/15 | SEOS TO NEOS | 1408 | 85 | GZ | VK | 368 | 118 | | P | 09/26/15 | VK | DS-41 | |
| P161 \ P162 | 09/26/15 | SEOS TO NEOS | 1426 | 85 | GZ | VK | 368 | 79 | | P | 09/26/15 | VK | | |
| P162 \ P163 | 09/26/15 | SEOS TO NEOS | 1445 | 85 | GZ | VK | 368 | 63 | | P | 09/26/15 | VK | | |
| P166 \ P167 | 09/28/15 | SEOS TO NEOS | 1322 | 75 | MA | VK | 3781 | 181 | | P | 09/28/15 | VK | DS-45 | |
| P170 \ P171 | 09/28/15 | SEOS TO NEOS | 1405 | 75 | MA | VK | 3781 | 184 | | P | 09/28/15 | VK | | |
| P174 \ P175 | 09/28/15 | SEOS TO NEOS | 1511 | 80 | MA | VK | 3781 | 184 | | P | 09/28/15 | VK | DS-46 | |
| P177 \ P178 | 09/28/15 | SEOS TO NEOS | 1603 | 80 | MA | VK | 3781 | 185 | | P | 09/28/15 | VK | | |
| P180 \ P181 | 09/28/15 | SEOS TO NEOS | 1642 | 80 | MA | VK | 3781 | 186 | | P | 09/28/15 | VK | | |
| P182 \ P183 | 09/28/15 | SEOS TO NEOS | 1717 | 80 | MA | VK | 3781 | 185 | | P | 09/28/15 | VK | DS-49 | |
| P136 \ P137 | 09/28/15 | 9X TO 10J | 0811 | 70 | VT | VK | 206 | 22 | | P | 09/28/15 | VK | | |
| P138 \ P139 | 09/28/15 | 10J TO 10K | 0817 | 70 | VT | VK | 206 | 20 | | P | 09/28/15 | VK | | |
| P140 \ P139 | 09/28/15 | 10K TO 10M | 0821 | 70 | VT | VK | 206 | 5 | | P | 09/28/15 | VK | | |
| P140 \ P148 | 09/28/15 | 10M TO 10N | 0822 | 70 | VT | VK | 206 | 18 | | P | 09/28/15 | VK | | |
| P141 \ P148 | 09/28/15 | 10N TO 10E | 0827 | 70 | VT | VK | 206 | 8 | | P | 09/28/15 | VK | | |
| P141 \ P150 | 09/28/15 | 10E TO 10P | 0828 | 70 | VT | VK | 206 | 12 | | P | 09/28/15 | VK | | |
| P142 \ P150 | 09/28/15 | 10P TO 10Q | 0831 | 70 | VT | VK | 206 | 16 | | P | 09/28/15 | VK | | |
| P143 \ P151 | 09/28/15 | 10Q TO 10R | 0837 | 70 | VT | VK | 206 | 20 | | P | 09/28/15 | VK | | |
| P114 \ P166 | 09/28/15 | SEOS TO NEOS | 1320 | 75 | VT | VK | 206 | 14 | | P | 09/28/15 | VK | | |
| P115 \ P166 | 09/28/15 | SEOS TO NEOS | 1323 | 75 | VT | VK | 206 | 76 | | P | 09/28/15 | VK | | |
| P094 \ P166 | 09/28/15 | SEOS TO NEOS | 1356 | 75 | VT | VK | 206 | 96 | | P | 09/28/15 | VK | DS-44 | |
| P169 \ P170 | 09/28/15 | SEOS TO NEOS | 1357 | 75 | VT | VK | 206 | 186 | | P | 09/28/15 | VK | | |
| P172 \ P173 | 09/28/15 | SEOS TO NEOS | 1430 | 75 | VT | VK | 206 | 183 | | P | 09/28/15 | VK | | |
| P175 \ P176 | 09/28/15 | SEOS TO NEOS | 1522 | 75 | VT | VK | 206 | 182 | | P | 09/28/15 | VK | DS-48 | |
| P167 \ P169 | 09/28/15 | SEOS TO NEOS | 1340 | 75 | GZ | VK | 368 | 89 | | P | 09/28/15 | VK | | |
| P168 \ P167 | 09/28/15 | SEOS TO NEOS | 1353 | 75 | GZ | VK | 368 | 92 | | P | 09/28/15 | VK | | |
| P171 \ P172 | 09/28/15 | SEOS TO NEOS | 1411 | 80 | GZ | VK | 368 | 183 | | P | 09/28/15 | VK | DS-47 | |
| P173 \ P174 | 09/28/15 | SEOS TO NEOS | 1444 | 80 | GZ | VK | 368 | 184 | | P | 09/28/15 | VK | | |
| P176 \ P177 | 09/28/15 | SEOS TO NEOS | 1533 | 80 | GZ | VK | 368 | 185 | | P | 09/28/15 | VK | | |
| P178 \ P179 | 09/28/15 | SEOS TO NEOS | 1610 | 80 | GZ | VK | 368 | 186 | | P | 09/28/15 | VK | DS-50 | |
| P179 \ P180 | 09/28/15 | SEOS TO NEOS | 1645 | 80 | GZ | VK | 368 | 185 | | P | 09/28/15 | VK | | |
| P181 \ P182 | 09/28/15 | SEOS TO NEOS | 1720 | 80 | GZ | VK | 368 | 185 | | P | 09/28/15 | VK | DS-51 | |
| P154 \ P180 | 09/29/15 | 13B TO 13A | 1115 | 85 | GZ | MO | 368 | 12 | | P | 09/29/15 | MO | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P153 \ P180 | 09/29/15 | 13A TO 11X | 1117 | 85 | GZ | MO | 368 | 8 | | P | 09/29/15 | MO | | |
| P153 \ P179 | 09/29/15 | 11X TO 13I | 1119 | 85 | GZ | MO | 368 | 13 | | P | 09/29/15 | MO | | |
| P152 \ P179 | 09/29/15 | 13I TO 11W | 1122 | 85 | GZ | MO | 368 | 8 | | P | 09/29/15 | MO | | |
| P152 \ P178 | 09/29/15 | 11W TO 13J | 1124 | 85 | GZ | MO | 368 | 13 | | P | 09/29/15 | MO | | |
| P150 \ P178 | 09/29/15 | 13J TO 11T | 1126 | 85 | GZ | MO | 368 | 8 | | P | 09/29/15 | MO | | |
| P150 \ P177 | 09/29/15 | 11T TO 13K | 1100 | 85 | GZ | MO | 368 | 13 | | P | 09/29/15 | MO | | |
| P149 \ P177 | 09/29/15 | 13K TO 11S | 1102 | 85 | GZ | MO | 368 | 8 | | P | 09/29/15 | MO | | |
| P149 \ P176 | 09/29/15 | 11S TO 13M | 1104 | 85 | GZ | MO | 368 | 13 | | P | 09/29/15 | MO | | |
| P139 \ P176 | 09/29/15 | 13M TO 11R | 1106 | 85 | GZ | MO | 368 | 9 | | P | 09/29/15 | MO | | |
| P139 \ P175 | 09/29/15 | SEOS TO NEOS | 1108 | 85 | GZ | MO | 368 | 13 | | P | 09/29/15 | MO | | |
| P137 \ P175 | 09/29/15 | SEOS TO NEOS | 1110 | 85 | GZ | MO | 368 | 9 | | P | 09/29/15 | MO | | |
| P185 \ P186 | 09/29/15 | SEOS TO NEOS | 1439 | 85 | GZ | AM | 368 | 180 | | P | 09/29/15 | AM | | |
| P188 \ P189 | 09/29/15 | SEOS TO NEOS | 1523 | 85 | GZ | AM | 368 | 168 | | P | 09/29/15 | AM | DS-54 | |
| P192 \ P194 | 09/29/15 | SEOS TO NEOS | 1700 | 85 | GZ | AM | 368 | 84 | | P | 09/30/15 | AM | | |
| P194 \ P193 | 09/29/15 | EEOS TO WEOS | 1645 | 85 | GZ | AM | 368 | 25 | | P | 09/30/15 | AM | | |
| P192 \ P193 | 09/29/15 | SEOS TO NEOS | 1650 | 85 | GZ | AM | 368 | 26 | | P | 09/30/15 | AM | | |
| P193 \ P089 | 09/30/15 | SEOS TO NEOS | 0825 | 70 | GZ | AM | 368 | 23 | | P | 09/30/15 | AM | | |
| P193 \ P088 | 09/30/15 | SEOS TO NEOS | 0830 | 70 | GZ | AM | 368 | 4 | | P | 09/30/15 | AM | | |
| P192 \ P088 | 09/30/15 | SEOS TO NEOS | 0831 | 70 | GZ | AM | 368 | 19 | | P | 09/30/15 | AM | | |
| P192 \ P087 | 09/30/15 | SEOS TO NEOS | 0835 | 70 | GZ | AM | 368 | 5 | | P | 09/30/15 | AM | | |
| P191 \ P087 | 09/30/15 | SEOS TO NEOS | 0837 | 70 | GZ | AM | 368 | 16 | | P | 09/30/15 | AM | | |
| P191 \ P086 | 09/30/15 | SEOS TO NEOS | 0839 | 70 | GZ | AM | 368 | 9 | | P | 09/30/15 | AM | | |
| P190 \ P086 | 09/30/15 | SEOS TO NEOS | 0842 | 70 | GZ | AM | 368 | 15 | | P | 09/30/15 | AM | | |
| P190 \ P085 | 09/30/15 | SEOS TO NEOS | 0846 | 70 | GZ | AM | 368 | 11 | | P | 09/30/15 | AM | | |
| P089 \ P085 | 09/30/15 | SEOS TO NEOS | 0849 | 70 | GZ | AM | 368 | 12 | | P | 09/30/15 | AM | | |
| P089 \ P084 | 09/30/15 | SEOS TO NEOS | 0852 | 70 | GZ | AM | 368 | 11 | | P | 09/30/15 | AM | | |
| P197 \ P195 | 09/30/15 | NEOS TO SEOS | 0902 | 70 | GZ | AM | 368 | 22 | | P | 09/30/15 | AM | | |
| P200 \ P201 | 09/30/15 | WEOS TO EEOS | 0935 | 70 | GZ | AM | 368 | 88 | | P | 09/30/15 | AM | | |
| P203 \ P204 | 09/30/15 | WEOS TO EEOS | 0952 | 70 | GZ | AM | 368 | 87 | | P | 09/30/15 | AM | DS-55 | |
| P206 \ P207 | 09/30/15 | WEOS TO EEOS | 1015 | 80 | GZ | AM | 368 | 87 | | P | 09/30/15 | AM | | |
| P209 \ P210 | 09/30/15 | WEOS TO EEOS | 1037 | 80 | GZ | AM | 368 | 87 | | P | 09/30/15 | AM | | |
| P212 \ P213 | 09/30/15 | WEOS TO EEOS | 1059 | 85 | GZ | AM | 368 | 86 | | P | 09/30/15 | AM | | |
| P215 \ P216 | 09/30/15 | WEOS TO EEOS | 1115 | 85 | GZ | AM | 368 | 86 | | P | 09/30/15 | AM | | |
| P218 \ P219 | 09/30/15 | WEOS TO EEOS | 1156 | 85 | GZ | AM | 368 | 85 | | P | 09/30/15 | MO | DS-56 | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AMBIENT | | | WELDING | LENGTH | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | | DATE | LOCATION | START TIME | TEMP. (F) | WELDING TECH. | QA MON. | MACHINE NUMBER | WELDED (FT) | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P220 | P221 | 09/30/15 | WEOS TO EEOS | 1334 | 90 | GZ | AM | 368 | 55 | P | 09/30/15 | AM | | |
| P221 | P222 | 09/30/15 | WEOS TO EEOS | 1340 | 90 | GZ | AM | 368 | 15 | P | 09/30/15 | AM | | |
| P223 | P219 | 09/30/15 | SEOS TO NEOS | 1435 | 90 | GZ | AM | 368 | 18 | P | 09/30/15 | MO | | |
| P223 | P218 | 09/30/15 | SEOS TO NEOS | 1439 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P217 | 09/30/15 | SEOS TO NEOS | 1442 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P216 | 09/30/15 | SEOS TO NEOS | 1445 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P215 | 09/30/15 | SEOS TO NEOS | 1449 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P214 | 09/30/15 | SEOS TO NEOS | 1452 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P213 | 09/30/15 | SEOS TO NEOS | 1456 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P212 | 09/30/15 | SEOS TO NEOS | 1459 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P211 | 09/30/15 | SEOS TO NEOS | 1503 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P210 | 09/30/15 | SEOS TO NEOS | 1506 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P209 | 09/30/15 | SEOS TO NEOS | 1510 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P208 | 09/30/15 | SEOS TO NEOS | 1514 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P207 | 09/30/15 | SEOS TO NEOS | 1517 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P206 | 09/30/15 | SEOS TO NEOS | 1521 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P205 | 09/30/15 | SEOS TO NEOS | 1524 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P204 | 09/30/15 | SEOS TO NEOS | 1527 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P203 | 09/30/15 | SEOS TO NEOS | 1551 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P202 | 09/30/15 | SEOS TO NEOS | 1534 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P223 | P201 | 09/30/15 | SEOS TO NEOS | 1538 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | DS-57 | |
| P223 | P200 | 09/30/15 | SEOS TO NEOS | 1541 | 90 | GZ | AM | 368 | 22 | P | 09/30/15 | MO | | |
| P224 | P228 | 09/30/15 | SEOS TO NEOS | 1548 | 90 | GZ | AM | 368 | 520 | P | 10/01/15 | MO | DS-58 | |
| P177 | P060 | 10/01/15 | NEOS TO SEOS | 0838 | 85 | GZ | AM | 368 | 7 | P | 10/01/15 | MO | | |
| P177 | P061 | 10/01/15 | NEOS TO DEFECT | 0840 | 85 | GZ | AM | 368 | 11 | P | 10/01/15 | MO | | |
| P230 | P231 | 10/01/15 | NEOS TO SEOS | 0945 | 85 | GZ | AM | 368 | 520 | P | 10/01/15 | MO | DS-74 | |
| P233 | P234 | 10/01/15 | NEOS TO SEOS | 1105 | 85 | GZ | AM | 368 | 520 | P | 10/01/15 | MO | DS-75 | |
| P235 | P236 | 10/01/15 | NEOS TO SEOS | 1334 | 85 | GZ | AM | 368 | 520 | P | 10/01/15 | MO | DS-76 | |
| P238 | P239 | 10/01/15 | NEOS TO SEOS | 1525 | 85 | GZ | AM | 368 | 520 | P | 10/01/15 | MO | DS-77 | |
| P183 | P184 | 09/29/15 | SEOS TO NEOS | 1423 | 85 | MA | AM | 3781 | 178 | P | 09/29/15 | AM | | |
| P187 | P188 | 09/29/15 | SEOS TO NEOS | 1511 | 85 | MA | AM | 3781 | 178 | P | 09/29/15 | AM | | |
| P190 | P191 | 09/29/15 | SEOS TO NEOS | 1618 | 85 | MA | AM | 3781 | 144 | P | 09/30/15 | AM | DS-53 | |
| P199 | P198 | 09/30/15 | 15C TO 15E | 0858 | 70 | MA | MO | 3781 | 28 | P | 09/30/15 | MO | | |
| P196 | P199 | 09/30/15 | 15E TO NEOS | 0913 | 70 | MA | MO | 3781 | 13 | P | 09/30/15 | MO | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P198 \ P200 | 09/30/15 | WEOS TO EEOS | 0916 | 70 | MA | MO | 3781 | 88 | | P | 09/30/15 | MO | | |
| P195 \ P194 | 09/30/15 | WEOS TO EEOS | 0929 | 70 | MA | AM | 3781 | 63 | | P | 09/30/15 | AM | | |
| P201 \ P202 | 09/30/15 | WEOS TO EEOS | 0939 | 70 | MA | AM | 3781 | 88 | | P | 09/30/15 | AM | | |
| P204 \ P205 | 09/30/15 | WEOS TO EEOS | 0952 | 70 | MA | AM | 3781 | 87 | | P | 09/30/15 | AM | DS-59 | |
| P207 \ P208 | 09/30/15 | WEOS TO EEOS | 1024 | 80 | MA | AM | 3781 | 87 | | P | 09/30/15 | AM | | |
| P210 \ P211 | 09/30/15 | WEOS TO EEOS | 1046 | 80 | MA | AM | 3781 | 87 | | P | 09/30/15 | AM | | |
| P213 \ P214 | 09/30/15 | WEOS TO EEOS | 1106 | 80 | MA | AM | 3781 | 86 | | P | 09/30/15 | AM | | |
| P216 \ P217 | 09/30/15 | WEOS TO EEOS | 1128 | 80 | MA | AM | 3781 | 86 | | P | 09/30/15 | AM | | |
| P219 \ P220 | 09/30/15 | WEOS TO EEOS | 1323 | 90 | MA | AM | 3781 | 79 | | P | 09/30/15 | AM | DS-60 | |
| P223 \ P224 | 09/30/15 | NEOS TO SEOS | 1417 | 90 | MA | AM | 3781 | 520 | | P | 10/01/15 | AM | DS-61 | |
| P228 \ P229 | 09/30/15 | NEOS TO SEOS | 1559 | 90 | MA | AM | 3781 | 520 | | P | 10/01/15 | AM | DS-62 | |
| P229 \ P230 | 10/01/15 | NEOS TO SEOS | 0925 | 70 | MA | AM | 3781 | 520 | | P | 10/01/15 | MO | DS-70 | |
| P232 \ P233 | 10/01/15 | NEOS TO SEOS | 1103 | 80 | MA | AM | 3781 | 520 | | P | 10/01/15 | MO | DS-71 | |
| P236 \ P237 | 10/01/15 | NEOS TO SEOS | 1351 | 90 | MA | AM | 3781 | 520 | | P | 10/01/15 | MO | DS-72 | |
| P239 \ P240 | 10/01/15 | NEOS TO SEOS | 1524 | 90 | MA | AM | 3781 | 520 | | P | 10/01/15 | MO | DS-73 | |
| P243 \ P240 | 10/01/15 | WEOS TO EEOS | 1720 | 90 | MA | AM | 3781 | 20 | | P | 10/01/15 | MO | | |
| P243 \ P239 | 10/01/15 | WEOS TO EEOS | 1722 | 90 | MA | AM | 3781 | 22 | | P | 10/01/15 | MO | | |
| P243 \ P238 | 10/01/15 | WEOS TO EEOS | 1726 | 90 | MA | AM | 3781 | 22 | | P | 10/01/15 | MO | | |
| P243 \ P237 | 10/01/15 | WEOS TO EEOS | 1730 | 90 | MA | AM | 3781 | 22 | | P | 10/01/15 | MO | | |
| P243 \ P236 | 10/01/15 | WEOS TO EEOS | 1736 | 90 | MA | AM | 3781 | 22 | | P | 10/01/15 | MO | | |
| P243 \ P235 | 10/01/15 | WEOS TO EEOS | 1740 | 90 | MA | AM | 3781 | 22 | | P | 10/01/15 | MO | | |
| P243 \ P234 | 10/01/15 | WEOS TO EEOS | 1745 | 90 | MA | AM | 3781 | 22 | | P | 10/01/15 | MO | | |
| P243 \ P233 | 10/01/15 | WEOS TO EEOS | 1749 | 90 | MA | AM | 3781 | 10 | | P | 10/01/15 | MO | | |
| P242 \ P233 | 10/01/15 | WEOS TO EEOS | 1752 | 90 | MA | AM | 3781 | 12 | | P | 10/02/15 | MO | DS-78 | |
| P242 \ P232 | 10/01/15 | WEOS TO EEOS | 1754 | 90 | MA | AM | 3781 | 22 | | P | 10/02/15 | MO | | |
| P242 \ P231 | 10/01/15 | WEOS TO EEOS | 1758 | 90 | MA | AM | 3781 | 22 | | P | 10/02/15 | MO | | |
| P242 \ P230 | 10/01/15 | WEOS TO EEOS | 1803 | 90 | MA | AM | 3781 | 22 | | P | 10/02/15 | MO | | |
| P242 \ P229 | 10/01/15 | WEOS TO EEOS | 1809 | 90 | MA | AM | 3781 | 22 | | P | 10/02/15 | MO | | |
| P242 \ P228 | 10/01/15 | WEOS TO EEOS | 1813 | 80 | MA | AM | 3781 | 22 | | P | 10/02/15 | MO | | |
| P242 \ P224 | 10/01/15 | WEOS TO EEOS | 1818 | 80 | MA | AM | 3781 | 22 | | P | 10/02/15 | MO | | |
| P242 \ P223 | 10/01/15 | WEOS TO EEOS | 1823 | 80 | MA | AM | 3781 | 15 | | P | 10/02/15 | MO | | |
| P243 \ P154 | 10/02/15 | WEOS TO EEOS | 0815 | 65 | MA | AM | 3781 | 14 | | P | 10/02/15 | AM | | |
| P243 \ P156 | 10/02/15 | WEOS TO EEOS | 0819 | 65 | MA | AM | 3781 | 26 | | P | 10/02/15 | AM | | |
| P243 \ P157 | 10/02/15 | WEOS TO EEOS | 0825 | 65 | MA | AM | 3781 | 26 | | P | 10/02/15 | AM | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P243 \ P158 | 10/02/15 | WEOS TO EEOS | 0831 | 65 | MA | AM | 3781 | 26 | | P | 10/02/15 | AM | | |
| P243 \ P159 | 10/02/15 | WEOS TO EEOS | 0838 | 65 | MA | AM | 3781 | 26 | | P | 10/02/15 | AM | | |
| P243 \ P160 | 10/02/15 | WEOS TO EEOS | 0844 | 65 | MA | AM | 3781 | 26 | | P | 10/02/15 | AM | | |
| P243 \ P161 | 10/02/15 | WEOS TO EEOS | 0851 | 65 | MA | AM | 3781 | 14 | | P | 10/02/15 | AM | | |
| P242 \ P161 | 10/02/15 | WEOS TO EEOS | 0853 | 65 | MA | AM | 3781 | 12 | | P | 10/02/15 | AM | | |
| P242 \ P162 | 10/02/15 | WEOS TO EEOS | 0858 | 65 | MA | AM | 3781 | 26 | | P | 10/02/15 | AM | | |
| P242 \ P163 | 10/02/15 | WEOS TO EEOS | 0904 | 70 | MA | AM | 3781 | 26 | | P | 10/02/15 | AM | | |
| P242 \ P164 | 10/02/15 | WEOS TO EEOS | 0910 | 70 | MA | AM | 3781 | 26 | | P | 10/02/15 | AM | | |
| P242 \ P165 | 10/02/15 | WEOS TO EEOS | 917 | 70 | MA | AM | 3781 | 26 | | P | 10/02/15 | AM | | |
| P242 \ P191 | 10/02/15 | WEOS TO EEOS | 0924 | 70 | MA | AM | 3781 | 16 | | P | 10/02/15 | AM | | |
| P242 \ P192 | 10/02/15 | WEOS TO EEOS | 929 | 70 | MA | AM | 3781 | 26 | | P | 10/02/15 | AM | | |
| P244 \ P151 | 10/02/15 | WEOS TO EEOS | 952 | 70 | MA | AM | 3781 | 12 | | P | 10/02/15 | AM | DS-81 | |
| P244 \ P153 | 10/02/15 | WEOS TO EEOS | 955 | 70 | MA | AM | 3781 | 10 | | P | 10/02/15 | AM | | |
| P244 \ P247 | 10/02/15 | NEOS TO SEOS | 1002 | 70 | MA | AM | 3781 | 12 | | P | 10/02/15 | AM | | |
| P247 \ P153 | 10/02/15 | WEOS TO EEOS | 1005 | 70 | MA | AM | 3781 | 17 | | P | 10/02/15 | AM | | |
| P247 \ P154 | 10/02/15 | WEOS TO EEOS | 1010 | 70 | MA | AM | 3781 | 12 | | P | 10/02/15 | AM | | |
| P243 \ P247 | 10/02/15 | WEOS TO EEOS | 1016 | 70 | MA | AM | 3781 | 14 | | P | 10/02/15 | AM | | |
| P247 \ P241 | 10/02/15 | WEOS TO EEOS | 1020 | 70 | MA | AM | 3781 | 22 | | P | 10/02/15 | AM | | |
| P247 \ P240 | 10/02/15 | WEOS TO EEOS | 1026 | 70 | MA | AM | 3781 | 10 | | P | 10/02/15 | AM | | |
| P248 \ P147 | 10/02/15 | WEOS TO EEOS | 1048 | 70 | MA | AM | 3781 | 85 | | P | 10/02/15 | AM | | |
| P250 \ P251 | 10/02/15 | WEOS TO EEOS | 1116 | 70 | MA | AM | 3781 | 86 | | P | 10/02/15 | AM | | |
| P252 \ P253 | 10/02/15 | WEOS TO EEOS | 1139 | 70 | MA | AM | 3781 | 92 | | P | 10/02/15 | AM | | |
| P254 \ P255 | 10/02/15 | WEOS TO EEOS | 1200 | 70 | MA | AM | 3781 | 108 | | P | 10/02/15 | AM | DS-85 | |
| P255 \ P256 | 10/02/15 | WEOS TO EEOS | 1340 | 80 | MA | AM | 3781 | 108 | | P | 10/02/15 | AM | | |
| P259 \ P258 | 10/02/15 | WEOS TO EEOS | 1412 | 80 | MA | AM | 3781 | 48 | | P | 10/02/15 | AM | | |
| P259 \ P257 | 10/02/15 | WEOS TO EEOS | 1426 | 80 | MA | AM | 3781 | 61 | | P | 10/02/15 | AM | | |
| P260 \ P261 | 10/02/15 | WEOS TO EEOS | 1446 | 80 | MA | AM | 3781 | 110 | | P | 10/02/15 | AM | | |
| P262 \ P264 | 10/02/15 | WEOS TO EEOS | 1525 | 80 | MA | AM | 3781 | 20 | | P | 10/02/15 | AM | | |
| P263 \ P264 | 10/02/15 | WEOS TO EEOS | 1529 | 80 | MA | AM | 3781 | 90 | | P | 10/02/15 | AM | DS-86 | |
| P265 \ P266 | 10/02/15 | WEOS TO EEOS | 1555 | 80 | MA | AM | 3781 | 84 | | P | 10/03/15 | MO | | |
| P241 \ P268 | 10/02/15 | NEOS TO SEOS | 1625 | 90 | MA | AM | 3781 | 84 | | P | 10/03/15 | MO | | |
| P268 \ P269 | 10/02/15 | NEOS TO SEOS | 1646 | 90 | MA | AM | 3781 | 67 | | P | 10/03/15 | MO | | |
| P269 \ P270 | 10/02/15 | NEOS TO SEOS | 1704 | 90 | MA | AM | 3781 | 41 | | P | 10/03/15 | MO | | |
| P270 \ P271 | 10/02/15 | NEOS TO SEOS | 1713 | 90 | MA | AM | 3781 | 24 | | P | 10/03/15 | MO | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P173 \ P133 | 09/29/15 | SEOS TO NEOS | 1041 | 80 | VT | AM | 088 | 9 | P | 09/29/15 | MO | | |
| P172 \ P133 | 09/29/15 | SEOS TO NEOS | 1042 | 80 | VT | AM | 088 | 13 | P | 09/29/15 | MO | | |
| P172 \ P132 | 09/29/15 | SEOS TO NEOS | 1049 | 80 | VT | AM | 088 | 9 | P | 09/29/15 | MO | | |
| P171 \ P132 | 09/29/15 | SEOS TO NEOS | 1050 | 80 | VT | AM | 088 | 13 | P | 09/29/15 | MO | | |
| P171 \ P131 | 09/29/15 | SEOS TO NEOS | 1053 | 80 | VT | AM | 088 | 9 | P | 09/29/15 | MO | | |
| P170 \ P131 | 09/29/15 | SEOS TO NEOS | 1054 | 80 | VT | AM | 088 | 13 | P | 09/29/15 | MO | | |
| P170 \ P130 | 09/29/15 | SEOS TO NEOS | 1057 | 80 | VT | AM | 088 | 9 | P | 09/29/15 | MO | | |
| P169 \ P130 | 09/29/15 | SEOS TO NEOS | 1059 | 80 | VT | AM | 088 | 13 | P | 09/29/15 | MO | | |
| P169 \ P129 | 09/29/15 | SEOS TO NEOS | 1112 | 80 | VT | AM | 088 | 9 | P | 09/29/15 | MO | | |
| P167 \ P129 | 09/29/15 | SEOS TO NEOS | 1117 | 80 | VT | AM | 088 | 13 | P | 09/29/15 | MO | | |
| P167 \ P126 | 09/29/15 | SEOS TO NEOS | 1149 | 80 | VT | AM | 088 | 9 | P | 09/29/15 | MO | | |
| P166 \ P126 | 09/29/15 | SEOS TO NEOS | 1150 | 80 | VT | AM | 088 | 13 | P | 09/29/15 | MO | | |
| P174 \ P137 | 09/29/15 | SEOS TO NEOS | 1024 | 80 | VT | AM | 088 | 13 | P | 09/29/15 | MO | | |
| P174 \ P135 | 09/29/15 | SEOS TO NEOS | 1027 | 80 | VT | AM | 088 | 9 | P | 09/29/15 | MO | | |
| P173 \ P135 | 09/29/15 | SEOS TO NEOS | 1039 | 80 | VT | AM | 088 | 13 | P | 09/29/15 | MO | | |
| P158 \ P183 | 09/29/15 | 13G TO 13F | 1114 | 90 | VT | MO | 088 | 13 | P | 09/28/15 | MO | | |
| P157 \ P183 | 09/29/15 | 13F TO 13E | 1116 | 90 | VT | MO | 088 | 8 | P | 09/29/15 | MO | | |
| P157 \ P182 | 09/29/15 | 13E TO 13D | 1118 | 90 | VT | MO | 088 | 14 | P | 09/29/15 | MO | | |
| P155 \ P182 | 09/29/15 | 13D TO 13H | 1120 | 90 | VT | MO | 088 | 8 | P | 09/29/15 | MO | | |
| P155 \ P181 | 09/29/15 | 13H TO 13C | 1122 | 90 | VT | MO | 088 | 14 | P | 09/29/15 | MO | | |
| P154 \ P181 | 09/29/15 | 13C TO 13B | 1124 | 90 | VT | MO | 088 | 8 | P | 09/29/15 | MO | | |
| P184 \ P185 | 09/29/15 | SEOS TO NEOS | 1421 | 90 | TM | AM | 088 | 178 | P | 09/29/15 | AM | DS-80 | |
| P186 \ P187 | 09/29/15 | SEOS TO NEOS | 1459 | 90 | VT | AM | 088 | 180 | P | 09/29/15 | AM | | |
| P189 \ P190 | 09/29/15 | SEOS TO NEOS | 1527 | 90 | VT | AM | 088 | 160 | P | 09/30/15 | AM | DS-52 | |
| P191 \ P192 | 09/29/15 | SEOS TO NEOS | 1626 | 90 | VT | AM | 088 | 147 | P | 09/30/15 | AM | | |
| P197 \ P089 | 09/29/15 | SEOS TO NEOS | 1713 | 90 | VT | AM | 088 | 40 | P | 09/30/15 | AM | | |
| P195 \ P196 | 09/29/15 | SEOS TO NEOS | 1706 | 90 | VT | AM | 088 | 20 | P | 09/30/15 | AM | | |
| P165 \ P191 | 09/30/15 | 14C TO 14D | 0750 | 70 | VT | MO | 088 | 8 | P | 09/30/15 | MO | | |
| P165 \ P190 | 09/30/15 | 14D TO 14E | 0757 | 70 | VT | MO | 088 | 14 | P | 09/30/15 | MO | | |
| P164 \ P190 | 09/30/15 | 14E TO 14F | 0801 | 70 | VT | MO | 088 | 8 | P | 09/30/15 | MO | | |
| P164 \ P189 | 09/30/15 | 14F TO 14G | 0802 | 70 | VT | MO | 088 | 14 | P | 09/30/15 | MO | | |
| P163 \ P189 | 09/30/15 | 14G TO 14H | 805 | 70 | VT | MO | 088 | 9 | P | 09/30/15 | MO | | |
| P163 \ P188 | 09/30/15 | 14H TO 14I | 0806 | 70 | VT | MO | 088 | 13 | P | 09/30/15 | MO | | |
| P162 \ P188 | 09/30/15 | 14I TO 14J | 808 | 70 | VT | MO | 088 | 8 | P | 09/30/15 | MO | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AMBIENT | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P162 \ P187 | 09/30/15 | 14J TO 14K | 810 | 70 | VT | MO | 088 | 14 | P | 09/30/15 | MO | | |
| P161 \ P187 | 09/30/15 | 14K TO 14M | 812 | 70 | VT | MO | 088 | 8 | P | 09/30/15 | MO | | |
| P161 \ P186 | 09/30/15 | 14M TO 14N | 0814 | 70 | VT | MO | 088 | 14 | P | 09/30/15 | MO | | |
| P160 \ P186 | 09/30/15 | 14N TO 14P | 0816 | 70 | VT | MO | 088 | 8 | P | 09/30/15 | MO | | |
| P160 \ P185 | 09/30/15 | 14P TO 14Q | 0814 | 70 | VT | MO | 088 | 13 | P | 09/30/15 | MO | DS-55 | |
| P165 \ P191 | 09/30/15 | 14R TO 14C | 0829 | 70 | VT | MO | 088 | 19 | P | 09/30/15 | MO | | |
| P194 \ P198 | 09/30/15 | 15A TO 15B | 0854 | 70 | VT | MO | 088 | 33 | P | 09/30/15 | MO | | |
| P195 \ P199 | 09/30/15 | 15A TO EEOS | 0908 | 70 | VT | MO | 088 | 35 | P | 09/30/15 | MO | | |
| P202 \ P203 | 09/30/15 | WEOS TO EEOS | 0940 | 70 | VT | AM | 088 | 88 | P | 09/30/15 | AM | | |
| P205 \ P206 | 09/30/15 | WEOS TO EEOS | 1007 | 70 | VT | AM | 088 | 87 | P | 09/30/15 | AM | | |
| P208 \ P209 | 09/30/15 | WEOS TO EEOS | 1025 | 70 | VT | AM | 088 | 87 | P | 09/30/15 | AM | | |
| P211 \ P212 | 09/30/15 | WEOS TO EEOS | 1050 | 70 | VT | AM | 088 | 87 | P | 09/30/15 | AM | | |
| P214 \ P215 | 09/30/15 | WEOS TO EEOS | 1110 | 70 | VT | AM | 088 | 86 | P | 09/30/15 | AM | DS-63 | |
| P217 \ P218 | 09/30/15 | WEOS TO EEOS | 1143 | 70 | VT | AM | 088 | 86 | P | 09/30/15 | AM | | |
| P221 \ P222 | 09/30/15 | WEOS TO EEOS | 1344 | 90 | VT | AM | 088 | 15 | P | 09/30/15 | AM | | |
| P223 \ P225 | 09/30/15 | SEOS TO NEOS | 1517 | 90 | VT | AM | 088 | 85 | P | 09/30/15 | AM | | |
| P226 \ P225 | 09/30/15 | NEOS TO SEOS | 1642 | 90 | VT | AM | 088 | 69 | P | 10/01/15 | MO | | |
| P226 \ P227 | 09/30/15 | NEOS TO SEOS | 1647 | 90 | VT | AM | 088 | 29 | P | 10/01/15 | MO | | |
| P227 \ P222 | 09/30/15 | SEOS TO NEOS | 1720 | 90 | VT | AM | 088 | 10 | P | 10/01/15 | MO | | |
| P227 \ P221 | 09/30/15 | SEOS TO NEOS | 1731 | 90 | VT | AM | 088 | 6 | P | 10/01/15 | MO | | |
| P226 \ P221 | 09/30/15 | SEOS TO NEOS | 1732 | 90 | VT | AM | 088 | 30 | P | 10/01/15 | MO | | |
| P226 \ P220 | 09/30/15 | SEOS TO NEOS | 1737 | 90 | VT | AM | 088 | 5 | P | 10/01/15 | MO | | |
| P225 \ P220 | 09/30/15 | SEOS TO NEOS | 1738 | 90 | VT | AM | 088 | 26 | P | 10/01/15 | MO | | |
| P225 \ P219 | 09/30/15 | SEOS TO NEOS | 1745 | 90 | VT | AM | 088 | 4 | P | 10/01/15 | MO | | |
| P166 \ P047 | 10/01/15 | NEOS TO SEOS | 0817 | 70 | VT | AM | 088 | 15 | P | 10/01/15 | MO | DS-64 | |
| P167 \ P047 | 10/01/15 | NEOS TO SEOS | 0822 | 70 | VT | AM | 088 | 7 | P | 10/01/15 | MO | | |
| P167 \ P048 | 10/01/15 | NEOS TO SEOS | 0823 | 70 | VT | AM | 088 | 15 | P | 10/01/15 | MO | | |
| P168 \ P048 | 10/01/15 | NEOS TO SEOS | 0826 | 70 | VT | AM | 088 | 7 | P | 10/01/15 | MO | | |
| P168 \ P050 | 10/01/15 | NEOS TO SEOS | 0827 | 70 | VT | AM | 088 | 15 | P | 10/01/15 | MO | | |
| P170 \ P050 | 10/01/15 | NEOS TO SEOS | 0830 | 70 | VT | AM | 088 | 7 | P | 10/01/15 | MO | | |
| P170 \ P051 | 10/01/15 | NEOS TO SEOS | 0832 | 70 | VT | AM | 088 | 15 | P | 10/01/15 | MO | | |
| P171 \ P051 | 10/01/15 | NEOS TO SEOS | 0836 | 70 | VT | AM | 088 | 7 | P | 10/01/15 | MO | | |
| P171 \ P053 | 10/01/15 | NEOS TO SEOS | 0837 | 70 | VT | AM | 088 | 15 | P | 10/01/15 | MO | | |
| P172 \ P053 | 10/01/15 | NEOS TO SEOS | 0840 | 70 | VT | AM | 088 | 7 | P | 10/01/15 | MO | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | AMBIENT TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P172 \ P054 | 10/01/15 | NEOS TO SEOS | 0841 | 70 | VT | AM | 088 | 15 | | P | 10/01/15 | MO | | |
| P173 \ P054 | 10/01/15 | NEOS TO SEOS | 0844 | 70 | VT | AM | 088 | 7 | | P | 10/01/15 | MO | | |
| P173 \ P055 | 10/01/15 | NEOS TO SEOS | 0846 | 70 | VT | AM | 088 | 15 | | P | 10/01/15 | MO | | |
| P174 \ P055 | 10/01/15 | NEOS TO SEOS | 0849 | 70 | VT | AM | 088 | 7 | | P | 10/01/15 | MO | | |
| P174 \ P056 | 10/01/15 | NEOS TO SEOS | 0850 | 70 | VT | AM | 088 | 15 | | P | 10/01/15 | MO | | |
| P175 \ P056 | 10/01/15 | NEOS TO SEOS | 0853 | 70 | VT | AM | 088 | 7 | | P | 10/01/15 | MO | | |
| P175 \ P058 | 10/01/15 | NEOS TO SEOS | 0854 | 70 | VT | AM | 088 | 15 | | P | 10/01/15 | MO | | |
| P176 \ P058 | 10/01/15 | NEOS TO SEOS | 0855 | 70 | VT | AM | 088 | 7 | | P | 10/01/15 | MO | | |
| P176 \ P060 | 10/01/15 | NEOS TO SEOS | 0857 | 70 | VT | AM | 088 | 13 | | P | 10/01/15 | MO | | |
| P178 \ P061 | 10/01/15 | NEOS TO SEOS | 0905 | 70 | VT | AM | 088 | 7 | | P | 10/01/15 | MO | | |
| P178 \ P062 | 10/01/15 | NEOS TO SEOS | 0907 | 70 | VT | AM | 088 | 15 | | P | 10/01/15 | MO | | |
| P179 \ P062 | 10/01/15 | NEOS TO SEOS | 0910 | 70 | VT | AM | 088 | 7 | | P | 10/01/15 | MO | | |
| P179 \ P063 | 10/01/15 | NEOS TO SEOS | 0911 | 70 | VT | AM | 088 | 15 | | P | 10/01/15 | MO | | |
| P180 \ P063 | 10/01/15 | NEOS TO SEOS | 0914 | 70 | VT | AM | 088 | 7 | | P | 10/01/15 | MO | | |
| P180 \ P064 | 10/01/15 | NEOS TO SEOS | 0916 | 70 | VT | AM | 088 | 15 | | P | 10/01/15 | MO | | |
| P181 \ P064 | 10/01/15 | NEOS TO SEOS | 0919 | 70 | VT | AM | 088 | 7 | | P | 10/01/15 | MO | | |
| P181 \ P066 | 10/01/15 | NEOS TO SEOS | 0921 | 70 | VT | AM | 088 | 15 | | P | 10/01/15 | MO | | |
| P182 \ P066 | 10/01/15 | NEOS TO SEOS | 0923 | 70 | VT | AM | 088 | 7 | | P | 10/01/15 | MO | | |
| P182 \ P073 | 10/01/15 | NEOS TO SEOS | 0924 | 70 | VT | AM | 088 | 15 | | P | 10/01/15 | MO | | |
| P183 \ P073 | 10/01/15 | NEOS TO SEOS | 0924 | 70 | VT | AM | 088 | 7 | | P | 10/01/15 | MO | | |
| P183 \ P074 | 10/01/15 | NEOS TO SEOS | 0929 | 70 | VT | AM | 088 | 15 | | P | 10/01/15 | MO | | |
| P231 \ P232 | 10/01/15 | NEOS TO SEOS | 1016 | 75 | VT | AM | 088 | 520 | | P | 10/01/15 | MO | DS-65 | |
| P234 \ P235 | 10/01/15 | NEOS TO SEOS | 1317 | 80 | VT | AM | 088 | 520 | | P | 10/01/15 | MO | DS-66 | |
| P237 \ P238 | 10/01/15 | NEOS TO SEOS | 1437 | 85 | VT | AM | 088 | 520 | | P | 10/01/15 | MO | DS-67 | DS-68 |
| P240 \ P241 | 10/01/15 | NEOS TO SEOS | 1557 | 90 | VT | AM | 088 | 520 | | P | 10/01/15 | AM | DS-69 | |
| P241 \ P244 | 10/01/15 | NEOS TO SEOS | 1720 | 90 | VT | AM | 088 | 69 | | P | 10/02/15 | AM | | |
| P242 \ P243 | 10/01/15 | NEOS TO SEOS | 1736 | 90 | VT | AM | 088 | 13 | | P | 10/02/15 | AM | | |
| P244 \ P245 | 10/01/15 | WEOS TO EEOS | 1742 | 90 | VT | AM | 088 | 22 | | P | 10/02/15 | AM | | |
| P245 \ P246 | 10/01/15 | WEOS TO EEOS | 1750 | 90 | VT | AM | 088 | 22 | | P | 10/02/15 | AM | | |
| P241 \ P245 | 10/01/15 | NEOS TO SEOS | 1759 | 90 | VT | AM | 088 | 78 | | P | 10/02/15 | AM | | |
| P241 \ P246 | 10/01/15 | NEOS TO SEOS | 1909 | 90 | VT | AM | 088 | 60 | | P | 10/02/15 | AM | | |
| P144 \ P244 | 10/02/15 | NEOS TO SEOS | 802 | 65 | VT | AM | 088 | 22 | | P | 10/02/15 | AM | | |
| P145 \ P244 | 10/02/15 | NEOS TO SEOS | 808 | 65 | VT | AM | 088 | 22 | | P | 10/02/15 | AM | | |
| P146 \ P244 | 10/02/15 | NEOS TO SEOS | 812 | 65 | VT | AM | 088 | 22 | | P | 10/02/15 | AM | | |

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AMBIENT | | | | | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | DATE | LOCATION | START TIME | TEMP. (F) | WELDING TECH. | QA MON. | WELDING MACHINE NUMBER | LENGTH WELDED (FT) | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P147 \ P244 | 10/02/15 | NEOS TO SEOS | 0818 | 65 | VT | AM | 088 | 3 | P | 10/02/15 | AM | | |
| P147 \ P245 | 10/02/15 | NEOS TO SEOS | 0819 | 65 | VT | AM | 088 | 19 | P | 10/02/15 | AM | | |
| P184 \ P074 | 10/02/15 | NEOS TO SEOS | 0932 | 70 | VT | AM | 088 | 7 | P | 10/02/15 | AM | | |
| P184 \ P079 | 10/02/15 | NEOS TO SEOS | 0934 | 70 | VT | AM | 088 | 15 | P | 10/02/15 | AM | | |
| P185 \ P079 | 10/02/15 | NEOS TO SEOS | 0938 | 70 | VT | AM | 088 | 7 | P | 10/02/15 | AM | | |
| P185 \ P090 | 10/02/15 | NEOS TO SEOS | 0939 | 70 | VT | AM | 088 | 15 | P | 10/02/15 | AM | | |
| P186 \ P090 | 10/02/15 | NEOS TO SEOS | 0943 | 70 | VT | AM | 088 | 7 | P | 10/02/15 | AM | | |
| P186 \ P091 | 10/02/15 | NEOS TO SEOS | 0944 | 70 | VT | AM | 088 | 15 | P | 10/02/15 | AM | DS-79 | |
| P187 \ P091 | 10/02/15 | NEOS TO SEOS | 0949 | 70 | VT | AM | 088 | 7 | P | 10/02/15 | AM | | |
| P187 \ P092 | 10/02/15 | NEOS TO SEOS | 0950 | 70 | VT | AM | 088 | 15 | P | 10/02/15 | AM | | |
| P188 \ P092 | 10/02/15 | NEOS TO SEOS | 0953 | 70 | VT | AM | 088 | 7 | P | 10/02/15 | AM | | |
| P188 \ P093 | 10/02/15 | NEOS TO SEOS | 0955 | 70 | VT | AM | 088 | 5 | P | 10/02/15 | AM | | |
| P188 \ P084 | 10/02/15 | SEOS TO NEOS | 0958 | 70 | VT | AM | 088 | 10 | P | 10/02/15 | AM | | |
| P249 \ P248 | 10/02/15 | WEOS TO EEOS | 1033 | 90 | VT | AM | 088 | 86 | P | 10/02/15 | AM | | |
| P250 \ P249 | 10/02/15 | WEOS TO EEOS | 1110 | 90 | VT | AM | 088 | 86 | P | 10/02/15 | AM | | |
| P252 \ P251 | 10/02/15 | WEOS TO EEOS | 1130 | 90 | VT | AM | 088 | 86 | P | 10/02/15 | AM | | |
| P254 \ P253 | 10/02/15 | WEOS TO EEOS | 1147 | 90 | VT | AM | 088 | 108 | P | 10/02/15 | AM | | |
| P257 \ P258 | 10/02/15 | SEOS TO NEOS | 1356 | 90 | VT | AM | 088 | 23 | P | 10/02/15 | AM | | |
| P256 \ P258 | 10/02/15 | WEOS TO EEOS | 1406 | 90 | VT | AM | 088 | 57 | P | 10/02/15 | AM | DS-83 | |
| P256 \ P257 | 10/02/15 | WEOS TO EEOS | 1426 | 90 | VT | AM | 088 | 51 | P | 10/02/15 | AM | | |
| P259 \ P260 | 10/02/15 | WEOS TO EEOS | 1432 | 90 | VT | AM | 088 | 109 | P | 10/02/15 | AM | | |
| P262 \ P263 | 10/02/15 | SEOS TO NEOS | 1504 | 90 | VT | AM | 088 | 23 | P | 10/02/15 | AM | | |
| P261 \ P262 | 10/02/15 | WEOS TO EEOS | 1515 | 90 | VT | AM | 088 | 30 | P | 10/02/15 | AM | | |
| P261 \ P263 | 10/02/15 | WEOS TO EEOS | 1519 | 90 | VT | AM | 088 | 80 | P | 10/02/15 | AM | | |
| P264 \ P265 | 10/02/15 | WEOS TO EEOS | 1542 | 90 | VT | AM | 088 | 92 | P | 10/03/15 | MO | | |
| P266 \ P267 | 10/02/15 | WEOS TO EEOS | 1617 | 90 | VT | AM | 088 | 52 | P | 10/03/15 | MO | DS-84 | |
| P253 \ P241 | 10/03/15 | 23T TO 23W | 0836 | 65 | MA | MO | 3781 | 11 | P | 10/03/15 | MO | | |
| P254 \ P241 | 10/03/15 | 23W TO 23X | 0841 | 65 | MA | MO | 3781 | 21 | P | 10/03/15 | MO | | |
| P255 \ P241 | 10/03/15 | 23X TO 24A | 0844 | 65 | MA | MO | 3781 | 20 | P | 10/03/15 | MO | | |
| P256 \ P241 | 10/03/15 | 24A TO 24B | 0849 | 65 | MA | MO | 3781 | 20 | P | 10/03/15 | MO | | |
| P257 \ P241 | 10/03/15 | 24B TO 24C | 0854 | 65 | MA | MO | 3781 | 21 | P | 10/03/15 | MO | | |
| P259 \ P241 | 10/03/15 | 24C TO 24D | 0858 | 65 | MA | MO | 3781 | 20 | P | 10/03/15 | MO | | |
| P260 \ P241 | 10/03/15 | 24D TO 24E | 0902 | 65 | MA | MO | 3781 | 21 | P | 10/03/15 | MO | | |
| P261 \ P241 | 10/03/15 | 24E TO 24F | 0908 | 70 | MA | MO | 3781 | 22 | P | 10/03/15 | MO | | |

APPENDIX E-Revision 1 November 21, 2022

# GEOMEMBRANE FUSION SEAM SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAMING PROCESS | | | | | | | | | | TESTING PROCESS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AMBIENT | | | WELDING | LENGTH | NON-DESTRUCTIVE | | | DESTRUCTIVE | |
| SEAM NUMBER | | DATE | LOCATION | START TIME | TEMP. (F) | WELDING TECH. | QA MON. | MACHINE NUMBER | WELDED (FT) | P/V (Note 1) | DATE COMPLETE | QA MONITOR | TEST NUMBER | REMARKS |
| P263 | \ P241 | 10/03/15 | 24F TO 24G | 0914 | 70 | MA | MO | 3781 | 21 | P | 10/03/15 | MO | | |
| P264 | \ P241 | 10/03/15 | 24G TO 24H | 0918 | 70 | MA | MO | 3781 | 21 | P | 10/03/15 | MO | | |
| P265 | \ P241 | 10/03/15 | 24H TO 24I | 0923 | 70 | MA | MO | 3781 | 21 | P | 10/03/15 | MO | | |
| P266 | \ P268 | 10/03/15 | 24I TO 24J | 0928 | 70 | MA | MO | 3781 | 24 | P | 10/03/15 | MO | | |
| P266 | \ P269 | 10/03/15 | 24J TO 24K | 0933 | 70 | MA | MO | 3781 | 11 | P | 10/03/15 | MO | | |
| P267 | \ P269 | 10/03/15 | 24K TO 24M | 0936 | 70 | MA | MO | 3781 | 12 | P | 10/03/15 | MO | | |
| P267 | \ P270 | 10/03/15 | 24M TO 24N | 0941 | 75 | MA | MO | 3781 | 15 | P | 10/03/15 | MO | | |
| P267 | \ P271 | 10/03/15 | 24N TO SEOS | 0945 | 75 | MA | MO | 3781 | 15 | P | 10/03/15 | MO | | |

NOTES: (1) "P" denotes pressure testing; individual test data in Appendix K .
(2) Welding machines #'s 088, 206, 368, 591, and 3781 are dual track fusion welders.

# PRESSURE TEST SUMMARY

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P001 \ P029 | 09/22/15 | 1M TO SEOS | UL | 0752 | 0757 | 30 | 30 | PASS | MO | |
| P027 \ P029 | 09/22/15 | 1P TO 1M | UL | 0756 | 0801 | 30 | 30 | PASS | MO | |
| P027 \ P030 | 09/22/15 | 1J TO 1P | UL | 0801 | 0806 | 30 | 30 | PASS | MO | |
| P028 \ P030 | 09/22/15 | 1R TO 1J | UL | 0802 | 0807 | 30 | 30 | PASS | MO | |
| P028 \ P031 | 09/22/15 | 1R TO NEOS | UL | 0804 | 0809 | 30 | 30 | PASS | MO | |
| P027 \ P028 | 09/22/15 | 1J TO NEOS | UL | 0806 | 0811 | 30 | 30 | PASS | MO | |
| P029 \ P030 | 09/22/15 | 1P TO NEOS | UL | 0808 | 0813 | 30 | 30 | PASS | MO | |
| P002 \ P003 | 09/22/15 | EEOS TO 1B | UL | 0809 | 0814 | 30 | 30 | PASS | MO | |
| P001 \ P029 | 09/22/15 | 1N TO WEOS | UL | 0810 | 0815 | 30 | 30 | PASS | MO | |
| P002 \ P003 | 09/22/15 | 1B TO NEOS | UL | 0811 | 0816 | 30 | 30 | PASS | MO | |
| P003 \ P004 | 09/22/15 | EEOS TO WEOS | UL | 0815 | 0820 | 30 | 30 | PASS | MO | |
| P004 \ P005 | 09/22/15 | EEOS TO WEOS | UL | 0816 | 0821 | 30 | 30 | PASS | MO | |
| P005 \ P006 | 09/22/15 | EEOS TO WEOS | UL | 0821 | 0826 | 30 | 30 | PASS | MO | |
| P006 \ P007 | 09/22/15 | EEOS TO WEOS | UL | 0822 | 0827 | 30 | 30 | PASS | MO | |
| P007 \ P008 | 09/22/15 | EEOS TO WEOS | UL | 0825 | 0830 | 30 | 30 | PASS | MO | |
| P008 \ P009 | 09/22/15 | EEOS TO WEOS | UL | 0826 | 0831 | 30 | 30 | PASS | MO | |
| P009 \ P010 | 09/22/15 | EEOS TO WEOS | UL | 0827 | 0832 | 30 | 30 | PASS | MO | |
| P010 \ P011 | 09/22/15 | EEOS TO WEOS | UL | 0828 | 0833 | 30 | 30 | PASS | MO | |
| P011 \ P012 | 09/22/15 | EEOS TO WEOS | UL | 0831 | 0836 | 30 | 30 | PASS | MO | |
| P012 \ P013 | 09/22/15 | 2A TO WEOS | UL | 0832 | 0837 | 30 | 30 | PASS | MO | |
| P013 \ P014 | 09/22/15 | EEOS TO WEOS | UL | 0902 | 0907 | 30 | 30 | PASS | MO | |
| P014 \ P015 | 09/22/15 | 2E TO WEOS | UL | 0903 | 0908 | 30 | 30 | PASS | MO | |
| P015 \ P016 | 09/22/15 | 2G TO WEOS | UL | 0905 | 0910 | 30 | 30 | PASS | MO | |
| P016 \ P017 | 09/22/15 | 2H TO WEOS | UL | 0906 | 0911 | 30 | 30 | PASS | MO | |
| P017 \ P018 | 09/22/15 | 2I TO WEOS | UL | 0910 | 0915 | 30 | 30 | PASS | MO | |
| P018 \ P019 | 09/22/15 | 2J TO WEOS | UL | 0911 | 0916 | 30 | 30 | PASS | MO | |
| P019 \ P020 | 09/22/15 | 2M TO WEOS | UL | 0916 | 0921 | 30 | 30 | PASS | MO | |
| P020 \ P021 | 09/22/15 | 2P TO WEOS | UL | 0917 | 0922 | 30 | 30 | PASS | MO | |
| P021 \ P022 | 09/22/15 | 2Q TO WEOS | UL | 0920 | 0925 | 30 | 30 | PASS | MO | |
| P023 \ P026 | 09/22/15 | 2S TO SEOS | UL | 0930 | 0935 | 30 | 30 | PASS | MO | |
| P025 \ P026 | 09/22/15 | 2S TO SEOS | UL | 0931 | 0936 | 30 | 30 | PASS | MO | |
| P024 \ P025 | 09/22/15 | 2Q TO SEOS | UL | 0933 | 0938 | 30 | 30 | PASS | MO | |
| P024 \ P025 | 09/22/15 | 2Q TO 2R | UL | 0935 | 0940 | 30 | 30 | PASS | MO | |
| P024 \ P035 | 09/22/15 | 2P TO SEOS | UL | 0939 | 0944 | 30 | 30 | PASS | MO | |
| P021 \ P024 | 09/22/15 | 2P TO 2Q | UL | 0940 | 0945 | 30 | 30 | PASS | MO | |
| P020 \ P030 | 09/22/15 | 2M TO 2N | UL | 0946 | 0951 | 30 | 30 | PASS | VK | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P019 \ P032 | 09/22/15 | 2M TO 2J | UL | 0947 | 0952 | 30 | 30 | PASS | JK | |
| P017 \ P032 | 09/22/15 | SEOS TO NEOS | UL | 0949 | 0954 | 30 | 30 | PASS | JK | |
| P018 \ P032 | 09/22/15 | SEOS TO NEOS | UL | 0950 | 0955 | 30 | 30 | PASS | JK | |
| P016 \ P032 | 09/22/15 | 2H TO 2G | UL | 0952 | 0957 | 30 | 30 | PASS | JK | |
| P015 \ P032 | 09/22/15 | 2G TO 2F | UL | 0954 | 0959 | 30 | 30 | PASS | JK | |
| P014 \ P032 | 09/22/15 | 2F TO 2E | UL | 1000 | 1005 | 30 | 30 | PASS | JK | |
| P013 \ P032 | 09/22/15 | 2E TO 2X | UL | 1001 | 1006 | 30 | 30 | PASS | JK | |
| P012 \ P032 | 09/22/15 | 2A TO 1X | UL | 1020 | 1025 | 30 | 30 | PASS | JK | |
| P011 \ P032 | 09/22/15 | 1X TO 3A | UL | 1021 | 1026 | 30 | 30 | PASS | JK | |
| P010 \ P032 | 09/22/15 | 3A TO 3B | UL | 1026 | 1031 | 30 | 30 | PASS | JK | |
| P009 \ P032 | 09/22/15 | 3B TO 2D | UL | 1027 | 1032 | 30 | 30 | PASS | JK | |
| P008 \ P032 | 09/22/15 | 2D TO 3C | UL | 1035 | 1040 | 30 | 30 | PASS | JK | |
| P007 \ P032 | 09/22/15 | 3C TO 1W | UL | 1036 | 1041 | 30 | 30 | PASS | JK | |
| P006 \ P032 | 09/22/15 | 1W TO 3D | UL | 1039 | 1044 | 30 | 30 | PASS | JK | |
| P005 \ P032 | 09/22/15 | 3D TO 2C | UL | 1040 | 1045 | 30 | 30 | PASS | JK | |
| P004 \ P032 | 09/22/15 | 2C TO 3E | UL | 1040 | 1045 | 30 | 30 | PASS | JK | |
| P003 \ P032 | 09/22/15 | 3E TO 3F | UL | 1041 | 1046 | 30 | 30 | PASS | JK | |
| P002 \ P032 | 09/22/15 | 3F TO 3G | UL | 1043 | 1048 | 30 | 30 | PASS | JK | |
| P001 \ P032 | 09/22/15 | 3G TO 3H | UL | 1044 | 1049 | 30 | 30 | PASS | JK | |
| P032 \ P033 | 09/22/15 | 2X to NEOS | UL | 1100 | 1105 | 30 | 30 | PASS | JK | |
| P035 \ P032 | 09/22/15 | 2P TO 2X | UL | 1104 | 1109 | 30 | 30 | PASS | JK | |
| P035 \ P032 | 09/22/15 | 2X TO 2P | UL | 1104 | 1109 | 30 | 30 | PASS | JK | |
| P036 \ P033 | 09/22/15 | 2X TO 2T | UL | 1105 | 1110 | 30 | 30 | PASS | JK | |
| P040 \ P042 | 09/22/15 | NEOS TO SEOS | UL | 1105 | 1110 | 30 | 30 | PASS | VK | |
| P042 \ P043 | 09/22/15 | NEOS TO SEOS | UL | 1107 | 1112 | 30 | 30 | PASS | VK | |
| P037 \ P036 | 09/22/15 | 2T TO SEOS | UL | 1111 | 1116 | 30 | 30 | PASS | JK | |
| P036 \ P035 | 09/22/15 | 2X TO EEOS | UL | 1112 | 1117 | 30 | 30 | PASS | JK | |
| P037 \ P034 | 09/22/15 | 2T TO WEOS | UL | 1118 | 1123 | 30 | 30 | PASS | JK | |
| P038 \ P039 | 09/22/15 | NEOS to SEOS | UL | 1132 | 1137 | 30 | 30 | PASS | JK | |
| P039 \ P040 | 09/22/15 | NEOS TO SEOS | UL | 1133 | 1138 | 30 | 30 | PASS | VK | |
| P039 \ P041 | 09/22/15 | NEOS TO SEOS | UL | 1135 | 1140 | 30 | 30 | PASS | JK | |
| P041 \ P040 | 09/22/15 | 4H TO 4I | UL | 1303 | 1308 | 30 | 30 | PASS | JK | |
| P041 \ P042 | 09/22/15 | NEOS TO SEOS | UL | 1311 | 1316 | 30 | 30 | PASS | JK | |
| P042 \ P044 | 09/22/15 | NEOS TO SEOS | UL | 1316 | 1321 | 30 | 30 | PASS | JK | |
| P044 \ P043 | 09/22/15 | 4J TO 4K | UL | 1318 | 1323 | 30 | 30 | PASS | JK | |
| P044 \ P045 | 09/22/15 | 4K TO NEOS | UL | 1510 | 1515 | 30 | 30 | PASS | JK | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P043 \ P045 | 09/22/15 | 4K TO SEOS | UL | 1511 | 1516 | 30 | 30 | PASS | JK | |
| P045 \ P046 | 09/22/15 | SEOS TO NEOS | UL | 1515 | 1520 | 30 | 30 | PASS | VK | |
| P046 \ P047 | 09/22/15 | SEOS TO 4B | UL | 1517 | 1522 | 30 | 30 | PASS | VK | |
| P046 \ P047 | 09/22/15 | 4B TO NEOS | UL | 1526 | 1531 | 30 | 30 | PASS | JK | |
| P047 \ P048 | 09/22/15 | SEOS TO NEOS | UL | 1528 | 1533 | 30 | 30 | PASS | VK | |
| P048 \ P049 | 09/22/15 | 4G TO NEOS | UL | 1531 | 1536 | 30 | 30 | PASS | VK | |
| P049 \ P051 | 09/22/15 | 4C TO NEOS | UL | 1534 | 1539 | 30 | 30 | PASS | JK | |
| P049 \ P051 | 09/22/15 | 4M TO 4C | UL | 1535 | 1540 | 30 | 30 | PASS | JK | |
| P049 \ P050 | 09/22/15 | 4G TO 4M | UL | 1545 | 1550 | 30 | 30 | PASS | JK | |
| P048 \ P050 | 09/22/15 | 4G TO SEOS | UL | 1546 | 1551 | 30 | 30 | PASS | VK | |
| P050 \ P051 | 09/22/15 | 4C TO SEOS | UL | 1548 | 1553 | 30 | 30 | PASS | VK | |
| P051 \ P053 | 09/22/15 | 4N TO SEOS | UL | 1600 | 1605 | 30 | 30 | PASS | VK | |
| P052 \ P053 | 09/22/15 | 4P TO 4N | UL | 1607 | 1612 | 30 | 30 | PASS | VK | |
| P051 \ P052 | 09/22/15 | 4N TO NEOS | UL | 1610 | 1615 | 30 | 30 | PASS | VK | |
| P052 \ P054 | 09/22/15 | 4P TO NEOS | UL | 1611 | 1616 | 30 | 30 | PASS | VK | |
| P053 \ P054 | 09/22/15 | 4P TO SEOS | UL | 1615 | 1620 | 30 | 30 | PASS | VK | |
| P057 \ P056 | 09/22/15 | 4Q TO 4R | UL | 1647 | 1652 | 30 | 30 | PASS | VK | |
| P057 \ P058 | 09/22/15 | 4R TO NEOS | UL | 1712 | 1717 | 30 | 30 | PASS | VK | |
| P056 \ P058 | 09/22/15 | 4R TO SEOS | UL | 1715 | 1720 | 30 | 30 | PASS | VK | |
| P055 \ P056 | 09/22/15 | 4Q TO SEOS | UL | 1717 | 1722 | 30 | 30 | PASS | VK | |
| P055 \ P057 | 09/22/15 | 4Q TO NEOS | UL | 1730 | 1735 | 30 | 30 | PASS | VK | |
| P054 \ P055 | 09/22/15 | SEOS TO NEOS | UL | 1737 | 1742 | 30 | 30 | PASS | VK | |
| P058 \ P060 | 09/23/15 | 4S TO SEOS | UL | 0720 | 0725 | 30 | 30 | PASS | VK | |
| P059 \ P060 | 09/23/15 | 4S TO 5A | UL | 0722 | 0727 | 30 | 30 | PASS | VK | |
| P058 \ P059 | 09/23/15 | 4S TO NEOS | UL | 0725 | 0730 | 30 | 30 | PASS | VK | |
| P012/P01: \ P011/P01 | 09/23/15 | 2A TO 1X | UL | 0835 | 0840 | 30 | 30 | PASS | MO | |
| P059 \ P061 | 09/23/15 | 5A TO NEOS | UL | 0840 | 0845 | 30 | 30 | PASS | VK | |
| P060 \ P061 | 09/23/15 | SEOS TO 5A | UL | 0850 | 0855 | 30 | 30 | PASS | VK | |
| P061 \ P062 | 09/23/15 | SEOS TO NEOS | UL | 0856 | 0861 | 30 | 30 | PASS | VK | |
| P062 \ P063 | 09/23/15 | SEOS TO NEOS | UL | 0913 | 0918 | 30 | 30 | PASS | VK | |
| P065 \ P066 | 09/23/15 | 5B TO 5D | UL | 0930 | 0935 | 30 | 30 | PASS | VK | |
| P063 \ P064 | 09/23/15 | SEOS TO NEOS | UL | 0935 | 0940 | 30 | 30 | PASS | VK | |
| P064 \ P065 | 09/23/15 | 5B TO NEOS | UL | 0950 | 0955 | 30 | 30 | PASS | VK | |
| P064 \ P066 | 09/23/15 | 5B TO SEOS | UL | 0952 | 0957 | 30 | 30 | PASS | VK | |
| P065 \ P067 | 09/23/15 | 5D TO NEOS | UL | 1006 | 1011 | 30 | 30 | PASS | VK | |
| P067 \ P068 | 09/23/15 | 5D TO NEOS | UL | 1024 | 1029 | 30 | 30 | PASS | VK | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P068 \ P069 | 09/23/15 | 5D TO NEOS | UL | 1042 | 1047 | 30 | 30 | PASS | VK | |
| P069 \ P070 | 09/23/15 | 5F TO NEOS | UL | 1044 | 1049 | 30 | 30 | PASS | VK | |
| P070 \ P071 | 09/23/15 | SEOS TO NEOS | UL | 1050 | 1055 | 30 | 30 | PASS | VK | |
| P066 \ P073 | 09/23/15 | 5E TO SEOS | UL | 1112 | 1117 | 30 | 30 | PASS | VK | |
| P072 \ P073 | 09/23/15 | 5E TO 5G | UL | 1114 | 1119 | 30 | 30 | PASS | VK | |
| P066 \ P072 | 09/23/15 | 5E TO 5D | UL | 1119 | 1124 | 30 | 30 | PASS | VK | |
| P073 \ P074 | 09/23/15 | 5G TO SEOS | UL | 1124 | 1129 | 30 | 30 | PASS | VK | |
| P072 \ P074 | 09/23/15 | 5F TO 5G | UL | 1130 | 1135 | 30 | 30 | PASS | VK | |
| P071 \ P075 | 09/23/15 | SEOS TO NEOS | UL | 1136 | 1141 | 30 | 30 | PASS | VK | |
| P075 \ P076 | 09/23/15 | SEOS TO NEOS | UL | 1150 | 1155 | 30 | 30 | PASS | VK | |
| P076 \ P077 | 09/23/15 | SEOS TO NEOS | UL | 1154 | 1159 | 30 | 30 | PASS | VK | |
| P074 \ P078 | 09/23/15 | 5K TO 5J | UL | 1302 | 1307 | 30 | 30 | PASS | VK | |
| P074 \ P079 | 09/23/15 | 5K TO SEOS | UL | 1303 | 1308 | 30 | 30 | PASS | VK | |
| P078 \ P079 | 09/23/15 | 5K TO 5S | UL | 1310 | 1315 | 30 | 30 | PASS | VK | |
| P077 \ P080 | 09/23/15 | SEOS TO NEOS | UL | 1344 | 1349 | 30 | 30 | PASS | VK | |
| P080 \ P081 | 09/23/15 | SEOS TO NEOS | UL | 1352 | 1357 | 30 | 30 | PASS | VK | |
| P081 \ P082 | 09/23/15 | SEOS TO NEOS | UL | 1359 | 1404 | 30 | 30 | PASS | VK | |
| P082 \ P083 | 09/23/15 | SEOS TO NEOS | UL | 1403 | 1408 | 30 | 30 | PASS | VK | |
| P083 \ P084 | 09/23/15 | SEOS TO NEOS | UL | 1406 | 1411 | 30 | 30 | PASS | VK | |
| P084 \ P085 | 09/23/15 | SEOS TO 5M | UL | 1426 | 1431 | 30 | 30 | PASS | VK | |
| P084 \ P085 | 09/23/15 | 5M TO NEOS | UL | 1427 | 1432 | 30 | 30 | PASS | VK | |
| P085 \ P086 | 09/23/15 | SEOS TO NEOS | UL | 1436 | 1441 | 30 | 30 | PASS | VK | |
| P086 \ P087 | 09/23/15 | SEOS TO 5N | UL | 1438 | 1443 | 30 | 30 | PASS | VK | |
| P086 \ P087 | 09/23/15 | 5N TO NEOS | UL | 1440 | 1445 | 30 | 30 | PASS | VK | |
| P087 \ P088 | 09/23/15 | SEOS TO NEOS | UL | 1448 | 1453 | 30 | 30 | PASS | VK | |
| P088 \ P089 | 09/23/15 | SEOS TO NEOS | UL | 1502 | 1507 | 30 | 30 | PASS | VK | |
| P078 \ P090 | 09/23/15 | 5S TO 5T | UL | 1508 | 1513 | 30 | 30 | PASS | VK | |
| P079 \ P090 | 09/23/15 | 5S TO SEOS | UL | 1512 | 1517 | 30 | 30 | PASS | VK | |
| P091 \ P090 | 09/23/15 | 5W TO SEOS | UL | 1515 | 1520 | 30 | 30 | PASS | VK | |
| P091 \ P092 | 09/23/15 | 5X TO SEOS | UL | 1525 | 1530 | 30 | 30 | PASS | VK | |
| P092 \ P093 | 09/23/15 | 6B TO SEOS | UL | 1527 | 1532 | 30 | 30 | PASS | VK | |
| P082 \ P092 | 09/24/15 | 7B TO 7A | UL | 0900 | 0905 | 30 | 30 | PASS | VK | |
| P080 \ P092 | 09/24/15 | 7B TO 5X | UL | 0901 | 0906 | 30 | 30 | PASS | VK | |
| P080 \ P091 | 09/24/15 | 7C TO 5X | UL | 0910 | 0915 | 30 | 30 | PASS | VK | |
| P077 \ P091 | 09/24/15 | 7C TO 5W | UL | 0911 | 0916 | 30 | 30 | PASS | VK | |
| P077 \ P090 | 09/24/15 | 7D TO 5W | UL | 0915 | 0920 | 30 | 30 | PASS | VK | |

# PRESSURE TEST SUMMARY
# LUMINANT, INC.
# LUMINANT OAK GROVE
# FDG-C POND CQA
# ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P076 \ P090 | 09/24/15 | 7D TO 6D | UL | 0916 | 0921 | 30 | 30 | PASS | VK | |
| P075 \ P090 | 09/24/15 | 5T TO 6D | UL | 0918 | 0923 | 30 | 30 | PASS | VK | |
| P075 \ P078 | 09/24/15 | 5T TO 5R | UL | 0920 | 0925 | 30 | 30 | PASS | VK | |
| P071 \ P078 | 09/24/15 | 5J TO 5R | UL | 0930 | 0935 | 30 | 30 | PASS | VK | |
| P071 \ P074 | 09/24/15 | 5J TO 5Q | UL | 0931 | 0936 | 30 | 30 | PASS | VK | |
| P070 \ P074 | 09/24/15 | 5F TO 5Q | UL | 0937 | 0942 | 30 | 30 | PASS | VK | |
| P069 \ P072 | 09/24/15 | 5F TO 5D | UL | 0938 | 0943 | 30 | 30 | PASS | VK | |
| P094 \ P095 | 09/24/15 | 6T TO SEOS | UL | 1108 | 1113 | 30 | 30 | PASS | VK | |
| P095 \ P096 | 09/24/15 | 6S TO SEOS | UL | 1110 | 1115 | 30 | 30 | PASS | VK | |
| P096 \ P097 | 09/24/15 | 6R TO SEOS | UL | 1115 | 1120 | 30 | 30 | PASS | VK | |
| P097 \ P098 | 09/24/15 | 6N TO SEOS | UL | 1120 | 1125 | 30 | 30 | PASS | VK | |
| P098 \ P099 | 09/24/15 | 6M TO SEOS | UL | 1130 | 1135 | 30 | 30 | PASS | VK | |
| P099 \ P100 | 09/24/15 | 6K TO SEOS | UL | 1132 | 1137 | 30 | 30 | PASS | VK | |
| P100 \ P101 | 09/24/15 | 6J TO SEOS | UL | 1140 | 1145 | 30 | 30 | PASS | VK | |
| P101 \ P102 | 09/24/15 | 6I TO SEOS | UL | 1143 | 1148 | 30 | 30 | PASS | VK | |
| P102 \ P103 | 09/24/15 | 7E TO EEOS | UL | 1301 | 1306 | 30 | 30 | PASS | VK | |
| P103 \ P104 | 09/24/15 | 7F TO EEOS | UL | 1305 | 1310 | 30 | 30 | PASS | VK | |
| P104 \ P105 | 09/24/15 | 7G TO 7K | UL | 1310 | 1315 | 30 | 30 | PASS | VK | |
| P104 \ P105 | 09/24/15 | 7K TO EEOS | UL | 1317 | 1322 | 30 | 30 | PASS | VK | |
| P105 \ P106 | 09/24/15 | 7H TO EEOS | UL | 1320 | 1325 | 30 | 30 | PASS | VK | |
| P106 \ P107 | 09/24/15 | 7W TO EEOS | UL | 1323 | 1328 | 30 | 30 | PASS | VK | |
| P107 \ P108 | 09/24/15 | 7X TO EEOS | UL | 1330 | 1335 | 30 | 30 | PASS | VK | |
| P108 \ P109 | 09/24/15 | 8A TO EEOS | UL | 1332 | 1337 | 30 | 30 | PASS | VK | |
| P109 \ P110 | 09/24/15 | 8B TO NEOS | UL | 1335 | 1340 | 30 | 30 | PASS | VK | |
| P110 \ P111 | 09/24/15 | 8C TO NEOS | UL | 1336 | 1341 | 30 | 30 | PASS | VK | |
| P111 \ P112 | 09/24/15 | 8D TO 8H | UL | 1339 | 1344 | 30 | 30 | PASS | VK | |
| P111 \ P112 | 09/24/15 | 8H TO NEOS | UL | 1345 | 1350 | 30 | 30 | PASS | VK | |
| P112 \ P113 | 09/24/15 | 8E TO NEOS | UL | 1348 | 1353 | 30 | 30 | PASS | VK | |
| P113 \ P114 | 09/24/15 | 8F TO 7P | UL | 1408 | 1413 | 30 | 30 | PASS | VK | |
| P113 \ P114 | 09/24/15 | 7P TO NEOS | UL | 1415 | 1420 | 30 | 30 | PASS | VK | |
| P114 \ P115 | 09/24/15 | 7M TO NEOS | UL | 1417 | 1422 | 30 | 30 | PASS | VK | |
| P114 \ P115 | 09/24/15 | 8G TO 7M | UL | 1428 | 1433 | 30 | 30 | PASS | VK | |
| P038 \ P102 | 09/24/15 | 6I TO 6G | UL | 1450 | 1455 | 30 | 30 | PASS | VK | |
| P038 \ P101 | 09/24/15 | 6I TO 6H | UL | 1451 | 1456 | 30 | 30 | PASS | VK | |
| P101 \ P039 | 09/24/15 | 6J TO 6H | UL | 1500 | 1505 | 30 | 30 | PASS | VK | |
| P100 \ P039 | 09/24/15 | 6J TO 6X | UL | 1501 | 1506 | 30 | 30 | PASS | VK | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P100 \ P039 | 09/24/15 | 6K TO 6X | UL | 1507 | 1512 | 30 | 30 | PASS | VK | |
| P099 \ P040 | 09/24/15 | 6K TO 6M | UL | 1508 | 1513 | 30 | 30 | PASS | VK | |
| P098 \ P040 | 09/24/15 | 6Q TO 6M | UL | 1510 | 1515 | 30 | 30 | PASS | VK | |
| P098 \ P042 | 09/24/15 | 6Q TO 6N | UL | 1511 | 1516 | 30 | 30 | PASS | VK | |
| P097 \ P042 | 09/24/15 | 6P TO 6N | UL | 1517 | 1522 | 30 | 30 | PASS | VK | |
| P097 \ P043 | 09/24/15 | 6P TO 6R | UL | 1518 | 1523 | 30 | 30 | PASS | VK | |
| P096 \ P043 | 09/24/15 | 6S TO 6R | UL | 1525 | 1530 | 30 | 30 | PASS | VK | |
| P095 \ P045 | 09/24/15 | 6S TO 6T | UL | 1526 | 1531 | 30 | 30 | PASS | VK | |
| P094 \ P046 | 09/24/15 | 6T TO 6W | UL | 1532 | 1537 | 30 | 30 | PASS | VK | |
| P034 \ P106 | 09/25/15 | 7H TO 7I | UL | 0807 | 0812 | 30 | 30 | PASS | MO | |
| P034 \ P105 | 09/25/15 | 7H TO 7G | UL | 0810 | 0815 | 30 | 30 | PASS | MO | |
| P034 \ P104 | 09/25/15 | 7F TO 7G | UL | 0813 | 0818 | 30 | 30 | PASS | MO | |
| P034 \ P103 | 09/25/15 | 7F TO 7E | UL | 0820 | 0825 | 30 | 30 | PASS | MO | |
| P034 \ P102 | 09/25/15 | 7E TO 6G | UL | 0825 | 0830 | 30 | 30 | PASS | MO | |
| P094 \ P115 | 09/25/15 | 8J TO 8M | UL | 0850 | 0855 | 30 | 30 | PASS | VK | |
| P083 \ P093 | 09/25/15 | 8P TO 6B | UL | 1125 | 1130 | 30 | 30 | PASS | VK | |
| P083 \ P092 | 09/25/15 | 6B TO 6A | UL | 1127 | 1132 | 30 | 30 | PASS | VK | |
| P116 \ P117 | 09/25/15 | 8R TO 8Q | UL | 1350 | 1355 | 30 | 30 | PASS | MO | |
| P116 \ P037 | 09/25/15 | 9I TO SEOS | UL | 1359 | 1364 | 30 | 30 | PASS | MO | |
| P116 \ P034 | 09/25/15 | 8R TO 9I | UL | 1418 | 1423 | 30 | 30 | PASS | MO | |
| P116 \ P118 | 09/25/15 | 8Q TO SEOS | UL | 1425 | 1430 | 30 | 30 | PASS | MO | |
| P117 \ P118 | 09/25/15 | 8Q TO NEOS | UL | 1428 | 1433 | 30 | 30 | PASS | MO | |
| P118 \ P119 | 09/25/15 | 8A TO SEOS | UL | 1430 | 1435 | 30 | 30 | PASS | MO | |
| P121 \ P123 | 09/25/15 | 8T TO 8X | UL | 1430 | 1435 | 30 | 30 | PASS | MO | |
| P122 \ P123 | 09/25/15 | 9G TO 8T | UL | 1438 | 1443 | 30 | 30 | PASS | MO | |
| P123 \ P125 | 09/25/15 | 9S TO 9H | UL | 1441 | 1446 | 30 | 30 | PASS | MO | |
| P123 \ P124 | 09/25/15 | 8X TO 9H | UL | 1448 | 1453 | 30 | 30 | PASS | MO | |
| P119 \ P120 | 09/25/15 | 8S TO NEOS | UL | 1500 | 1505 | 30 | 30 | PASS | MO | |
| P119 \ P120 | 09/25/15 | 8S TO SEOS | UL | 1501 | 1506 | 30 | 30 | PASS | MO | |
| P121 \ P124 | 09/25/15 | 8X TO 9B | UL | 1503 | 1508 | 30 | 30 | PASS | MO | |
| P120 \ P121 | 09/25/15 | 8I TO SEOS | UL | 1510 | 1515 | 30 | 30 | PASS | MO | |
| P121 \ P122 | 09/25/15 | 8T TO SEOS | UL | 1526 | 1531 | 30 | 30 | PASS | MO | |
| P122 \ P125 | 09/25/15 | 9G TO SEOS | UL | 1528 | 1533 | 30 | 30 | PASS | MO | |
| P113 \ P124 | 09/25/15 | 8E TO 8F | UL | 1530 | 1535 | 30 | 30 | PASS | MO | |
| P112 \ P124 | 09/25/15 | 8E TO 9B | UL | 1531 | 1536 | 30 | 30 | PASS | MO | |
| P112 \ P121 | 09/25/15 | 8D TO 9B | UL | 1535 | 1540 | 30 | 30 | PASS | MO | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P111 \ P121 | 09/25/15 | 8D TO 8I | UL | 1536 | 1541 | 30 | 30 | PASS | MO | |
| P111 \ P120 | 09/25/15 | 8C TO 8I | UL | 1537 | 1542 | 30 | 30 | PASS | MO | |
| P123 \ P125 | 09/25/15 | 9H TO 8F | UL | 1538 | 1543 | 30 | 30 | PASS | MO | |
| P110 \ P120 | 09/25/15 | 8C TO 9C | UL | 1545 | 1550 | 30 | 30 | PASS | MO | |
| P110 \ P119 | 09/25/15 | 8B TO 9C | UL | 1547 | 1552 | 30 | 30 | PASS | MO | |
| P109 \ P119 | 09/25/15 | 8B TO 8A | UL | 1555 | 1560 | 30 | 30 | PASS | MO | |
| P108 \ P118 | 09/25/15 | 7X TO 8A | UL | 1605 | 1610 | 30 | 30 | PASS | MO | |
| P107 \ P118 | 09/25/15 | 7X TO 9D | UL | 1607 | 1612 | 30 | 30 | PASS | MO | |
| P107 \ P117 | 09/25/15 | 7W TO 9D | UL | 1615 | 1620 | 30 | 30 | PASS | MO | |
| P127 \ P128 | 09/25/15 | 9N TO 9P | UL | 1628 | 1633 | 30 | 30 | PASS | MO | |
| P115 \ P126 | 09/25/15 | 9E TO 9K | UL | 1628 | 1633 | 30 | 30 | PASS | MO | |
| P115 \ P125 | 09/25/15 | 9E TO 8G | UL | 1630 | 1635 | 30 | 30 | PASS | MO | |
| P114 \ P125 | 09/25/15 | 8F TO 8G | UL | 1632 | 1637 | 30 | 30 | PASS | MO | |
| P128 \ P129 | 09/25/15 | 9M TO 9Q | UL | 1636 | 1641 | 30 | 30 | PASS | MO | |
| P125 \ P126 | 09/25/15 | 9E TO SEOS | UL | 1640 | 1645 | 30 | 30 | PASS | MO | |
| P126 \ P127 | 09/25/15 | 9N TO SEOS | UL | 1645 | 1650 | 30 | 30 | PASS | MO | |
| P126 \ P128 | 09/25/15 | 9M TO 9N | UL | 1653 | 1658 | 30 | 30 | PASS | MO | |
| P126 \ P129 | 09/25/15 | 9M TO NEOS | UL | 1656 | 1661 | 30 | 30 | PASS | MO | |
| P127 \ P130 | 09/25/15 | 9P TO SEOS | UL | 1703 | 1708 | 30 | 30 | PASS | MO | |
| P128 \ P130 | 09/25/15 | 9Q TO 9P | UL | 1720 | 1725 | 30 | 30 | PASS | MO | |
| P129 \ P130 | 09/25/15 | 9Q TO NEOS | UL | 1727 | 1732 | 30 | 30 | PASS | MO | |
| P130 \ P131 | 09/25/15 | NEOS TO SEOS | UL | 1735 | 1740 | 30 | 30 | PASS | MO | |
| P131 \ P132 | 09/25/15 | NEOS TO SEOS | UL | 1740 | 1745 | 30 | 30 | PASS | MO | |
| P133 \ P135 | 09/26/15 | NEOS TO 9R | UL | 1307 | 1312 | 30 | 30 | PASS | MO | |
| P135 \ P137 | 09/26/15 | NEOS TO 9X | UL | 1310 | 1315 | 30 | 30 | PASS | MO | |
| P134 \ P135 | 09/26/15 | 9X TO 9W | UL | 1317 | 1322 | 30 | 30 | PASS | MO | |
| P133 \ P134 | 09/26/15 | 9R TO SEOS | UL | 1320 | 1325 | 30 | 30 | PASS | MO | |
| P134 \ P136 | 09/26/15 | 9X TO SEOS | UL | 1326 | 1331 | 30 | 30 | PASS | MO | |
| P137 \ P139 | 09/26/15 | SEOS TO NEOS | UL | 1327 | 1332 | 30 | 30 | PASS | MO | |
| P139 \ P148 | 09/26/15 | SEOS TO 10C | UL | 1330 | 1335 | 30 | 30 | PASS | MO | |
| P148 \ P150 | 09/26/15 | 10E TO 10D | UL | 1333 | 1338 | 30 | 30 | PASS | MO | |
| P148 \ P149 | 09/26/15 | 10C TO 10D | UL | 1336 | 1341 | 30 | 30 | PASS | MO | |
| P139 \ P149 | 09/26/15 | 10C TO NEOS | UL | 1340 | 1345 | 30 | 30 | PASS | MO | |
| P149 \ P150 | 09/26/15 | 10D TO NEOS | UL | 1342 | 1347 | 30 | 30 | PASS | MO | |
| P150 \ P152 | 09/26/15 | 10F TO NEOS | UL | 1343 | 1348 | 30 | 30 | PASS | MO | |
| P152 \ P153 | 09/26/15 | 10G TO NEOS | UL | 1344 | 1349 | 30 | 30 | PASS | MO | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P151 \ P152 | 09/26/15 | 10G TO 10F | UL | 1345 | 1350 | 30 | 30 | PASS | MO | |
| P151 \ P153 | 09/26/15 | 10G TO SEOS | UL | 1350 | 1355 | 30 | 30 | PASS | MO | |
| P150 \ P151 | 09/26/15 | 10F TO SEOS | UL | 1351 | 1356 | 30 | 30 | PASS | MO | |
| P153 \ P154 | 09/26/15 | SEOS TO NEOS | UL | 1435 | 1440 | 30 | 30 | PASS | MO | |
| P154 \ P156 | 09/26/15 | SEOS TO 10H | UL | 1437 | 1442 | 30 | 30 | PASS | MO | |
| P155 \ P156 | 09/26/15 | 10H TO 10I | UL | 1455 | 1500 | 30 | 30 | PASS | MO | |
| P156 \ P157 | 09/26/15 | 10I TO SEOS | UL | 1501 | 1506 | 30 | 30 | PASS | MO | |
| P155 \ P157 | 09/26/15 | 10I TO NEOS | UL | 1504 | 1509 | 30 | 30 | PASS | MO | |
| P157 \ P158 | 09/26/15 | SEOS TO NEOS | UL | 1507 | 1512 | 30 | 30 | PASS | MO | |
| P158 \ P159 | 09/26/15 | SEOS TO NEOS | UL | 1510 | 1515 | 30 | 30 | PASS | MO | |
| P159 \ P160 | 09/26/15 | SEOS TO NEOS | UL | 1511 | 1516 | 30 | 30 | PASS | MO | |
| P160 \ P161 | 09/26/15 | SEOS TO NEOS | UL | 1512 | 1517 | 30 | 30 | PASS | MO | |
| P161 \ P162 | 09/26/15 | SEOS TO NEOS | UL | 1515 | 1520 | 30 | 30 | PASS | MO | |
| P162 \ P163 | 09/26/15 | SEOS TO NEOS | UL | 1516 | 1521 | 30 | 30 | PASS | MO | |
| P163 \ P164 | 09/26/15 | SEOS TO NEOS | UL | 1520 | 1525 | 30 | 30 | PASS | MO | |
| P164 \ P165 | 09/26/15 | SEOS TO NEOS | UL | 1521 | 1526 | 30 | 30 | PASS | MO | |
| P136 \ P138 | 09/26/15 | 10J TO SEOS | UL | 1535 | 1540 | 30 | 30 | PASS | MO | |
| P138 \ P140 | 09/26/15 | 10K TO SEOS | UL | 1536 | 1541 | 30 | 30 | PASS | MO | |
| P141 \ P142 | 09/26/15 | NEOS TO SEOS | UL | 1537 | 1542 | 30 | 30 | PASS | MO | |
| P140 \ P141 | 09/26/15 | 10N TO SEOS | UL | 1543 | 1548 | 30 | 30 | PASS | MO | |
| P141 \ P142 | 09/26/15 | 10P TO 10T | UL | 1544 | 1549 | 30 | 30 | PASS | MO | |
| P142 \ P143 | 09/26/15 | 10Q TO SEOS | UL | 1546 | 1551 | 30 | 30 | PASS | MO | |
| P143 \ P144 | 09/26/15 | NEOS TO SEOS | UL | 1548 | 1553 | 30 | 30 | PASS | MO | |
| P144 \ P145 | 09/26/15 | NEOS TO SEOS | UL | 1550 | 1555 | 30 | 30 | PASS | MO | |
| P145 \ P146 | 09/26/15 | NEOS TO SEOS | UL | 1555 | 1600 | 30 | 30 | PASS | MO | |
| P146 \ P147 | 09/26/15 | NEOS TO SEOS | UL | 1602 | 1607 | 30 | 30 | PASS | MO | |
| P143 \ P151 | 09/28/15 | 10R TO 10Q | UL | 0905 | 0910 | 30 | 30 | PASS | MO | |
| P142 \ P150 | 09/28/15 | 10R TO 10P | UL | 0906 | 0911 | 30 | 30 | PASS | MO | |
| P141 \ P150 | 09/28/15 | 10P TO 10E | UL | 0911 | 0916 | 30 | 30 | PASS | MO | |
| P140 \ P148 | 09/28/15 | 10M TO 10N | UL | 0918 | 0923 | 30 | 30 | PASS | MO | |
| P140 \ P139 | 09/28/15 | 10M TO 10K | UL | 0920 | 0925 | 30 | 30 | PASS | MO | |
| P138 \ P139 | 09/28/15 | 10J TO 10K | UL | 0930 | 0935 | 30 | 30 | PASS | MO | |
| P136 \ P137 | 09/28/15 | 10J TO 9X | UL | 0931 | 0936 | 30 | 30 | PASS | MO | |
| P114 \ P166 | 09/28/15 | 11E TO SEOS | UL | 1320 | 1325 | 30 | 30 | PASS | MO | |
| P168 \ P169 | 09/28/15 | 11G TO 11F | UL | 1339 | 1344 | 30 | 30 | PASS | MO | |
| P115 \ P166 | 09/28/15 | 11E TO 8M | UL | 1340 | 1345 | 30 | 30 | PASS | MO | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P166 \ P094 | 09/28/15 | 8M TO SEOS | UL | 1354 | 1359 | 30 | 30 | PASS | MO | |
| P166 \ P167 | 09/28/15 | 11H TO NEOS | UL | 1357 | 1362 | 30 | 30 | PASS | MO | |
| P167 \ P169 | 09/28/15 | 11I TO 11F | UL | 1400 | 1405 | 30 | 30 | PASS | MO | |
| P169 \ P170 | 09/28/15 | 11J TO NEOS | UL | 1410 | 1415 | 30 | 30 | PASS | MO | |
| P167 \ P168 | 09/28/15 | 11F TO NEOS | UL | 1411 | 1416 | 30 | 30 | PASS | MO | |
| P168 \ P170 | 09/28/15 | 11J TO 11G | UL | 1421 | 1426 | 30 | 30 | PASS | MO | |
| P168 \ P170 | 09/28/15 | 11G TO NEOS | UL | 1421 | 1426 | 30 | 30 | PASS | MO | |
| P170 \ P171 | 09/28/15 | 11K TO NEOS | UL | 1440 | 1445 | 30 | 30 | PASS | MO | |
| P171 \ P172 | 09/28/15 | 11M TO NEOS | UL | 1446 | 1451 | 30 | 30 | PASS | MO | |
| P172 \ P173 | 09/28/15 | 11N TO SEOS | UL | 1457 | 1502 | 30 | 30 | PASS | MO | |
| P173 \ P174 | 09/28/15 | 11P TO SEOS | UL | 1515 | 1520 | 30 | 30 | PASS | MO | |
| P174 \ P175 | 09/28/15 | 11Q TO SEOS | UL | 1540 | 1545 | 30 | 30 | PASS | MO | |
| P175 \ P176 | 09/28/15 | 11R TO 13A | UL | 1545 | 1550 | 30 | 30 | PASS | MO | |
| P175 \ P176 | 09/28/15 | 13A TO SEOS | UL | 1600 | 1605 | 30 | 30 | PASS | MO | |
| P176 \ P177 | 09/28/15 | 11S TO SEOS | UL | 1606 | 1611 | 30 | 30 | PASS | MO | |
| P177 \ P178 | 09/28/15 | 11T TO SEOS | UL | 1640 | 1645 | 30 | 30 | PASS | MO | |
| P178 \ P179 | 09/28/15 | 11W TO SEOS | UL | 1641 | 1646 | 30 | 30 | PASS | MO | |
| P179 \ P180 | 09/28/15 | 11X TO SEOS | UL | 1715 | 1720 | 30 | 30 | PASS | MO | |
| P180 \ P181 | 09/28/15 | 13B TO SEOS | UL | 1716 | 1721 | 30 | 30 | PASS | MO | |
| P181 \ P182 | 09/28/15 | NEOS TO SEOS | UL | 1750 | 1755 | 30 | 30 | PASS | MO | |
| P182 \ P183 | 09/28/15 | NEOS TO SEOS | UL | 1751 | 1756 | 30 | 30 | PASS | MO | |
| P185 \ P186 | 09/29/15 | SEOS TO NEOS | UL | 0511 | 0516 | 30 | 30 | PASS | AM | |
| P186 \ P187 | 09/29/15 | SEOS TO NEOS | UL | 0525 | 0530 | 30 | 30 | PASS | AM | |
| P187 \ P188 | 09/29/15 | SEOS TO NEOS | UL | 0548 | 0553 | 30 | 30 | PASS | AM | |
| P188 \ P189 | 09/29/15 | SEOS TO NEOS | UL | 0555 | 0560 | 30 | 30 | PASS | AM | |
| P137 \ P174 | 09/29/15 | 13P TO 11Q | UL | 1040 | 1045 | 30 | 30 | PASS | MO | |
| P135 \ P174 | 09/29/15 | 11P TO 13P | UL | 1041 | 1046 | 30 | 30 | PASS | MO | |
| P135 \ P173 | 09/29/15 | 13Q TO 11P | UL | 1043 | 1048 | 30 | 30 | PASS | MO | |
| P133 \ P173 | 09/29/15 | 13Q TO 11N | UL | 1051 | 1056 | 30 | 30 | PASS | MO | |
| P133 \ P172 | 09/29/15 | 13R TO 11N | UL | 1053 | 1058 | 30 | 30 | PASS | MO | |
| P132 \ P172 | 09/29/15 | 13R TO 11M | UL | 1055 | 1060 | 30 | 30 | PASS | MO | |
| P132 \ P171 | 09/29/15 | 11M TO 13S | UL | 1057 | 1062 | 30 | 30 | PASS | MO | |
| P131 \ P171 | 09/29/15 | 11K TO 13S | UL | 1100 | 1105 | 30 | 30 | PASS | MO | |
| P131 \ P170 | 09/29/15 | 11K TO 13T | UL | 1105 | 1110 | 30 | 30 | PASS | MO | |
| P130 \ P170 | 09/29/15 | 11T TO 13T | UL | 1106 | 1111 | 30 | 30 | PASS | MO | |
| P137 \ P175 | 09/29/15 | 13N TO 11Q | UL | 1108 | 1113 | 30 | 30 | PASS | MO | |

# PRESSURE TEST SUMMARY
# LUMINANT, INC.
# LUMINANT OAK GROVE
# FDG-C POND CQA
# ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P130 \ P169 | 09/29/15 | 11T TO 13W | UL | 1112 | 1117 | 30 | 30 | PASS | MO | |
| P139 \ P175 | 09/29/15 | 13N TO 11R | UL | 1113 | 1118 | 30 | 30 | PASS | MO | |
| P139 \ P176 | 09/29/15 | 13M TO 11R | UL | 1115 | 1120 | 30 | 30 | PASS | MO | |
| P149 \ P177 | 09/29/15 | 13K TO 11S | UL | 1118 | 1123 | 30 | 30 | PASS | MO | |
| P150 \ P177 | 09/29/15 | 11T TO 13K | UL | 1120 | 1125 | 30 | 30 | PASS | MO | |
| P150 \ P178 | 09/29/15 | 11T TO 13J | UL | 1130 | 1135 | 30 | 30 | PASS | MO | |
| P152 \ P178 | 09/29/15 | 11W TO 13J | UL | 1131 | 1136 | 30 | 30 | PASS | MO | |
| P152 \ P179 | 09/29/15 | 13I TO 11W | UL | 1132 | 1137 | 30 | 30 | PASS | MO | |
| P153 \ P179 | 09/29/15 | 11X TO 13I | UL | 1135 | 1140 | 30 | 30 | PASS | MO | |
| P153 \ P180 | 09/29/15 | 13A TO 11X | UL | 1136 | 1141 | 30 | 30 | PASS | MO | |
| P154 \ P180 | 09/29/15 | 13A TO 13B | UL | 1138 | 1143 | 30 | 30 | PASS | MO | |
| P154 \ P181 | 09/29/15 | 13C TO 13B | UL | 1145 | 1150 | 30 | 30 | PASS | MO | |
| P155 \ P181 | 09/29/15 | 13C TO 13H | UL | 1146 | 1151 | 30 | 30 | PASS | MO | |
| P155 \ P182 | 09/29/15 | 13D TO 13C | UL | 1150 | 1155 | 30 | 30 | PASS | MO | |
| P157 \ P182 | 09/29/15 | 13D TO 13E | UL | 1151 | 1156 | 30 | 30 | PASS | MO | |
| P157 \ P183 | 09/29/15 | 13F TO 13E | UL | 1156 | 1161 | 30 | 30 | PASS | MO | |
| P158 \ P183 | 09/29/15 | 13F TO 13G | UL | 1157 | 1162 | 30 | 30 | PASS | MO | |
| P129 \ P169 | 09/29/15 | 11I TO 13W | UL | 1203 | 1208 | 30 | 30 | PASS | MO | |
| P129 \ P167 | 09/29/15 | 11I TO 13X | UL | 1205 | 1210 | 30 | 30 | PASS | MO | |
| P126 \ P167 | 09/29/15 | 11H TO 13X | UL | 1215 | 1220 | 30 | 30 | PASS | MO | |
| P126 \ P166 | 09/29/15 | 11H TO 9K | UL | 1216 | 1221 | 30 | 30 | PASS | MO | |
| P126 \ P125 | 09/29/15 | @ P166 9K TO 14B | UL | 1223 | 1228 | 30 | 30 | PASS | MO | |
| P183 \ P184 | 09/29/15 | SEOS TO NEOS | UL | 1450 | 1455 | 30 | 30 | PASS | AM | |
| P184 \ P185 | 09/29/15 | SEOS TO NEOS | UL | 1451 | 1456 | 30 | 30 | PASS | AM | |
| P189 \ P190 | 09/30/15 | 14F TO NEOS | UL | 0704 | 0709 | 30 | 30 | PASS | MO | |
| P190 \ P191 | 09/30/15 | 14D TO NEOS | UL | 0705 | 0710 | 30 | 30 | PASS | MO | |
| P191 \ P192 | 09/30/15 | 14S TO NEOS | UL | 0715 | 0720 | 30 | 30 | PASS | MO | |
| P192 \ P194 | 09/30/15 | SEOS TO 14S | UL | 0716 | 0721 | 30 | 30 | PASS | AM | |
| P194 \ P195 | 09/30/15 | WEOS TO EEOS | UL | 0721 | 0726 | 30 | 30 | PASS | MO | |
| P192 \ P194 | 09/30/15 | NEOS TO 14S | UL | 0730 | 0735 | 30 | 30 | PASS | AM | |
| P192 \ P193 | 09/30/15 | SEOS TO 14T | UL | 0731 | 0736 | 30 | 30 | PASS | AM | |
| P192 \ P193 | 09/30/15 | 14T TO NEOS | UL | 0735 | 0740 | 30 | 30 | PASS | AM | |
| P195 \ P196 | 09/30/15 | 15E TO NEOS | UL | 0736 | 0741 | 30 | 30 | PASS | MO | |
| P193 \ P194 | 09/30/15 | WEOS TO EEOS | UL | 0736 | 0741 | 30 | 30 | PASS | AM | |
| P165 \ P191 | 09/30/15 | 14C TO 14R | UL | 0834 | 0839 | 30 | 30 | PASS | MO | |
| P165 \ P191 | 09/30/15 | 14C TO 14D | UL | 0835 | 0840 | 30 | 30 | PASS | MO | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P165 \ P190 | 09/30/15 | 14E TO 14D | UL | 0836 | 0841 | 30 | 30 | PASS | MO | |
| P164 \ P190 | 09/30/15 | 14E TO 14F | UL | 0837 | 0842 | 30 | 30 | PASS | MO | |
| P164 \ P189 | 09/30/15 | 14G TO 14F | UL | 0839 | 0844 | 30 | 30 | PASS | MO | |
| P163 \ P189 | 09/30/15 | 14G TO 14H | UL | 0840 | 0845 | 30 | 30 | PASS | MO | |
| P163 \ P188 | 09/30/15 | 14I TO 14H | UL | 0844 | 0849 | 30 | 30 | PASS | MO | |
| P162 \ P188 | 09/30/15 | 14I TO 14J | UL | 0845 | 0850 | 30 | 30 | PASS | MO | |
| P162 \ P187 | 09/30/15 | 14K TO 14J | UL | 0848 | 0853 | 30 | 30 | PASS | MO | |
| P161 \ P187 | 09/30/15 | 14K TO 14M | UL | 0849 | 0854 | 30 | 30 | PASS | MO | |
| P161 \ P186 | 09/30/15 | 14N TO 14M | UL | 0852 | 0857 | 30 | 30 | PASS | MO | |
| P160 \ P186 | 09/30/15 | 14N TO 14P | UL | 0853 | 0858 | 30 | 30 | PASS | MO | |
| P160 \ P185 | 09/30/15 | 14P TO 14Q | UL | 0900 | 0905 | 30 | 30 | PASS | MO | |
| P194 \ P198 | 09/30/15 | 15B TO 15A | UL | 0908 | 0913 | 30 | 30 | PASS | MO | |
| P195 \ P198 | 09/30/15 | 15B TO 15C | UL | 0909 | 0914 | 30 | 30 | PASS | MO | |
| P199 \ P198 | 09/30/15 | SEOS TO NEOS | UL | 0911 | 0916 | 30 | 30 | PASS | AM | |
| P195 \ P199 | 09/30/15 | 15C TO 15E | UL | 0914 | 0919 | 30 | 30 | PASS | MO | |
| P196 \ P199 | 09/30/15 | 15E TO NEOS | UL | 0920 | 0925 | 30 | 30 | PASS | MO | |
| P197 \ P195 | 09/30/15 | WEOS TO EEOS | UL | 0920 | 0925 | 30 | 30 | PASS | AM | |
| P197 \ P089 | 09/30/15 | SWEOS TO NEEOS | UL | 0921 | 0926 | 30 | 30 | PASS | AM | |
| P193 \ P089 | 09/30/15 | WEOS TO EEOS | UL | 0926 | 0931 | 30 | 30 | PASS | AM | |
| P193 \ P088 | 09/30/15 | EEOS TO WEOS | UL | 0927 | 0932 | 30 | 30 | PASS | AM | |
| P192 \ P088 | 09/30/15 | WEOS TO EEOS | UL | 0930 | 0935 | 30 | 30 | PASS | AM | |
| P192 \ P087 | 09/30/15 | WEOS TO EEOS | UL | 0931 | 0936 | 30 | 30 | PASS | AM | |
| P191 \ P087 | 09/30/15 | DEFECT TO EEOS | UL | 0937 | 0942 | 30 | 30 | PASS | AM | |
| P191 \ P087 | 09/30/15 | DEFECT TO WEOS | UL | 0938 | 0943 | 30 | 30 | PASS | AM | |
| P191 \ P086 | 09/30/15 | EEOS TO WEOS | UL | 0941 | 0946 | 30 | 30 | PASS | AM | |
| P190 \ P086 | 09/30/15 | EEOS TO WEOS | UL | 0942 | 0947 | 30 | 30 | PASS | AM | |
| P189 \ P085 | 09/30/15 | EEOS TO WEOS | UL | 0943 | 0948 | 30 | 30 | PASS | AM | |
| P190 \ P085 | 09/30/15 | WEOS TO EEOS | UL | 0945 | 0950 | 30 | 30 | PASS | AM | |
| P189 \ 8H | 09/30/15 | EEOS TO WEOS | UL | 0956 | 0961 | 30 | 30 | PASS | AM | |
| P198 \ P200 | 09/30/15 | SEOS TO NEOS | UL | 1002 | 1007 | 30 | 30 | PASS | AM | |
| P200 \ P201 | 09/30/15 | SEOS TO NEOS | UL | 1003 | 1008 | 30 | 30 | PASS | AM | |
| P201 \ P202 | 09/30/15 | SEOS TO NEOS | UL | 1008 | 1013 | 30 | 30 | PASS | AM | |
| P202 \ P203 | 09/30/15 | SEOS TO NEOS | UL | 1009 | 1014 | 30 | 30 | PASS | AM | |
| P203 \ P204 | 09/30/15 | SEOS TO NEOS | UL | 1018 | 1023 | 30 | 30 | PASS | AM | |
| P204 \ P205 | 09/30/15 | SEOS TO NEOS | UL | 1019 | 1024 | 30 | 30 | PASS | AM | |
| P205 \ P206 | 09/30/15 | SEOS TO NEOS | UL | 1025 | 1030 | 30 | 30 | PASS | AM | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P206 \ P207 | 09/30/15 | SEOS TO NEOS | UL | 1030 | 1035 | 30 | 30 | PASS | AM | |
| P207 \ P208 | 09/30/15 | SEOS TO NEOS | UL | 1045 | 1050 | 30 | 30 | PASS | AM | |
| P208 \ P209 | 09/30/15 | SEOS TO NEOS | UL | 1047 | 1052 | 30 | 30 | PASS | AM | |
| P209 \ P210 | 09/30/15 | SEOS TO NEOS | UL | 1055 | 1060 | 30 | 30 | PASS | AM | |
| P210 \ P211 | 09/30/15 | SEOS TO NEOS | UL | 1105 | 1110 | 30 | 30 | PASS | AM | |
| P211 \ P212 | 09/30/15 | SEOS TO NEOS | UL | 1107 | 1112 | 30 | 30 | PASS | AM | |
| P212 \ P213 | 09/30/15 | SEOS TO NEOS | UL | 1115 | 1120 | 30 | 30 | PASS | AM | |
| P213 \ P214 | 09/30/15 | SEOS TO NEOS | UL | 1125 | 1130 | 30 | 30 | PASS | AM | |
| P214 \ P215 | 09/30/15 | SEOS TO NEOS | UL | 1127 | 1132 | 30 | 30 | PASS | AM | |
| P215 \ P216 | 09/30/15 | SEOS TO NEOS | UL | 1132 | 1137 | 30 | 30 | PASS | AM | |
| P216 \ P217 | 09/30/15 | SEOS TO NEOS | UL | 1145 | 1150 | 30 | 30 | PASS | AM | |
| P217 \ P218 | 09/30/15 | 15I TO NEOS | UL | 1303 | 1308 | 30 | 30 | PASS | MO | |
| P218 \ P219 | 09/30/15 | 15H TO 15F | UL | 1305 | 1310 | 30 | 30 | PASS | MO | |
| P218 \ P219 | 09/30/15 | 15F TO NEOS | UL | 1310 | 1315 | 30 | 30 | PASS | MO | |
| P219 \ P220 | 09/30/15 | WEOS TO EEOS | UL | 1340 | 1345 | 30 | 30 | PASS | AM | |
| P220 \ P221 | 09/30/15 | WEOS TO 16M | UL | 1342 | 1347 | 30 | 30 | PASS | AM | |
| P220 \ P221 | 09/30/15 | 16M TO EEOS | UL | 1347 | 1352 | 30 | 30 | PASS | AM | |
| P221 \ P222 | 09/30/15 | WEOS TO EEOS | UL | 1350 | 1355 | 30 | 30 | PASS | AM | |
| P219 \ P223 | 09/30/15 | EOS TO 15H | UL | 1601 | 1606 | 30 | 30 | PASS | MO | |
| P218 \ P223 | 09/30/15 | 15I TO 15H | UL | 1608 | 1613 | 30 | 30 | PASS | MO | |
| P217 \ P223 | 09/30/15 | 15I TO 15J | UL | 1610 | 1615 | 30 | 30 | PASS | MO | |
| P216 \ P223 | 09/30/15 | 15K TO 15J | UL | 1610 | 1615 | 30 | 30 | PASS | MO | |
| P215 \ P223 | 09/30/15 | 15K TO 15M | UL | 1611 | 1616 | 30 | 30 | PASS | MO | |
| P214 \ P223 | 09/30/15 | 15N TO 15M | UL | 1617 | 1622 | 30 | 30 | PASS | MO | |
| P213 \ P223 | 09/30/15 | 15N TO 15P | UL | 1618 | 1623 | 30 | 30 | PASS | MO | |
| P212 \ P223 | 09/30/15 | 15Q TO 15P | UL | 1630 | 1635 | 30 | 30 | PASS | MO | |
| P211 \ P223 | 09/30/15 | 15Q TO 15R | UL | 1631 | 1636 | 30 | 30 | PASS | MO | |
| P210 \ P223 | 09/30/15 | 15S TO 15R | UL | 1634 | 1639 | 30 | 30 | PASS | MO | |
| P209 \ P223 | 09/30/15 | 15S TO 15T | UL | 1635 | 1640 | 30 | 30 | PASS | MO | |
| P208 \ P223 | 09/30/15 | 15W TO 15T | UL | 1637 | 1642 | 30 | 30 | PASS | MO | |
| P207 \ P223 | 09/30/15 | 15W TO 15X | UL | 1638 | 1643 | 30 | 30 | PASS | MO | |
| P208 \ P223 | 09/30/15 | 17A TO 15X | UL | 1640 | 1645 | 30 | 30 | PASS | MO | |
| P205 \ P223 | 09/30/15 | 17A TO 17B | UL | 1641 | 1646 | 30 | 30 | PASS | MO | |
| P204 \ P223 | 09/30/15 | 17C TO 17B | UL | 1645 | 1650 | 30 | 30 | PASS | MO | |
| P203 \ P223 | 09/30/15 | 17C TO 17D | UL | 1646 | 1651 | 30 | 30 | PASS | MO | |
| P202 \ P223 | 09/30/15 | 17E TO 17D | UL | 1650 | 1655 | 30 | 30 | PASS | MO | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P201 \ P223 | 09/30/15 | 17E TO 17F | UL | 1651 | 1656 | 30 | 30 | PASS | MO | |
| P200 \ P223 | 09/30/15 | 17F TO 15A | UL | 1700 | 1705 | 30 | 30 | PASS | MO | |
| P223 \ P225 | 09/30/15 | SEON TO NEOS | UL | 1600 | 1605 | 30 | 30 | PASS | AM | |
| P233 \ P243 | 10/01/15 | 21J TO 21K | UL | 0605 | 0610 | 30 | 30 | PASS | MO | |
| P223 \ P224 | 10/01/15 | NEOS TO 17Q | UL | 0705 | 0710 | 30 | 30 | PASS | MO | |
| P224 \ P228 | 10/01/15 | NEOS TO SEOS | UL | 0706 | 0711 | 30 | 30 | PASS | MO | |
| P223 \ P224 | 10/01/15 | 17Q TO NEOS | UL | 0718 | 0723 | 30 | 30 | PASS | MO | |
| P228 \ P229 | 10/01/15 | NEOS TO SEOS | UL | 0720 | 0725 | 30 | 30 | PASS | MO | |
| P225 \ P226 | 10/01/15 | 17K TO NEOS | UL | 0726 | 0731 | 30 | 30 | PASS | MO | |
| P227 \ P226 | 10/01/15 | 17N TO NEOS | UL | 0726 | 0731 | 30 | 30 | PASS | MO | |
| P222 \ P227 | 10/01/15 | 17P TO NEOS | UL | 0731 | 0736 | 30 | 30 | PASS | MO | |
| P221 \ P227 | 10/01/15 | 17P TO 17P | UL | 0732 | 0737 | 30 | 30 | PASS | MO | |
| P221 \ P226 | 10/01/15 | 17M TO 17N | UL | 0736 | 0741 | 30 | 30 | PASS | MO | |
| P220 \ P226 | 10/01/15 | 17M TO 17K | UL | 0737 | 0742 | 30 | 30 | PASS | MO | |
| P220 \ P225 | 10/01/15 | 17J TO 17K | UL | 0740 | 0745 | 30 | 30 | PASS | MO | |
| P219 \ P225 | 10/01/15 | 17J TO 15G | UL | 0741 | 0746 | 30 | 30 | PASS | MO | |
| P047 \ P166 | 10/01/15 | 6W TO 17S | UL | 0830 | 0835 | 30 | 30 | PASS | MO | |
| P047 \ P167 | 10/01/15 | 17S TO 17T | UL | 0831 | 0836 | 30 | 30 | PASS | MO | |
| P048 \ P167 | 10/01/15 | 17W TO 17T | UL | 0837 | 0842 | 30 | 30 | PASS | MO | |
| P048 \ P168 | 10/01/15 | 17W TO 17X | UL | 0838 | 0843 | 30 | 30 | PASS | MO | |
| P050 \ P168 | 10/01/15 | 18A TO 17X | UL | 0845 | 0850 | 30 | 30 | PASS | MO | |
| P050 \ P170 | 10/01/15 | 18A TO 18B | UL | 0846 | 0851 | 30 | 30 | PASS | MO | |
| P051 \ P170 | 10/01/15 | 18B TO 18C | UL | 0855 | 0860 | 30 | 30 | PASS | MO | |
| P051 \ P171 | 10/01/15 | 18C TO 18D | UL | 0856 | 0861 | 30 | 30 | PASS | MO | |
| P053 \ P171 | 10/01/15 | 18D TO 18E | UL | 0905 | 0910 | 30 | 30 | PASS | MO | |
| P053 \ P172 | 10/01/15 | 18E TO 18F | UL | 0906 | 0911 | 30 | 30 | PASS | MO | |
| P054 \ P172 | 10/01/15 | 18G TO 18F | UL | 0913 | 0918 | 30 | 30 | PASS | MO | |
| P054 \ P172 | 10/01/15 | 18G TO 18H | UL | 0914 | 0919 | 30 | 30 | PASS | MO | |
| P054 \ P173 | 10/01/15 | 18I TO 18H | UL | 0921 | 0926 | 30 | 30 | PASS | MO | |
| P055 \ P173 | 10/01/15 | 18I TO 18J | UL | 0922 | 0927 | 30 | 30 | PASS | MO | |
| P055 \ P174 | 10/01/15 | 18K TO 18J | UL | 0930 | 0935 | 30 | 30 | PASS | MO | |
| P056 \ P174 | 10/01/15 | 18K TO 18M | UL | 0931 | 0936 | 30 | 30 | PASS | MO | |
| P056 \ P175 | 10/01/15 | 18N TO 18M | UL | 0938 | 0943 | 30 | 30 | PASS | MO | |
| P058 \ P175 | 10/01/15 | 18N TO 18P | UL | 0939 | 0944 | 30 | 30 | PASS | MO | |
| P058 \ P176 | 10/01/15 | 18Q TO 18P | UL | 0945 | 0950 | 30 | 30 | PASS | MO | |
| P060 \ P176 | 10/01/15 | 18Q TO 18R | UL | 0946 | 0951 | 30 | 30 | PASS | MO | |

# PRESSURE TEST SUMMARY
# LUMINANT, INC.
# LUMINANT OAK GROVE
# FDG-C POND CQA
# ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P060 \ P177 | 10/01/15 | 18S TO 18R | UL | 0953 | 0958 | 30 | 30 | PASS | MO | |
| P061 \ P177 | 10/01/15 | 18T TO 18X | UL | 0954 | 0959 | 30 | 30 | PASS | MO | |
| P061 \ P178 | 10/01/15 | 19A TO 18X | UL | 1001 | 1006 | 30 | 30 | PASS | MO | |
| P062 \ P178 | 10/01/15 | 19A TO 19B | UL | 1002 | 1007 | 30 | 30 | PASS | MO | |
| P062 \ P179 | 10/01/15 | 19C TO 19B | UL | 1010 | 1015 | 30 | 30 | PASS | MO | |
| P063 \ P179 | 10/01/15 | 19C TO 19D | UL | 1011 | 1016 | 30 | 30 | PASS | MO | |
| P063 \ P180 | 10/01/15 | 19E TO 19D | UL | 1015 | 1020 | 30 | 30 | PASS | MO | |
| P064 \ P180 | 10/01/15 | 19E TO 19F | UL | 1016 | 1021 | 30 | 30 | PASS | MO | |
| P064 \ P181 | 10/01/15 | 19G TO 19E | UL | 1023 | 1028 | 30 | 30 | PASS | MO | |
| P066 \ P181 | 10/01/15 | 19G TO 19H | UL | 1024 | 1029 | 30 | 30 | PASS | MO | |
| P066 \ P182 | 10/01/15 | 19I TO 19H | UL | 1031 | 1036 | 30 | 30 | PASS | MO | |
| P073 \ P182 | 10/01/15 | 19I TO 19J | UL | 1032 | 1037 | 30 | 30 | PASS | MO | |
| P073 \ P183 | 10/01/15 | 19K TO 19J | UL | 1040 | 1045 | 30 | 30 | PASS | MO | |
| P074 \ P183 | 10/01/15 | 19K TO 19M | UL | 1041 | 1046 | 30 | 30 | PASS | MO | |
| P229 \ P230 | 10/01/15 | NEOS TO SEOS | UL | 1105 | 1110 | 30 | 30 | PASS | MO | |
| P230 \ P231 | 10/01/15 | NEOS TO SEOS | UL | 1110 | 1115 | 30 | 30 | PASS | MO | |
| P231 \ P232 | 10/01/15 | NEOS TO SEOS | UL | 1130 | 1135 | 30 | 30 | PASS | MO | |
| P232 \ P233 | 10/01/15 | NEOS TO SEOS | UL | 1305 | 1310 | 30 | 30 | PASS | MO | |
| P233 \ P234 | 10/01/15 | NEOS TO SEOS | UL | 1308 | 1313 | 30 | 30 | PASS | MO | |
| P234 \ P235 | 10/01/15 | NEOS TO SEOS | UL | 1440 | 1445 | 30 | 30 | PASS | MO | |
| P235 \ P236 | 10/01/15 | NEOS TO SEOS | UL | 1500 | 1505 | 30 | 30 | PASS | MO | |
| P236 \ P237 | 10/01/15 | NEOS TO SEOS | UL | 1525 | 1530 | 30 | 30 | PASS | MO | |
| P238 \ P239 | 10/01/15 | 10A TO NEOS | UL | 1526 | 1531 | 30 | 30 | PASS | MO | |
| P240 \ P241 | 10/01/15 | NEOS TO SEOS | UL | 1557 | 1562 | 30 | 30 | PASS | AM | |
| P237 \ P238 | 10/01/15 | NEOS TO SEOS | UL | 1605 | 1610 | 30 | 30 | PASS | MO | |
| P238 \ P239 | 10/01/15 | 21B TO SEOS | UL | 1658 | 1663 | 30 | 30 | PASS | MO | |
| P238 \ P239 | 10/01/15 | 21A TO 21B | UL | 1704 | 1709 | 30 | 30 | PASS | MO | |
| P239 \ P240 | 10/01/15 | NEOS TO SEOS | UL | 1710 | 1715 | 30 | 30 | PASS | MO | |
| P240 \ P243 | 10/01/15 | 21D TO 21C | UL | 1725 | 1730 | 30 | 30 | PASS | MO | |
| P239 \ P243 | 10/01/15 | 21D TO 21E | UL | 1727 | 1732 | 30 | 30 | PASS | MO | |
| P238 \ P243 | 10/01/15 | 21F TO 21E | UL | 1732 | 1737 | 30 | 30 | PASS | MO | |
| P237 \ P243 | 10/01/15 | 21F TO 21G | UL | 1738 | 1743 | 30 | 30 | PASS | MO | |
| P236 \ P243 | 10/01/15 | 21H TO 21G | UL | 1743 | 1748 | 30 | 30 | PASS | MO | |
| P235 \ P243 | 10/01/15 | 21H TO 21I | UL | 1747 | 1752 | 30 | 30 | PASS | MO | |
| P234 \ P243 | 10/01/15 | 21J TO 21I | UL | 1752 | 1757 | 30 | 30 | PASS | MO | |
| P233 \ P242 | 10/02/15 | 21M TO 21K | UL | 0710 | 0715 | 30 | 30 | PASS | MO | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P232 \ P242 | 10/02/15 | 21M TO 21N | UL | 0711 | 0716 | 30 | 30 | PASS | MO | |
| P231 \ P242 | 10/02/15 | 21P TO 21N | UL | 0712 | 0717 | 30 | 30 | PASS | MO | |
| P230 \ P242 | 10/02/15 | 21P TO 21Q | UL | 0716 | 0721 | 30 | 30 | PASS | MO | |
| P229 \ P242 | 10/02/15 | 21R TO 21Q | UL | 0725 | 0730 | 30 | 30 | PASS | MO | |
| P228 \ P242 | 10/02/15 | 21R TO 21S | UL | 0726 | 0731 | 30 | 30 | PASS | MO | |
| P224 \ P242 | 10/02/15 | 21T TO 21S | UL | 0735 | 0740 | 30 | 30 | PASS | MO | |
| P223 \ P242 | 10/02/15 | 21T TO 21W | UL | 0736 | 0741 | 30 | 30 | PASS | MO | |
| P144 \ P244 | 10/02/15 | SEOS TO NEOS | UL | 0810 | 0815 | 30 | 30 | PASS | AM | |
| P145 \ P244 | 10/02/15 | NEOS TO SEOS | UL | 0814 | 0819 | 30 | 30 | PASS | AM | |
| P147 \ P245 | 10/02/15 | NEOS TO SEOS | UL | 0824 | 0829 | 30 | 30 | PASS | AM | |
| P146 \ P244 | 10/02/15 | SEOS TO NEOS | UL | 0825 | 0830 | 30 | 30 | PASS | AM | |
| P243 \ P154 | 10/02/15 | EEOS TO WEOS | UL | 0826 | 0831 | 30 | 30 | PASS | AM | |
| P243 \ P156 | 10/02/15 | WEOS TO EEOS | UL | 0827 | 0832 | 30 | 30 | PASS | AM | |
| P243 \ P157 | 10/02/15 | EEOS TO WEOS | UL | 0833 | 0838 | 30 | 30 | PASS | AM | |
| P243 \ P158 | 10/02/15 | WEOS TO EEOS | UL | 0840 | 0845 | 30 | 30 | PASS | AM | |
| P243 \ P159 | 10/02/15 | EEOS TO WEOS | UL | 0846 | 0851 | 30 | 30 | PASS | AM | |
| P243 \ P160 | 10/02/15 | WEOS TO EEOS | UL | 0853 | 0858 | 30 | 30 | PASS | AM | |
| P243 \ P161 | 10/02/15 | EEOS TO WEOS | UL | 0855 | 0860 | 30 | 30 | PASS | AM | |
| P242 \ P161 | 10/02/15 | WEOS TO EEOS | UL | 0900 | 0905 | 30 | 30 | PASS | AM | |
| P242 \ P162 | 10/02/15 | EEOS TO WEOS | UL | 0906 | 0911 | 30 | 30 | PASS | AM | |
| P242 \ P163 | 10/02/15 | WEOS TO EEOS | UL | 0912 | 0917 | 30 | 30 | PASS | AM | |
| P242 \ P164 | 10/02/15 | EEOS TO WEOS | UL | 0919 | 0924 | 30 | 30 | PASS | AM | |
| P242 \ P165 | 10/02/15 | WEOS TO EEOS | UL | 0926 | 0931 | 30 | 30 | PASS | AM | |
| P242 \ P191 | 10/02/15 | EEOS TO WEOS | UL | 0932 | 0937 | 30 | 30 | PASS | AM | |
| P184 \ P074 | 10/02/15 | SEOS TO NEOS | UL | 0936 | 0941 | 30 | 30 | PASS | AM | |
| P242 \ P192 | 10/02/15 | WEOS TO EEOS | UL | 0940 | 0945 | 30 | 30 | PASS | AM | |
| P184 \ P079 | 10/02/15 | NEOS TO SEOS | UL | 0940 | 0945 | 30 | 30 | PASS | AM | |
| P185 \ P079 | 10/02/15 | SEOS TO NEOS | UL | 0942 | 0947 | 30 | 30 | PASS | AM | |
| P185 \ P090 | 10/02/15 | NEOS TO SEOS | UL | 0945 | 0950 | 30 | 30 | PASS | AM | |
| P186 \ P090 | 10/02/15 | SEOS TO NEOS | UL | 0946 | 0951 | 30 | 30 | PASS | AM | |
| P186 \ P091 | 10/02/15 | NEOS TO SEOS | UL | 0953 | 0958 | 30 | 30 | PASS | AM | |
| P187 \ P091 | 10/02/15 | SEOS TO NEOS | UL | 0953 | 0958 | 30 | 30 | PASS | AM | |
| P188 \ P092 | 10/02/15 | SEOS TO NEOS | UL | 1000 | 1005 | 30 | 30 | PASS | AM | |
| P188 \ P093 | 10/02/15 | NEOS TO SEOS | UL | 1001 | 1006 | 30 | 30 | PASS | AM | |
| P188 \ P084 | 10/02/15 | SEOS TO NEOS | UL | 1006 | 1011 | 30 | 30 | PASS | AM | |
| P244 \ P151 | 10/02/15 | WEOS TO EEOS | UL | 1010 | 1015 | 30 | 30 | PASS | AM | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P244 \ P153 | 10/02/15 | WEOS TO EEOS | UL | 1011 | 1016 | 30 | 30 | PASS | AM | |
| P244 \ P247 | 10/02/15 | NEOS TO SEOS | UL | 1013 | 1018 | 30 | 30 | PASS | AM | |
| P247 \ P153 | 10/02/15 | WEOS TO EEOS | UL | 1015 | 1020 | 30 | 30 | PASS | AM | |
| P247 \ P154 | 10/02/15 | EEOS TO WEOS | UL | 1022 | 1027 | 30 | 30 | PASS | AM | |
| P243 \ P247 | 10/02/15 | NEOS TO SEOS | UL | 1025 | 1030 | 30 | 30 | PASS | AM | |
| P247 \ P241 | 10/02/15 | EEOS TO WEOS | UL | 1031 | 1036 | 30 | 30 | PASS | AM | |
| P247 \ P240 | 10/02/15 | EEOS TO WEOS | UL | 1032 | 1037 | 30 | 30 | PASS | AM | |
| P244 \ P241 | 10/02/15 | NEOS TO SEOS | UL | 1720 | 1725 | 30 | 30 | PASS | AM | |
| P242 \ P243 | 10/02/15 | NEOS TO SEOS | UL | 1736 | 1741 | 30 | 30 | PASS | AM | |
| P244 \ P245 | 10/02/15 | WEOS TO EEOS | UL | 1742 | 1747 | 30 | 30 | PASS | AM | |
| P245 \ P246 | 10/02/15 | WEOS TO EEOS | UL | 1750 | 1755 | 30 | 30 | PASS | AM | |
| P245 \ P241 | 10/02/15 | NEOS TO SEOS | UL | 1759 | 1764 | 30 | 30 | PASS | AM | |
| P246 \ P241 | 10/02/15 | SEOS TO NEOS | UL | 1909 | 1914 | 30 | 30 | PASS | AM | |
| P187 \ P092 | 10/02/15 | NEOS TO SEOS | UL | 0955 | 1000 | 30 | 30 | PASS | AM | |
| P147 \ P248 | 10/02/15 | EEOS TO WEOS | UL | 1500 | 1505 | 30 | 30 | PASS | AM | |
| P250 \ P251 | 10/02/15 | EEOS TO WEOS | UL | 1510 | 1515 | 30 | 30 | PASS | AM | |
| P252 \ P253 | 10/02/15 | EEOS TO WEOS | UL | 1520 | 1525 | 30 | 30 | PASS | AM | |
| P254 \ P255 | 10/02/15 | EEOS TO WEOS | UL | 1528 | 1533 | 30 | 30 | PASS | AM | |
| P255 \ P256 | 10/02/15 | EEOS TO WEOS | UL | 1530 | 1535 | 30 | 30 | PASS | AM | |
| P258 \ P259 | 10/02/15 | EEOS TO WEOS | UL | 1541 | 1546 | 30 | 30 | PASS | AM | |
| P257 \ P259 | 10/02/15 | EEOS TO WEOS | UL | 1533 | 1538 | 30 | 30 | PASS | AM | |
| P260 \ P261 | 10/02/15 | EEOS TO WEOS | UL | 1601 | 1606 | 30 | 30 | PASS | AM | |
| P262 \ P264 | 10/02/15 | EEOS TO WEOS | UL | 1615 | 1620 | 30 | 30 | PASS | AM | |
| P263 \ P264 | 10/02/15 | EEOS TO WEOS | UL | 1610 | 1615 | 30 | 30 | PASS | AM | |
| P245 \ P248 | 10/03/15 | 23M TO 23K | UL | 0830 | 0835 | 30 | 30 | PASS | MO | |
| P245 \ P249 | 10/03/15 | 23M TO 23N | UL | 0831 | 0836 | 30 | 30 | PASS | MO | |
| P245 \ P250 | 10/03/15 | 23P TO 23N | UL | 0834 | 0839 | 30 | 30 | PASS | MO | |
| P246 \ P250 | 10/03/15 | 23P TO 23Q | UL | 0836 | 0841 | 30 | 30 | PASS | MO | |
| P246 \ P251 | 10/03/15 | 23R TO 23Q | UL | 0840 | 0845 | 30 | 30 | PASS | MO | |
| P246 \ P252 | 10/03/15 | 23R TO 23S | UL | 0841 | 0846 | 30 | 30 | PASS | MO | |
| P246 \ P253 | 10/03/15 | 23T TO 23S | UL | 0845 | 0850 | 30 | 30 | PASS | MO | |
| P241 \ P253 | 10/03/15 | 23T TO 23W | UL | 0846 | 0851 | 30 | 30 | PASS | MO | |
| P241 \ P254 | 10/03/15 | 23X TO 23W | UL | 0857 | 0862 | 30 | 30 | PASS | MO | |
| P241 \ P255 | 10/03/15 | 23X TO 24A | UL | 0858 | 0863 | 30 | 30 | PASS | MO | |
| P241 \ P256 | 10/03/15 | 24B TO 24A | UL | 0908 | 0913 | 30 | 30 | PASS | MO | |
| P241 \ P257 | 10/03/15 | 24B TO 24C | UL | 0909 | 0914 | 30 | 30 | PASS | MO | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P241 \ P259 | 10/03/15 | 24D TO 24C | UL | 0915 | 0920 | 30 | 30 | PASS | MO | |
| P241 \ P260 | 10/03/15 | 24D TO 24E | UL | 0916 | 0921 | 30 | 30 | PASS | MO | |
| P241 \ P261 | 10/03/15 | 24F TO 24E | UL | 1103 | 1108 | 30 | 30 | PASS | MO | |
| P241 \ P263 | 10/03/15 | 24F TO 24G | UL | 1104 | 1109 | 30 | 30 | PASS | MO | |
| P241 \ P264 | 10/03/15 | 24H TO 24G | UL | 1115 | 1120 | 30 | 30 | PASS | MO | |
| P241 \ P265 | 10/03/15 | 24H TO 24I | UL | 1116 | 1121 | 30 | 30 | PASS | MO | |
| P264 \ P265 | 10/03/15 | 24H TO WEOS | UL | 1121 | 1126 | 30 | 30 | PASS | MO | |
| P265 \ P266 | 10/03/15 | 24I TO WEOS | UL | 1122 | 1127 | 30 | 30 | PASS | MO | |
| P241 \ P268 | 10/03/15 | 24I TO SEOS | UL | 1300 | 1305 | 30 | 30 | PASS | MO | |
| P268 \ P269 | 10/03/15 | 24J TO SEOS | UL | 1306 | 1311 | 30 | 30 | PASS | MO | |
| P266 \ P268 | 10/03/15 | 24J TO 24I | UL | 1309 | 1314 | 30 | 30 | PASS | MO | |
| P266 \ P269 | 10/03/15 | 24J TO 24K | UL | 1310 | 1315 | 30 | 30 | PASS | MO | |
| P267 \ P269 | 10/03/15 | 24M TO 24K | UL | 1320 | 1325 | 30 | 30 | PASS | MO | |
| P269 \ P270 | 10/03/15 | NEOS TO SEOS | UL | 1330 | 1335 | 30 | 30 | PASS | MO | |
| P267 \ P270 | 10/03/15 | 24M TO 24N | UL | 1322 | 1327 | 30 | 30 | PASS | MO | |
| P270 \ P271 | 10/03/15 | 24N TO SEOS | UL | 1340 | 1345 | 30 | 30 | PASS | MO | |
| P267 \ P271 | 10/03/15 | 24N TO SEOS | UL | 1345 | 1350 | 30 | 30 | PASS | MO | |
| P249 \ P248 | 10/02/15 | EEOS TO WEOS | UL | 1501 | 1506 | 30 | 30 | PASS | AM | |
| P250 \ P249 | 10/02/15 | WEOS TO EEOS | UL | 1508 | 1513 | 30 | 30 | PASS | AM | |
| P252 \ P251 | 10/02/15 | EEOS TO WEOS | UL | 1518 | 1523 | 30 | 30 | PASS | AM | |
| P254 \ P253 | 10/02/15 | EEOS TO WEOS | UL | 1526 | 1531 | 30 | 30 | PASS | AM | |
| P257 \ P258 | 10/02/15 | EEOS TO WEOS | UL | 1537 | 1542 | 30 | 30 | PASS | AM | |
| P256 \ P258 | 10/02/15 | EEOS TO WEOS | UL | 1540 | 1545 | 30 | 30 | PASS | AM | |
| P256 \ P257 | 10/02/15 | EEOS TO WEOS | UL | 1531 | 1536 | 30 | 30 | PASS | AM | |
| P259 \ P260 | 10/02/15 | EEOS TO WEOS | UL | 1600 | 1605 | 30 | 30 | PASS | AM | |
| P262 \ P263 | 10/02/15 | NEOS TO SEOS | UL | 1611 | 1616 | 30 | 30 | PASS | AM | |
| P261 \ P262 | 10/02/15 | EEOS TO WEOS | UL | 1612 | 1617 | 30 | 30 | PASS | AM | |
| P261 \ P263 | 10/02/15 | EEOS TO WEOS | UL | 1608 | 1613 | 30 | 30 | PASS | AM | |
| P264 \ P265 | 10/03/15 | EEOS TO WEOS | UL | 1121 | 1126 | 30 | 30 | PASS | MO | |
| P266 \ P267 | 10/03/15 | EEOS TO WEOS | UL | 1130 | 1135 | 30 | 30 | PASS | MO | |
| P034 \ P117 | 09/25/15 | NEOS TO SEOS | UL | 1424 | 1429 | 30 | 30 | PASS | MO | |
| P124 \ P125 | 09/25/15 | EEOS TO WEOS | UL | 1538 | 1543 | 30 | 30 | PASS | MO | |
| P132 \ P133 | 09/25/15 | EEOS TO WEOS | UL | 1305 | 1310 | 30 | 30 | PASS | MO | |
| P162 \ P163 | 09/25/15 | EEOS TO WEOS | UL | 1516 | 1521 | 30 | 30 | PASS | MO | |
| P001 \ P002 | 09/22/15 | NEOS TO SEOS | UL | 0811 | 0816 | 30 | 30 | PASS | MO | |
| P031 \ P030 | 09/22/15 | EEOS TO WEOS | UL | 0805 | 0810 | 30 | 30 | PASS | MO | |

# PRESSURE TEST SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| SEAM NUMBER | DATE | LOCATION | TECH | TIME | | PRESSURE | | PASS/ FAIL | MON | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | FINISH | START | FINISH | | | |
| P027 \ P001 | 09/22/15 | NEOS TO SEOS | UL | 0810 | 0815 | 30 | 30 | PASS | MO | |
| P022 \ P023 | 09/22/15 | NEOS TO SEOS | UL | 0923 | 0928 | 30 | 30 | PASS | MO | |
| P029 \ P032 | 09/22/15 | EEOS TO WEOS | UL | 1048 | 1053 | 30 | 30 | PASS | MO | |
| P033 \ P034 | 09/22/15 | EEOS TO WEOS | UL | 1101 | 1106 | 30 | 30 | PASS | MO | |
| P034 \ P038 | 09/22/15 | EEOS TO WEOS | UL | 1120 | 1125 | 30 | 30 | PASS | MO | |
| P167 \ P169 | 09/28/15 | SEOS TO NEOS | UL | 1400 | 1405 | 30 | 30 | PASS | MO | |
| P168 \ P167 | 09/28/15 | SEOS TO NEOS | UL | 1411 | 1416 | 30 | 30 | PASS | MO | |
| P171 \ P172 | 09/28/15 | SEOS TO NEOS | UL | 1430 | 1435 | 30 | 30 | PASS | MO | |
| P173 \ P174 | 09/28/15 | SEOS TO NEOS | UL | 1515 | 1520 | 30 | 30 | PASS | MO | |
| P176 \ P177 | 09/28/15 | SEOS TO NEOS | UL | 1606 | 1611 | 30 | 30 | PASS | MO | |
| P178 \ P179 | 09/28/15 | SEOS TO NEOS | UL | 1641 | 1646 | 30 | 30 | PASS | MO | |
| P179 \ P180 | 09/28/15 | SEOS TO NEOS | UL | 1715 | 1720 | 30 | 30 | PASS | MO | |
| P181 \ P182 | 09/28/15 | SEOS TO NEOS | UL | 1750 | 1755 | 30 | 30 | PASS | MO | |
| P166 \ P167 | 09/28/15 | SEOS TO NEOS | UL | 1357 | 1362 | 30 | 30 | PASS | MO | |
| P170 \ P171 | 09/28/15 | SEOS TO NEOS | UL | 1440 | 1445 | 30 | 30 | PASS | MO | |
| P174 \ P175 | 09/28/15 | SEOS TO NEOS | UL | 1540 | 1545 | 30 | 30 | PASS | MO | |
| P177 \ P178 | 09/28/15 | SEOS TO NEOS | UL | 1640 | 1645 | 30 | 30 | PASS | MO | |
| P180 \ P181 | 09/28/15 | SEOS TO NEOS | UL | 1716 | 1721 | 30 | 30 | PASS | MO | |
| P182 \ P183 | 09/28/15 | SEOS TO NEOS | UL | 1731 | 1736 | 30 | 30 | PASS | MO | |
| P141 \ P148 | 09/28/15 | SEOS TO NEOS | UL | 0911 | 0916 | 30 | 30 | PASS | MO | |

# APPENDIX L
# GEOMEMBRANE SEAM STRENGTH DESTRUCTIVE TEST SUMMARIES

# Lone Star Lining Company

1675 American Way
Cedar Hill, Texas 75104
972-291-5494 972-291-5515 FAX


# SEAM DESTRUCTIVE SAMPLE LOG

| | |
|---|---|
| PROJECT NAME: | Luminant OG FGD Pond C |
| PROJECT NUMBER: | 21521 |
| MATERIAL: | 60 mil HDT |
| QC REP.: | LT |

| | SMOOTH (ppi) | | TEXTURED (ppi) | |
|---|---|---|---|---|
| | PEEL | SHEAR | PEEL | SHEAR |
| FUSION (min.) | 91 | 120 | 91 | 120 |
| EXTRUSION (min.) | 78 | 120 | 78 | 120 |

| Destruct | Seam | Repair | Seam | Peel (ppi) | | | | | | | | | | Shear (ppi) | | | | | Field | Lab |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | # | # | Tech ID | In1 | Out1 | In2 | Out2 | In3 | Out3 | In4 | Out4 | In5 | Out5 | 1 | 2 | 3 | 4 | 5 | Pass/Fail | Pass/Fail |
| DS-1 | 2 / 1 | R 33 | VT | 117 | 112 | 119 | 113 | 119 | 126 | 123 | 119 | 117 | 126 | 149 | 153 | 147 | 151 | 146 | PASS | PASS |
| DS-2 | 3 / 2 | R 30 | MA | 126 | 125 | 131 | 121 | 117 | 121 | 116 | 120 | 119 | 123 | 155 | 156 | 149 | 144 | 156 | PASS | PASS |
| DS-3 | 7 / 6 | R 25 | GZ | 116 | 121 | 116 | 119 | 123 | 117 | 126 | 119 | 114 | 117 | 141 | 110 | 145 | 139 | 156 | PASS | PASS |
| DS-4 | 14 / 13 | R 17 | VT | 127 | 121 | 130 | 123 | 131 | 119 | 127 | 117 | 121 | 116 | 150 | 147 | 141 | 143 | 139 | PASS | PASS |
| DS-5 | 17 / 16 | R 13 | MA | 127 | 119 | 131 | 124 | 117 | 119 | 123 | 120 | 117 | 122 | 137 | 149 | 153 | 140 | 146 | PASS | PASS |
| DS-6 | 21 / 20 | R 6 | GZ | 119 | 117 | 121 | 123 | 120 | 116 | 113 | 127 | 114 | 111 | 136 | 139 | 141 | 137 | 140 | PASS | PASS |
| DS-7 | 32 / 2 | R 31 | VT | 120 | 116 | 119 | 123 | 109 | 115 | 116 | 121 | 119 | 115 | 141 | 136 | 139 | 145 | 143 | PASS | PASS |
| DS-8 | 32 / 33 | R 40 | MA | 119 | 126 | 116 | 111 | 120 | 129 | 113 | 119 | 120 | 117 | 139 | 144 | 139 | 140 | 137 | PASS | PASS |
| DS-9 | 33 / 34 | R 41 | GZ | 115 | 120 | 116 | 119 | 117 | 123 | 119 | 124 | 110 | 116 | 145 | 136 | 141 | 141 | 149 | PASS | PASS |
| DS-10 | 35 / 24 | R 4 | VT | 116 | 121 | 111 | 117 | 113 | 110 | 119 | 121 | 113 | 110 | 139 | 143 | 149 | 135 | 136 | PASS | PASS |
| DS-11 | 36 / 37 | R 3 | GZ | 121 | 120 | 126 | 119 | 123 | 117 | 109 | 115 | 113 | 100 | 136 | 139 | 140 | 141 | 136 | PASS | PASS |
| DS-12 | 34 / 38 | R 42 | MA | 120 | 113 | 110 | 117 | 118 | 123 | 109 | 116 | 119 | 124 | 141 | 149 | 132 | 147 | 140 | PASS | PASS |
| DS-13 | 43 / 42 | R 88 | GZ | 121 | 119 | 132 | 127 | 134 | 131 | 126 | 129 | 133 | 126 | 156 | 147 | 159 | 163 | 154 | PASS | PASS |
| DS-14 | 43 / 45 | R 47 | VT | 130 | 131 | 123 | 120 | 119 | 127 | 116 | 131 | 119 | 121 | 159 | 163 | 157 | 164 | 160 | PASS | PASS |
| DS-15 | 45 / 46 | R 48 | MA | 137 | 131 | 127 | 119 | 124 | 130 | 136 | 123 | 125 | 119 | 167 | 161 | 159 | 151 | 163 | PASS | PASS |
| DS-16 | 51 / 50 | R 54 | GZ | 129 | 121 | 127 | 118 | 120 | 116 | 127 | 123 | 121 | 127 | 160 | 159 | 163 | 170 | 171 | PASS | PASS |
| DS-17 | 51 / 52 | R 53 | VT | 121 | 132 | 126 | 130 | 128 | 132 | 137 | 119 | 124 | 129 | 176 | 171 | 163 | 160 | 167 | PASS | PASS |
| DS-18 | 55 / 54 | R 57 | MA | 127 | 129 | 131 | 136 | 121 | 127 | 119 | 120 | 130 | 132 | 162 | 174 | 159 | 169 | 171 | PASS | PASS |
| DS-19 | 59 / 61 | R 63 | MA | 136 | 119 | 123 | 128 | 123 | 136 | 127 | 117 | 119 | 121 | 163 | 156 | 161 | 154 | 159 | PASS | PASS |
| DS-20 | 61 / 62 | R 58 | GZ | 130 | 142 | 129 | 126 | 131 | 119 | 129 | 117 | 119 | 130 | 149 | 151 | 147 | 159 | 163 | PASS | PASS |
| DS-21 | 62 / 63 | R 64 | VT | 119 | 116 | 121 | 124 | 130 | 120 | 119 | 116 | 121 | 129 | 151 | 149 | 150 | 157 | 161 | PASS | PASS |
| DS-22 | 69 / 70 | R 68 | GZ | 120 | 115 | 117 | 121 | 117 | 126 | 129 | 113 | 111 | 120 | 145 | 151 | 149 | 153 | 157 | PASS | PASS |
| DS-23 | 74 / 73 | R 71 | MA | 127 | 120 | 116 | 117 | 130 | 124 | 115 | 121 | 110 | 124 | 144 | 156 | 150 | 140 | 139 | PASS | PASS |
| DS-24 | 76 / 77 | R 80 | VT | 126 | 131 | 130 | 129 | 115 | 114 | 119 | 124 | 120 | 131 | 156 | 151 | 149 | 145 | 137 | PASS | PASS |
| DS-25 | 87 / 88 | R 86 | GZ | 119 | 121 | 119 | 116 | 126 | 117 | 131 | 113 | 125 | 120 | 141 | 144 | 154 | 161 | 147 | PASS | PASS |
| DS-26 | 95 / 96 | R 93 | VT | 121 | 120 | 117 | 115 | 123 | 117 | 109 | 111 | 116 | 119 | 150 | 149 | 157 | 163 | 154 | PASS | PASS |
| DS-27 | 98 / 99 | R 99 | MA | 131 | 121 | 127 | 123 | 119 | 109 | 117 | 120 | 115 | 116 | 147 | 158 | 149 | 151 | 163 | PASS | PASS |
| DS-28 | 103 / 104 | R 105 | VT | 129 | 121 | 130 | 118 | 123 | 122 | 116 | 117 | 109 | 111 | 146 | 151 | 147 | 156 | 150 | PASS | PASS |

# Lone Star Lining Company

1675 American Way
Cedar Hill, Texas 75104
972-291-5494 972-291-5515 FAX

# SEAM DESTRUCTIVE SAMPLE LOG

| | |
|---|---|
| PROJECT NAME: | Luminant OG FGD Pond C |
| PROJECT NUMBER: | 21521 |
| MATERIAL: | 60 mil HDT |
| QC REP.: | LT |

| | SMOOTH (ppi) | | TEXTURED (ppi) | |
|---|---|---|---|---|
| | PEEL | SHEAR | PEEL | SHEAR |
| FUSION (min.) | 91 | 120 | 91 | 120 |
| EXTRUSION (min.) | 78 | 120 | 78 | 120 |

| Destruct | Seam | Repair | Seam | Peel (ppi) | | | | | | | | | | Shear (ppi) | | | | | Field | Lab |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | # | # | Tech ID | In1 | Out1 | In2 | Out2 | In3 | Out3 | In4 | Out4 | In5 | Out5 | 1 | 2 | 3 | 4 | 5 | Pass/Fail | Pass/Fail |
| DS-29 | 104 / 105 | R 106 | GZ | 119 | 112 | 115 | 117 | 121 | 110 | 111 | 123 | 119 | 105 | 159 | 141 | 150 | 147 | 140 | PASS | PASS |
| DS-30 | 110 / 111 | R 113 | MA | 126 | 119 | 121 | 120 | 114 | 116 | 110 | 126 | 131 | 125 | 149 | 156 | 154 | 161 | 149 | PASS | PASS |
| DS-31 | 114 / 115 | R 118 | VT | 125 | 130 | 124 | 131 | 121 | 129 | 116 | 119 | 126 | 115 | 151 | 159 | 161 | 147 | 156 | PASS | PASS |
| DS-32 | 117 / 118 | R 125 | MA | 129 | 119 | 130 | 119 | 128 | 119 | 121 | 124 | 134 | 137 | 161 | 158 | 155 | 149 | 160 | PASS | PASS |
| DS-33 | 122 / 121 | R 132 | VT | 139 | 121 | 124 | 129 | 123 | 117 | 120 | 129 | 127 | 124 | 159 | 161 | 154 | 151 | 163 | PASS | PASS |
| DS-34 | 121 / 120 | R 176 | MA | 121 | 129 | 131 | 137 | 121 | 115 | 123 | 131 | 120 | 120 | 164 | 162 | 153 | 150 | 164 | PASS | PASS |
| DS-35 | 127 / 126 | R 139 | GZ | 130 | 119 | 127 | 123 | 115 | 117 | 127 | 124 | 121 | 119 | 159 | 161 | 157 | 167 | 150 | PASS | PASS |
| DS-36 | 132 / 133 | R 140 | MA | 136 | 123 | 126 | 131 | 129 | 121 | 130 | 121 | 123 | 117 | 169 | 161 | 151 | 155 | 163 | PASS | PASS |
| DS-37 | 133 / 135 | R 142 | GZ | 125 | 121 | 131 | 127 | 131 | 124 | 120 | 130 | 133 | 127 | 156 | 157 | 161 | 147 | 160 | PASS | PASS |
| DS-38 | 134 / 135 | R 143 | VT | 119 | 120 | 127 | 123 | 134 | 117 | 117 | 137 | 135 | 128 | 161 | 150 | 162 | 141 | 150 | PASS | PASS |
| DS-39 | 145 / 144 | R 173 | VT | 116 | 113 | 120 | 107 | 110 | 100 | 120 | 113 | 113 | 123 | 156 | 159 | 149 | 161 | 153 | PASS | PASS |
| DS-40 | 146 / 147 | R 174 | GZ | 124 | 117 | 119 | 120 | 126 | 124 | 119 | 121 | 125 | 130 | 160 | 158 | 150 | 167 | 171 | PASS | PASS |
| DS-41 | 158 / 159 | R 162 | GZ | 109 | 121 | 117 | 115 | 120 | 107 | 110 | 119 | 126 | 121 | 16 | 154 | 161 | 150 | 147 | PASS | PASS |
| DS-42 | 150 / 151 | R 159 | MA | 116 | 120 | 127 | 117 | 113 | 120 | 119 | 111 | 107 | 116 | 154 | 149 | 151 | 157 | 148 | PASS | PASS |
| DS-43 | 149 / 160 | R 163 | VT | 109 | 113 | 121 | 119 | 120 | 119 | 116 | 113 | 108 | 119 | 160 | 155 | 147 | 151 | 156 | PASS | PASS |
| DS-44 | 94 / 166 | R 435 | VT | 110 | 104 | 108 | 118 | 114 | 117 | 110 | 105 | 102 | 117 | 162 | 171 | 160 | 158 | 151 | PASS | PASS |
| DS-45 | 166 / 167 | R 185 | MA | 101 | 109 | 116 | 111 | 113 | 104 | 102 | 118 | 114 | 110 | 139 | 142 | 155 | 158 | 150 | PASS | PASS |
| DS-46 | 174 / 175 | R 416 | MA | 116 | 117 | 110 | 113 | 118 | 120 | 114 | 116 | 113 | 112 | 147 | 158 | 150 | 144 | 158 | PASS | PASS |
| DS-47 | 171 / 172 | R 192 | GZ | 104 | 106 | 114 | 118 | 111 | 118 | 104 | 103 | 107 | 111 | 140 | 155 | 166 | 148 | 155 | PASS | PASS |
| DS-48 | 175 / 176 | R 200 | VT | 101 | 109 | 113 | 101 | 120 | 114 | 117 | 119 | 112 | 116 | 166 | 157 | 150 | 145 | 152 | PASS | PASS |
| DS-49 | 182 / 183 | R 367 | MA | 128 | 120 | 130 | 121 | 124 | 119 | 115 | 120 | 116 | 121 | 170 | 174 | 165 | 173 | 169 | PASS | PASS |
| DS-50 | 178 / 179 | R 207 | GZ | 116 | 118 | 117 | 111 | 107 | 109 | 121 | 118 | 113 | 106 | 149 | 158 | 166 | 144 | 170 | PASS | PASS |
| DS-51 | 181 / 182 | R 402 | GZ | 120 | 114 | 112 | 102 | 107 | 112 | 118 | 117 | 104 | 113 | 160 | 167 | 154 | 171 | 168 | PASS | PASS |
| DS-52 | 189 / 190 | R 231 | VT | 112 | 118 | 111 | 101 | 104 | 108 | 119 | 121 | 126 | 117 | 158 | 164 | 161 | 159 | 171 | PASS | PASS |
| DS-53 | 190 / 191 | R 232 | MA | 117 | 121 | 124 | 118 | 131 | 141 | 130 | 126 | 120 | 122 | 161 | 173 | 162 | 155 | 160 | PASS | PASS |
| DS-54 | 188 / 189 | R 230 | GZ | 130 | 126 | 120 | 131 | 121 | 118 | 114 | 128 | 134 | 130 | 170 | 178 | 164 | 170 | 162 | PASS | PASS |
| DS-55 | 203 / 204 | R 285 | GZ | 124 | 120 | 118 | 113 | 106 | 113 | 111 | 120 | 110 | 105 | 160 | 155 | 158 | 161 | 164 | PASS | PASS |
| DS-56 | 218 / 219 | R 304 | GZ | 107 | 110 | 112 | 115 | 101 | 100 | 109 | 114 | 118 | 116 | 172 | 160 | 158 | 166 | 159 | PASS | PASS |

# Lone Star Lining Company

1675 American Way
Cedar Hill, Texas 75104
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## SEAM DESTRUCTIVE SAMPLE LOG

| | |
|---|---|
| PROJECT NAME: | Luminant OG FGD Pond C |
| PROJECT NUMBER: | 21521 |
| MATERIAL: | 60 mil HDT |
| QC REP.: | LT |

| | SMOOTH (ppi) | | TEXTURED (ppi) | |
|---|---|---|---|---|
| | PEEL | SHEAR | PEEL | SHEAR |
| FUSION (min.) | 91 | 120 | 91 | 120 |
| EXTRUSION (min.) | 78 | 120 | 78 | 120 |

| Destruct | Seam | Repair | Seam | Peel (ppi) | | | | | | | | | | Shear (ppi) | | | | | Field | Lab |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | # | # | Tech ID | In1 | Out1 | In2 | Out2 | In3 | Out3 | In4 | Out4 | In5 | Out5 | 1 | 2 | 3 | 4 | 5 | Pass/Fail | Pass/Fail |
| DS-57 | 223 / 201 | R 281 | GZ | 114 | 117 | 106 | 103 | 101 | 118 | 104 | 105 | 109 | 111 | 138 | 145 | 157 | 146 | 141 | PASS | PASS |
| DS-58 | 224 / 228 | R 315 | GZ | 106 | 108 | 113 | 116 | 111 | 109 | 114 | 113 | 112 | 118 | 147 | 156 | 150 | 141 | 148 | PASS | PASS |
| DS-59 | 204 / 205 | R 286 | MA | 115 | 118 | 120 | 104 | 107 | 112 | 116 | 114 | 101 | 115 | 158 | 149 | 155 | 148 | 141 | PASS | PASS |
| DS-60 | 219 / 220 | R 305 | MA | 117 | 109 | 117 | 101 | 116 | 104 | 118 | 111 | 101 | 104 | 147 | 141 | 144 | 146 | 150 | PASS | PASS |
| DS-61 | 223 / 224 | R 313 | MA | 121 | 104 | 119 | 104 | 117 | 118 | 101 | 107 | 104 | 109 | 152 | 156 | 161 | 150 | 149 | PASS | PASS |
| DS-62 | 228 / 229 | R 314 | MA | 120 | 102 | 115 | 107 | 120 | 121 | 107 | 102 | 103 | 116 | 170 | 172 | 151 | 160 | 151 | PASS | PASS |
| DS-63 | 214 / 215 | R 298 | VT | 111 | 118 | 113 | 102 | 118 | 114 | 120 | 107 | 117 | 108 | 151 | 156 | 147 | 160 | 166 | PASS | PASS |
| DS-64 | 166 / 47 | R 432 | VT | 104 | 101 | 118 | 110 | 102 | 110 | 100 | 104 | 102 | 108 | 139 | 142 | 140 | 137 | 140 | PASS | PASS |
| DS-65 | 231 / 232 | R 318 | VT | 112 | 108 | 115 | 112 | 104 | 112 | 108 | 111 | 112 | 115 | 136 | 140 | 141 | 136 | 145 | PASS | PASS |
| DS-66 | 234 / 235 | R 321 | VT | 120 | 124 | 117 | 114 | 120 | 127 | 124 | 124 | 120 | 128 | 150 | 155 | 156 | 148 | 153 | PASS | PASS |
| DS-67 | 237 / 238 | R 324 | VT | 125 | 129 | 130 | 131 | 121 | 109 | 122 | 122 | 123 | 124 | 109 | 156 | 150 | 156 | 149 | PASS | PASS |
| DS-68 | 237 / 238 | R 325 | VT | 124 | 126 | 120 | 109 | 108 | 124 | 120 | 109 | 124 | 117 | 120 | 108 | 144 | 146 | 150 | PASS | PASS |
| DS-69 | 240 / 241 | R 328 | VT | 114 | 119 | 108 | 107 | 114 | 119 | 121 | 124 | 126 | 111 | 156 | 157 | 148 | 156 | 151 | PASS | PASS |
| DS-70 | 229 / 230 | R 316 | MA | 110 | 101 | 106 | 100 | 112 | 110 | 104 | 102 | 102 | 110 | 139 | 139 | 141 | 146 | 139 | PASS | PASS |
| DS-71 | 232 / 233 | R 319 | MA | 102 | 104 | 115 | 116 | 120 | 121 | 102 | 109 | 121 | 102 | 141 | 146 | 143 | 142 | 138 | PASS | PASS |
| DS-72 | 236 / 237 | R 323 | MA | 127 | 124 | 131 | 136 | 127 | 124 | 126 | 124 | 127 | 129 | 151 | 156 | 149 | 148 | 143 | PASS | PASS |
| DS-73 | 239 / 240 | R 327 | MA | 110 | 123 | 111 | 110 | 111 | 110 | 122 | 126 | 123 | 129 | 138 | 136 | 141 | 143 | 138 | PASS | PASS |
| DS-74 | 230 / 231 | R 317 | GZ | 106 | 102 | 100 | 101 | 100 | 108 | 106 | 108 | 106 | 100 | 141 | 138 | 149 | 145 | 139 | PASS | PASS |
| DS-75 | 233 / 234 | R 320 | GZ | 121 | 116 | 120 | 116 | 124 | 126 | 108 | 114 | 111 | 120 | 140 | 146 | 139 | 140 | 145 | PASS | PASS |
| DS-76 | 235 / 236 | R 322 | GZ | 114 | 111 | 116 | 100 | 102 | 115 | 113 | 114 | 116 | 124 | 139 | 456 | 154 | 150 | 144 | PASS | PASS |
| DS-77 | 238 / 239 | R 326 | GZ | 102 | 116 | 124 | 108 | 109 | 107 | 100 | 116 | 120 | 119 | 150 | 148 | 152 | 151 | 149 | PASS | PASS |
| DS-78 | 242 / 233 | R 275 | MA | 121 | 122 | 129 | 121 | 129 | 120 | 119 | 121 | 126 | 114 | 138 | 136 | 140 | 141 | 146 | PASS | PASS |
| DS-79 | 186 / 187 | R 390 | VT | 114 | 116 | 114 | 117 | 118 | 109 | 108 | 114 | 120 | 121 | 139 | 136 | 141 | 140 | 144 | PASS | PASS |
| DS-80 | 184 / 185 | R 220 | VT | 101 | 103 | 101 | 104 | 103 | 111 | 116 | 104 | 102 | 103 | 141 | 144 | 146 | 149 | 143 | PASS | PASS |
| DS-81 | 244 / 151 | R 329 | MA | 117 | 119 | 108 | 117 | 108 | 120 | 120 | 117 | 108 | 117 | 139 | 143 | 150 | 140 | 141 | PASS | PASS |
| EXT-DS-82 | 242 / DS-78 | R 274 | DL | 100 | | 114 | | 110 | | 106 | | 109 | | 150 | 161 | 144 | 150 | 142 | PASS | PASS |
| DS-83 | 256 / 258 | R 351 | VT | 106 | 114 | 115 | 117 | 106 | 111 | 110 | 106 | 104 | 115 | 149 | 139 | 140 | 139 | 146 | PASS | PASS |
| DS-84 | 266 / 267 | R 362 | VT | 114 | 124 | 116 | 120 | 121 | 124 | 116 | 114 | 120 | 121 | 141 | 146 | 149 | 144 | 149 | PASS | PASS |

# Lone Star Lining Company

1675 American Way
Cedar Hill, Texas 75104
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# SEAM DESTRUCTIVE SAMPLE LOG

| | |
|---|---|
| PROJECT NAME: | Luminant OG FGD Pond C |
| PROJECT NUMBER: | 21521 |
| MATERIAL: | 60 mil HDT |
| QC REP.: | LT |

| | SMOOTH (ppi) | | TEXTURED (ppi) | |
|---|---|---|---|---|
| | PEEL | SHEAR | PEEL | SHEAR |
| FUSION (min.) | 91 | 120 | 91 | 120 |
| EXTRUSION (min.) | 78 | 120 | 78 | 120 |

| Destruct | Seam | Repair | Seam | Peel (ppi) | | | | | | | | | | Shear (ppi) | | | | | Field | Lab |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | # | # | Tech ID | In1 | Out1 | In2 | Out2 | In3 | Out3 | In4 | Out4 | In5 | Out5 | 1 | 2 | 3 | 4 | 5 | Pass/Fail | Pass/Fail |
| DS-85 | 254 / 255 | R 346 | MA | 106 | 121 | 108 | 121 | 123 | 106 | 121 | 108 | 106 | 124 | 146 | 143 | 144 | 146 | 143 | PASS | PASS |
| DS-86 | 263 / 264 | R 438 | MA | 104 | 102 | 110 | 106 | 104 | 102 | 120 | 104 | 104 | 102 | 139 | 141 | 146 | 149 | 151 | PASS | PASS |
| DS-32-A | 117 / 34 | R 177 | GZ | 124 | 126 | 120 | 124 | 120 | 124 | 120 | 119 | 126 | 124 | 146 | 143 | 146 | 147 | 150 | PASS | PASS |
| EXT DS-1 | R-13 / 16 | R 45 | VT | 131 | | 129 | | 127 | | 121 | | 130 | | 149 | 156 | 159 | 140 | 147 | PASS | PASS |
| EXT DS-2 | R-57 / 55 | R 175 | MA | 125 | | 123 | | 121 | | 130 | | 123 | | 145 | 155 | 140 | 149 | 151 | PASS | PASS |

# FUSION

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-1 | 172.9 | BRK | 132.9 | SE 1 | 142.1 | SE 1 | Pass |
| | 173.0 | BRK | 139.0 | SE 1 | 135.4 | SE 1 | |
| | 172.7 | BRK | 131.1 | SE 1 | 144.9 | SE 1 | |
| | 172.0 | BRK | 131.3 | SE 1 | 131.9 | SE 1 | |
| | 172.4 | BRK | 133.3 | SE 1 | 134.4 | SE 1 | |
| DS-2 | 180.6 | BRK | 140.4 | SE 1 | 161.5 | SE 1 | Pass |
| | 182.0 | BRK | 140.0 | SE 1 | 152.6 | SE 1 | |
| | 181.4 | BRK | 145.9 | SE 1 | 153.2 | SE 1 | |
| | 180.5 | BRK | 143.3 | SE 1 | 161.9 | SE 1 | |
| | 180.2 | BRK | 140.5 | SE 1 | 164.9 | SE 1 | |
| DS-3 | 172.9 | BRK | 139.1 | SE 1 | 136.0 | SE 1 | Pass |
| | 173.2 | BRK | 140.2 | SE 1 | 126.0 | SE 1 | |
| | 172.6 | BRK | 129.5 | SE 1 | 145.6 | SE 1 | |
| | 172.9 | BRK | 135.6 | SE 1 | 141.6 | SE 1 | |
| | 171.6 | BRK | 130.7 | SE 1 | 127.7 | SE 1 | |
| DS-4 | 171.0 | BRK | 131.2 | SE 1 | 139.5 | SE 1 | Pass |
| | 172.4 | BRK | 128.6 | SE 1 | 134.5 | SE 1 | |
| | 171.8 | BRK | 127.8 | SE 1 | 144.0 | SE 1 | |
| | 172.2 | BRK | 130.5 | SE 1 | 137.4 | SE 1 | |
| | 172.8 | BRK | 137.9 | SE 1 | 146.6 | SE 1 | |
| DS-5 | 173.6 | BRK | 135.5 | SE 1 | 152.2 | SE 1 | Pass |
| | 174.7 | BRK | 134.6 | SE 1 | 152.3 | SE 1 | |
| | 175.2 | BRK | 136.7 | SE 1 | 158.2 | SE 1 | |
| | 175.3 | BRK | 134.2 | SE 1 | 147.7 | SE 1 | |
| | 168.0 | BRK | 125.8 | SE 1 | 161.4 | SE 1 | |
| DS-6 | 167.7 | BRK | 120.8 | SE 1 | 142.9 | SE 1 | Pass |
| | 168.7 | BRK | 146.6 | SE 1 | 137.5 | SE 1 | |
| | 167.1 | BRK | 124.3 | SE 1 | 141.0 | SE 1 | |
| | 168.0 | BRK | 140.5 | SE 1 | 138.3 | SE 1 | |
| | 166.3 | BRK | 126.4 | SE 1 | 144.2 | SE 1 | |
| DS-7 | 179.8 | BRK | 149.3 | SE 1 | 144.6 | SE 1 | Pass |
| | 181.1 | BRK | 157.4 | SE 1 | 148.2 | SE 1 | |
| | 180.8 | BRK | 145.1 | SE 1 | 143.8 | SE 1 | |
| | 177.4 | BRK | 156.0 | SE 1 | 135.9 | SE 1 | |
| | 170.7 | BRK | 138.0 | SE 1 | 132.1 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.
(2) PEEL (2) represents inner track or bottom flap.
(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

DFSUM

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-8 | 181.1 | BRK | 153.3 | SE 1 | 157.6 | SE 1 | Pass |
| | 182.9 | BRK | 140.6 | SE 1 | 141.6 | SE 1 | |
| | 182.7 | BRK | 141.8 | SE 1 | 158.4 | SE 1 | |
| | 182.0 | BRK | 100.9 | SE 1 | 158.2 | SE 1 | |
| | 177.2 | BRK | 133.6 | SE 1 | 164.5 | SE 1 | |
| DS-9 | 171.3 | BRK | 135.0 | SE 1 | 145.0 | SE 1 | Pass |
| | 172.0 | BRK | 132.4 | SE 1 | 150.0 | SE 1 | |
| | 170.7 | BRK | 141.2 | SE 1 | 152.8 | SE 1 | |
| | 163.7 | BRK | 142.8 | SE 1 | 153.9 | SE 1 | |
| | 165.3 | BRK | 139.4 | SE 1 | 147.2 | SE 1 | |
| DS-10 | 183.7 | BRK | 133.4 | SE 1 | 170.7 | SE 1 | Pass |
| | 184.9 | BRK | 134.5 | SE 1 | 136.6 | SE 1 | |
| | 182.6 | BRK | 132.3 | SE 1 | 171.2 | SE 1 | |
| | 183.2 | BRK | 131.4 | SE 1 | 164.6 | SE 1 | |
| | 175.8 | BRK | 133.0 | SE 1 | 158.7 | SE 1 | |
| DS-11 | 176.8 | BRK | 127.8 | SE 1 | 112.7 | SE 1 | Pass |
| | 178.9 | BRK | 136.7 | SE 1 | 110.1 | SE 1 | |
| | 177.3 | BRK | 140.5 | SE 1 | 131.2 | SE 1 | |
| | 178.5 | BRK | 143.6 | SE 1 | 135.4 | SE 1 | |
| | 177.9 | BRK | 144.7 | SE 1 | 140.0 | SE 1 | |
| DS-12 | 176.1 | BRK | 142.1 | SE 1 | 150.0 | SE 1 | Pass |
| | 175.6 | BRK | 137.9 | SE 1 | 153.5 | SE 1 | |
| | 174.6 | BRK | 135.0 | SE 1 | 126.1 | SE 1 | |
| | 173.7 | BRK | 131.8 | SE 1 | 130.7 | SE 1 | |
| | 173.6 | BRK | 130.0 | SE 1 | 135.1 | SE 1 | |
| DS-13 | 197.4 | BRK | 149.9 | SE 1 | 141.7 | SIP | Pass |
| | 197.1 | BRK | 145.6 | SE 1 | 134.7 | SIP | |
| | 195.3 | BRK | 139.7 | SE 1 | 129.3 | SIP | |
| | 194.2 | BRK | 148.4 | SE 1 | 128.1 | SE 1 | |
| | 192.9 | BRK | 142.0 | SE 1 | 137.3 | SE 1 | |
| DS-14 | 172.5 | BRK | 130.4 | SE 1 | 144.1 | SE 1 | Pass |
| | 173.2 | BRK | 134.6 | SE 1 | 133.0 | SE 1 | |
| | 172.4 | BRK | 138.0 | SE 1 | 140.1 | SE 1 | |
| | 172.7 | BRK | 135.7 | SE 1 | 142.9 | SE 1 | |
| | 170.0 | BRK | 126.4 | SE 1 | 135.9 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.
(2) PEEL (2) represents inner track or bottom flap.
(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

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**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-15 | 185.6 | BRK | 139.5 | SE 1 | 150.6 | SE 1 | Pass |
| | 186.1 | BRK | 140.8 | SE 1 | 145.8 | SE 1 | |
| | 185.0 | BRK | 141.6 | SE 1 | 161.1 | SE 1 | |
| | 184.5 | BRK | 144.5 | SE 1 | 153.0 | SE 1 | |
| | 183.3 | BRK | 144.9 | SE 1 | 141.9 | SE 1 | |
| DS-16 | 195.8 | BRK | 146.6 | SE 1 | 144.9 | SE 1 | Pass |
| | 197.3 | BRK | 141.7 | SE 1 | 156.7 | SE 1 | |
| | 194.4 | BRK | 139.8 | SE 1 | 149.5 | SE 1 | |
| | 195.4 | BRK | 139.3 | SE 1 | 164.3 | SE 1 | |
| | 192.7 | BRK | 143.5 | SE 1 | 158.4 | SE 1 | |
| DS-17 | 186.9 | BRK | 145.1 | SE 1 | 143.0 | SE 1 | Pass |
| | 187.5 | BRK | 133.0 | SE 1 | 141.2 | SE 1 | |
| | 186.4 | BRK | 132.7 | SE 1 | 144.8 | SE 1 | |
| | 187.9 | BRK | 156.5 | SE 1 | 145.2 | SE 1 | |
| | 183.9 | BRK | 136.1 | SE 1 | 156.3 | SE 1 | |
| DS-18 | 169.8 | BRK | 152.1 | SE 1 | 141.3 | SE 1 | Pass |
| | 169.9 | BRK | 148.3 | SE 1 | 141.3 | SE 1 | |
| | 169.3 | BRK | 151.6 | SE 1 | 141.5 | SE 1 | |
| | 168.2 | BRK | 147.6 | SE 1 | 139.1 | SE 1 | |
| | 167.1 | BRK | 135.0 | SE 1 | 135.9 | SE 1 | |
| DS-19 | 183.9 | BRK | 150.5 | SE 1 | 163.8 | SE 1 | Pass |
| | 183.6 | BRK | 143.2 | SE 1 | 168.5 | SE 1 | |
| | 182.1 | BRK | 152.1 | SE 1 | 152.5 | SE 1 | |
| | 180.7 | BRK | 147.9 | SE 1 | 147.2 | SE 1 | |
| | 177.4 | BRK | 136.7 | SE 1 | 157.1 | SE 1 | |
| DS-20 | 183.6 | BRK | 145.2 | SE 1 | 152.7 | SE 1 | Pass |
| | 183.7 | BRK | 144.0 | SE 1 | 164.9 | SE 1 | |
| | 182.7 | BRK | 136.3 | SE 1 | 149.7 | SE 1 | |
| | 182.2 | BRK | 139.4 | SE 1 | 147.0 | SE 1 | |
| | 180.1 | BRK | 141.0 | SE 1 | 155.0 | SE 1 | |
| DS-21 | 168.2 | BRK | 137.5 | SE 1 | 126.2 | SE 1 | Pass |
| | 168.0 | BRK | 138.1 | SE 1 | 115.7 | SE 1 | |
| | 166.9 | BRK | 133.1 | SE 1 | 142.2 | SE 1 | |
| | 166.5 | BRK | 127.6 | SE 1 | 131.8 | SE 1 | |
| | 163.1 | BRK | 126.5 | SE 1 | 125.5 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

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(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-22 | 179.4 | BRK | 138.4 | SE 1 | 146.1 | SE 1 | Pass |
| | 179.9 | BRK | 148.7 | SE 1 | 158.7 | SE 1 | |
| | 177.7 | BRK | 140.0 | SE 1 | 164.6 | SE 1 | |
| | 177.6 | BRK | 142.2 | SE 1 | 159.3 | SE 1 | |
| | 172.9 | BRK | 141.4 | SE 1 | 161.4 | SE 1 | |
| DS-23 | 171.0 | BRK | 131.3 | SE 1 | 135.5 | SE 1 | Pass |
| | 170.9 | BRK | 130.8 | SE 1 | 134.9 | SE 1 | |
| | 170.0 | BRK | 141.0 | SE 1 | 145.1 | SE 1 | |
| | 170.2 | BRK | 131.1 | SE 1 | 135.3 | SE 1 | |
| | 170.7 | BRK | 129.8 | SE 1 | 142.0 | SE 1 | |
| DS-24 | 181.7 | BRK | 140.5 | SE 1 | 151.8 | SE 1 | Pass |
| | 183.5 | BRK | 138.7 | SE 1 | 147.5 | SE 1 | |
| | 181.0 | BRK | 141.1 | SE 1 | 145.0 | SE 1 | |
| | 178.8 | BRK | 141.8 | SE 1 | 138.7 | SE 1 | |
| | 176.3 | BRK | 137.5 | SE 1 | 143.6 | SE 1 | |
| DS-25 | 170.0 | BRK | 125.5 | SE 1 | 159.1 | SE 1 | Pass |
| | 170.4 | BRK | 128.5 | SE 1 | 162.9 | SE 1 | |
| | 170.0 | BRK | 127.0 | SE 1 | 160.7 | SE 1 | |
| | 169.6 | BRK | 129.6 | SE 1 | 153.7 | SE 1 | |
| | 169.2 | BRK | 134.1 | SE 1 | 154.0 | SE 1 | |
| DS-26 | 177.6 | BRK | 132.4 | SE 1 | 150.0 | SE 1 | Pass |
| | 178.2 | BRK | 132.5 | SE 1 | 139.8 | SE 1 | |
| | 178.2 | BRK | 127.8 | SE 1 | 138.8 | SE 1 | |
| | 176.8 | BRK | 128.9 | SE 1 | 140.9 | SE 1 | |
| | 174.5 | BRK | 127.8 | SE 1 | 145.0 | SE 1 | |
| DS-27 | 191.0 | BRK | 144.2 | SE 1 | 148.0 | SE 1 | Pass |
| | 192.0 | BRK | 145.0 | SE 1 | 169.0 | SE 1 | |
| | 190.0 | BRK | 144.8 | SE 1 | 162.6 | SE 1 | |
| | 189.4 | BRK | 147.9 | SE 1 | 162.1 | SE 1 | |
| | 190.1 | BRK | 139.7 | SE 1 | 170.0 | SE 1 | |
| DS-28 | 181.7 | BRK | 130.8 | SE 1 | 145.0 | SE 1 | Pass |
| | 181.8 | BRK | 127.3 | SE 1 | 150.5 | SE 1 | |
| | 181.8 | BRK | 127.1 | SE 1 | 144.1 | SE 1 | |
| | 181.7 | BRK | 134.3 | SE 1 | 144.4 | SE 1 | |
| | 171.5 | BRK | 131.0 | SE 1 | 147.9 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

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(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-29 | 186.1 | BRK | 142.4 | SE 1 | 161.3 | SE 1 | Pass |
| | 186.6 | BRK | 141.8 | SE 1 | 165.7 | SE 1 | |
| | 187.1 | BRK | 140.4 | SE 1 | 161.9 | SE 1 | |
| | 186.8 | BRK | 140.5 | SE 1 | 152.1 | SE 1 | |
| | 181.1 | BRK | 142.3 | SE 1 | 168.2 | SE 1 | |
| DS-30 | 180.9 | BRK | 127.2 | SE 1 | 128.6 | SE 1 | Pass |
| | 180.4 | BRK | 136.3 | SE 1 | 133.5 | SE 1 | |
| | 180.1 | BRK | 149.1 | SE 1 | 137.9 | SE 1 | |
| | 180.8 | BRK | 143.3 | SE 1 | 136.1 | SE 1 | |
| | 179.4 | BRK | 151.1 | SE 1 | 144.9 | SE 1 | |
| DS-31 | 190.2 | BRK | 147.1 | SE 1 | 141.8 | SE 1 | Pass |
| | 189.8 | BRK | 148.3 | SE 1 | 136.5 | SE 1 | |
| | 189.5 | BRK | 153.7 | SE 1 | 144.0 | SE 1 | |
| | 188.0 | BRK | 144.3 | SE 1 | 133.2 | SE 1 | |
| | 186.4 | BRK | 143.1 | SE 1 | 135.8 | SE 1 | |
| DS-32 | 186.0 | BRK | 145.4 | SE 1 | 164.5 | SE 1 | Pass |
| | 186.2 | BRK | 155.9 | SE 1 | 164.6 | SE 1 | |
| | 185.4 | BRK | 161.9 | SE 1 | 153.2 | SE 1 | |
| | 183.0 | BRK | 162.0 | SE 1 | 157.1 | SE 1 | |
| | 185.0 | BRK | 165.8 | SE 1 | 161.7 | SE 1 | |
| DS-33 | 167.3 | BRK | 115.3 | SE 1 | 141.2 | SE 1 | Pass |
| | 166.9 | BRK | 109.7 | SE 1 | 143.3 | SE 1 | |
| | 167.9 | BRK | 111.5 | SE 1 | 134.5 | SE 1 | |
| | 165.1 | BRK | 116.6 | SE 1 | 140.3 | SE 1 | |
| | 160.8 | BRK | 117.0 | SE 1 | 139.2 | SE 1 | |
| DS-34 | 182.8 | BRK | 163.0 | SE 1 | 153.2 | SE 1 | Pass |
| | 183.3 | BRK | 163.0 | SE 1 | 138.2 | SE 1 | |
| | 183.0 | BRK | 165.4 | SE 1 | 132.9 | SE 1 | |
| | 183.0 | BRK | 156.4 | SE 1 | 135.7 | SE 1 | |
| | 182.9 | BRK | 144.4 | SE 1 | 131.1 | SE 1 | |
| DS-35 | 180.9 | BRK | 143.1 | SE 1 | 144.6 | SE 1 | Pass |
| | 181.5 | BRK | 143.0 | SE 1 | 139.9 | SE 1 | |
| | 181.8 | BRK | 139.0 | SE 1 | 138.4 | SE 1 | |
| | 180.8 | BRK | 138.6 | SE 1 | 142.2 | SE 1 | |
| | 174.9 | BRK | 145.0 | SE 1 | 143.8 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.
(2) PEEL (2) represents inner track or bottom flap.
(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

DFSUM

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-36 | 168.0 | BRK | 158.3 | SE 1 | 143.5 | SE 1 | Pass |
| | 169.6 | BRK | 145.2 | SE 1 | 135.9 | SE 1 | |
| | 170.4 | BRK | 148.0 | SE 1 | 138.5 | SE 1 | |
| | 173.5 | BRK | 132.6 | SE 1 | 135.7 | SE 1 | |
| | 172.1 | BRK | 132.8 | SE 1 | 138.4 | SE 1 | |
| DS-37 | 180.2 | BRK | 137.1 | SE 1 | 138.3 | SE 1 | Pass |
| | 180.6 | BRK | 138.3 | SE 1 | 167.0 | SE 1 | |
| | 180.1 | BRK | 131.4 | SE 1 | 154.8 | SE 1 | |
| | 180.9 | BRK | 140.9 | SE 1 | 151.4 | SE 1 | |
| | 180.2 | BRK | 149.1 | SE 1 | 141.5 | SE 1 | |
| DS-38 | 182.1 | BRK | 138.1 | SE 1 | 162.0 | SE 1 | Pass |
| | 187.3 | BRK | 141.7 | SE 1 | 160.1 | SE 1 | |
| | 191.1 | BRK | 146.5 | SE 1 | 166.7 | SE 1 | |
| | 188.5 | BRK | 142.1 | SE 1 | 158.7 | AD BRK (14%) | |
| | 180.5 | BRK | 156.9 | SE 1 | 142.5 | SE 1 | |
| DS-39 | 181.0 | BRK | 142.8 | SE 1 | 153.9 | SE 1 | Pass |
| | 179.0 | BRK | 124.0 | SE 1 | 149.3 | SE 1 | |
| | 179.7 | BRK | 144.1 | SE 1 | 151.1 | SE 1 | |
| | 179.2 | BRK | 128.1 | SE 1 | 154.8 | SE 1 | |
| | 175.8 | BRK | 123.0 | SE 1 | 154.6 | SE 1 | |
| DS-40 | 175.4 | BRK | 139.9 | SE 1 | 155.4 | SE 1 | Pass |
| | 173.8 | BRK | 137.8 | SE 1 | 155.5 | SE 1 | |
| | 172.9 | BRK | 140.7 | SE 1 | 134.5 | SE 1 | |
| | 172.8 | BRK | 137.9 | SE 1 | 150.6 | SE 1 | |
| | 172.6 | BRK | 131.9 | SE 1 | 144.5 | SE 1 | |
| DS-41 | 184.8 | BRK | 134.2 | SE 1 | 145.8 | SE 1 | Pass |
| | 182.0 | BRK | 131.3 | SE 1 | 136.5 | SE 1 | |
| | 181.0 | BRK | 135.5 | SE 1 | 140.3 | SE 1 | |
| | 180.3 | BRK | 137.8 | SE 1 | 139.1 | SE 1 | |
| | 178.4 | BRK | 135.1 | SE 1 | 139.0 | SE 1 | |
| DS-42 | 176.4 | BRK | 147.0 | SE 1 | 152.4 | SE 1 | Pass |
| | 175.7 | BRK | 146.3 | SE 1 | 155.5 | SE 1 | |
| | 172.7 | BRK | 146.6 | SE 1 | 141.7 | SE 1 | |
| | 172.6 | BRK | 143.5 | SE 1 | 144.9 | SE 1 | |
| | 172.0 | BRK | 139.8 | SE 1 | 143.1 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.
(2) PEEL (2) represents inner track or bottom flap.
(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

DFSUM

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-43 | 176.7 | BRK | 129.6 | SE 1 | 156.5 | SE 1 | Pass |
| | 175.2 | BRK | 134.8 | SE 1 | 157.9 | SE 1 | |
| | 175.1 | BRK | 132.9 | SE 1 | 159.4 | SE 1 | |
| | 174.0 | BRK | 133.1 | SE 1 | 151.3 | SE 1 | |
| | 174.4 | BRK | 127.7 | SE 1 | 134.8 | SE 1 | |
| DS-44 | 184.2 | BRK | 124.3 | SE 1 | 142.2 | SE 1 | Pass |
| | 181.7 | BRK | 132.9 | SE 1 | 140.7 | SE 1 | |
| | 181.8 | BRK | 128.3 | SE 1 | 125.4 | SE 1 | |
| | 181.7 | BRK | 121.3 | SE 1 | 133.5 | SE 1 | |
| | 179.6 | BRK | 121.6 | SE 1 | 139.5 | SE 1 | |
| DS-45 | 170.9 | BRK | 138.3 | SE 1 | 153.8 | SE 1 | Pass |
| | 169.7 | BRK | 135.4 | SE 1 | 140.7 | SE 1 | |
| | 172.4 | BRK | 143.7 | SE 1 | 146.3 | SE 1 | |
| | 172.6 | BRK | 138.0 | SE 1 | 152.7 | SE 1 | |
| | 168.6 | BRK | 138.6 | SE 1 | 143.5 | SE 1 | |
| DS-46 | 176.0 | BRK | 130.8 | SE 1 | 145.4 | SE 1 | Pass |
| | 173.6 | BRK | 126.3 | SE 1 | 151.8 | SE 1 | |
| | 172.9 | BRK | 126.0 | SE 1 | 154.8 | SE 1 | |
| | 174.3 | BRK | 129.2 | SE 1 | 140.8 | SE 1 | |
| | 173.1 | BRK | 127.5 | SE 1 | 139.3 | SE 1 | |
| DS-47 | 185.7 | BRK | 141.7 | SE 1 | 155.6 | SE 1 | Pass |
| | 184.7 | BRK | 129.9 | SE 1 | 145.3 | SE 1 | |
| | 185.5 | BRK | 139.8 | SE 1 | 145.9 | SE 1 | |
| | 184.4 | BRK | 132.9 | SE 1 | 150.1 | SE 1 | |
| | 181.5 | BRK | 147.3 | SE 1 | 150.7 | SE 1 | |
| DS-48 | 176.1 | BRK | 146.3 | SE 1 | 153.7 | SE 1 | Pass |
| | 177.4 | BRK | 130.5 | SE 1 | 150.0 | SE 1 | |
| | 176.0 | BRK | 120.5 | SE 1 | 144.5 | SE 1 | |
| | 176.2 | BRK | 127.4 | SE 1 | 149.0 | SE 1 | |
| | 176.0 | BRK | 122.3 | SE 1 | 147.5 | SE 1 | |
| DS-49 | 182.1 | BRK | 137.3 | SE 1 | 166.0 | SE 1 | Pass |
| | 180.6 | BRK | 139.4 | SE 1 | 158.4 | SE 1 | |
| | 183.0 | BRK | 139.8 | SE 1 | 165.2 | SE 1 | |
| | 182.6 | BRK | 133.2 | SE 1 | 164.9 | SE 1 | |
| | 182.3 | BRK | 138.7 | SE 1 | 164.6 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

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(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| Pass | 188.2 | BRK | 159.1 | SE 1 | 140.6 | SE 1 | Pass |
| | 189.9 | BRK | 133.3 | SE 1 | 146.4 | SE 1 | |
| | 189.8 | BRK | 141.3 | SE 1 | 143.7 | SE 1 | |
| | 188.9 | BRK | 145.1 | SE 1 | 146.3 | SE 1 | |
| | 185.4 | BRK | 137.2 | SE 1 | 143.1 | SE 1 | |
| DS-51 | 173.1 | BRK | 130.3 | SE 1 | 122.7 | SE 1 | Pass |
| | 172.1 | BRK | 123.6 | SE 1 | 123.7 | SE 1 | |
| | 172.1 | BRK | 123.8 | SE 1 | 123.1 | SE 1 | |
| | 172.4 | BRK | 125.1 | SE 1 | 152.7 | SE 1 | |
| | 172.4 | BRK | 116.6 | SE 1 | 141.3 | SE 1 | |
| DS-52 | 174.4 | BRK | 131.2 | SE 1 | 149.5 | SE 1 | Pass |
| | 174.3 | BRK | 132.4 | SE 1 | 143.9 | SE 1 | |
| | 174.2 | BRK | 147.6 | SE 1 | 134.7 | SE 1 | |
| | 174.1 | BRK | 156.2 | SE 1 | 143.7 | SE 1 | |
| | 171.6 | BRK | 141.7 | SE 1 | 141.9 | SE 1 | |
| DS-53 | 182.0 | BRK | 140.8 | SE 1 | 139.4 | SE 1 | Pass |
| | 183.2 | BRK | 149.5 | SE 1 | 150.3 | SE 1 | |
| | 182.8 | BRK | 160.0 | SE 1 | 155.2 | SE 1 | |
| | 182.9 | BRK | 157.8 | SE 1 | 142.1 | SE 1 | |
| | 180.6 | BRK | 152.4 | SE 1 | 139.7 | SE 1 | |
| DS-54 | 184.8 | BRK | 139.5 | SE 1 | 163.1 | SE 1 | Pass |
| | 187.2 | BRK | 130.6 | SE 1 | 168.4 | SE 1 | |
| | 185.9 | BRK | 126.0 | SE 1 | 163.0 | SE 1 | |
| | 185.5 | BRK | 130.7 | SE 1 | 169.4 | SE 1 | |
| | 182.1 | BRK | 123.8 | SE 1 | 168.3 | SE 1 | |
| DS-55 | 186.0 | BRK | 131.0 | SE 1 | 134.9 | SE 1 | Pass |
| | 187.4 | BRK | 129.7 | SE 1 | 140.3 | SE 1 | |
| | 184.7 | BRK | 133.8 | SE 1 | 150.6 | SE 1 | |
| | 185.3 | BRK | 136.6 | SE 1 | 169.2 | SE 1 | |
| | 184.4 | BRK | 127.0 | SE 1 | 163.7 | SE 1 | |
| DS-56 | 183.6 | BRK | 154.5 | SE 1 | 160.8 | SE 1 | Pass |
| | 185.9 | BRK | 154.8 | SE 1 | 133.6 | SE 1 | |
| | 184.5 | BRK | 167.5 | SE 1 | 131.1 | SE 1 | |
| | 184.7 | BRK | 142.9 | SE 1 | 133.6 | SE 1 | |
| | 185.6 | BRK | 155.6 | SE 1 | 132.9 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

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(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-57 | 186.0 | BRK | 150.1 | SE1 | 162.0 | SE1 | Pass |
| | 185.7 | BRK | 154.7 | SE1 | 171.2 | SE1 | |
| | 184.7 | BRK | 155.6 | SE1 | 148.9 | SE1 | |
| | 186.0 | BRK | 149.6 | SE1 | 165.5 | SE1 | |
| | 186.9 | BRK | 162.8 | SE1 | 148.3 | SE1 | |
| DS-58 | 181.6 | BRK | 142.4 | SE1 | 129.5 | SE1 | Pass |
| | 182.2 | BRK | 144.4 | SE1 | 129.8 | SE1 | |
| | 182.1 | BRK | 148.5 | SE1 | 131.4 | SE1 | |
| | 181.9 | BRK | 141.1 | SE1 | 169.8 | SE1 | |
| | 182.5 | BRK | 146.4 | SE1 | 129.2 | SE1 | |
| DS-59 | 177.5 | BRK | 140.4 | SE1 | 170.9 | SE1 | Pass |
| | 179.5 | BRK | 142.0 | SE1 | 171.1 | SE1 | |
| | 179.5 | BRK | 157.3 | SE1 | 159.0 | SE1 | |
| | 178.7 | BRK | 126.6 | SE1 | 165.5 | SE1 | |
| | 176.8 | BRK | 123.2 | SE1 | 165.8 | SE1 | |
| DS-60 | 182.3 | BRK | 142.0 | SE1 | 125.9 | SE1 | Pass |
| | 173.2 | BRK | 140.6 | SE1 | 126.6 | SE1 | |
| | 182.7 | BRK | 146.8 | SE1 | 134.6 | SE1 | |
| | 182.7 | BRK | 139.4 | SE1 | 150.3 | SE1 | |
| | 180.7 | BRK | 134.3 | SE1 | 140.1 | SE1 | |
| DS-61 | 140.2 | BRK | 163.4 | SE1 | 162.2 | SE1 | Pass |
| | 188.4 | BRK | 168.9 | SE1 | 177.9 | SE1 | |
| | 187.9 | BRK | 172.7 | SE1 | 165.7 | SE1 | |
| | 189.8 | BRK | 169.4 | SE1 | 168.4 | SE1 | |
| | 187.0 | BRK | 157.3 | SE1 | 179.8 | SE1 | |
| DS-62 | 184.4 | BRK | 131.4 | SE1 | 158.0 | SE1 | Pass |
| | 186.4 | BRK | 131.2 | SE1 | 155.6 | SE1 | |
| | 184.8 | BRK | 137.9 | SE1 | 155.8 | SE1 | |
| | 183.6 | BRK | 141.8 | SE1 | 153.9 | SE1 | |
| | 183.5 | BRK | 153.3 | SE1 | 154.8 | SE1 | |
| DS-63 | 183.8 | BRK | 134.4 | SE1 | 165.9 | SE1 | Pass |
| | 182.8 | BRK | 133.0 | SE1 | 165.7 | SE1 | |
| | 182.3 | BRK | 133.8 | SE1 | 158.7 | SE1 | |
| | 182.4 | BRK | 132.1 | SE1 | 164.6 | SE1 | |
| | 179.5 | BRK | 131.4 | SE1 | 159.4 | SE1 | |

(1) PEEL (1) represents outer track or top flap.
(2) PEEL (2) represents inner track or bottom flap.
(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

DFSUM

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-64 | 182.6 | BRK | 162.6 | SE 1 | 138.9 | SE 1 | Pass |
| | 190.8 | BRK | 155.6 | SE 1 | 148.2 | SE 1 | |
| | 189.0 | BRK | 174.8 | SE 1 | 147.2 | SE 1 | |
| | 183.6 | BRK | 168.1 | SE 1 | 146.8 | SE 1 | |
| | 180.4 | BRK | 138.5 | SE 1 | 124.8 | SE 1 | |
| DS-65 | 177.3 | BRK | 125.5 | SE 1 | 135.7 | SE 1 | Pass |
| | 177.5 | BRK | 123.9 | SE 1 | 140.0 | SE 1 | |
| | 176.8 | BRK | 128.6 | SE 1 | 152.2 | SE 1 | |
| | 176.5 | BRK | 128.8 | SE 1 | 151.4 | SE 1 | |
| | 174.2 | BRK | 123.4 | SE 1 | 152.4 | SE 1 | |
| DS-66 | 177.2 | BRK | 119.6 | SE 1 | 147.3 | SE 1 | Pass |
| | 178.3 | BRK | 125.5 | SE 1 | 142.3 | SE 1 | |
| | 177.7 | BRK | 127.6 | SE 1 | 136.4 | SE 1 | |
| | 177.1 | BRK | 130.0 | SE 1 | 141.7 | SE 1 | |
| | 176.6 | BRK | 129.6 | SE 1 | 150.6 | SE 1 | |
| DS-67 | 176.4 | BRK | 130.9 | SE 1 | 146.1 | SE 1 | Pass |
| | 177.5 | BRK | 129.1 | SE 1 | 156.3 | SE 1 | |
| | 176.5 | BRK | 123.6 | SE 1 | 133.0 | SE 1 | |
| | 177.4 | BRK | 122.8 | SE 1 | 132.9 | SE 1 | |
| | 173.7 | BRK | 128.8 | SE 1 | 141.5 | SE 1 | |
| DS-68 | 180.1 | BRK | 132.0 | SE 1 | 149.9 | SE 1 | Pass |
| | 179.1 | BRK | 128.4 | SE 1 | 151.3 | SE 1 | |
| | 179.4 | BRK | 118.4 | SE 1 | 152.3 | SE 1 | |
| | 179.0 | BRK | 119.6 | SE 1 | 149.0 | SE 1 | |
| | 179.1 | BRK | 120.0 | SE 1 | 148.4 | SE 1 | |
| DS-69 | 175.4 | BRK | 135.4 | SE 1 | 138.3 | SE 1 | Pass |
| | 174.7 | BRK | 135.2 | SE 1 | 146.4 | SE 1 | |
| | 175.8 | BRK | 122.5 | SE 1 | 141.9 | SE 1 | |
| | 175.8 | BRK | 122.3 | SE 1 | 131.9 | SE 1 | |
| | 174.8 | BRK | 127.9 | SE 1 | 144.0 | SE 1 | |
| DS-70 | 177.4 | BRK | 129.6 | SE 1 | 149.5 | SE 1 | Pass |
| | 177.6 | BRK | 127.1 | SE 1 | 156.8 | SE 1 | |
| | 177.4 | BRK | 130.2 | SE 1 | 151.2 | SE 1 | |
| | 176.9 | BRK | 133.0 | SE 1 | 150.5 | SE 1 | |
| | 176.0 | BRK | 124.8 | SE 1 | 154.0 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-71 | 174.2 | BRK | 123.9 | SE 1 | 153.9 | SE 1 | Pass |
| | 173.7 | BRK | 123.1 | SE 1 | 162.2 | SE 1 | |
| | 173.8 | BRK | 120.0 | SE 1 | 154.3 | SE 1 | |
| | 173.5 | BRK | 128.0 | SE 1 | 149.0 | SE 1 | |
| | 173.2 | BRK | 130.4 | SE 1 | 159.0 | SE 1 | |
| DS-72 | 171.9 | BRK | 125.8 | SE 1 | 151.7 | SE 1 | Pass |
| | 171.8 | BRK | 128.0 | SE 1 | 144.8 | SE 1 | |
| | 172.6 | BRK | 121.4 | SE 1 | 141.4 | SE 1 | |
| | 172.5 | BRK | 121.4 | SE 1 | 157.5 | SE 1 | |
| | 171.6 | BRK | 126.4 | SE 1 | 141.5 | SE 1 | |
| DS-73 | 177.0 | BRK | 149.8 | SE 1 | 162.4 | SE 1 | Pass |
| | 176.6 | BRK | 146.5 | SE 1 | 157.3 | SE 1 | |
| | 175.8 | BRK | 149.6 | SE 1 | 161.6 | SE 1 | |
| | 176.0 | BRK | 139.0 | SE 1 | 159.3 | SE 1 | |
| | 174.9 | BRK | 144.4 | SE 1 | 159.0 | SE 1 | |
| DS-74 | 176.4 | BRK | 119.5 | SE 1 | 123.4 | SE 1 | Pass |
| | 177.1 | BRK | 124.7 | SE 1 | 120.5 | SE 1 | |
| | 176.9 | BRK | 115.8 | SE 1 | 120.4 | SE 1 | |
| | 176.8 | BRK | 115.1 | SE 1 | 128.5 | SE 1 | |
| | 175.8 | BRK | 121.8 | SE 1 | 124.3 | SE 1 | |
| DS-75 | 176.9 | BRK | 128.8 | SE 1 | 126.6 | SE 1 | Pass |
| | 177.1 | BRK | 126.5 | SE 1 | 123.1 | SE 1 | |
| | 176.7 | BRK | 125.8 | SE 1 | 119.7 | SE 1 | |
| | 175.8 | BRK | 126.8 | SE 1 | 119.1 | SE 1 | |
| | 173.2 | BRK | 122.1 | SE 1 | 117.0 | SE 1 | |
| DS-76 | 185.8 | BRK | 146.3 | SE 1 | 140.4 | SE 1 | Pass |
| | 185.2 | BRK | 122.9 | SE 1 | 140.2 | SE 1 | |
| | 186.0 | BRK | 121.6 | SE 1 | 138.9 | SE 1 | |
| | 186.1 | BRK | 119.8 | SE 1 | 146.1 | SE 1 | |
| | 184.0 | BRK | 117.1 | SE 1 | 124.8 | SE 1 | |
| DS-77 | 186.1 | BRK | 131.9 | SE 1 | 124.1 | SE 1 | Pass |
| | 185.3 | BRK | 132.1 | SE 1 | 122.6 | SE 1 | |
| | 185.2 | BRK | 128.3 | SE 1 | 135.7 | SE 1 | |
| | 185.1 | BRK | 128.1 | SE 1 | 127.3 | SE 1 | |
| | 185.8 | BRK | 128.3 | SE 1 | 127.0 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-78 | 191.1 | BRK | 160.8 | SE 1 | 157.0 | SE 1 | Pass |
| | 187.6 | BRK | 165.8 | SE 1 | 161.9 | SE 1 | |
| | 187.5 | BRK | 158.4 | SE 1 | 150.5 | SE 1 | |
| | 186.1 | BRK | 168.6 | SE 1 | 150.4 | SE 1 | |
| | 188.7 | BRK | 160.1 | SE 1 | 152.7 | SE 1 | |
| DS-79 | 179.8 | BRK | 149.3 | SE 1 | 130.7 | SE 1 | Pass |
| | 180.4 | BRK | 142.5 | SE 1 | 135.9 | SE 1 | |
| | 179.5 | BRK | 155.7 | SE 1 | 128.6 | SE 1 | |
| | 179.7 | BRK | 145.6 | SE 1 | 137.6 | SE 1 | |
| | 183.7 | BRK | 156.4 | SE 1 | 138.6 | SE 1 | |
| DS-80 | 186.4 | BRK | 133.7 | SE 1 | 150.5 | SE 1 | Pass |
| | 185.2 | BRK | 135.4 | SE 1 | 149.6 | SE 1 | |
| | 186.8 | BRK | 137.8 | SE 1 | 135.9 | SE 1 | |
| | 186.0 | BRK | 139.0 | SE 1 | 145.8 | SE 1 | |
| | 184.7 | BRK | 139.2 | SE 1 | 140.5 | SE 1 | |
| DS-81 | 182.6 | BRK | 165.5 | SE 1 | 162.8 | SE 1 | Pass |
| | 186.3 | BRK | 154.8 | SE 1 | 157.4 | SE 1 | |
| | 188.9 | BRK | 164.2 | SE 1 | 160.1 | SE 1 | |
| | 187.7 | BRK | 154.3 | SE 1 | 162.3 | SE 1 | |
| | 184.2 | BRK | 159.3 | SE 1 | 164.1 | SE 1 | |
| DS-83 | 185.0 | BRK | 127.9 | SE 1 | 151.4 | SE 1 | Pass |
| | 184.9 | BRK | 128.9 | SE 1 | 152.3 | SE 1 | |
| | 184.0 | BRK | 127.4 | SE 1 | 150.3 | SE 1 | |
| | 184.8 | BRK | 130.0 | SE 1 | 147.0 | SE 1 | |
| | 182.7 | BRK | 135.4 | SE 1 | 147.0 | SE 1 | |
| DS-84 | 185.6 | BRK | 141.5 | SE 1 | 160.1 | SE 1 | Pass |
| | 185.8 | BRK | 137.0 | SE 1 | 152.6 | SE 1 | |
| | 186.1 | BRK | 155.5 | SE 1 | 159.5 | SE 1 | |
| | 186.5 | BRK | 140.1 | SE 1 | 158.9 | SE 1 | |
| | 182.5 | BRK | 136.8 | SE 1 | 159.5 | SE 1 | |
| DS-85 | 184.9 | BRK | 147.1 | SE 1 | 141.5 | SE 1 | Pass |
| | 185.6 | BRK | 158.5 | SE 1 | 141.2 | SE 1 | |
| | 185.7 | BRK | 140.1 | SE 1 | 140.9 | SE 1 | |
| | 185.4 | BRK | 150.5 | SE 1 | 146.5 | SE 1 | |
| | 182.5 | BRK | 148.9 | SE 1 | 157.0 | SE 1 | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**FUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (3) | PEEL (1) STRENGTH (ppi) | PEEL (1) BREAK CODE (3) | PEEL (2) STRENGTH (ppi) | PEEL (2) BREAK CODE (3) | REMARKS |
|---|---|---|---|---|---|---|---|
| DS-86 | 182.3 | BRK | 126.2 | SE 1 | 137.6 | SE 1 | Pass |
| | 182.0 | BRK | 126.5 | SE 1 | 142.2 | SE 1 | |
| | 182.1 | BRK | 138.3 | SE 1 | 141.3 | SE 1 | |
| | 180.7 | BRK | 133.5 | SE 1 | 147.4 | SE 1 | |
| | 181.7 | BRK | 152.1 | SE 1 | 142.8 | SE 1 | |
| - | - | - | - | - | - | - | - |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |
| | - | - | - | - | - | - | |

(1) PEEL (1) represents outer track or top flap.

DFSUM

(2) PEEL (2) represents inner track or bottom flap.

(3) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

# EXTRUSION

**SUMMARY OF DESTRUCTIVE TEST RESULTS**
**EXTRUSION METHOD**
**ASTM D6392**

**LUMINANT**
**OGSES FGD-C POND CQA**
**TEXAS**

| SAMPLE NUMBER | SHEAR STRENGTH (ppi) | SHEAR BREAK CODE (1) | PEEL STRENGTH (ppi) | PEEL BREAK CODE (1) | REMARKS |
|---|---|---|---|---|---|
| DSE-01 | 171.6 | BRK1 | 112.9 | SE 3 | Pass |
| | 170.4 | SE 2 | 131.4 | SE 3 | |
| | 168.8 | BRK1 | 147.6 | SE 3 | |
| | 170.4 | BRK1 | 151.5 | SE 3 | |
| | 166.6 | BRK1 | 128.2 | SE 3 | |
| DSE-02 | 179.3 | BRK 1 | 107.7 | SE 3 | Pass |
| | 183.9 | BRK 1 | 119.3 | SE 3 | |
| | 183.1 | BRK 1 | 135.1 | SE 3 | |
| | 181.4 | BRK 1 | 140.0 | SE 3 | |
| | 179.7 | BRK 1 | 143.4 | SE 3 | |
| DSE-03 | 190.1 | BRK 2 | 128.3 | SE 3 | Pass |
| | 190.2 | BRK 2 | 133.5 | SE 3 | |
| | 190.3 | BRK 2 | 151.1 | SE 3 | |
| | 187.9 | BRK 2 | 138.8 | SE 3 | |
| | 192.9 | BRK1 | 155.0 | SE 3 | |
| - | - | - | - | - | - |
| | - | - | - | - | |
| | - | - | - | - | |
| | - | - | - | - | |
| | - | - | - | - | |
| - | - | - | - | - | - |
| | - | - | - | - | |
| | - | - | - | - | |
| | - | - | - | - | |
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| | - | - | - | - | |
| | - | - | - | - | |
| - | - | - | - | - | - |
| | - | - | - | - | |
| | - | - | - | - | |
| | - | - | - | - | |
| | - | - | - | - | |

(1) BREAK CODES BASED ON MODES ILLUSTRATED IN ATTACHED FIGURE.

DESUM

# APPENDIX M
# GEOMEMBRANE REPAIR SUMMARY

# GEOSYNTHETIC CQA MONITORING
# DEFECT AND REPAIR TYPES AND MAPPING NOTES

## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT AND REPAIR TYPES | |
|---|---|
| AD | ANIMAL RELATED DAMAGE |
| B | UNDISPERSED RESIN BEAD |
| BO | FUSION WELDER BURNOUT |
| BS | BOOT/SKIRT FOR FML PENETRATION |
| CO | CHANGE OF OVERLAP |
| CR | CREASE |
| D | GENERAL FIELD DAMAGE |
| DS-000 | DESTRUCTIVE TEST NUMBER - FUSION |
| DSE-000 | DESTRUCTIVE TEST NUMBER - EXTRUSION |
| EE | EARTHWORK EQUIPMENT DAMAGE |
| EXT | EXTENSION |
| FM | FISHMOUTH |
| FS | FAILED SEAM LENGTH |
| FTS | FAILED TEST STRIP |
| HT | HEAT TRACK BURN |
| INT | MULTIPLE PANEL INTERSECTION |
| IO | INSUFFICIENT OVERLAP (UNDER SPEC.) |
| MD | MANUFACTURER/DELIVERY DAMAGE |
| OL | EQUIPMENT OIL LEAK |
| PT | PRESSURE TEST CUT |
| SI | SUBGRADE IRREGULARITY |
| SL | SLAG ON TEXTURED SHEET |
| VL | VACUUM TEST LEAK |
| WR | WRINKLE |
| WS | WELDER START |
| C | CAP |
| P | PATCH |
| G&W | GRIND AND WELD |
| RS | RECONSTRUCTED SEAM |
| P/RS | PATCH AND RECONSTRUCTED SEAM |
| SPS | SUMP PROTECTION SHEET |

| MAPPING NOTES | |
|---|---|
| W | WEST |
| E | EAST |
| S | SOUTH |
| N | NORTH |
| AT | ANCHOR TRENCH |
| @ | AT |
| EOS | END OF SEAM |
| W/ | WITH |
| SOS | START OF SEAM |
| O | OF |
| ' | FEET |
| P | PANEL |
| SEOS | SOUTH END OF SEAM |
| NEOS | NORTH END OF SEAM |
| EEOS | EAST END OF SEAM |
| WEOS | WEST END OF SEAM |
| SEOP | SOUTH END OF PANEL |
| NEOP | NORTH END OF PANEL |
| EEOP | EAST END OF PANEL |
| WEOP | WEST END OF PANEL |
| TI | TIE-IN TO EXISTING GEOMEMBRANE |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 1 | A | P001 / | SEOS | EXT | 09/24/15 | 1545 | P | 3 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 1 | B | P002 / P003 | 15' E OF WEOS | D | --- | --- | | COVERED BY 1D | | --- | --- | --- | --- |
| 1 | C | P001 / P002 | 10' W OF EEOS | DS-01 | 09/24/15 | 1522 | P | 8 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 1 | D | P002 / P003 | 10' W OF EEOS | DS-02 | 09/24/15 | 1459 | P | 8 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 1 | E | P006 / P007 | 10' W OF EEOS | DS-03 | 09/24/15 | 1421 | P | 8 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 1 | F | P013 / P014 | 10' W OF EEOS | DS-04 | 09/24/15 | 1525 | P | 8 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 1 | G | P016 / P017 | 10' W OF EEOS | DS-05 | 09/24/15 | 1508 | P | 8 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 1 | H | | DEFECT CODE NOT USED | | --- | --- | | DEFECT CODE NOT USED | | --- | --- | --- | --- |
| 1 | I | P020 / P021 | 10' W OF EEOS | DS-06 | 09/24/15 | 1408 | P | 4 X 2 | VT | 197 | VK | 09/25/15 | MO |
| 1 | J | P027 / P028 | @ P030 | T | 09/24/15 | 1535 | P | 4 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 1 | K | P002 / P032 | 8' W OF EEOS | DS-07 | 09/24/15 | 1510 | P | 8 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 1 | M | --- --- | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | | --- | --- | --- | --- |
| 1 | N | P001 / P027 | @ P029 | T | 09/24/15 | 1525 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 1 | P | P001 / P027 | @ P029/P030 | T | 09/24/15 | 1530 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 1 | Q | P032 / P033 | 100' S OF NEOS | DS-08 | 09/24/15 | 1559 | P | 4 X 1 | MT | 131 | MO | 09/25/15 | VK |
| 1 | R | P028 / P030 | @ P031 | T | 09/24/15 | 1540 | P | 3 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 1 | S | P033 / P034 | 100' S OF NEOS | DS-09 | 09/24/15 | 1601 | P | 2 X 5 | MT | 131 | VK | 09/25/15 | VK |
| 1 | T | P024 / P035 | 40' S OF NEOS | DS-10 | 09/24/15 | 1422 | P | 8 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 1 | W | P007 / P006 | @ P032 | T | 09/24/15 | 1419 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 1 | X | P011 / P012 | @ P032 | T | 09/24/15 | 1345 | P | 3 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 2 | A | P012 / P013 | @ P032 | T | 09/24/15 | 1340 | P | 3 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 2 | B | P036 / P037 | 33' N OF SEOS | DS-11 | 09/24/15 | 1416 | P | 8 X 2 | VT | 197 | VK | 09/28/15 | MO |
| 2 | C | P004 / P005 | @ P032 | T | 09/24/15 | 1426 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 2 | D | P008 / P009 | @ P032 | T | 09/24/15 | 1415 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 2 | E | P013 / P014 | @ P032 | T | 09/24/15 | 1520 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 2 | F | P014 / P015 | @ P032 | T | 09/24/15 | 1516 | P | 2 X 2 | VT | 197 | VK | 09/28/15 | MO |
| 2 | G | P015 / P016 | @ P032 | T | 09/24/15 | 1512 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 2 | H | P016 / P017 | @ P032 | T | 09/24/15 | 1503 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | WELDER I.D. TECH. | WELDER I.D. MACH. | WELDER I.D. QA MON. | DATE | QA MON. |
| 2 | I | P017 / P018 | @ P032 | T | 09/24/15 | 1500 | P | 2 X 2 | VT | 197 | VK | 09/28/15 | MO |
| 2 | J | P018 / P019 | @ P032 | T | 09/24/15 | 1457 | P | 2 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 2 | K | P034 / P038 | 40' S OF NEOS | DS-12 | 09/24/15 | 1610 | P | 4 X 1 | MT | 131 | MO | 09/25/15 | VK |
| 2 | M | P019 / P020 | @ P032 | T | 09/24/15 | 1454 | P | 2 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 2 | N | P020 / P021 | @ P024/P032/P035 | T | 09/24/15 | 1400 | P | 4 X 2 | VT | 197 | VK | 09/28/15 | MO |
| 2 | P | P021 / P024 | @ P035 | T | | | | COVERED BY 2N | | | | 09/28/15 | VK |
| 2 | Q | P022 / P024 | @ P025 | T | 09/24/15 | 1433 | P | 8 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 2 | R | P023 / P025 | @ P025/P026 | T | 09/24/15 | 1450 | P | 8 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 2 | S | P023 / P026 | SEOS | T | | | | COVERED BY 2R | | | | 09/28/15 | MO |
| 2 | T | P037 / P036 | @ P033/P034 | PT | 09/24/15 | 1351 | P | 2 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 2 | W | P042 / P043 | 44' N OF SEOS | DS-13 | 09/24/15 | 1655 | P | 4 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 2 | X | P036 / P035 | @ P032/P033 | T | 09/24/15 | 1355 | P | 1 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 3 | A | P011 / P010 | @ P032 | T | 09/24/15 | 1405 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 3 | B | P009 / P010 | @ P009 | T | 09/24/15 | 1409 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 3 | C | P007 / P008 | @ P032 | T | 09/24/15 | 1418 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 3 | D | P005 / P006 | @ P032 | T | 09/24/15 | 1424 | P | 3 X 3 | MT | 131 | VK | 09/25/15 | VK |
| 3 | E | P003 / P004 | @ P032 | T | 09/24/15 | 1445 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 3 | F | P002 / P003 | @ P032 | T | 09/24/15 | 1455 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 3 | G | P002 / P001 | @ P032 | T | 09/24/15 | 1515 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 3 | H | P001 / P029 | @ P032 | T | 09/24/15 | 1518 | P | 2 X 2 | MT | 131 | VK | 09/25/15 | VK |
| 3 | I | --- | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | --- | --- | --- | --- | --- |
| 3 | J | --- | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | --- | --- | --- | --- | --- |
| 3 | K | --- | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | --- | --- | --- | --- | --- |
| 3 | M | --- | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | --- | --- | --- | --- | --- |
| 3 | N | --- | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | --- | --- | --- | --- | --- |
| 3 | P | --- | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | --- | --- | --- | --- | --- |
| 3 | Q | --- | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | --- | --- | --- | --- | --- |
| 3 | R | --- | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | --- | --- | --- | --- | --- |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | WELDER I.D. TECH. | WELDER I.D. MACH. | WELDER I.D. QA MON. | DATE | QA MON. |
| 3 | S | — — | DEFECT CODE NOT USED | — | — | — | DEFECT CODE NOT USED | | — | — | — | — | |
| 3 | T | — — | DEFECT CODE NOT USED | — | — | — | DEFECT CODE NOT USED | | — | — | — | — | |
| 3 | W | P043 / P045 | 12' S OF NEOS | DS-14 | 09/24/15 | 1656 | P | 3 X 1 | MT | 131 | MO | 09/25/15 | VK |
| 3 | X | P045 / P046 | 50' S OF NEOS | DS-15 | 09/24/15 | 1705 | P | 4 X 1 | MT | 131 | MO | 09/25/15 | VK |
| 4 | A | P039 / P038 | 20' N OF TOE OF SLOPE | WR/D | 09/24/15 | 1615 | P | 3 X 1 | MT | 131 | MO | 09/25/15 | VK |
| 4 | B | P046 / P047 | 122' N OF SEOS | WR/D | 09/24/15 | 1710 | P | 2 X 1 | MT | 131 | MO | 09/25/15 | VK |
| 4 | C | P049 / P051 | 60' S OF NEOS | WR/D | 09/24/15 | 1730 | P | 3 X 1 | MT | 131 | MO | 09/28/15 | MO |
| 4 | D | P050 / P051 | 26' N OF SEOS | DS-16 | 09/25/15 | 0847 | P | 4 X 1 | MA | 131 | MO | 09/28/15 | MO |
| 4 | E | P051 / P052 | 54' N OF SEOS | DS-17 | 09/25/15 | 1140 | P | 4 X 1 | VT | 197 | MO | 09/25/15 | VK |
| 4 | F | P054 / P055 | 100' S OF NEOS | DS-18 | 09/25/15 | 0840 | P | 4 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 4 | G | P048 / P049 | @ P050 | T | 09/24/15 | 1715 | P | 1 X 1 | MT | 131 | MO | 09/25/15 | VK |
| 4 | H | P039 / P040 | @ P041 | T | 09/24/15 | 1610 | P | 2 X 2 | VT | 197 | VK | 09/28/15 | MO |
| 4 | I | P040 / P041 | @ P042 | T | 09/25/15 | 1127 | P | 4 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 4 | J | P042 / P043 | @ P044 | T | 09/24/15 | 1650 | P | 1 X 1 | MT | 131 | MO | 09/25/15 | VK |
| 4 | K | P043 / P044 | @ P045 | T | 09/24/15 | 1653 | P | 1 X 1 | MT | 131 | MO | 09/25/15 | VK |
| 4 | M | P049 / P050 | @ P051 | T | 09/24/15 | 1720 | P | 1 X 1 | MT | 131 | MO | 09/25/15 | VK |
| 4 | N | P051 / P052 | @ P053 | T | 09/25/15 | 0852 | P | 2 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 4 | P | P052 / P053 | @ P054 | T | 09/25/15 | 0857 | P | 1 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 4 | Q | P055 / P056 | @ P057 | T | 09/25/15 | 0902 | P | 1 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 4 | R | P056 / P057 | @ P058 | T | 09/25/15 | 0907 | P | 2 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 4 | S | P058 / P059 | @ P060 | T | 09/25/15 | 0917 | P | 2 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 4 | T | P059 / P061 | 120' S OF NEOS | DS-19 | 09/25/15 | 0938 | P | 4 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 4 | W | P061 / P062 | 20' S OF NEOS | DS-20 | 09/25/15 | 0947 | P | 4 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 4 | X | P062 / P063 | 83' N OF SEOS | DS-21 | 09/25/15 | 0956 | P | 4 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | A | P059 / P060 | @ P061 | T | 09/25/15 | 0921 | P | 2 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | B | P064 / P065 | @ P066 | T | 09/25/15 | 1020 | P | 1 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | C | P069 / P070 | 10' N OF SEOS | DS-22 | 09/25/15 | 1053 | P | 4 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | D | P065 / P066 | @ P067/P068/P069/P072 | | 09/25/15 | 1013 | P | 2 X 2 | MA | 131 | MO | 09/25/15 | VK |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | WELDER I.D. TECH. | WELDER I.D. MACH. | WELDER I.D. QA MON. | DATE | QA MON. |
| 5 | E | P066 / P072 | @ P073 | T | 09/25/15 | 1022 | P | 1 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | F | P069 / P070 | @ P074/P072 | | 09/25/15 | 1046 | P | 2 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | G | P073 / P072 | @ P074 | T | 09/25/15 | 1025 | P | 2 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | H | P073 / P074 | 10' N OF SEOS | DS-23 | 09/25/15 | 1130 | P | 4 X 1 | VT | 197 | MO | 09/25/15 | VK |
| 5 | I | P076 / P077 | 38' S OF NEOS | DS-24 | 09/25/15 | 1127 | P | 1 X 4 | MA | 131 | MO | 09/25/15 | VK |
| 5 | J | P071 / P074 | @ P078 | T | 09/25/15 | 1102 | P | 1 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | K | P074 / P078 | @ P079 | T | 09/25/15 | 1136 | P | 2 X 1 | VT | 197 | MO | 09/25/15 | VK |
| 5 | M | P084 / P085 | 42' S OF NEOS | PT | 10/04/15 | 0835 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 5 | N | P086 / P087 | 12' N OF SEOS | PT | 10/04/15 | 0838 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 5 | P | P087 / P086 | 30' N OF SEOS | DS-25 | 10/04/15 | 0829 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 5 | Q | P070 / P071 | @ P074 | T | 09/25/15 | 1056 | P | 1 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | R | P071 / P075 | @ P078 | T | 09/25/15 | 1106 | P | 2 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | S | P079 / P078 | @ P090 | T | 09/25/15 | 1140 | P | 2 X 1 | VT | 197 | MO | 09/25/15 | VK |
| 5 | T | P075 / P078 | @ P090 | T | 09/25/15 | 1111 | P | 1 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | W | P077 / P090 | @ P091 | T | 09/25/15 | 1131 | P | 2 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 5 | X | P080 / P091 | @ P092 | T | 09/25/15 | 1138 | P | 2 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 6 | A | P082 / P083 | @ P092 | T | 01/00/00 | 1153 | P | 1 X 1 | VT | 197 | MO | 09/25/15 | VK |
| 6 | B | P083 / P092 | @ P093 | T | 09/25/15 | 1148 | P | 18 X 1 | VT | 197 | MO | 09/25/15 | VK |
| 6 | C | P083 / P084 | @ P093 | T | --- | --- | | COVERED BY 25A | | --- | --- | --- | --- |
| 6 | D | P075 / P076 | @ P090 | T | 09/25/15 | 1116 | P | 1 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 6 | E | P095 / P096 | 15' S OF NEOS | DS-26 | 09/24/15 | 1708 | P | 8 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 | F | P098 / P099 | 20' S OF NEOS | DS-27 | 09/24/15 | 1715 | P | 8 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 | G | P034 / P038 | @ P102 | T | 09/25/15 | 1038 | P | 5 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 | H | P038 / P039 | @ P101 | T | 09/24/15 | 1557 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 | I | P038 / P101 | @ P102 | T | 09/24/15 | 1538 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 | J | P039 / P100 | @ P101 | T | 09/24/15 | 1600 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 | K | P039 / P040 | @ P99/P100 | T | 09/24/15 | 1607 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 | M | P040 / P098 | @ P099 | T | 09/24/15 | 1617 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | WELDER I.D. | | | | |
| | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 6 N | P042 / P097 | @ P098 | T | 09/24/15 | 1623 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 P | P042 / P043 | @ P097 | T | 09/24/15 | 1627 | P | 3 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 Q | P040 / P042 | @ P098 | T | 09/24/15 | 1620 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 R | P043 / P096 | @ P097 | T | 09/24/15 | 1629 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 S | P043 / P045 | @ P095/P096 | T | 09/24/15 | 1639 | P | 4 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 T | P045 / P046 | @ P094/P095 | T | 09/24/15 | 1700 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 6 W | P046 / P047 | @ P166 | T | --- | --- | | COVERED BY 17T | | --- | --- | --- | --- |
| 6 X | P039 / P100 | 8' W OF EEOS | D | 09/24/15 | 1603 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 7 A | P082 / P092 | 8' E OF PATCH (7B) | T | --- | --- | | COVERED BY 6B | | --- | --- | --- | --- |
| 7 B | P080 / P081 | @ P082/P092 | T | 09/25/15 | 1154 | P | 4 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 7 C | P077 / P080 | @ P091 | T | 09/25/15 | 1137 | P | 3 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 7 D | P076 / P077 | @ P090 | T | 09/25/15 | 1119 | P | 2 X 1 | MA | 131 | MO | 09/25/15 | VK |
| 7 E | P034 / P102 | @ P103 | T | 09/25/15 | 1043 | P | 5 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 7 F | P034 / P103 | @ P104 | T | 09/25/15 | 1048 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 7 G | P034 / P104 | @ P105 | T | 09/25/15 | 1052 | P | 2 X 1 | VT | 197 | VK | 09/25/15 | VK |
| 7 H | P034 / P105 | @ P106 | T | 09/25/15 | 1056 | P | 2 X 1 | VT | 197 | VK | 09/25/15 | VK |
| 7 I | P034 / P106 | @ P117 | T | 09/26/15 | 1613 | P | 3 X 3 | MA | 131 | VK | 09/28/15 | VK |
| 7 J | P102 / P103 | 15' W OF EEOS | D | 09/26/15 | 1635 | P | 2 X 2 | MA | 131 | VK | 09/28/15 | VK |
| 7 K | P104 / P105 | 66' E OF WEOS | D | 09/24/15 | 1738 | P | 2 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 7 M | P114 / P115 | 72' N OF SEOS | D | 09/25/15 | 1000 | P | 2 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 7 N | P113 / P114 | 50' S OF NEOS | SI | 09/25/15 | 1010 | P | 5 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 7 P | P113 / P114 | 55' S OF NEOS | D | --- | --- | | COVERED BY 7N | | --- | --- | --- | --- |
| 7 Q | P103 / P104 | 43' E OF WEOS | DS-28 | 09/24/15 | 1726 | P | 8 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 7 R | P104 / P105 | 43' E OF WEOS | DS-29 | 09/24/15 | 1734 | P | 8 X 2 | VT | 197 | VK | 09/25/15 | VK |
| 7 S | P110 / P111 | 70' N OF SEOS | DS-30 | 09/25/15 | 1029 | P | 5 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 7 T | P114 / P115 | 10' N OF SEOS | DS-31 | 09/25/15 | 1015 | P | 5 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 7 W | P106 / P107 | @ P117 | T | 09/26/15 | 1617 | P | 3 X 2 | MA | 131 | VK | 09/28/15 | VK |
| 7 X | P107 / P108 | @ P118 | T | 09/26/15 | 1623 | P | 1 X 1 | MA | 131 | VK | 09/28/15 | VK |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 8 | A | P108 / P109 | @ P118/P119 | T | 09/26/15 | 1630 | P | 3 X 1 | MA | 131 | VK | 09/28/15 | VK |
| 8 | B | P109 / P110 | @ P119 | T | 09/28/15 | 0826 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 8 | C | P110 / P111 | @ P120 | T | 09/28/15 | 0833 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 8 | D | P111 / P112 | @ P121 | T | 09/28/15 | 0843 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 8 | E | P112 / P113 | @ P124 | T | 09/28/15 | 0851 | P | 2 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 8 | F | P113 / P114 | @ P125 | T | 09/28/15 | 0858 | P | 5 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 8 | G | P114 / P115 | @ P166 | T | 09/28/15 | 0901 | P | 1 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 8 | H | P111 / P112 | 25' N OF SEOS | D | 09/28/15 | 0838 | P | 1 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 8 | I | P120 / P121 | @P111 | T | 01/00/00 | 0838 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 8 | J | P094 / P115 | @ WEOS | EXT | 09/25/15 | 0923 | P | 20 X 25 | VT | 197 | VK | 09/25/15 | VK |
| 8 | K | P054 / P055 | 100' S OF NEOS | DSE-02 | 09/25/15 | 0930 | P | 2 X 4 | VT | 197 | VK | 09/25/15 | VK |
| 8 | M | P094 / P115 | @ P166 | T | 10/04/15 | 1610 | P | 8 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 8 | N | P110 / P111 | 50' N OF SEOS | D | 09/25/15 | 0949 | P | 5 X 2 | VT | 197 | VK | 09/28/15 | VK |
| 8 | P | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 8 | Q | P116 / P117 | @ P118 | PT | 09/26/15 | 1558 | P | 2 X 2 | MA | 131 | VK | 09/28/15 | VK |
| 8 | R | P037 / P116 | @ P117 | PT | 09/26/15 | 1554 | P | 2 X 2 | MA | 131 | VK | 09/28/15 | VK |
| 8 | S | P120 / P119 | 50' N OF SEOS | PT | 09/28/15 | 1115 | P | 2 X 2 | MA | 131 | VK | 09/28/15 | VK |
| 8 | T | P121 / P122 | @ P123 | PT/T | 09/26/15 | 1554 | P | 2 X 2 | VT | 197 | MO | 09/28/15 | VK |
| 8 | W | P121 / P122 | 40' S OF NEOS | DS-33 | 09/26/15 | 1608 | P | 4 X 1 | VT | 197 | MO | 09/28/15 | VK |
| 8 | X | P121 / P123 | @ P124 | T | 09/26/15 | 1601 | P | 2 X 2 | VT | 197 | MO | 09/28/15 | VK |
| 9 | A | P117 / P118 | 7' S OF PATCH (8Q) | DS-32 | 09/26/15 | 1604 | P | 6 X 2 | MA | 131 | VK | 09/28/15 | VK |
| 9 | B | P112 / P121 | @ P124 | T | 09/28/15 | 0846 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 9 | C | P110 / P119 | @ P120 | T | 09/28/15 | 0830 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 9 | D | P107 / P117 | @ P118 | T | 09/26/15 | 1620 | P | 2 X 2 | MA | 131 | VK | 09/28/15 | VK |
| 9 | E | P125 / P126 | @ P166 | T | 09/28/15 | 0905 | P | 2 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 9 | F | P120 / P121 | 150' N OF SEOS | DS-34 | 09/26/15 | 1556 | P | 4 X 1 | VT | 197 | MO | 09/28/15 | VK |
| 9 | G | P122 / P123 | @ P125 | T | 09/26/15 | 1550 | P | 2 X 1 | VT | 197 | MO | 09/28/15 | VK |
| 9 | H | P123 / P124 | @ P125 | T | 09/26/15 | 1503 | P | 2 X 2 | VT | 197 | MO | 09/28/15 | VK |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | WELDER I.D. TECH. | WELDER I.D. MACH. | WELDER I.D. QA MON. | DATE | QA MON. |
| 9 | I | P034 / P037 | @ P116 | T | 09/28/15 | 1130 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 9 | J | P126 / P127 | 40' S OF NEOS | DS-35 | 09/26/15 | 1613 | P | 4 X 1 | VT | 197 | MO | 09/28/15 | VK |
| 9 | K | P126 / P166 | 3' W OF EEOS | PT | 09/25/15 | 1110 | P | 1 X 1 | VT | 197 | VK | 09/28/15 | VK |
| 9 | M | P126 / P128 | @ P129 | T | 09/26/15 | 1546 | P | 2 X 2 | VT | 197 | MO | 09/28/15 | VK |
| 9 | N | P126 / P127 | @ P128 | T | 09/26/15 | 1542 | P | 2 X 2 | VT | 197 | MO | 09/28/15 | VK |
| 9 | P | P127 / P128 | @ P130 | T | 09/26/15 | 1540 | P | 2 X 2 | VT | 197 | MO | 09/28/15 | VK |
| 9 | Q | P128 / P129 | @ P130 | T | 09/26/15 | 1548 | P | 2 X 2 | VT | 197 | MO | 09/28/15 | VK |
| 9 | R | P133 / P134 | @ P135 | T | 09/26/15 | 1625 | P | 1 X 1 | VT | 197 | MO | 09/28/15 | VK |
| 9 | S | P132 / P133 | 10' N OF SEOS | DS-36 | 09/28/15 | 0936 | P | 4 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 9 | T | P133 / P135 | 15' N OF SEOS | DS-37 | 09/26/15 | 1636 | P | 3 X 1 | VT | 197 | MO | 09/28/15 | VK |
| 9 | W | P134 / P135 | 10' E OF WEOS | DS-38 | 09/26/15 | 1640 | P | 4 X 1 | VT | 197 | MO | 09/28/15 | VK |
| 9 | X | P134 / P135 | @ P136/P137 | T | 09/28/15 | 1104 | P | 3 X 2 | DL | 197 | VK | 09/28/15 | VK |
| 10 | A | P144 / P145 | 10' S OF NEOS | DS-39 | 09/28/15 | 1104 | P | 4 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 10 | B | P146 / P147 | 50' E OF WEOS | DS-40 | 09/28/15 | 1059 | P | 4 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 10 | C | P139 / P148 | @ P149 | PT | 09/28/15 | 0922 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 10 | D | P148 / P149 | @ P150 | PT | 09/28/15 | 0925 | P | 2 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 10 | E | P148 / P150 | @ P141 | PT | 09/28/15 | 1043 | P | 2 X 2 | DL | 197 | VK | 09/28/15 | VK |
| 10 | F | P150 / P151 | @ P152 | PT | 09/28/15 | 1040 | P | 2 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 10 | G | P151 / P152 | @ P153 | PT | 09/28/15 | 1037 | P | 2 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 10 | H | P154 / P155 | @ P156 | PT | 09/28/15 | 1048 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 10 | I | P155 / P156 | @ P157 | PT | 09/28/15 | 1052 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 10 | J | P136 / P137 | @ P138 | T | 09/28/15 | 1059 | P | 2 X 2 | DL | 197 | VK | 09/28/15 | VK |
| 10 | K | P138 / P139 | @ P140 | T | 09/28/15 | 1053 | P | 2 X 2 | DL | 197 | VK | 09/28/15 | VK |
| 10 | M | P138 / P140 | @ P148 | T | 09/28/15 | 1047 | P | 2 X 2 | DL | 197 | VK | 09/28/15 | VK |
| 10 | N | P140 / P141 | @ P148 | T | 09/28/15 | 1045 | P | 2 X 2 | DL | 197 | VK | 09/28/15 | VK |
| 10 | P | P141 / P142 | @ P150 | T | 09/28/15 | 1038 | P | 2 X 2 | DL | 197 | VK | 09/28/15 | VK |
| 10 | Q | P142 / P143 | @ P150 | T | 09/28/15 | 1035 | P | 5 X 2 | DL | 197 | VK | 09/28/15 | VK |
| 10 | R | P143 / P144 | @ P151/P244 | T | 10/02/15 | 1127 | P | 3 X 2 | DL | 197 | AM | 10/04/15 | MO |

# GEOMEMBRANE REPAIR SUMMARY
# LUMINANT, INC.
# LUMINANT OAK GROVE
# FDG-C POND CQA
# ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 10 | S | P064 / P065 | 5' S OF NEOS | D | 09/26/15 | 1640 | P | 2 X 2 | MA | 131 | VK | 09/28/15 | VK |
| 10 | T | P141 / P142 | 15' N OF SEOS | DT | 09/28/15 | 1110 | P | 2 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 10 | W | P094 / P166 | 26' S OF NEOS | DS-44 | 10/04/15 | 0818 | P | 4 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 10 | X | P166 / P167 | 20' N OF SEOS | DS-45 | 09/29/15 | | P | 2 X 5 | MA | 131 | VK | 10/04/15 | MO |
| 11 | A | P158 / P159 | 10' N OF SEOS | DS-41 | 09/28/15 | 1027 | P | 4 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 11 | B | P150 / P151 | 20' N OF SEOS | DS-42 | 09/28/15 | 1047 | P | 4 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 11 | C | P159 / P160 | 15' N OF SEOS | DS-43 | 09/28/15 | 1032 | P | 4 X 1 | MA | 131 | MO | 09/28/15 | VK |
| 11 | D | P114 / P125 | @ P166 | PT | 09/28/15 | 1035 | P | 2 X 2 | MA | 131 | MO | 09/28/15 | VK |
| 11 | E | P114 / P115 | @ P166 | PT | --- | --- | | COVERED BY 8G | | --- | --- | --- | --- |
| 11 | F | P167 / P168 | @ P169 | T | 10/04/15 | 1615 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 11 | G | P168 / P169 | @ P170 | T | 10/04/15 | 1620 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 11 | H | P126 / P166 | @ P167 | T | 10/03/15 | | P | 2 X 2 | VT | 131 | MO | 10/04/15 | MO |
| 11 | I | P129 / P167 | @ P169 | T | 10/03/15 | | P | 2 X 2 | VT | 131 | MO | 10/04/15 | MO |
| 11 | J | P130 / P169 | @ P170 | T | 10/03/15 | 1445 | P | 2 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 11 | K | P131 / P170 | @ P171 | T | 09/29/15 | | P | 2 X 2 | MA | 131 | MO | 10/04/15 | MO |
| 11 | M | P132 / P171 | @ P172 | T | 09/29/15 | | P | 2 X 2 | MA | 131 | MO | 10/04/15 | MO |
| 11 | N | P133 / P172 | @ P173 | T | 09/29/15 | | P | 2 X 2 | MA | 131 | MO | 10/04/15 | MO |
| 11 | P | P135 / P173 | @ P174 | T | 09/29/15 | | P | 2 X 2 | MA | 131 | MO | 10/04/15 | MO |
| 11 | Q | P137 / P174 | @ P175 | T | 09/29/15 | | P | 2 X 2 | MA | 131 | MO | 10/04/15 | MO |
| 11 | R | P139 / P175 | @ P176 | T | 10/03/15 | | P | 2 X 2 | VT | 131 | MO | 10/04/15 | MO |
| 11 | S | P149 / P176 | @ P177 | T | 10/03/15 | 1451 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 11 | T | P150 / P177 | @ P178 | T | 10/03/15 | | P | 2 X 2 | VT | 131 | MO | 10/04/15 | MO |
| 11 | W | P152 / P178 | @ P179 | T | 10/03/15 | 1418 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 11 | X | P153 / P179 | @ P180 | T | 10/03/15 | 1409 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 12 | A | P171 / P172 | 63' N OF SEOS | DS-47 | 09/29/15 | | P | 2 X 5 | MA | 197 | MO | 10/03/15 | MO |
| 12 | B | P175 / P176 | 10' OF SEOS | DS-48 | 10/03/15 | | P | 2 X 5 | VT | 131 | MO | 10/03/15 | MO |
| 12 | C | --- — | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | | --- | --- | --- | --- |
| 12 | D | --- — | DEFECT CODE NOT USED | — | --- | --- | | DEFECT CODE NOT USED | | --- | --- | --- | --- |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | WELDER I.D. TECH. | WELDER I.D. MACH. | WELDER I.D. QA MON. | DATE | QA MON. |
| 12 | E | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | F | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | G | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | H | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | I | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | J | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | K | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | M | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | N | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | P | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | Q | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | R | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | S | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | T | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | W | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 12 | X | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 13 | A | P175 / P176 | 60' N OF SEOS | BO | 10/04/15 | 0926 | P | 7 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | B | P154 / P180 | @ P181 | T | 10/03/15 | 1403 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | C | P154 / P155 | @ P181 | T | 10/03/15 | 1400 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | D | P155 / P157 | @ P182 | T | 10/03/15 | 1355 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | E | P157 / P182 | @ P183 | T | 10/03/15 | 1352 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | F | P157 / P158 | @ P183 | T | 10/03/15 | 1350 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | G | P158 / P183 | @ P184 | T | 10/03/15 | 1345 | P | 2 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | H | P155 / P181 | @ P182 | T | 10/03/15 | 1358 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | I | P152 / P153 | @ P179 | T | 10/03/15 | 1416 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | J | P150 / P152 | @ P178 | T | 10/03/15 | 1440 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | K | P149 / P150 | @ P177 | T | 10/03/15 | 1448 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 13 | M | P139 / P149 | @ P176 | T | 10/03/15 | | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 13 | N | P139 / P137 | @ P175 | T | 09/29/15 | | P | 1 X 1 | MA | 131 | MO | 10/04/15 | MO |
| 13 | P | P135 / P137 | @ P174 | T | 09/29/15 | | P | 2 X 2 | MA | 131 | MO | 10/04/15 | MO |
| 13 | Q | P133 / P135 | @ P173 | T | 09/29/15 | | P | 2 X 2 | MA | 131 | MO | 10/04/15 | MO |
| 13 | R | P132 / P133 | @ P172 | T | 09/29/15 | | P | 2 X 2 | MA | 131 | MO | 10/04/15 | MO |
| 13 | S | P131 / P132 | @ P171 | T | 09/29/15 | | P | 2 X 2 | MA | 131 | MO | 10/04/15 | MO |
| 13 | T | P130 / P131 | @ P170 | T | 09/29/15 | | P | 2 X 2 | MA | 131 | MO | 10/04/15 | MO |
| 13 | W | P129 / P130 | @ P169 | T | 10/03/15 | | P | 2 X 2 | VT | 131 | MO | 10/04/15 | MO |
| 13 | X | P126 / P129 | @ P167 | T | 10/03/15 | | P | 2 X 2 | VT | 131 | MO | 10/04/15 | MO |
| 14 | A | P126 / P166 | @ P167 | T | --- | --- | | COVERED BY 11H | | --- | --- | --- | --- |
| 14 | B | P114 / P125 | @ P166 | T | --- | --- | | COVERED BY 11D | | --- | --- | --- | --- |
| 14 | C | P165 / P191 | SEOS | T | 10/04/15 | 0900 | P | 2 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | D | P165 / P190 | @ P191 | T | 10/04/15 | 0903 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | E | P164 / P165 | @ P190 | T | 10/04/15 | 0911 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | F | P164 / P189 | @ P190 | T | 10/04/15 | 0914 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | G | P163 / P164 | @ P189 | T | 10/04/15 | 0948 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | H | P163 / P188 | @ P189 | T | 10/03/15 | 0958 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | I | P162 / P163 | @ P188 | T | 10/03/15 | 1001 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | J | P162 / P187 | @ P188 | T | 10/03/15 | 1004 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | K | P161 / P162 | @ P187 | T | 10/03/15 | 1007 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | M | P161 / P186 | @ P187 | T | 10/03/15 | 1011 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | N | P160 / P161 | @ P186 | T | 10/03/15 | 1014 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | P | P160 / P185 | @ P186 | T | 10/03/15 | 1045 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | Q | P159 / P160 | @ P185 | T | 10/03/15 | 1150 | P | 4 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 14 | R | P165 / P191 | @ P242 | T | 10/02/15 | 1536 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 14 | S | P192 / P194 | 6' S OF NEOS | BO | 10/04/15 | 0808 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 14 | T | P192 / P193 | 6' N OF SEOS | BO | 10/04/15 | 0816 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 14 | W | P192 / P193 | @ P194 | T | 10/04/15 | 0812 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 14 | X | P191 / P192 | @ P242 | T | 10/02/15 | 1601 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | WELDER I.D. TECH. | WELDER I.D. MACH. | WELDER I.D. QA MON. | DATE | QA MON. |
| 15 | A | P194 / P198 | @ P200 | T | 10/02/15 | 1643 | P | 9 X 2 | DL | 197 | MO | 10/03/15 | MO |
| 15 | B | P194 / P195 | @ P198 | T | 10/04/15 | 0758 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | C | P195 / P199 | @ P198 | | 10/02/15 | 1630 | P | 3 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 15 | D | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | | --- | --- | --- | --- |
| 15 | E | P195 / P196 | @ P197/P199 | T | 10/04/15 | 0913 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | F | P218 / P219 | 49' N OF SEOS | BO | 10/03/15 | 0918 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | G | P219 / P223 | @ P225 | T | 10/03/15 | 1034 | P | 3 X 2 | DL | 197 | MO | 10/04/15 | MO |
| 15 | H | P218 / P219 | @ P223 | T | 10/03/15 | 0911 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | I | P217 / P218 | @ P223 | T | 10/03/15 | 0907 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | J | P216 / P217 | @ P223 | T | 10/03/15 | 0902 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | K | P215 / P216 | @ P223 | T | 10/03/15 | 0856 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | M | P214 / P215 | @ P223 | T | 10/03/15 | 0846 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | N | P213 / P214 | @ P223 | T | 10/03/15 | 0838 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | P | P212 / P213 | @ P223 | T | 10/03/15 | 0834 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | Q | P211 / P212 | @ P223 | T | 10/03/15 | 0829 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | R | P210 / P211 | @ P223 | T | 10/03/15 | 0825 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | S | P209 / P210 | @ P223 | T | 10/03/15 | 0821 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | T | P208 / P209 | @ P223 | T | 10/03/15 | 0816 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | W | P207 / P208 | @ P223 | T | 10/03/15 | 0804 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 15 | X | P206 / P207 | @ P223 | T | 10/02/15 | 1752 | P | 2 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 16 | A | P089 / P193 | P194/P195/P197 | T | 10/04/15 | 0820 | P | 3 X 3 | DL | 197 | MO | 10/04/15 | MO |
| 16 | B | P088 / P089 | @ P193 | T | 10/04/15 | 1053 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 16 | C | P088 / P192 | @ P193 | T | 10/04/15 | 1049 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 16 | D | P087 / P088 | @ P192 | T | 10/04/15 | 1045 | P | 3 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 16 | E | P087 / P191 | @ P192 | T | 10/04/15 | 1041 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 16 | F | P087 / P191 | 4' W OF EEOS | BO | 10/04/15 | 1039 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 16 | G | P086 / P087 | @ P191 | T | 10/04/15 | 1036 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 16 | H | P086 / P190 | @ P191 | T | 10/04/15 | 1030 | P | 3 X 1 | DL | 197 | MO | 10/04/15 | MO |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | WELDER I.D. TECH. | WELDER I.D. MACH. | WELDER I.D. QA MON. | DATE | QA MON. |
| 16 | I | P085 / P086 | @ P190 | T | 10/04/15 | 1026 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 16 | J | P085 / P189 | @ P190 | T | 10/04/15 | 1024 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 16 | K | P084 / P085 | @ P189 | T | 10/04/15 | 1020 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 16 | M | P220 / P221 | 10' E OF WEOS | PT | 10/03/15 | 1028 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 16 | N | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 16 | P | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 16 | Q | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 16 | R | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 16 | S | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 16 | T | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 16 | W | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 16 | X | --- --- | DEFECT CODE NOT USED | --- | --- | --- | DEFECT CODE NOT USED | | --- | --- | --- | --- | --- |
| 17 | A | P205 / P206 | @ P223 | T | 10/02/15 | 1748 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 17 | B | P204 / P205 | @ P223 | T | 10/02/15 | 1743 | P | 2 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 17 | C | P203 / P204 | @ P223 | T | 10/02/15 | 1714 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 17 | D | P202 / P203 | @ P223 | T | 10/02/15 | 1708 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 17 | E | P201 / P202 | @ P223 | T | 10/02/15 | 1704 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 17 | F | P200 / P201 | @ P223 | T | 10/02/15 | 1652 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 17 | G | P190 / P191 | 14' N OF SEOS | DS-53 | 10/04/15 | 0908 | P | 4 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 17 | H | P189 / P190 | 10' N OF SEOS | DS-52 | 10/04/15 | 0945 | P | 4 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 17 | I | P188 / P189 | 50' N OF SEOS | T | 10/04/15 | 0954 | P | 4 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 17 | J | P220 / P225 | 4' N OF SEOS | T | 10/03/15 | 1032 | P | 2 X 2 | DL | 197 | MO | 10/04/15 | MO |
| 17 | K | P220 / P225 | @ P226 | T | 10/03/15 | 1023 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 17 | M | P220 / P221 | @ P226 | T | 10/03/15 | 1018 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 17 | N | P221 / P226 | @ P227 | T | 10/03/15 | 1007 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 17 | P | P221 / P222 | @ P227 | T | 10/03/15 | 1002 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 17 | Q | P223 / P224 | 6' N OF SEOS | BO | 10/03/15 | 1013 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 17 | R | P046 / P094 | @ P166 | T | 10/04/15 | 0810 | C | 7 X 1 | VT | 131 | MO | 10/04/15 | MO |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | WELDER I.D. | | | | |
| | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 17 S | P046 / P047 | @ P166 | T | --- | --- | | COVERED BY 17T | | --- | --- | --- | --- |
| 17 T | P047 / P048 | @ P166 | T | 10/04/15 | 0806 | C | 15 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 17 W | P048 / P167 | @ P168 | T | 10/04/15 | 0821 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 17 X | P048 / P050 | @ P168 | T | 10/04/15 | 0824 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 A | P050 / P168 | @ P170 | T | 10/04/15 | 0828 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 B | P050 / P051 | @ P170 | T | 10/04/15 | 0831 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 C | P051 / P170 | @ P171 | T | 10/04/15 | 0835 | P | 2 X 2 | VT | 131 | MO | 10/04/15 | MO |
| 18 D | P051 / P053 | @ P171 | T | 10/04/15 | 0838 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 E | P053 / P171 | @ P172 | T | 10/04/15 | 0842 | P | 2 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 F | P053 / P054 | @ P172 | T | 10/04/15 | 0846 | P | 2 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 G | P054 / P172 | 10' N OF SEOS | T | 10/04/15 | 0849 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 H | P172 / P173 | @ P054 | T | 10/04/15 | 0852 | P | 2 X 2 | VT | 131 | MO | 10/04/15 | MO |
| 18 I | P054 / P055 | @ P173 | T | 10/04/15 | 0856 | P | 2 X 2 | VT | 131 | MO | 10/04/15 | MO |
| 18 J | P055 / P173 | @ P174 | T | 10/04/15 | 0859 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 K | P055 / P056 | @ P174 | T | 10/04/15 | 0903 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 M | P056 / P174 | @ P175 | T | 10/04/15 | 0906 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 N | P056 / P058 | @ P175 | T | 10/04/15 | 0910 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 P | P058 / P175 | @ P176 | T | 10/04/15 | 1005 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 Q | P058 / P060 | @ P176 | T | 10/04/15 | 1008 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 R | P060 / P176 | @ P177 | T | 10/04/15 | 1013 | P | 2 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 S | P060 / P061 | @ P177 | T | 10/04/15 | 1018 | P | 3 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 18 T | P061 / P177 | SEOS | BO | --- | --- | | COVERED BY 18S | | --- | --- | --- | --- |
| 18 W | P061 / P177 | SEOS | BO | --- | --- | | COVERED BY 18X | | --- | --- | --- | --- |
| 18 X | P061 / P177 | @ P178 | T | 10/04/15 | 1026 | C | 6 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 A | P061 / P062 | @ P178 | T | 10/04/15 | 1029 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 B | P062 / P178 | @ P179 | T | 10/04/15 | 1033 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 C | P062 / P063 | @ P179 | T | 10/04/15 | 1036 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 D | P063 / P179 | @ P180 | T | 10/04/15 | 1039 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |

APPENDIX E-Revision 1 November 21, 2022

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | WELDER I.D. | | | | |
| | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 19 E | P063 / P064 | @ P180 | T | 10/04/15 | 1043 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 F | P064 / P180 | @ P181 | T | 10/04/15 | 1047 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 G | P064 / P066 | @ P181 | T | 10/04/15 | 1051 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 H | P066 / P181 | @ P182 | T | 10/04/15 | 1056 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 I | P066 / P073 | @ P182 | T | 10/04/15 | 1059 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 J | P073 / P182 | @ P183 | T | 10/04/15 | 1103 | P | 1 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 K | P073 / P074 | @ P183 | T | 10/04/15 | 1008 | P | 2 X 2 | DL | 197 | MO | 10/04/15 | MO |
| 19 M | P074 / P183 | @ P184 | T | 10/04/15 | 1010 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 19 N | P174 / P175 | 40' S OF NEOS | DS-46 | 10/04/15 | 0918 | P | 4 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 P | P181 / P182 | 50' S OF NEOS | DS-51 | 10/04/15 | 1110 | P | 4 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 19 Q | P188 / P189 | 50' S OF NEOS | DS-54 | 10/04/15 | 0842 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 19 R | P203 / P204 | 30' E OF WEOS | DS-55 | 10/02/15 | 1723 | P | 4 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 19 S | P218 / P219 | 8' W OF EEOS | DS-56 | 10/03/15 | 0945 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 19 T | P219 / P220 | 22' W OF EEOS | DS-60 | 10/03/15 | 0957 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 19 W | P223 / P224 | 67' N OF SEOS | DS-61 | 10/03/15 | 1039 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 19 X | P228 / P229 | 112' N OF SEOS | DS-62 | 10/03/15 | 1044 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 20 A | P214 / P215 | 10' E OF WEOS | DS-63 | 10/03/15 | 0849 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 20 B | P048 / P167 | 6' N OF SEOS | DS-64 | --- | --- | | COVERED BY 17T | | --- | --- | --- | --- |
| 20 C | P223 / P201 | 10' N OF SEOS | DS-57 | 10/02/15 | 1659 | P | 4 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 20 D | P224 / P228 | 170' S OF NEOS | DS-58 | 10/03/15 | | P | 2 X 5 | DL | 197 | MO | 10/03/15 | MO |
| 20 E | P204 / P205 | 40' E OF WEOS | DS-59 | 10/02/15 | 1738 | P | 4 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 20 F | P231 / P232 | 116' S OF NEOS | DS-65 | 10/03/15 | 1132 | P | 4 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 20 G | P234 / P235 | 71' S OF NEOS | DS-66 | 10/03/15 | 1138 | P | 4 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 20 H | P237 / P238 | 26' S OF NEOS | DS-67 | 10/03/15 | 1150 | P | 4 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 20 I | P232 / P233 | 212' N OF SEOS | DS-71 | 10/03/15 | | P | 2 X 5 | DL | 197 | MO | 10/03/15 | MO |
| 20 J | P237 / P238 | 19' N OF SEOS | DS-68 | 10/03/15 | 1635 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 20 K | P240 / P241 | 64' N OF SEOS | DS-69 | 10/03/15 | 1621 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 20 M | P229 / P230 | 167' N OF SEOS | DS-70 | 10/03/15 | 1049 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 20 | N | P167 / P047 | 2' N OF SEOS | DS-64N1 | --- | --- | | COVERED BY 17T | | --- | --- | --- | --- |
| 20 | P | P236 / P237 | 257' N OF SEOS | DS-72 | 10/03/15 | 1108 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 20 | Q | P239 / P240 | 302' N OF SEOS | DS-73 | 10/03/15 | 1120 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 20 | R | P230 / P231 | 183' N OF SEOS | DS-74 | 10/03/15 | 1052 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 20 | S | P233 / P234 | 228' N OF SEOS | DS-75 | 10/03/15 | 1101 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 20 | T | P235 / P236 | 273' N OF SEOS | DS-76 | 10/03/15 | 1112 | P | 4 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 20 | W | P238 / P239 | 310' N OF SEOS | DS-77 | 10/03/15 | 1117 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 20 | X | P233 / P242 | 6' W OF EEOS | DS-78 | 10/02/15 | 1445 | P | 2 X 4 | DL | 197 | AM | 10/03/15 | MO |
| 21 | A | P238 / P239 | 7' N OF SEOS | BO | 10/02/15 | | P | 2 X 2 | DL | 197 | MO | 10/03/15 | MO |
| 21 | B | P238 / P239 | 9' S OF NEOS | BO | 10/03/15 | 1628 | P | 4 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 21 | C | P240 / P243 | @ P247 | T | 10/02/15 | 1157 | P | 4 X 2 | DL | 197 | AM | 10/03/15 | MO |
| 21 | D | P239 / P240 | @ P243 | T | 10/02/15 | 1207 | P | 1 X 1 | DL | 197 | AM | 10/03/15 | MO |
| 21 | E | P238 / P239 | @ P243 | T | 10/02/15 | 1212 | P | 1 X 2 | DL | 197 | AM | 10/03/15 | MO |
| 21 | F | P237 / P238 | @ P243 | T | 10/02/15 | 1344 | P | 1 X 1 | DL | 197 | AM | 10/03/15 | MO |
| 21 | G | P236 / P237 | @ P243 | T | 10/02/15 | 1355 | P | 1 X 1 | DL | 197 | AM | 10/03/15 | MO |
| 21 | H | P235 / P236 | @ P243 | T | 10/02/15 | 1402 | P | 1 X 1 | DL | 197 | AM | 10/03/15 | MO |
| 21 | I | P234 / P235 | @ P243 | T | 10/02/15 | 1411 | P | 1 X 2 | DL | 197 | AM | 10/03/15 | MO |
| 21 | J | P233 / P234 | @ P243 | T | 10/02/15 | 1413 | P | 1 X 2 | DL | 197 | AM | 10/03/15 | MO |
| 21 | K | P233 / P242 | @ P243 | T | 10/02/15 | 1438 | P | 1 X 4 | DL | 197 | AM | 10/03/15 | MO |
| 21 | M | P232 / P233 | @ P242 | T | 10/02/15 | 1451 | P | 1 X 2 | DL | 197 | AM | 10/03/15 | MO |
| 21 | N | P231 / P232 | @ P242 | T | 10/02/15 | 1500 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 21 | P | P230 / P231 | @ P242 | T | 10/02/15 | 1509 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 21 | Q | P229 / P230 | @ P242 | T | 10/02/15 | 1527 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 21 | R | P228 / P229 | @ P242 | T | 10/02/15 | 1534 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 21 | S | P224 / P228 | @ P242 | T | 10/02/15 | 1546 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 21 | T | P223 / P224 | @ P242 | T | 10/02/15 | 1602 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 21 | W | P223 / P242 | NEOS | T | 10/02/15 | 1635 | P | 7 X 4 | DL | 197 | MO | 10/03/15 | MO |
| 21 | X | --- --- | DEFECT CODE NOT USED | --- | --- | --- | | DEFECT CODE NOT USED | | --- | --- | --- | --- |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 22 | A | P151 / P153 | @ P244 | T | 10/02/15 | 1132 | P | 2 X 2 | DL | 197 | AM | 10/04/15 | MO |
| 22 | B | P153 / P244 | @ P247 | T | 10/02/15 | 1137 | P | 1 X 1 | DL | 197 | AM | 10/04/15 | MO |
| 22 | C | P241 / P244 | @ P247 | T | 10/02/15 | 1140 | P | 2 X 2 | DL | 197 | AM | 10/04/15 | MO |
| 22 | D | P153 / P154 | @ P247 | T | 10/02/15 | 1146 | P | 2 X 2 | DL | 197 | AM | 10/04/15 | MO |
| 22 | E | P240 / P241 | @ P247 | T | 10/02/15 | 1148 | P | 1 X 1 | DL | 197 | AM | 10/04/15 | MO |
| 22 | F | P154 / P243 | @ P247 | T | 10/02/15 | 1200 | P | 3 X 2 | DL | 197 | AM | 10/04/15 | MO |
| 22 | G | P154 / P156 | @ P243 | T | 10/02/15 | 1204 | P | 2 X 2 | DL | 197 | AM | 10/04/15 | MO |
| 22 | H | P156 / P157 | @ P243 | T | 10/02/15 | 1220 | P | 1 X 1 | DL | 197 | AM | 10/04/15 | MO |
| 22 | I | P157 / P158 | @ P243 | T | 10/02/15 | 1347 | P | 1 X 1 | DL | 197 | AM | 10/04/15 | MO |
| 22 | J | P158 / P159 | @ P243 | T | 10/02/15 | 1357 | P | 1 X 1 | DL | 197 | AM | 10/03/15 | MO |
| 22 | K | P159 / P160 | @ P243 | T | 10/02/15 | 1405 | P | 1 X 1 | DL | 197 | AM | 10/04/15 | MO |
| 22 | M | P160 / P161 | @ P243 | T | 10/02/15 | 1420 | P | 1 X 2 | DL | 197 | AM | 10/04/15 | MO |
| 22 | N | P161 / P242 | @ P243 | T | 10/02/15 | 1431 | P | 1 X 1 | DL | 197 | AM | 10/04/15 | MO |
| 22 | P | P161 / P162 | @ P242 | T | 10/02/15 | 1456 | P | 2 X 2 | DL | 197 | AM | 10/04/15 | MO |
| 22 | Q | P162 / P163 | @ P242 | T | 10/02/15 | 1503 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 22 | R | P163 / P164 | @ P242 | T | 10/02/15 | 1512 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 22 | S | P164 / P165 | @ P242 | T | 10/02/15 | 1528 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 22 | T | P192 / P242 | 10' N OF SEOS | T | 10/02/15 | 1609 | P | 2 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 22 | W | P117 / P034 | 7' N OF SEOS | DS-32A | 10/04/15 | 1550 | P | 4 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 22 | X | P244 / P151 | 4' E OF WEOS | DS-81 | 10/03/15 | | P | 2 X 5 | DL | 197 | MO | 10/04/15 | MO |
| 23 | A | P186 / P187 | 7' S OF NEOS | DS-79 | 10/04/15 | 0918 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 23 | B | P164 / P185 | 10' N OF SEOS | DS-80 | 10/03/15 | 1332 | P | 4 X 1 | VT | 131 | MO | 10/04/15 | MO |
| 23 | C | P233 / P242 | 2' FROM PATCH (21K) | DS-82 | 10/03/15 | 1142 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 23 | D | P256 / P258 | 11' E OF WEOS | DS-83 | 10/03/15 | 1640 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 23 | E | P266 / P267 | 7' W OF EEOS | DS-84 | 10/03/15 | 1606 | P | 19 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 23 | F | P254 / P255 | 24' W FO EEOS | DS-85 | 10/03/15 | 1424 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 23 | G | P263 / P264 | 11' W OF EEOS | DS-86 | 10/03/15 | 1506 | P | 4 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 23 | H | P144 / P145 | @ P244 | T | 10/03/15 | 1156 | P | 2 X 2 | DL | 197 | MO | 10/03/15 | MO |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 23 | I | P145 / P146 | @ P244 | T | 10/03/15 | 1323 | P | 2 X 2 | DL | 197 | MO | 10/03/15 | MO |
| 23 | J | P146 / P147 | @ P244/P245 | T | 10/03/15 | 1327 | P | 5 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 23 | K | P147 / P245 | @ P248 | T | 10/03/15 | 1336 | P | 3 X 2 | DL | 197 | MO | 10/04/15 | MO |
| 23 | M | P245 / P248 | @ P249 | T | 10/03/15 | 1338 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 23 | N | P245 / P249 | @ P250 | T | 10/03/15 | 1341 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 23 | P | P245 / P246 | @ P250 | T | 10/03/15 | 1344 | P | 2 X 2 | DL | 197 | MO | 10/03/15 | MO |
| 23 | Q | P246 / P250 | @ P251 | T | 10/03/15 | | P | 2 X 2 | DL | 197 | MO | 10/03/15 | MO |
| 23 | R | P246 / P251 | @ P252 | T | 10/03/15 | 1353 | P | 2 X 2 | DL | 197 | MO | 10/03/15 | MO |
| 23 | S | P246 / P252 | @ P253 | T | 10/03/15 | 1403 | P | 3 X 2 | DL | 197 | MO | 10/03/15 | MO |
| 23 | T | P241 / P246 | @ P253 | T | 10/03/15 | 1359 | P | 2 X 2 | DL | 197 | MO | 10/03/15 | MO |
| 23 | W | P241 / P253 | @ P254 | T | 10/03/15 | 1407 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 23 | X | P241 / P254 | @ P255 | T | 10/03/15 | 1418 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | A | P241 / P255 | @ P256 | T | 10/03/15 | 1428 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | B | P241 / P256 | @ P257 | T | 10/03/15 | 1434 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | C | P241 / P257 | @ P259 | T | 10/03/15 | 1437 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | D | P241 / P259 | @ P260 | T | 10/03/15 | 1440 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | E | P241 / P260 | @ P261 | T | 10/03/15 | 1441 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | F | P241 / P261 | @ P263 | T | 10/03/15 | 1458 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | G | P241 / P263 | @ P264 | T | 10/03/15 | 1502 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | H | P241 / P264 | @ P265 | T | 10/03/15 | 1516 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | I | P241 / P265 | @ P266/P268 | T | 10/03/15 | 1542 | P | 3 X 2 | DL | 197 | MO | 10/04/15 | MO |
| 24 | J | P266 / P268 | @ P269 | T | 10/03/15 | 1544 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | K | P266 / P267 | @ P269 | T | --- | --- | | COVERED BY 23E | | --- | --- | --- | --- |
| 24 | M | P267 / P269 | @ P270 | T | 10/03/15 | 1613 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | N | P267 / P270 | @ P271 | T | 10/03/15 | 1609 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | P | P241 / P244 | @ P245 | T | 10/03/15 | 1330 | P | 3 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 24 | Q | P241 / P245 | @ P246 | T | 10/03/15 | 1349 | P | 1 X 1 | DL | 197 | MO | 10/03/15 | MO |
| 24 | R | P261 / P262 | @ P263 | T | 10/03/15 | 1522 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |

# GEOMEMBRANE REPAIR SUMMARY
## LUMINANT, INC.
## LUMINANT OAK GROVE
## FDG-C POND CQA
## ROBERTSON COUNTY, TEXAS

| DEFECT CODE | | SEAM OR PANEL NUMBER | MAPPED LOCATION | DEFECT TYPE | REPAIR | | | | | | | VACUUM TEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | WELDER I.D. | | | | |
| | | | | | DATE | TIME | TYPE | APPROX. SIZE (FT.) | TECH. | MACH. | QA MON. | DATE | QA MON. |
| 24 | S | P262 / P263 | @ P264 | T | 10/03/15 | 1525 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | T | P256 / P257 | @ P258 | T | 10/03/15 | 1453 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | W | P257 / P258 | @ P259 | T | 10/03/15 | 1455 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 24 | X | P083 / P084 | @ P188 | T | 10/04/15 | 0857 | P | 5 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 25 | A | P083 / P092 | @ P188 | T | 10/04/15 | 0857 | P | 5 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 25 | B | P092 / P093 | @ P187/P188 | T | 10/04/15 | 0900 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 25 | C | P091 / P092 | @ P187 | T | 10/04/15 | 0902 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 25 | D | P091 / P186 | @ P187 | T | 10/04/15 | 0905 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 25 | E | P090 / P091 | @ P186 | T | 10/04/15 | 0911 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 25 | F | P090 / P185 | @ P186 | T | 10/04/15 | 0921 | P | 2 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 25 | G | P079 / P090 | @ P185 | T | 10/04/15 | 0923 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 25 | H | P079 / P184 | @ P185 | T | 10/04/15 | 0926 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 25 | I | P074 / P079 | @ P184 | T | 10/04/15 | 0934 | P | 1 X 1 | DL | 197 | MO | 10/04/15 | MO |
| 25 | J | P183 / P184 | 10' E OF WEOS | T | 10/04/15 | 1004 | P | 2 X 2 | DL | 197 | MO | 10/04/15 | MO |
| 25 | K | P084 / P188 | @ P189 | T | 10/04/15 | 1016 | P | 3 X 2 | DL | 197 | MO | 10/04/15 | MO |
| 25 | M | P185 / P159 | 3' W OF EEOS | BO | 10/03/15 | 1154 | P | 2 X 5 | VT | 131 | MO | 10/04/15 | MO |
| 25 | N | P184 / P185 | @P159 | T | 10/03/15 | 1341 | P | 2 X 2 | VT | 131 | MO | 10/04/15 | MO |
| 25 | P | P159 / P158 | @P184/P184-183 | T | 10/03/15 | 1341 | P | 11 X 5 | VT | 131 | MO | 10/04/15 | MO |
| 25 | Q | P182 / P183 | 88' W OF SEOS | DS-49 | 10/04/15 | 0215 | P | 2 X 5 | VT | 131 | MO | 10/04/15 | MO |
| 25 | R | P177 / P178 | 70' W OF EEOS | BO | 10/04/15 | 0218 | P | 2 X 4 | VT | 131 | MO | 10/04/15 | MO |
| 25 | S | P178 / P179 | 80' W OF EEOS | DS-50 | 10/03/15 | - | P | 2 X 5 | VT | 131 | MO | 10/04/15 | MO |

# APPENDIX N
# PHOTOGRAPH LOG

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.


| | |
|---|---|
| Africa | + 27 11 254 4800 |
| Asia | + 852 2562 3658 |
| Australasia | + 61 3 8862 3500 |
| Europe | + 356 21 42 30 20 |
| North America | + 1 800 275 3281 |
| South America | + 55 21 3095 9500 |

solutions@golder.com
www.golder.com

**Golder Associates Inc.**
**500 Century Plaza Drive, Suite 190**
**Houston, TX 77073 USA**
**Tel: (281) 821-6868**
**Fax: (281) 821-6870**


Golder Associates



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**REPORT**

# Hazard Potential Classification Assessment
# 5 Year Update

*Oak Grove Steam Electric Station*
*FGD Ponds*
*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**
6555 Sierra Drive
Irving, TX 75039

Submitted by:

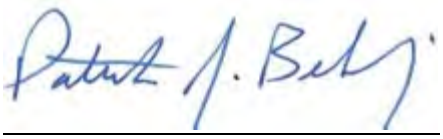
**Golder Associates Inc.**
2201 Double Creek Dr, Suite 4004, Round Rock, Texas USA 78664

+1 512 671-3434

October 2021

# PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the Hazard Potential Classification Assessment was conducted in accordance with the requirements of 40 C.F.R. § 257.73(a)(2) and 30 T.A.C. § 352.731.



Patrick J. Behling, P.E.
Principal Engineer
Golder Associates Inc.
Firm Registration No. F-2578

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Figure 1 - Site Location Map
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# 1.0 INTRODUCTION

Oak Grove Management Company LLC (Oak Grove) owns and operates the Oak Grove Steam Electric Station (OGSES) located approximately ten miles north of Franklin in Robertson County, Texas. The power plant and related support areas are located along the south side of Twin Oak Reservoir (Figure 1). The OGSES consists of two lignite-fired units with a combined operating capacity of approximately 1,796 megawatts. Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operation. The CCRs are transported off-site for beneficial use by third-parties or are disposed at the OGSES Ash Landfill 1.

The U.S. Environmental Protection Agency promulgated 40 C.F.R. Part 257, Subpart D (the CCR Rule) and the Texas Commission on Environmental Quality (TCEQ) promulgated 30 T.A.C. Chapter 352 (which largely adopts the federal CCR Rule by reference) to establish technical requirements for new and existing CCR landfills and surface impoundments. On June 28, 2021, USEPA approved the majority of TCEQ's CCR program, which will now operate in lieu of the federal regulations. FGD-A, FGD-B, and FGD-C (collectively the "FGD Ponds") at the OGSES have been identified as Existing CCR Surface Impoundments regulated under the CCR Rule.

Section 257.73(a)(2) specifies that periodic Hazard Potential Classification Assessments (HPCAs) be performed by a qualified professional engineer for each existing CCR surface impoundment and 30 T.A.C. 352.731 adopts this requirement by reference. In accordance with § 257.73(f)(1) of the CCR Rule, the initial HPCA for the FGD Ponds was completed and placed in the OGSES operating record in October 2016 (Golder, 2016). As specified in §257.73 (f)(3), the HPCAs must be updated every five years from the completion date of the initial plan. Golder Associates Inc., member of WSP (Golder), was retained by Oak Grove to prepare this updated HPCA for the FGD Ponds.

## 1.1 CCR Surface Impoundment Hazard Potential Classification Assessment Requirements

Section 257.73(a)(2) specifies that periodic hazard potential classification assessments be performed for each existing CCR surface impoundment. The hazard potential classification assessments must document the hazard potential classification of each CCR impoundment as either:

- A high hazard potential CCR surface impoundment,
- A significant hazard potential CCR surface impoundment, or
- A low hazard potential CCR surface impoundment.

The assessments must document the basis for each hazard potential classification and must be certified by a qualified professional engineer confirming that the hazard potential classifications were conducted in accordance with the requirements of § 257.73(a)(2).

## 1.2 OGSES Surface Impoundments Subject to Hazard Potential Classification Assessments

Section 257.53 defines CCRs as "fly ash, bottom ash, boiler slag, and flue gas desulfurization materials from burning coal for the purpose of generating electricity by electric utilities and independent power producers". The hazard potential classification assessment requirements of the CCR Rule apply to surface impoundments that dispose or otherwise engage in solid waste management of CCRs.

The FGD Ponds have been identified as CCR Units subject to the hazard potential classification assessment requirements at the OGSES.

## 1.3 Description of FGD Ponds

The FGD Ponds are located approximately 2,500 feet northwest of the OGSES power generation units (Figure 2) and are constructed above grade and surrounded by engineered earthen dikes that extend up to approximately 25 feet above surrounding grade.

The FGD Ponds receive wastewater from the FGD wet scrubber system blowdown, low volume wastewater, bottom ash contact water, and storm water runoff from part of the power plant area. All fluids are pumped into the FGD Ponds and there are no uncontrolled or gravity inflows into the ponds, with the exception of a gravity overflow from FGD-A to FGD-B. Process wastewater can be transferred between the FGD Ponds and is used as makeup water to the FGD scrubber system and related purposes. The are no spillways or other uncontrolled gravity flow releases from the ponds. Solids that accumulate in the FGD ponds are periodically removed and transported to OGSES Ash Landfill 1.

FGD-A covers an area of approximately 9 acres and was constructed in 2008. FGD-A is currently lined with a 3-foot thick compacted clay liner; however, FGD-A ceased receipt of waste by April 11, 2021, and Oak Grove has initiated the retrofit of FGD-A with a composite liner system meeting the requirements of § 257.71(a)(1)(ii). The retrofitted liner system will consist of a minimum 2-foot thick compacted clay liner or geosynthetic clay liner (GCL), overlain be a 60-mil HDPE geomembrane liner. The floor of the pond will be covered by a 1.5-foot thick layer of protective soil and the upper portion of the pond side slopes will be covered with concrete revetment mat.

FGD-B covers an area of approximately 11.2 acres and was constructed in 2011. FGD-B is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain be a 60-mil HDPE geomembrane liner, overlain by a 1-foot thick layer of protective soil. The composite liner system in FGD-B complies with the requirements of §257.71(a)(1)(ii).

FGD-C is approximately 15.2 acres and was constructed in 2016. FGD-C is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain by a 60-mil HDPE geomembrane liner, overlain by a 2-foot thick soil/ash protective layer. The composite liner system in FGD-C complies with the requirements of §257.71(a)(1)(ii).

Based on available construction data, the FGD Ponds were constructed to provide the following estimated storage capacities:

- FGD-A: 190 acre-feet,
- FGD-B: 125 acre-feet, and
- FGD-C: 248 acre-feet.

## 1.4 USACE Size Classification for FGD Ponds

The US Army Corps of Engineers (USACE) classifies the relative size of dams based on the height of the dam and the storage capacity of the impounded area behind the dam as follows (USACE, 1979):

| USACE Dam Size Classification | | |
|---|---|---|
| **Size Category** | **Impoundment Capacity (acre-ft)** | **Impoundment Height (ft)** |
| Small | 50 and < 1,000 | 25 and < 40 |
| Intermediate | 1,000 and < 50,000 | 40 and < 100 |
| Large | > 50,000 | > 100 |

Based on the dike heights and operating capacities of the FGD Ponds, these ponds are categorized as small impoundments based on the USACE dam size classification criteria.

## 1.5 Previous Hazard Potential Classification Assessments for FGD Ponds

The following Hazard Potential Classification Assessments were previously performed for the FGD Ponds:

- **Initial Hazard Potential Classification Assessment, 2016**. As required under § 257.73(a)(2), the initial Hazard Potential Classification Assessment for the FGD Ponds was completed and placed in the OGSES operating record in October 2016 (Golder, 2016). The FGD Ponds were classified as **LOW** hazard potential CCR surface impoundments, since a failure or mis-operation of the impoundments results in no probable loss of human life, low economic and/or environmental losses, and no significant disruption of lifeline systems.
- **EPA Hazard Potential Classification Assessment, 2014**. In 2009, the EPA initiated a program to assess the stability and functionality of coal ash impoundments at coal-fired electric generating plants across the United States. The assessment of the stability and functionality of the OGSES FGD Ponds was performed by O'Brien and Gere (OBG) on behalf of EPA (OBG, 2014). The FGD Ponds were classified as **LOW** hazard potential CCR surface impoundments in the 2014 OBG assessment.

## 2.0 CCR HAZARD CLASSIFICATION ASSESSMENT METHODOLOGY

As defined in § 257.53, hazard potential classification means the possible adverse incremental consequences that result from the release of water or stored contents due to failure of a diked CCR surface impoundment or mis-operation of the diked CCR surface impoundment or its appurtenances. Hazardous potential classifications for CCR surface impoundments include high hazard potential CCR surface impoundment, significant hazard potential CCR surface impoundment, and low hazard potential CCR surface impoundment, which are defined in the CCR Rule as follows:

- High Hazard Potential CCR Surface Impoundment. A diked surface impoundment where failure or mis-operation will probably cause loss of human life.
- Significant Hazard Potential CCR Surface Impoundment. A diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. FEMA considers lifeline facilities to include transportation facilities (highways, airports, ports, trains), electric power, water and sewer, communications (telephone, TV, radio, electronic) and gas and liquid fuel pipelines (FEMA, 1995).
- Low Hazard Potential CCR Surface Impoundment. A diked surface impoundment where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment owner's property.

The hazard classification assessment for the FGD Ponds was performed using the methodology presented in Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams developed by the Federal Emergency Management Agency (FEMA, 2004). The FEMA guidelines classify dams into similar hazard potential categories to those defined in the CCR Rule (low hazard potential, significant hazard potential and high hazard potential) and the FEMA guidelines are listed in the Preamble to the CCR Rule as one of the technical resources considered by EPA during development of the CCR Rule.

The FEMA hazard potential evaluation is based on assessing the probable loss of human life and the potential for economic losses, environmental damage, and/or disruption to lifelines caused by failure or mis-operation of a dam or its appurtenances. The location/size of the dam and impoundment area is evaluated against development, occupancy and land use conditions in areas downstream of the dam/impoundment that would be affected by a failure of the dam and release of the impounded water. The FEMA evaluation recognizes that the failure of any dam or water-retaining structure, no matter how small, represents a potential danger to downstream life and property and there is always the possibility of someone being in the path of the resulting discharge. However, the FEMA evaluation recognizes that considering every conceivable circumstance that might remotely place a person in the area potentially inundated as a result of the dam failure should not be the basis for determining the hazard classification level of the dam/impoundment. The FEMA evaluation considers "probable loss of life" to exist where persons are permanently located in the area potentially inundated as a result of the dam failure.

The hazard classification of the FGD Ponds was assessed by identifying the development, occupancy and land use characteristics of potentially affected areas downstream of the impoundments. The assessment included a review of available aerial photographs, USGS topographic maps, interviews with Oak Grove personnel familiar with the area, and similar resources. Classification of the FGD Ponds in accordance with the FEMA hazard potential criteria is based on the assessment of probable loss of human life and the potential for economic losses, environmental damage, and/or disruption to lifelines caused by failure of the embankments surrounding the ponds.

# 3.0 UPDATED HAZARD POTENTIAL CLASSIFICATION ASSESSMENT FOR FGD PONDS

The hazard potential classification of the FGD Ponds was assessed by identifying the development, occupancy and land use characteristics of areas downstream of the impoundments, assessing the probable loss of human life and/or the potential for economic losses, environmental damage, and/or disruption to lifelines caused by failure of the embankments surrounding the impoundments, and using the results of the assessment to classify the impoundments based on the FEMA hazard potential criteria described in Section 2.0 of this report.

## 3.1 Areas Downstream of FGD Ponds

The OGSES is located approximately ten miles north of Franklin, Texas and borders the south side of the Twin Oak Reservoir (Twin Oak). Twin Oak is a man-made reservoir that was constructed in 1982 to provide cooling water for the OGSES. Oak Grove owns the water rights to the lake and operates and maintains Twin Oak Dam. The emergency spillway of the dam is approximately 407 ft. above mean sea level (MSL) with a normal lake (conservation pool) elevation of 401 ft. MSL. At the conservation pool elevation, Twin Oak covers an area of approximately 2,330 acres, and contains a total volume of approximately 30,319 acre-ft of water (TWDB, 2021).

The FGD Ponds are located on the western edge of the OGSES and border Twin Oak Reservoir (see Figure 2). In the immediate vicinity of the FGD Ponds, Twin Oak Reservoir is subdivided into the following hydraulically connected areas separated by berms that extend 5 to 10 feet above the normal pool elevation:

- Upper Secondary Discharge Pond (Normal Pool Elevation of 410 ft. MSL, Area of approximately 80 acres), and
- Secondary Discharge Canal (Normal Pool Elevation of 410 ft. MSL, Area of approximately 270 acres).

The FGD Ponds are located adjacent to the Upper Secondary Discharge Pond. A berm separates the Upper Secondary Discharge Pond from the Secondary Discharge Canal, which are hydraulically connected by culverts through the berm. A second berm separates the Secondary Discharge Canal from the main body of Twin Oak Reservoir with the Tertiary Discharge Canal allowing flow to the main reservoir at a controlled rate. A potential release from the FGD Ponds would flow into Upper Secondary Discharge Pond, then into the Secondary Discharge Canal, then into the main body of the reservoir.

The shoreline of Twin Oak is mostly undeveloped and there are no permanent residences along the lake shoreline. Oak Grove owns all property immediately adjacent to the lake.

No gas or petroleum pipelines traverse Twin Oak Reservoir (RRC, 2021). Other than Oak Grove service roads that transverse the tops of the berms that run along the downstream edges of the Upper Secondary Discharge Pond and the Secondary Discharge Canal, no public roadways and no railroads cross the reservoir.

## 3.2 Hazard Potential Classification Assessment

A failure of the dikes surrounding the FGD Ponds would release CCR solids/fluids that would flow north toward Upper Secondary Discharge Pond, then potentially into the Secondary Discharge Canal, then potentially into Twin Oak Reservoir. As described in Section 1.3 of this report, the operating volume of the largest of the FGD Ponds (FGD-C) is approximately 248 acre-ft. In the unlikely event that the entire volume of FGD-C is released through catastrophic failure of the dikes, the solids/fluids would first flow into and be equalized by the Upper Secondary Discharge Pond, then flow into and be equalized by the Secondary Discharge Canal. Even if the total volume of FGD-C were to pass from the Secondary Discharge Canal to the main body of Twin Oak, the total volume of

FGD-C (248 acre-ft) represents less than one percent of the conservation pool volume of Twin Oak (30,319 acre-ft). Assuming a lake surface area of 2,330 acres at the conservation pool elevation of 401 feet, the total volume of FGD-C would raise the lake level by approximately 0.11 feet or slightly more than one inch. The resulting water surface elevation (401.11 feet) is well below the emergency spillway elevation at Twin Oak Dam (407 feet), indicating that the total volume of FGD-C would be retained and equalized within Twin Oak.

Using the FEMA hazard potential criteria described in Section 2.0 of this report, the projected effects of catastrophic failure or mis-operation of the impoundments results in a hazard potential classification of **LOW** for the FGD Ponds. This classification is supported by the following:

- No Probable Loss of Human Life. FEMA considers "probable loss of life" to exist where persons are permanently located in the area potentially inundated as a result of dam failure. The shoreline of Twin Oak Reservoir is mostly undeveloped and there are no permanent residences along the lake shoreline. In addition, the total volume of the largest FGD Pond (FGD-C) would be retained and equalized in Upper Secondary Discharge Pond, the Secondary Discharge Canal and/or the main body of Twin Oak. If the total volume of FGD-C were to pass into the main body of Twin Oak, the reservoir level would be raised by approximately 0.11 feet, which is well below the emergency spillway elevation of Twin Oak Dam. As a result, a release from the FGD Ponds would result in no probable loss of human life.

- Low Economic and/or Environmental Losses. FEMA considers low economic and or environmental losses to occur when losses resulting from a dam failure are principally limited to the dam owner's property. Since Oak Grove owns the water rights to Twin Oak Reservoir and the land surrounding the lake, any losses would primarily be limited to the Oak Grove property.

- No Significant Disruption of Lifelines. There are no gas/petroleum pipelines, public highways or railroads that traverse Twin Oak Reservoir. Therefore, no lifelines would be affected by a release from the FGD Ponds.

# 4.0 FINDINGS OF UPDATED HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

Golder was retained by Oak Grove to perform the 5-Year update to the Hazard Potential Classification Assessment for the FGD Ponds in accordance with the requirements of § 257.73(a)(2). The HPCA was performed using the methodology presented in Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams developed by the Federal Emergency Management Agency.

Based on the FEMA hazard potential criteria, the FGD Ponds are classified as **LOW** hazard potential CCR surface impoundments, since a failure or misoperation of the ponds results in no probable loss of human life, low economic and/or environmental losses, and no significant disruption of lifeline systems.

In accordance with § 257.73(f), this updated hazard potential classification assessment must be placed in the operating record for the OGSES no later than October 12, 2021. Subsequent periodic hazard potential classification assessments must be completed every five years.

# 5.0 REFERENCES

Golder Associates, Inc. (Golder), 2016. Initial Hazard Potential Classification Assessment, CCR Surface Impoundments – Oak Grove Steam Electric Station, Robertson County, Texas, October.

Federal Emergency Management Agency (FEMA), 2004. Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams.

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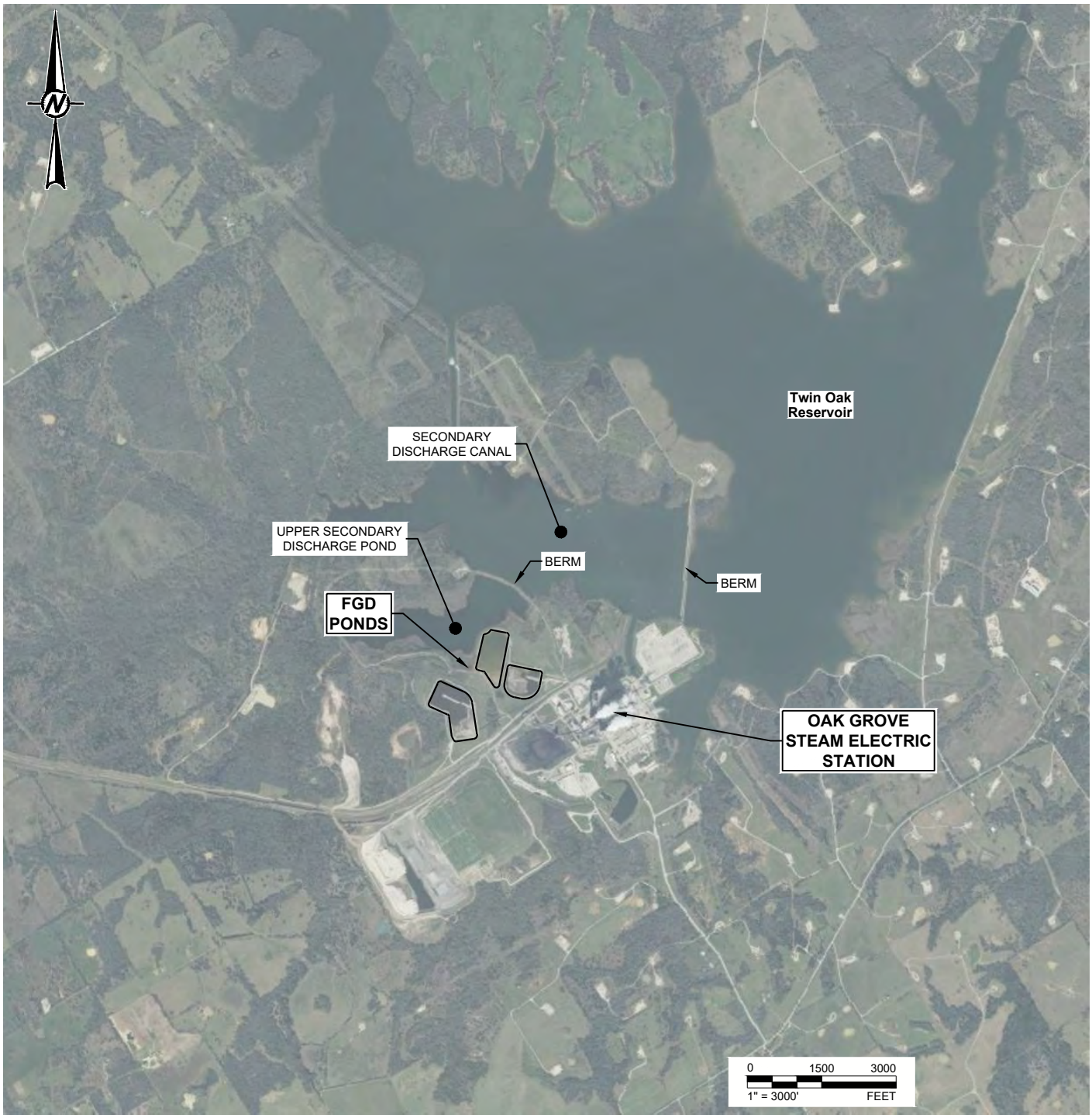
Texas Water Development Board (TWDB), 2021, Twin Oak Reservoir Information. On-line report.

United States Army Corps of Engineers (USACE), 1979. Recommended Guidelines for Safety Inspections of Dams, ER 1110-2-106, September 26.

# FIGURES




CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD PONDS
HAZARD POTENTIAL CLASSIFICATION ASSESSMENT UPDATE

TITLE
**SITE LOCATION MAP**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2021-09-28 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | PJB |
| APPROVED | PJB |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 21465177 | | 0 | 1 |

**REFERENCE(S)**
BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 12/2/18.



Last Edited By: adiamond Date: 2021-09-29 Time:10:07:29 AM | Printed By: adiamond Date: 2021-10-06 Time:4:05:55 PM
Path: \\golder.gds\complexdata\office\Texarkana\Projects - Round Rock_2021\21465177 - Luminant OGSES\PRODUCTION\A - 2021 HPCA\ | File Name: 1-Site Location Map (FGD Ponds).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in

CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD PONDS
HAZARD POTENTIAL CLASSIFICATION ASSESSMENT UPDATE

TITLE
**SITE PLAN**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2021-09-28 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | PJB |
| APPROVED | PJB |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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**REPORT**

# Inflow Design Flood Control System Plan 5 Year Update

*Oak Grove Steam Electric Station*

*FGD Ponds*

*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**
6555 Sierra Drive
Irving, TX 75039

Submitted by:

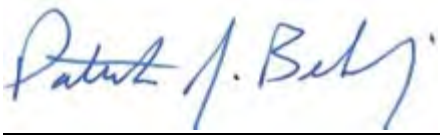
**Golder Associates Inc.**
2201 Double Creek Dr, Suite 4004, Round Rock, Texas USA 78664

+1 512 671-3434

October 2021

# PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the Inflow Design Flood Control System Plan has been prepared in accordance with the requirements of 40 C.F.R. § 257.82 and 30 T.A.C. § 352.821.



Patrick J. Behling, P.E.
Principal Engineer
Golder Associates Inc.
Firm Registration No. F-2578

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# 1.0 INTRODUCTION

Oak Grove Management Company LLC (Oak Grove) owns and operates the Oak Grove Steam Electric Station (OGSES) located approximately ten miles north of Franklin in Robertson County, Texas. The power plant and related support areas are located along the south side of Twin Oak Reservoir (Figure 1). The OGSES consists of two lignite-fired units with a combined operating capacity of approximately 1,796 megawatts. Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operation. The CCRs are transported off-site for beneficial use by third-parties or are disposed at the OGSES Ash Landfill 1.

The U.S. Environmental Protection Agency promulgated 40 C.F.R. Part 257, Subpart D (the CCR Rule) and the Texas Commission on Environmental Quality (TCEQ) promulgated 30 T.A.C. Chapter 352 (which largely adopts the federal CCR Rule by reference) to establish technical requirements for new and existing CCR landfills and surface impoundments. On June 28, 2021, USEPA approved the majority of TCEQ's CCR program, which will now operate in lieu of the federal regulations. FGD-A, FGD-B, and FGD-C (collectively the "FGD Ponds") at the OGSES have been identified as Existing CCR Surface Impoundments regulated under the CCR Rule.

Section 257.82 specifies that an Inflow Design Flood Control System Plan (IDFCSP) be designed, constructed, operated, and maintained for each existing CCR surface impoundment and 30 T.A.C. 352.821 adopts this requirement by reference. In accordance with § 257.82(c)(3), the initial IDFCSP for the FGD Ponds was completed and placed in the OGSES operating record in October 2016 (Golder, 2016a). As specified in §257.82(c)(4), the IDFCSP must be updated every five years from the completion date of the initial plan. Golder Associates Inc., a member of WSP (Golder), was retained by Oak Grove to prepare this updated IDFCSP for the FGD Ponds.

## 1.1 CCR Surface Impoundment Inflow Design Flood Control System Plan Requirements

Section 257.82(a) specifies that an IDFCSP be designed, constructed, operated, and maintained for each existing CCR surface impoundment. The flood control system must adequately:

- Manage flow into the CCR impoundment during and following the peak discharge of the specified inflow design flood.
- Manage flow from the CCR impoundment to collect and control the peak discharge resulting from the specified inflow design flood.

The inflow design flood (IDF) for each CCR impoundment varies based on the hazard potential classification of the impoundment:

- High hazard potential impoundment: Probable Maximum Flood
- Significant hazard potential impoundment: 1,000-year flood
- Low hazard potential impoundment: 100-year flood

The IDFCSP must document how the inflow design flood control system has been designed and constructed to comply with the requirements of § 257.82 and must be certified by a qualified professional engineer.

## 1.2 OGSES Surface Impoundments Subject to Inflow Design Flood Control System Plan Requirements

Section 257.53 defines CCR's such as fly ash, bottom ash, boiler slag, flue gas desulfurization (FGD) materials (gypsum), and related solids generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers. The IDFCSP requirements of the CCR Rule apply to surface impoundments that dispose or otherwise engage in solid waste management of CCRs.

The FGD Ponds have been identified as CCR Units subject to the IDFCSP requirements at the OGSES.

## 1.3 Description of FGD Ponds

The FGD Ponds are located approximately 2,500 feet northwest of the OGSES power generation units (Figure 2) and are constructed above grade and surrounded by engineered earthen dikes that extend up to approximately 25 feet above surrounding grade.

Figure 3 shows a simplified process flow schematic for the FGD Ponds. The FGD Ponds receive wastewater from the FGD wet scrubber system blowdown, low volume wastewater, bottom ash contact water, and storm water runoff from approximately 41 acres of the power plant. All fluids are pumped into the FGD Ponds and there are no uncontrolled or gravity inflows into the ponds, with the exception of a gravity overflow from FGD-A to FGD-B. Process wastewater can be transferred between the FGD Ponds and is used as makeup water to the FGD scrubber system and related purposes. The are no spillways or other uncontrolled gravity flow releases from the ponds. Solids that accumulate in the FGD ponds are periodically removed and transported to OGSES Ash Landfill 1.

FGD-A covers an area of approximately 9 acres and was constructed in 2008. FGD-A is currently lined with a 3-foot thick compacted clay liner; however, FGD-A ceased receipt of waste by April 11, 2021, and Oak Grove has initiated the retrofit of FGD-A with a composite liner system meeting the requirements of § 257.71(a)(1)(ii). The retrofitted liner system will consist of a minimum 2-foot thick compacted clay liner or geosynthetic clay liner (GCL), overlain be a 60-mil HDPE geomembrane liner. The floor of the pond will be covered by a 1.5-foot thick layer of protective soil and the upper portion of the pond side slopes will be covered with concrete revetment mat.

FGD-B covers an area of approximately 11.2 acres and was constructed in 2011. FGD-B is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain be a 60-mil HDPE geomembrane liner, overlain by a 1-foot thick layer of protective soil. The composite liner system in FGD-B complies with the requirements of § 257.71(a)(1)(ii).

FGD-C covers an area of approximately 15.2 acres and was constructed in 2016. FGD-C is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain by a 60-mil HDPE geomembrane liner, overlain by a 2-foot thick soil/ash protective layer. The composite liner system in FGD-C complies with the requirements of § 257.71(a)(1)(ii).

Based on available construction data, the FGD Ponds were constructed to provide the following estimated storage capacities (with zero freeboard):

- FGD-A: 190 acre-feet,
- FGD-B: 125 acre-feet, and
- FGD-C: 248 acre-feet.

Area-Capacity Curves for the FGD Ponds are reproduced in Appendix B (Golder, 2016b).

## 1.4 USACE Size Classification for FGD Ponds

The US Army Corps of Engineers (USACE) classifies the relative size of dams based on the height of the dam and the storage capacity of the impounded area behind the dam as follows (USACE, 1979):

| USACE Dam Size Classification | | |
|---|---|---|
| **Size Category** | **Impoundment Capacity (acre-ft)** | **Impoundment Height (ft)** |
| Small | 50 and < 1,000 | 25 and < 40 |
| Intermediate | 1,000 and < 50,000 | 40 and < 100 |
| Large | > 50,000 | > 100 |

Based on the dike heights and operating capacities of the FGD Ponds, these ponds are categorized as small impoundments based on the USACE dam size classification criteria.

## 1.5 Hazard Potential Classification of FGD Ponds

The FGD Ponds are classified as low hazard potential impoundments in accordance with the requirements of § 257.73(a)(2) (Golder, 2021).

## 1.6 Previous Hydraulic Capacity Evaluations of FGD Ponds

The FGD Ponds were previously subjected to the following Hydraulic Capacity Evaluations:

- **Initial Inflow Design Flood Control System Plan, 2016**. As required under § 257.82(c)(3), the initial Inflow Design Flood Control System Plan for the FGD Ponds was completed and placed in the OGSES operating record in October 2016 (Golder, 2016a). The initial IDFCSP concluded that the FGD Ponds were adequately designed to manage the 100-year, 24-hour inflow design flood in accordance with § 257.82.
- **EPA Hydraulic Capacity Evaluation, 2014**. In 2009, the EPA initiated a program to assess the stability and functionality of coal ash impoundments at coal-fired electric generating plants across the United States. The assessment of the stability and functionality of FGD-A and FGD-B was performed by O'Brien and Gere (OBG) on behalf of EPA (OBG, 2014). As part of the assessment, OBG evaluated the "Hydrologic/Hydraulic Safety" of FGD-A and FGD-B and concluded the following:
  - FGD-A and FGD-B only receive water pumped into the units at a controlled rate, with the exception of a gravity overflow from FGD-A to FGD-B.
  - The normal pool elevation of FGD-A and FGD-B is managed to provide a minimum of 2-foot freeboard.
  - OBG examined the 100-year rainfall event and compared the data with the available freeboard in the ponds. The freeboard should be adequate to contain the one-percent probability, 24- hour precipitation event without overtopping the impoundment embankments.

Based on the information reviewed, FGD-A and FGD-B were given the highest rating of "Satisfactory" for hydrologic and hydraulic safety.

# 2.0 UPDATED HYDRAULIC CAPACITY EVALUATION OF FGD PONDS

Section 257.73 defines the inflow design flood (IDF) as “the flood hydrograph that is used in the design or modification of the CCR surface impoundment and its appurtenant works.” From an engineering design standpoint, the IDF is the rate of water coming into a surface impoundment over time that the impoundment must be able to safely pass or contain using a combination of outlet works and surcharge storage (freeboard).

The updated IDFCSP for the FGD Ponds must demonstrate that the impoundments are designed to manage flow into and out of the units during and following the peak discharge of the specified inflow design flood. This demonstration will be accomplished through calculation of a water balance for the FGD Ponds. The basic equation for the water balance is as follows:

Inflows = Outflows + Change in Pond Storage

For the water balance to demonstrate compliance with CCR requirements, the rate of inflows into the FGD Ponds (the inflow design flood) must not be greater than the rate of outflows from the FGD Ponds plus the maximum allowable storage in the impoundments.

## 2.1 Inflows to FGD Ponds

The FGD Ponds are located above grade and inflows that enter the impoundments are pumped into the units under controlled conditions – there are no gravity or uncontrolled discharges to the FG Ponds, other than a gravity overflow from FGD-A to FGD-B. As shown on Figure 3, water coming into the FGD Ponds consists of the following:

- wastewater from the FGD wet scrubber system blowdown,
- low volume wastewater,
- bottom ash contact water,
- storm water runoff from approximately 41 acres of the power plant, and
- direct precipitation on the ponds.

Most of the sources of inflow to the FGD Ponds are process units that generate water at controlled rates which are not significantly affected by variations in precipitation intensity and associated flood conditions. In addition, approximately the same flow rate and volume of water is pumped from the FGD Ponds to the plant FGD wet scrubber system as is returned to the FGD Ponds form the plant. As a result, for the purposes of this IDFCSP, it is assumed that the only net contributions from inflows to the FGD Ponds during the design flood event are:

- storm water runoff from approximately 41 acres of the power plant, and
- direct precipitation on the ponds.

## 2.2 Outflows From FGD Ponds

The FGD Ponds act as surge basins for various water streams in the plant water system and process wastewater can be transferred to and from FGD-A, FGD-B and/or FGD-C. The rate of outflow from the FGD Ponds is controlled to maintain a minimum 2-foot freeboard in FGD-A and FGD-B and 3-foot freeboard in FGD-C under normal operating conditions.

The are no spillways or other uncontrolled gravity flow releases from the ponds, with the exception of a gravity overflow form FGD-A to FGD-B. It should be noted that water is also removed from the FGD Ponds through natural evaporation; however, evaporation from the FGD Ponds was not considered as part of this evaluation.

## 2.3 Inflow Design Flood for FGD Ponds

As described in Section 1.5, the FGD Ponds are classified as a low hazard potential CCR Impoundments. In accordance with § 257.82(a)(3), the inflow design flood for a low hazard potential CCR impoundment is the 100-year flood event.

The 100-year, 24-hour storm for the FGD Ponds is estimated to be 10.4 inches based on the Point Precipitation Frequency Estimate Table from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for Franklin, TX (NOAA, 2021, see Appendix A).

## 2.4 Hydraulic Capacity Evaluation for FGD Ponds

A hydraulic capacity evaluation was performed on the FGD Ponds for the inflow design flood as part of the development of the IDFCSP. The evaluation was based on the water balance equation described above and the following assumptions:

- The design operating level in the ponds is managed to maintain a minimum 2-foot freeboard in FGD-A and FGD-B and 3-foot freeboard in FGD-C under normal operating conditions.
- Inflows to and outflows from the FGD Ponds considered as part of the evaluation are as described in Sections 2.1 and 2.2 of this report.
- Evaporation from the ponds is assumed to be negligible during the inflow design flood event.

Based on these assumptions, the general water balance equation for the FGD Ponds can be modified as follows:

Process Inflows + Direct Precipitation = Process Outflows + Change in FGD Pond Storage

Since the rate of water decanted from the FGD Ponds (process outflow) is assumed to be equivalent to the process water inflows to the ponds, the FGD Pond water balance equation becomes:

Direct Precipitation + Runoff From Power Plant = Change in FGD Pond Storage

Stormwater runoff volumes were calculated using the Rational Method:

V = CiA, where:

V = Estimated Runoff Volume (cubic feet, cf)

C = Rational Method Runoff Coefficient. Assumed Runoff Coefficients:

- Direct Precipitation on Pond Surface: 1.00
- Runoff From Power Plant: 0.95

i = Rainfall (ft). Assumed to be 10.4 inches (0.87 feet) for the 100-year, 24-hr design flood.

A = Stormwater Drainage Area (sf)

Hydraulic capacity evaluation calculations for the FGD Ponds are presented in Appendix C. Inflows into the ponds during the design flood were estimated to be as follows:

- Direct Precipitation On Ponds. The surface areas of the FGD Ponds at the top of the perimeter dikes are approximately as follows:

  - FGD-A: 9 acres (391,789 sf)
  - FGD-B: 11.2 acres (486,669 sf)
  - FGD-C: 15.2 acres (662, 896 sf)

  A Runoff Coefficient of 1.0 was assumed for direct precipitation on the ponds. Based on these assumptions, the volume of direct precipitation onto the FGD Ponds is estimated to be as follows:

  - FGD-A: 339,768 cf
  - FGD-B: 422,822 cf
  - FGD-C: 573,830 cf

- Runoff From Power Plant. For the purposes of this IDFCSP, it is assumed that all stormwater runoff/drainage from the power plant area is pumped to the FGD Ponds during the design flood. The surface area of the plant area is estimated to be approximately 41 acres (1,785,960 sf) (Golder, 2016a). The plant area is primarily concrete, so a Runoff Coefficient of 0.95 was assumed for this area. Based on these assumptions, the volume of runoff from the Power Plant is estimated to be 1,470,440 cf.

The total inflow into the FGD Ponds during the design flood is estimated to be 2,806,861 cf (64.4 acre-ft).

Based on the Area-Capacity Curves in Appendix B, the available storage capacity provided by the 2-foot freeboard in FGD-A and FGD-B and 3-foot freeboard in FGD-C is estimated to be as follows:

- FGD-A:
  - Capacity at top of dike: 190 acre-ft
  - Capacity at 2 feet below top of dike: 172 acre-ft
  - Available Freeboard Storage: 18 acre-ft
- FGD-B:
  - Capacity at top of dike: 125 acre-ft
  - Capacity at 2 feet below top of dike: 104 acre-ft
  - Available Freeboard Storage: 21 acre-ft
- FGD-C:
  - Capacity at top of dike: 248 acre-ft
  - Capacity at 3 feet below top of dike: 204 acre-ft
  - Available Freeboard Storage: 44 acre-ft

The total available freeboard storage in the FGD Ponds is approximately 83 acre-ft (3,615,480 cf).

The available freeboard storage compares to the total inflow into the FGD Ponds during the design flood as follows:

- Available Freeboard Storage: 3,615,480 cf (83 acre-ft)
- Total Inflow into FGD Ponds: 2,806,861 cf (64.4 acre-ft)
  - Remaining Freeboard Storage: 808,619 cf (18.6 acre-ft)

As a result, the FGD Ponds are adequately designed to manage the inflow design flood in accordance with § 257.82.

# 3.0 UPDATED INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN FOR FGD PONDS

The FGD Ponds are adequately designed to manage the 100-year, 24-hour inflow design flood in accordance with § 257.82. The FGD Ponds should be operated in accordance with the following Inflow Design Flood Control System Plan to maintain adequate freeboard in the impoundment to manage the design flood conditions:

- The operating level in FGD-A and FGD-B should be maintained to provide a minimum of 2 feet of freeboard in the impoundments under normal operating conditions.
- The operating level in FGD-C should be maintained to provide a minimum of 3 feet of freeboard in the impoundment under normal operating conditions.
- Stormwater managed by OGSES sumps should be allowed to accumulate to the extent practicable and the transfer of stormwater collected by the plant sumps should be monitored and regulated to ensure adequate freeboard is maintained in the FGD Ponds during a storm event.

In accordance with § 257.82(c)(4), this updated IDFCSP must be placed in the operating record for the OGSES no later than October 12, 2021. Subsequent periodic IDFCSPs must be completed every five years. In addition, the IDFCSP must be amended whenever there is a change in conditions that would substantially affect the plan.

# 4.0 REFERENCES

Golder Associates, Inc. (Golder), 2021. Hazard Potential Classification Assessment – 5 Year Update, Oak Grove Steam Electric Station FGD Ponds, Robertson County, Texas. October.

Golder, 2016a. Hydrologic and Hydraulic Capacity Requirements – CCR Surface Impoundments, Oak Grove Steam Electric Station, Robertson County, Texas. October.

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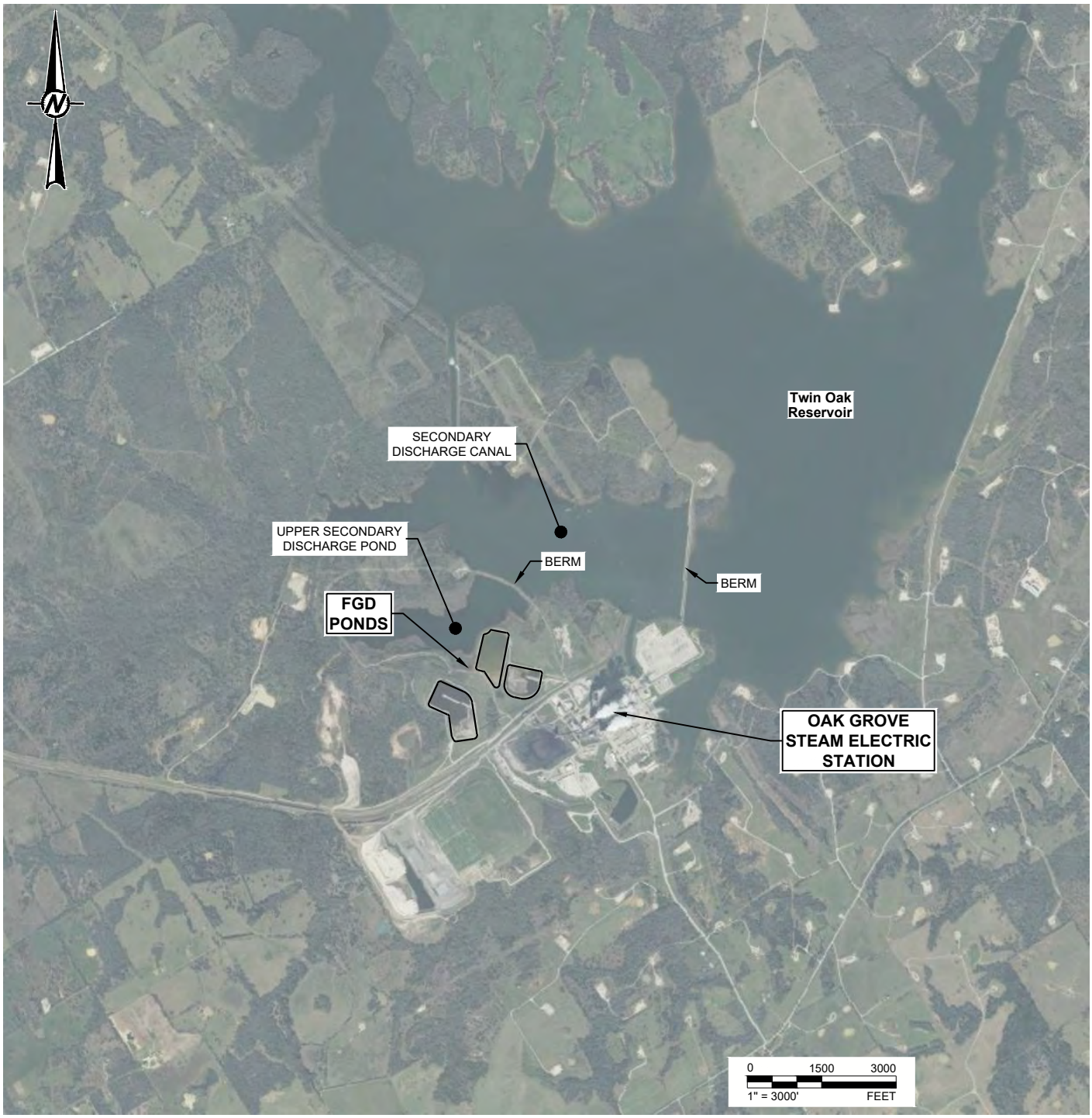
O'Brien & Gere (OBG), 2014. Dam Safety Assessment of CCW Impoundments – Luminant Oak Grove Steam Electric Station, June 3.

United States Army Corps of Engineers (USACE), 1979. Recommended Guidelines for Safety Inspections of Dams, ER 1110-2-106, September 26.

# FIGURES




CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD PONDS
INFLOW DESIGN CONTROL SYSTEM PLAN UPDATE

TITLE
**SITE LOCATION MAP**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2021-09-29 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | PJB |
| APPROVED | PJB |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD PONDS
INFLOW DESIGN CONTROL SYSTEM PLAN UPDATE

TITLE
**SITE PLAN**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2021-09-29 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | PJB |
| APPROVED | PJB |

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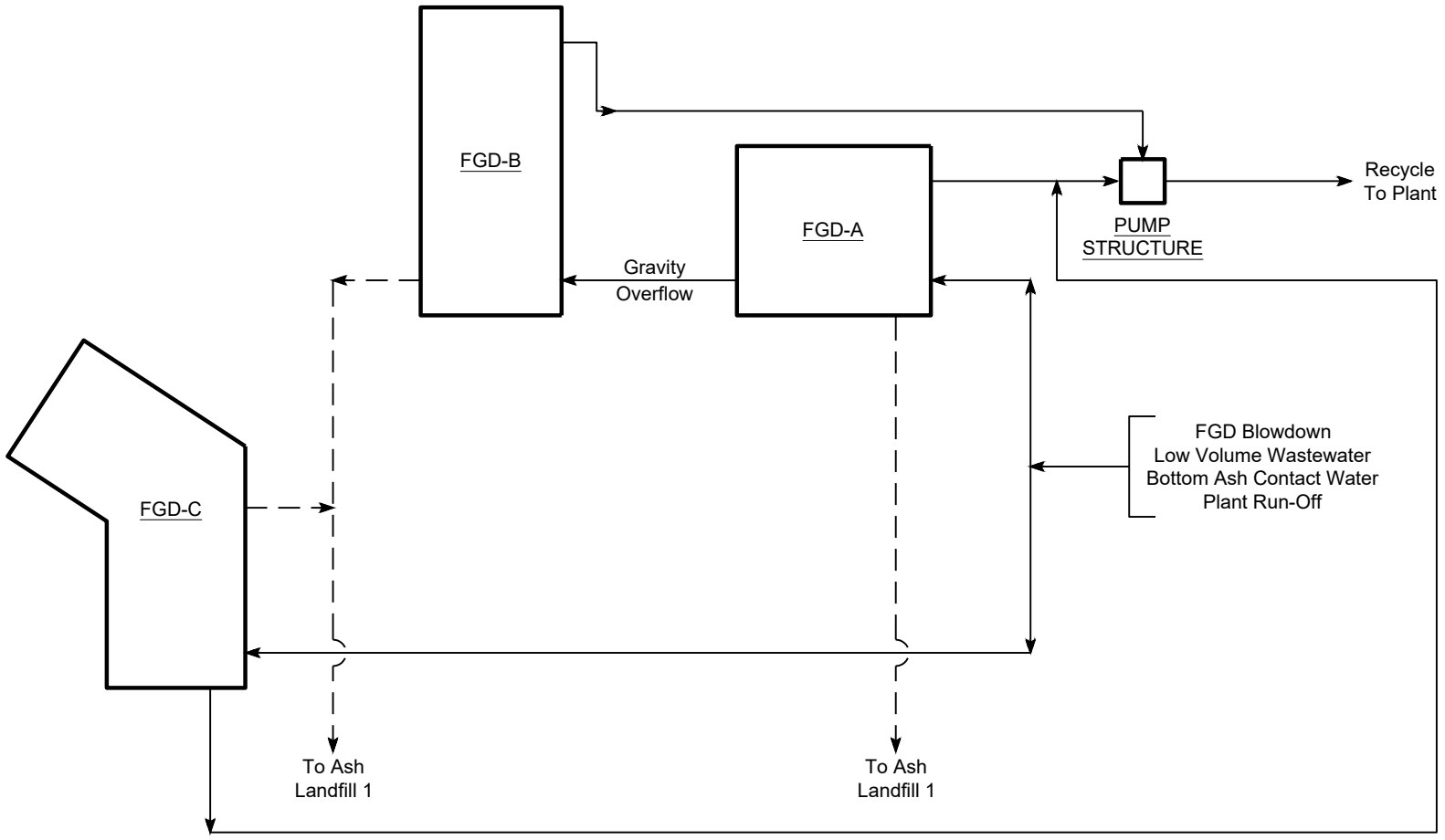


**LEGEND**

WATER

SOLIDS

CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
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| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | PJB |
| APPROVED | PJB |

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD PONDS
INFLOW DESIGN CONTROL SYSTEM PLAN UPDATE

TITLE
**SIMPLIFIED CCR SURFACE IMPOUNDMENT FLOW DIAGRAM**

| PROJECT NO. | CONTROL | REV. | FIGURE |
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**APPENDIX A**

# NOAA Atlas 14 Precipitation Data – Franklin, Texas

**NOAA Atlas 14, Volume 11, Version 2**
**Location name: Franklin, Texas, USA***
**Latitude: 31.1819°, Longitude: -96.4882°**
**Elevation: 436.43 ft****
* source: ESRI Maps
** source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

# PF tabular

**PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]**

| Duration | Average recurrence interval (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | **0.441** (0.334-0.583) | **0.512** (0.390-0.669) | **0.626** (0.476-0.822) | **0.722** (0.542-0.961) | **0.855** (0.622-1.17) | **0.958** (0.678-1.35) | **1.06** (0.734-1.54) | **1.17** (0.789-1.74) | **1.32** (0.859-2.03) | **1.44** (0.911-2.26) |
| 10-min | **0.704** (0.533-0.929) | **0.817** (0.623-1.07) | **1.00** (0.761-1.31) | **1.15** (0.866-1.54) | **1.37** (0.997-1.88) | **1.54** (1.09-2.17) | **1.71** (1.18-2.47) | **1.88** (1.26-2.78) | **2.10** (1.37-3.22) | **2.27** (1.44-3.57) |
| 15-min | **0.882** (0.668-1.17) | **1.02** (0.783-1.34) | **1.26** (0.958-1.65) | **1.45** (1.09-1.93) | **1.71** (1.24-2.35) | **1.91** (1.35-2.69) | **2.11** (1.46-3.06) | **2.33** (1.57-3.46) | **2.62** (1.70-4.02) | **2.85** (1.80-4.48) |
| 30-min | **1.24** (0.941-1.64) | **1.44** (1.10-1.88) | **1.75** (1.34-2.31) | **2.02** (1.51-2.69) | **2.38** (1.73-3.26) | **2.65** (1.87-3.73) | **2.93** (2.02-4.24) | **3.23** (2.17-4.80) | **3.65** (2.37-5.60) | **3.98** (2.52-6.26) |
| 60-min | **1.62** (1.23-2.14) | **1.88** (1.43-2.45) | **2.30** (1.75-3.02) | **2.65** (1.99-3.53) | **3.13** (2.28-4.29) | **3.51** (2.48-4.94) | **3.90** (2.69-5.64) | **4.32** (2.91-6.42) | **4.91** (3.19-7.55) | **5.38** (3.41-8.47) |
| 2-hr | **1.96** (1.50-2.57) | **2.32** (1.77-3.00) | **2.88** (2.21-3.76) | **3.37** (2.54-4.45) | **4.05** (2.96-5.50) | **4.58** (3.26-6.39) | **5.14** (3.56-7.36) | **5.76** (3.89-8.45) | **6.63** (4.32-10.0) | **7.33** (4.65-11.4) |
| 3-hr | **2.16** (1.65-2.82) | **2.58** (1.98-3.31) | **3.24** (2.49-4.20) | **3.82** (2.89-5.02) | **4.63** (3.40-6.27) | **5.28** (3.77-7.33) | **5.98** (4.15-8.50) | **6.74** (4.56-9.81) | **7.81** (5.11-11.8) | **8.69** (5.53-13.4) |
| 6-hr | **2.50** (1.93-3.24) | **3.04** (2.34-3.85) | **3.87** (2.99-4.97) | **4.60** (3.51-6.00) | **5.65** (4.17-7.58) | **6.51** (4.67-8.95) | **7.43** (5.19-10.5) | **8.45** (5.74-12.2) | **9.92** (6.51-14.7) | **11.1** (7.11-16.9) |
| 12-hr | **2.85** (2.21-3.67) | **3.50** (2.69-4.38) | **4.48** (3.47-5.70) | **5.36** (4.11-6.94) | **6.65** (4.94-8.85) | **7.72** (5.58-10.5) | **8.90** (6.25-12.4) | **10.2** (6.98-14.5) | **12.2** (8.01-17.8) | **13.8** (8.83-20.6) |
| 24-hr | **3.25** (2.53-4.14) | **4.00** (3.09-4.96) | **5.13** (4.01-6.49) | **6.16** (4.75-7.92) | **7.68** (5.74-10.1) | **8.95** (6.50-12.1) | **10.4** (7.31-14.2) | **12.0** (8.20-16.8) | **14.3** (9.46-20.7) | **16.3** (10.5-24.0) |
| 2-day | **3.73** (2.93-4.72) | **4.59** (3.58-5.67) | **5.90** (4.64-7.40) | **7.06** (5.48-9.00) | **8.77** (6.58-11.4) | **10.2** (7.40-13.5) | **11.7** (8.28-15.9) | **13.4** (9.26-18.6) | **16.0** (10.6-22.9) | **18.2** (11.7-26.4) |
| 3-day | **4.08** (3.21-5.15) | **5.00** (3.93-6.17) | **6.41** (5.06-8.02) | **7.65** (5.96-9.71) | **9.45** (7.11-12.2) | **10.9** (7.96-14.4) | **12.5** (8.86-16.8) | **14.3** (9.86-19.7) | **16.9** (11.3-24.0) | **19.1** (12.4-27.6) |
| 4-day | **4.37** (3.45-5.49) | **5.32** (4.20-6.56) | **6.80** (5.39-8.48) | **8.09** (6.32-10.2) | **9.94** (7.49-12.8) | **11.4** (8.35-15.0) | **13.0** (9.26-17.5) | **14.8** (10.3-20.3) | **17.5** (11.7-24.6) | **19.7** (12.8-28.3) |
| 7-day | **5.05** (4.01-6.31) | **6.06** (4.83-7.46) | **7.65** (6.10-9.50) | **9.02** (7.08-11.3) | **10.9** (8.27-14.0) | **12.4** (9.13-16.2) | **14.0** (10.0-18.7) | **15.9** (11.0-21.5) | **18.6** (12.4-25.8) | **20.8** (13.5-29.4) |
| 10-day | **5.62** (4.47-6.98) | **6.67** (5.35-8.21) | **8.36** (6.70-10.4) | **9.79** (7.71-12.2) | **11.8** (8.92-15.0) | **13.3** (9.78-17.2) | **14.9** (10.7-19.7) | **16.7** (11.7-22.6) | **19.4** (13.0-26.8) | **21.6** (14.1-30.4) |
| 20-day | **7.35** (5.88-9.06) | **8.54** (6.94-10.5) | **10.5** (8.52-13.0) | **12.2** (9.65-15.1) | **14.4** (10.9-18.1) | **16.0** (11.8-20.5) | **17.6** (12.7-23.0) | **19.4** (13.6-25.8) | **21.9** (14.7-29.8) | **23.9** (15.6-33.0) |
| 30-day | **8.78** (7.06-10.8) | **10.1** (8.25-12.4) | **12.3** (10.0-15.1) | **14.1** (11.2-17.4) | **16.4** (12.6-20.6) | **18.1** (13.5-23.1) | **19.8** (14.3-25.7) | **21.5** (15.1-28.5) | **23.9** (16.1-32.2) | **25.7** (16.8-35.2) |
| 45-day | **10.8** (8.72-13.2) | **12.2** (10.1-15.0) | **14.8** (12.1-18.1) | **16.8** (13.4-20.6) | **19.3** (14.8-24.0) | **21.1** (15.7-26.7) | **22.8** (16.5-29.4) | **24.5** (17.3-32.2) | **26.8** (18.2-35.9) | **28.5** (18.7-38.7) |
| 60-day | **12.6** (10.2-15.3) | **14.2** (11.7-17.4) | **17.0** (13.9-20.7) | **19.1** (15.3-23.4) | **21.8** (16.8-27.0) | **23.7** (17.7-29.8) | **25.4** (18.4-32.6) | **27.2** (19.2-35.4) | **29.4** (20.0-39.1) | **31.1** (20.4-41.9) |

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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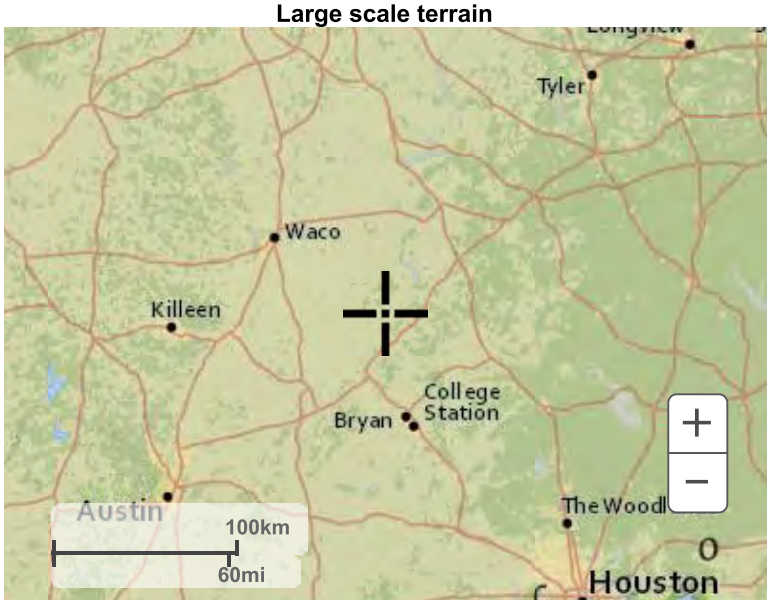
# PF graphical

**Large scale terrain**




**Large scale map**

**Large scale aerial**

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

**APPENDIX B**

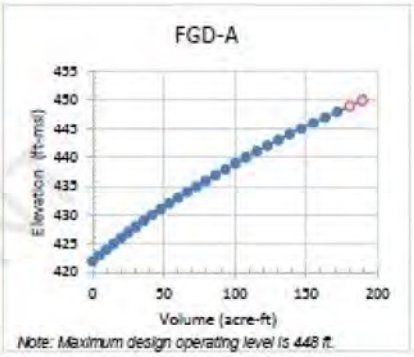
# Area Capacity Curves – FGD Ponds

Golder Associates

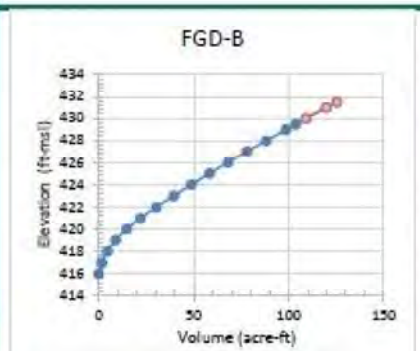
# CALCULATION

| | | | |
|---|---|---|---|
| **Date:** | July 5, 2016 | **Made by:** | AGM |
| **Project No.:** | 1648164 | **Checked by:** | VK |
| **Subject:** | FGD-A, FGD-B, FGD-C Area Capacity Curves | **Reviewed by:** | JBF |
| **Project Short Title:** | Luminant CCR Support | | |

| | Stage (ft) | Elevation (ft-msl) | Area ($ft^2$) | Incremental Volume (acre-ft) | Cumulative Volume (acre-ft) | Area Capacity Curve |
|---|---|---|---|---|---|---|
| FGD-A | 1 | 422 | 203733 | 0.0 | 0 | |
| | 2 | 423 | 209,836 | 4.7 | 5 | |
| | 3 | 424 | 215,986 | 4.9 | 10 | |
| | 4 | 425 | 222,184 | 5.0 | 15 | |
| | 5 | 426 | 228,431 | 5.2 | 20 | |
| | 6 | 427 | 234,727 | 5.3 | 25 | |
| | 7 | 428 | 241,063 | 5.5 | 31 | |
| | 8 | 429 | 247,456 | 5.6 | 36 | |
| | 9 | 430 | 253,888 | 5.8 | 42 | |
| | 10 | 431 | 260,372 | 5.9 | 48 | |
| | 11 | 432 | 266,886 | 6.1 | 54 | |
| | 12 | 433 | 273,441 | 6.2 | 60 | |
| | 13 | 434 | 280,042 | 6.4 | 66 | |
| | 14 | 435 | 286,685 | 6.5 | 73 | |
| | 15 | 436 | 293,375 | 6.7 | 80 | |
| | 16 | 437 | 300,109 | 6.8 | 86 | |
| | 17 | 438 | 306,888 | 7.0 | 93 | |
| | 18 | 439 | 313,712 | 7.1 | 101 | |
| | 19 | 440 | 320,580 | 7.3 | 108 | |
| | 20 | 441 | 327,492 | 7.4 | 115 | |
| | 21 | 442 | 334,451 | 7.6 | 123 | |
| | 22 | 443 | 341,453 | 7.8 | 131 | |
| | 23 | 444 | 348,499 | 7.9 | 139 | |
| | 24 | 445 | 355,584 | 8.1 | 147 | |
| | 25 | 446 | 362,726 | 8.2 | 155 | |
| | 26 | 447 | 369,907 | 8.4 | 163 | |
| | 27 | 448 | 377,132 | 8.6 | 172 | |
| | *28* | *449* | *384,402* | *8.7* | *181* | |
| | *29* | *450* | *391,789* | *8.9* | *190* | |
| FGD-B | 1 | 416 | 39958 | 0 | 0 | |
| | 2 | 417 | 98233 | 2 | 2 | |
| | 3 | 418 | 158638 | 3 | 5 | |
| | 4 | 419 | 220911 | 4 | 9 | |
| | 5 | 420 | 285836 | 6 | 15 | |
| | 6 | 421 | 347894 | 7 | 22 | |
| | 7 | 422 | 383271 | 8 | 30 | |
| | 8 | 423 | 403466 | 9 | 39 | |
| | 9 | 424 | 411926 | 9 | 49 | |
| | 10 | 425 | 420443 | 10 | 58 | |
| | 11 | 426 | 429015 | 10 | 68 | |
| | 12 | 427 | 437649 | 10 | 78 | |
| | 13 | 428 | 446337 | 10 | 88 | |
| | 14 | 429 | 455083 | 10 | 99 | |
| | 14.5 | 429.5 | 459629 | 5 | 104 | |
| | *15* | *430* | *463,885* | *5.3* | *109* | |
| | *16* | *431* | *472,743* | *10.8* | *120* | |
| | *16.5* | *431.5* | *486,669* | *5.5* | *125* | |



Note: Maximum design operating level is 448 ft.



Note: Maximum design operating level is 429.5 ft.

P:_2016 Project Folders\1648164 Luminant - 2016 CCR Support\OakGrove\HistoryOfConstruction\SupportingDocs\StageStorageCalcs\1648164_Luminant_OG_CALC_Combined_StageStorage_20160705.xlsx

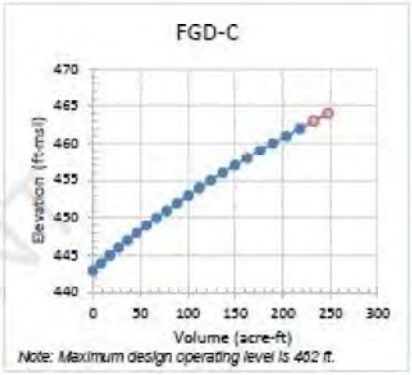
Golder Associates

# CALCULATION

| | | | |
|---|---|---|---|
| **Date:** | July 5, 2016 | **Made by:** | AGM |
| **Project No.:** | 1648164 | **Checked by:** | VK |
| **Subject:** | FGD-A, FGD-B, FGD-C Area Capacity Curves | **Reviewed by:** | JBF |
| **Project Short Title:** | Luminant CCR Support | | |

| | Stage (ft) | Elevation (ft-msl) | Area ($ft^2$) | Incremental Volume (acre-ft) | Cumulative Volume (acre-ft) |
|---|---|---|---|---|---|
| FGD-C | 1 | 443 | 369,540 | 0 | 0 |
| | 2 | 444 | 382,825 | 9 | 9 |
| | 3 | 445 | 396,177 | 9 | 18 |
| | 4 | 446 | 409,600 | 9 | 27 |
| | 5 | 447 | 423,093 | 10 | 36 |
| | 6 | 448 | 436,657 | 10 | 46 |
| | 7 | 449 | 450,291 | 10 | 56 |
| | 8 | 450 | 463,995 | 10 | 67 |
| | 9 | 451 | 477,769 | 11 | 78 |
| | 10 | 452 | 491,614 | 11 | 89 |
| | 11 | 453 | 505,529 | 11 | 100 |
| | 12 | 454 | 519,514 | 12 | 112 |
| | 13 | 455 | 533,570 | 12 | 124 |
| | 14 | 456 | 547,696 | 12 | 137 |
| | 15 | 457 | 561,892 | 13 | 149 |
| | 16 | 458 | 576,151 | 13 | 162 |
| | 17 | 459 | 590,467 | 13 | 176 |
| | 18 | 460 | 604,840 | 14 | 189 |
| | 19 | 461 | 619,269 | 14 | 204 |
| | 20 | 462 | 633,755 | 14 | 218 |
| | *21* | *463* | *648297* | *15* | *233* |
| | *22* | *464* | *662896* | *15* | *248* |

Area Capacity Curve




*Note: Maximum design operating level is 462 ft.*

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10-11-16

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED
PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

P:_2016 Project Folders\1648164 Luminant - 2016 CCR Support\CellGrove\HistoryOfConstruction\SupportingDocs\StageStorageCalcs\1648164_Luminant_OG_CALC_Combined_StageStorage_20160705.xlsx

**APPENDIX C**

# Hydraulic Capacity Evaluation Calculations - FGD Ponds

**Appendix C**
**Oak Grove Steam Electric Station**
**Inflow Design Flood Control System Plan**
**Inflow Volume Estimates**
**FGD Ponds**

**Assumptions**

1) Design Rainfall (in): 10.4 100-Year, 24-Hr Storm

2) Inflows to FGD Ponds Consist of the Following:

- Direct Precipitation on the FGD Ponds
- Runoff Pumped From Power Plant

3) Runoff Volumes Calculated Using the Rational Method:

V = CiA, where:

V = Estimated Runoff Volume (cf)
C = Rational Method Runoff Coefficient
i = Rainfall (ft)
A = Stormwater Drainage Area (sf)

4) Assumed Runoff Coefficients:

| | |
|---|---|
| - Direct Precipitation on Lined Pond Surface: | 1.00 |
| - Power Plant Drainage: | 0.95 |

5) Drainage Areas (acres):

| | |
|---|---|
| - FGD-A: | 9.0 |
| - FGD-B: | 11.2 |
| - FGD-C: | 15.2 |
| - Power Plant Drainage: | 41 |

6) Assume Total Inflow Volume Generated During 100-Yr, 24-Hr Storm must be Contained in Freeboard of FGD Ponds

**Inflow Volume Estimates**

| | |
|---|---|
| 1) Precip on FGD-A (cf): | 339,768 |
| 2) Precip on FGD-B (cf): | 422,822 |
| 3) Precip on FGD-C (cf): | 573,830 |
| 4) Power Plant Runoff Pumped to FGD Ponds (cf): | 1,470,440 |
| **Total Inflow Volume to FGD Ponds (cf):** | **2,806,861** |

**Notes:**
1) 100 Yr, 24-Hr Storm from NOAA Atlas 14 for Franklin, TX.

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October 2016 Project No. 1648164

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1601 Bryan Street
Dallas, Texas 75201

**RE: HISTORY OF CONSTRUCTION**
**CCR SURFACE IMPOUNDMENTS, OAK GROVE SES**
**ROBERTSON COUNTY, TX**

## 1.0 INTRODUCTION

The "Disposal of Coal Combustion Residuals (CCR) from Electric Utilities rule" (40 Code of Federal Regulations (40 CFR) Part 257), effective October 19, 2015, requires that existing CCR units meeting the requirements of §257.73(b) compile a history of construction, containing all the items, to the extent feasible, listed in §257.73(c)(1)(i) – (xii). This letter provides a history of construction pursuant to §257.73(c) for the Oak Grove Steam Electric Station's (OGSES) CCR Impoundments, identified as flue gas desulphurization (FGD) Ponds FGD-A, FGD-B, and FGD-C.

## 2.0 OWNER AND OPERATOR - §257.73(c)(1)(i)

OGSES is currently owned and operated by Oak Grove Management Company LLC. The three FGD Ponds referenced in this letter have been assigned the following TCEQ WMU numbers.

- FGD-A 011
- FGD-B 012
- FGD-C 013

## 3.0 HISTORY OF CONSTRUCTION

OGSES is a lignite-fueled (i.e. coal-fired) power plant that commenced final construction activities in 2007. Golder Associates Inc. (Golder) has provided engineering services supporting construction of the Oak Grove CCR units since 2008.

## 3.1 Location - §257.73(c)(1)(ii)

OGSES is located in Robertson County, Texas, approximately 10 miles north of the City of Franklin. Figure 1 provides the location of the Power Plant with the FGD Ponds identified on the most recent U.S. Geological Survey (USGS) topographic map. Figure 2 provides an aerial map view of the power plant and its ancillary facilities.

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**Golder Associates Inc.**
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA
Tel: (281) 821-6868 Fax: (281) 821-6870 www.golder.com

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## 3.2 Purpose - §257.73(c)(1)(iii)

The OGSES power plant produces coal combustion residuals (CCR's) in the form of fly ash, bottom ash and flue gas desulphurization (FGD) byproduct (gypsum). The CCR Surface Impoundments at OG that are covered by the CCR Rule (FGD- A, FGD- B and FGD-C) handle primarily the FGD gypsum. Fly ash and bottom ash are processed and transported by dry methods to Ash Landfill 1.

## 3.3 Watershed - §257.73(c)(1)(iv)

The embankments of all three ponds are raised above the surrounding ground surface; therefore, the surface impoundments are not affected by any adjacent watershed. However, in the event of a failure of the northern embankment in FGD-A, the contents of FGD-A could flow into FGD-B.

## 3.4 Foundation Materials - §257.73(c)(1)(v)

Preparation of FGD-A and FGD-B Pond's foundation occurred during the initial phase of construction in the 1980s. Golder conducted a subsurface investigation for FGD-A in 2008 and evaluated the existing liner in FGD-B in 2011. Based on a review of the available information and the subsurface investigations, the foundation soils at FGD-A and FGD-B Ponds consist of very stiff to hard clays and compact to very dense sands.

Continuous construction of FGD-C began on July, 12, 2015. Based on a subsurface investigation conducted by Golder in 2014, the foundation soils consist of a combination of fill and native clays and sands. Accurate identification of existing fill materials during drilling activities was not always possible, due to similarity with natural soils, not only in type but in relative consistency. In general, both the fill and native material consists of stiff to hard clays and compact to very dense sands.

## 3.5 Construction - §257.73(c)(1)(vi)

### *3.5.1 Construction Materials and Site Preparation*

The following sections provide details on the materials and site preparation methods employed during construction of each of the surface impoundments. Construction dates are provided in section 3.5.2 and specific construction documentation references are provided in section 3.10 of this letter.

#### 3.5.1.1 FGD-A Pond

The FGD-A Pond embankment was constructed of compacted site soils. No construction testing of the original embankment fill is available.

A compacted clay liner was installed within FGD-A in 2008. The clay was obtained from an on-site borrow source and compacted in 6-inch lifts to ≥ 95% of the maximum standard Proctor dry density and within +2% to +6% of the standard Proctor optimum water content. Based on testing of Shelby tube samples collected during clay liner construction, the 3-foot thick compacted clay liner has a hydraulic conductivity less than $1 \times 10^{-7}$ cm/s.

#### 3.5.1.2 FGD-B Pond

The original FGD-B Pond embankment was constructed of compacted site soils. No construction testing of the original embankment fill is available.

In 2011, the base and embankment crest elevation of FGD-B Pond were raised and the pond was lined with a composite geomembrane/clay liner system. The subgrade was raised using structural fill to increase the separation depth from the groundwater. Approximately 150,000 cy of structural fill was placed in 6-inch lifts and compacted to ≥ 95% of the maximum standard Proctor dry density and within -3% to +3% of the standard Proctor optimum water content. Following subgrade preparation, a 2-ft thick clay liner was placed and compacted in 6-inch thick lifts to 95% of the maximum standard Proctor dry density and within +2% to

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+6% of the standard Proctor optimum water content. Based on testing of Shelby tube samples collected during clay liner construction, the compacted clay liner has a hydraulic conductivity less than 1 x $10^{-7}$ cm/s. A 60-mil HDPE geomembrane was placed over the clay liner and subsequently covered with a 1-ft thick soil cover.

In 2015, repairs were made to the protective cover along the inside crest of the embankment.

#### 3.5.1.3 FGD-C Pond

Following removal of loose/soft and/or organic material, the FGD-C embankment was constructed of compacted site soils placed in 6-inch lifts compacted to ≥ 95% of the standard Proctor maximum dry density and within -3% to +3% of the standard Proctor optimum water content.

FGD-C Pond is lined with a composite liner consisting of a 2-ft thick clay liner, a 60-mil HDPE geomembrane and a 2-ft thick soil/ash protective cover. The clay liner was placed and compacted in 6-inch thick lifts to ≥ 95% of the maximum standard Proctor dry density and within +2% to +6% of the standard Proctor optimum water content. Based on testing of Shelby tube samples collected during clay liner construction, the compacted clay liner has a hydraulic conductivity less than 1 x $10^{-7}$ cm/s.

### *3.5.2 Construction Dates*

The following is a list of the Oak Grove FGD-A, FGD-B, and FGD-C Ponds' construction dates.

- Circa 1980: Site grading, structural fill placement, and soil liner placement at FGD-A and FGD-B Ponds.
- August 28, 2008 - October 18, 2008: Construction of the FGD-A Pond clay liner system.
- July 7, 2011 – July 25, 2011: Site grading and structural fill placement for FGD-B Pond.
- October 7, 2011 - November 9, 2011: Construction of the FGD-B Pond composite liner system.
- July 12, 2015 – August 20, 2015: Site grading and structural fill placement for FGD-C Pond.
- August 21, 2015 – February 10, 2016: Construction of the FGD-C Pond composite liner system.
- April 1, 2016 – June 24, 2016: Placement of the ash protective cover layer.

## 3.6 Drawings - §257.73(c)(1)(vii)

Attachment 1 provides the design drawings from the FGD-A, FGD-B, and FGD-C Pond Registration Packages as well as the as-built drawings submitted within each impoundment's Liner Evaluation Report.

In each pond the normal operating pool surface and maximum depth of CCR elevation is 2 feet below the crest elevation and the maximum pool surface is equal to the embankment crest elevation. The depths of CCR are 25.5 feet in FGD-A; 13.5 feet in FGD-B; and 19.0 feet in FGD-C.

## 3.7 Instrumentation - §257.73(c)(1)(viii)

With the exception of pool elevation gauges, there is no instrumentation on any of the surface impoundments.

## 3.8 Area-Capacity Curves - §257.73(c)(1)(ix)

Using as-built survey information, area capacity curves have been developed or each FGD pond. The capacity curves calculation is included as Attachment 2.

## 3.9 Spillways and Diversion Features - §257.73(c)(1)(x)

There are no spillways on any of the surface impoundments.

## 3.10 Construction Specifications and Surveillance - §257.73(c)(1)(xi)

The following tables list documents that contain the design, figures, specifications, construction and quality assurance reports for the FGD Ponds.

**Table 1 - FGD-A Construction Documentation**

| Document Category | Reference |
|---|---|
| TCEQ Registration Package | Pastor, Behling & Wheeler, LLC Consulting Engineers and Scientists (PBW), August 2008; TCEQ Registration Package Oak Grove Steam Electric Station FGD-A Pond. |
| Engineering Drawings and Technical Specifications | Fluor, August 2008; Oak Grove Power Plant, "Issued for Construction" Drawings.<br>Fluor, 2008; Contract Documents, FGD Impoundment Construction Specifications |
| Construction Quality Assurance | Fluor, 2008; Contractors Quality Assurance/Quality Control Plan, Oak Grove Project, Waste Containment Units, FGD Impoundment. |
| Quality Assurance Report | Golder, November 2008; FGD Pond Soil Liner Evaluation Report. |

**Table 2 - FGD-B Construction Documentation**

| Document Category | Document Reference |
|---|---|
| Technical Specifications | Burns and McDonnell, March 2011; Refurbished FGD-B Pond, Oak Grove Electric Station FGD-B Pond. |
| Update to Registration Package | Golder, October 2011; FGD-B Effluent Pond Notice of Registration Revision. |
| Construction Drawings | Golder, September 2011; Oak Grove Steam Electric Station FGD-B Pond Robertson County, Texas. |
| Construction Quality Assurance | Golder, March 2011; Soil Liner Quality Control Plan (Oak Grove Steam Electric Station).<br>Golder, October 2011; Geomembrane Liner Quality Control Plan (Oak Grove Steam Electric Station). |
| Quality Assurance Report | Golder, January 2012; Liner Evaluation Report, Oak Grove SES, FGD-B Pond. |

LUMINANT

**Table 3 - FGD-C Construction Documentation**

| Document Category | Document Reference |
|---|---|
| TCEQ Registration Package | Golder, June 2015; TCEQ Registration Package Oak Grove Steam Electric Station FGD-C Pond. |
| Construction Drawings | Golder, April 2015; Oak Grove Steam Electric Station, FGD-C Pond, Robertson County, Texas. |
| Specifications and Contract Documents | Golder, April 2015; Specifications and Contract Documents For Construction of FGD-C Pond, Oak Grove Steam Electric Station. |
| Quality Assurance Report | Golder, October 2016; FGD-C Pond Liner Evaluation Report. |

Each surface impoundment is inspected weekly by Luminant personnel and annually by a licensed professional engineer in accordance with §257.83. Items requiring maintenance and repair are identified during the inspections and subsequently repaired.

## 3.11 Structural Instability - §257.73(c)(1)(xii)

There is no knowledge of structural instability within any of the surface impoundments.

## 4.0 CLOSING

Golder Associates was retained by Luminant to prepare a history of construction for the CCR units at the Oak Grove SES. Based on our review of the available information, to the extent feasible, this letter provides information required by 40 CFR §257.73(c)(i) through (xii), related to construction of FGD-A, FGD-B, and FGD-C Ponds.

Sincerely,

**GOLDER ASSOCIATES INC.**

Varenya Kumar
Staff Geotechnical Engineer

Jeffrey B. Fassett, PE
Senior Consultant and Associate

Golder Associates Inc.
Firm Registration Number F-2578

VK/JBF/kc

Attachments or Enclosures:

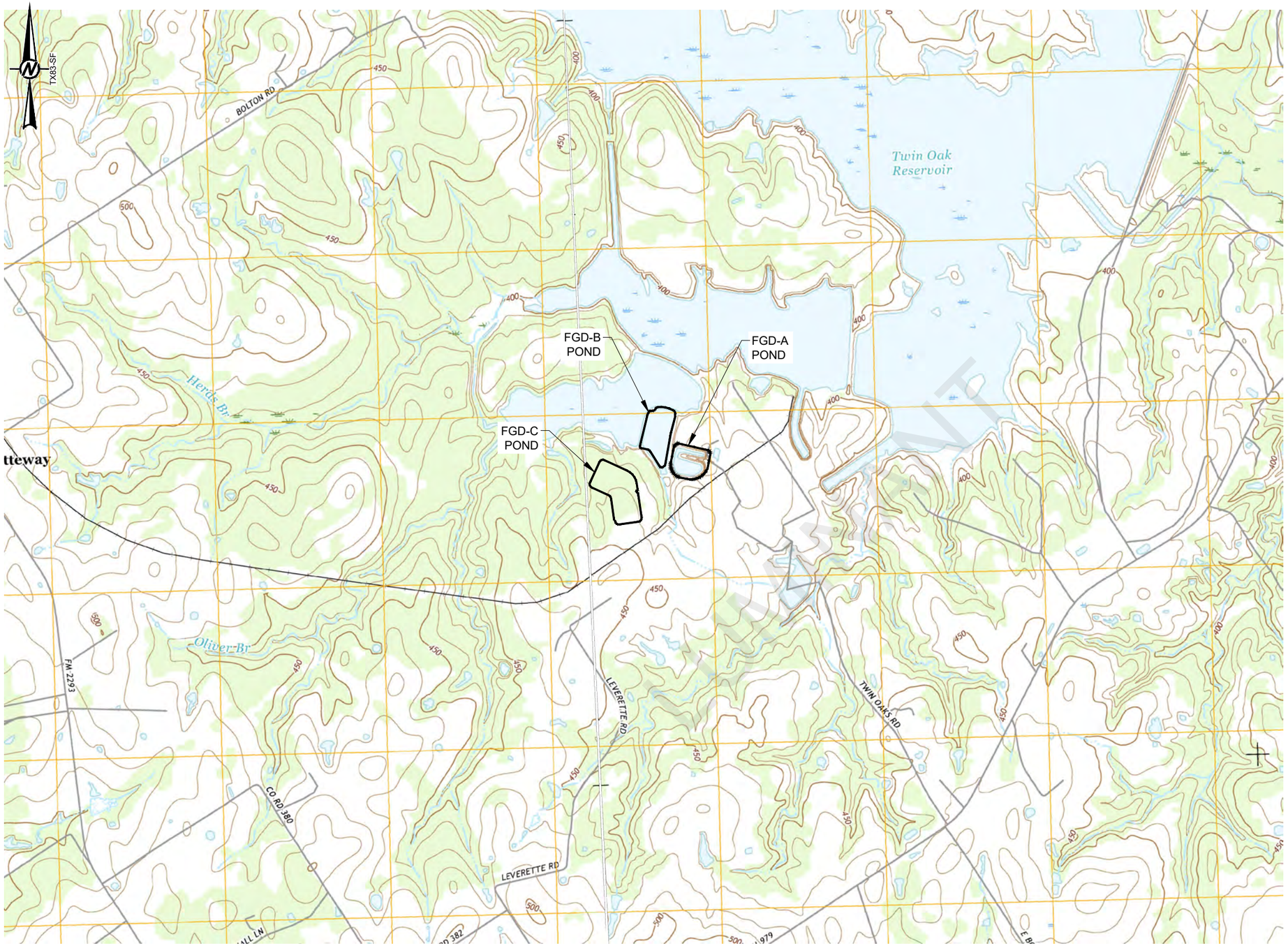
Figure 1 –Topographic Map
Figure 2 – General Site Map

Attachment 1 – Design Drawings
Attachment 2 – Area Capacity Curves

## 5.0 REFERENCES:


- Fluor Enterprises, Inc. (May 2008). Soil Liners and Cover Systems (Rev. 0). Robertson County, TX.
- Pastor, Behling & Wheeler, LLC Consulting Engineers and Scientists (August 2008). TCEQ Registration Package Oak Grove Steam Electric Station FGD-A Pond.
- Golder Associates Inc. (October 2008). Oak Grove SES FGD Pond Subsurface Investigation.
- Golder Associates Inc. (November 2008). FGD Pond Soil Liner Evaluation Report.
- Golder Associates Inc. (May 2010). FGD Pond Existing Liner Evaluation.
- Burns and McDonnell, (March 2011) Refurbished FGD-B Pond, Oak Grove Electric Station FGD-B Pond.
- Golder Associates Inc. (March 2011). Soil Liner Quality Control Plan (Oak Grove Steam Electric Station).
- Golder Associates Inc. (March 2011). FGD-A Slope Stability Evaluation Report.
- Golder Associates Inc. (October 2011). Geomembrane Liner Quality Control Plan (Oak Grove Steam Electric Station).
- Golder Associates Inc. (January 2012). Liner Evaluation Report, Oak Grove SES, FGD-B Pond.
- Golder Associates Inc. (March 2014). Addendum to Slope Stability Investigation Reports.
- O'Brien & Gere Engineers, Inc. (June 2014). Dam Safety Assessment of CCW Impoundments, Luminant/Oak Grove Steam Electric Station, Prepared for: US Environmental Protection Agency. Washington, DC.
- Golder Associates Inc. (August 2016). FGD-C Pond Liner Evaluation Report.
- Golder Associates Inc. (September 2016). Oak Grove SES FGD-A, FGD-B, and FGD-C Ponds Structural Stability Assessment.
- Golder Associates Inc. (September 2016). Oak Grove SES FGD-A, FGD-B, and FGD-C Ponds Safety Factor Assessment.


LUMINANT




**LEGEND**

ROAD CLASSIFICATION

INTERSTATE ROUTE
US ROUTE
RAMP
STATE ROUTE
LOCAL ROAD
4WD

Interstate Route
US Route
State Route

MAJOR CONTOURS 550
BODY OF WATER
WOODLAND
MINOR CONTOURS
PERENNIAL STREAM
INTERMITTENT STREAM

**REFERENCE**

BASE MAP PUBLISHED BY U.S. GEOLOGICAL SURVEY. PETTEWAY AND BALD PRAIRIE QUADRANGLES, TX. SCALE 1:24,000. 7.5 MINUTE SERIES. DATED MARCH 2016.

10/10/16

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

0 1000 2000
1" = 2000' FEET

CLIENT
LUMINANT POWER
OAK GROVE

CONSULTANT
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2016-09-29 |
| DESIGNED | VK |
| PREPARED | TNB |
| REVIEWED | MX |
| APPROVED | JBF |

PROJECT
2016 COAL COMBUSTION RESIDUALS
ENGINEERING SERVICES

TITLE
**TOPOGRAPHIC MAP**

PROJECT NO. 1648164 | REV. A | FIGURE 1

APPENDIX E-Revision 1 November 21, 2022

Path: \houston\drafting_2016_1648164 - Luminant\D_OakGrove\PRODUCTION\B-HISTORY OF CONSTRUCTION\ | File Name: 1648164B002.dwg | Last Edited By: tbookout Date: 2016-10-10 Time:10:31:38 AM | Printed By: TBookout Date: 2016-10-10 Time:10:31:50 AM
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

**REFERENCE(S)**
AERIAL PHOTO SOURCED FROM GOOGLE EARTH PRO DATED 2016

10/10/16
STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED
PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

0 400 800
1" = 800' FEET

CLIENT
LUMINANT POWER
OAK GROVE

CONSULTANT
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2016-09-29 |
| DESIGNED | VK |
| PREPARED | TNB |
| REVIEWED | MX |
| APPROVED | JBF |

PROJECT
2016 COAL COMBUSTION RESIDUALS
ENGINEERING SERVICES

TITLE
**GENERAL SITE MAP**

PROJECT NO. 1648164 | REV. A | FIGURE 2



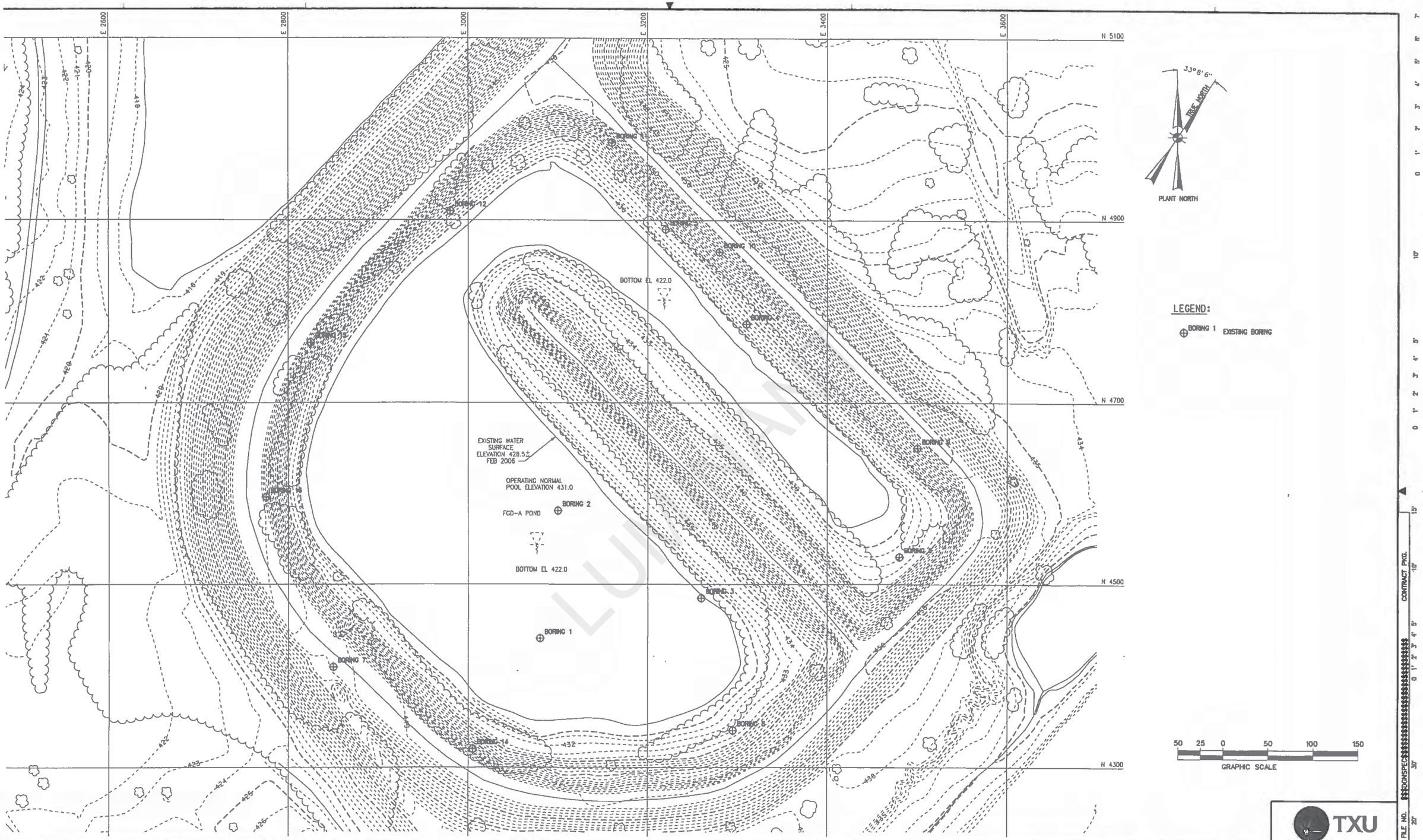
Path: \\houston\drafting_2016_1648164 - Luminant\D_OakGrove\PRODUCTION\B-HISTORY OF CONSTRUCTION\ | File Name: 1648164B001.dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
0

**ATTACHMENT 1**
**DESIGN DRAWINGS**

LUMINANT

**FDG A**
**DESIGN DRAWINGS**

LUMINANT




| REVISION DESCRIPTION | DRWN CHK. | LAYO MECH | CSA ELEC | ENGM REF. | DWG.NO. | REFERENCE DRAWINGS |
|---|---|---|---|---|---|---|
| OUSLY ISSUED AS A2YF00-0-CV-0-SW-SK-04 - ISSUED FOR CONSTRUCTION | DRF JG | TPC | | | | |

APPENDIX E-Revision 1 November 21, 2022

RESERVED FOR PROFESSIONAL ENGINEER'S SEAL, IF APPLICABLE

STATE OF TEXAS — JOSEPH M. MELE — 84177 — LICENSED PROFESSIONAL ENGINEER

FLUOR ENTERPRISES, Inc

NOTICE: THIS DRAWING HAS NOT BEEN PUBLISHED AND IS THE SOLE PROPERTY OF FLUOR CORPORATION AND IS LENT TO THE BORROWER FOR THEIR CONFIDENTIAL USE ONLY, AND IN CONSIDERATION OF THE LOAN OF THIS DRAWING, THE BORROWER PROMISES AND AGREES TO RETURN IT UPON REQUEST AND AGREES THAT IT SHALL NOT BE REPRODUCED, COPIED, LENT OR OTHERWISE DISPOSED OF DIRECTLY OR INDIRECTLY, NOR USED FOR ANY PURPOSE OTHER THAN FOR WHICH IT IS FURNISHED.

| | | |
|---|---|---|
| DESIGN BY | DJFOX | DATE/DATE DRF 8/5/08 |
| CHECKED BY | J.GERVAIS | DATE/DATE JKF 8/5/08 |
| APPROVED BY LAYOUT | | DATE/DATE |
| APPROVED BY SYSTEMS | | DATE/DATE |
| APPROVED BY QA | J.MELE | DATE/DATE 8-5-08 |
| APPROVED BY ELECTRICAL | | DATE/DATE |
| ENGINEERING MANAGER | | DATE/DATE 8/5/08 |

TXU

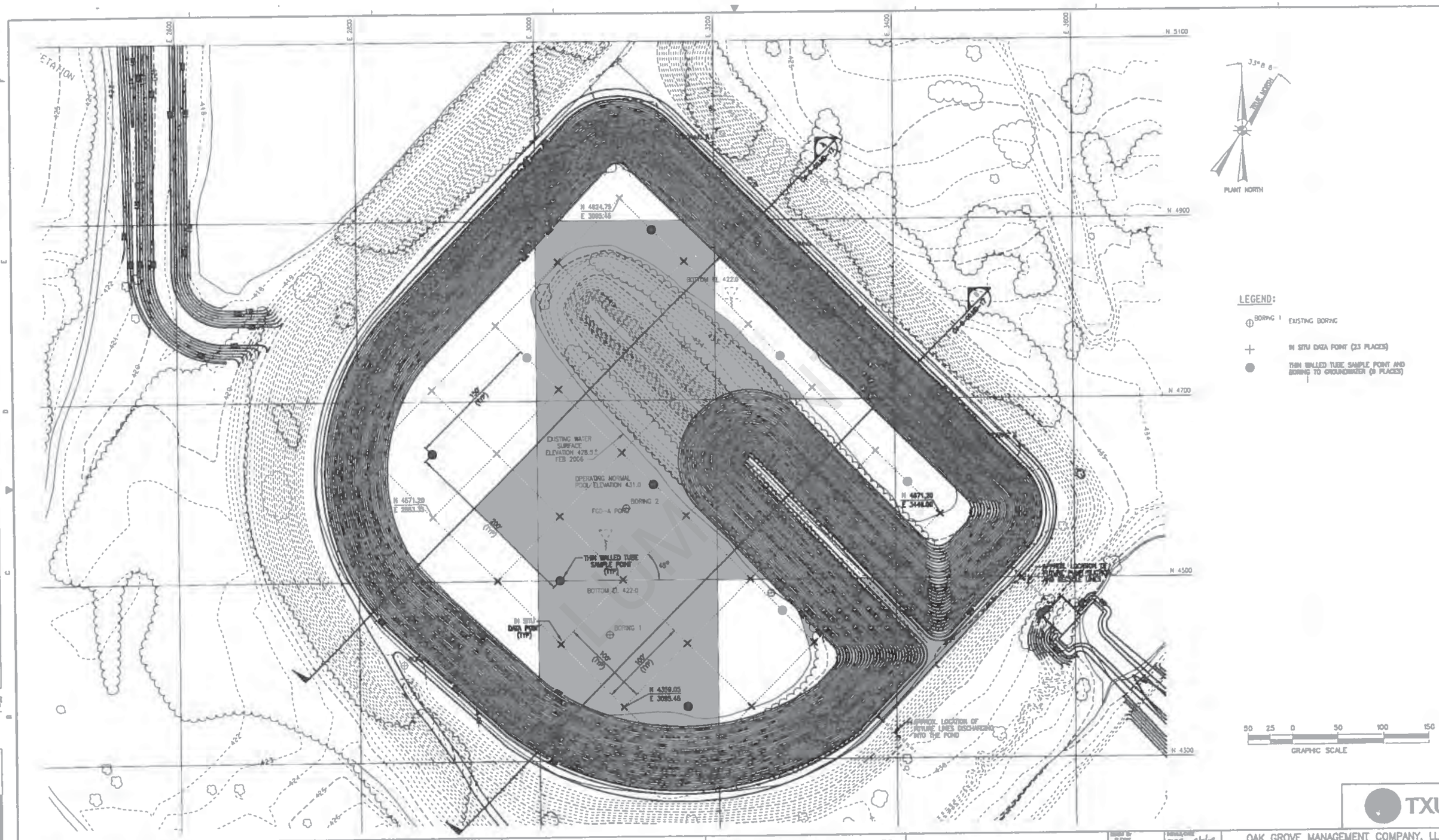
OAK GROVE MANAGEMENT COMPANY, LLC
OAK GROVE ELECTRIC STATION
ROBERTSON COUNTY, TX

FIGURE 1-1
FGD SCRUBBER POND
EXISTING BORING LOCATION PLAN

| SCALE | PROJECT NUMBER | UNIT No | DOC TYPE | FUNC | SUBJECT CODE | SEQ No | REV. |
|---|---|---|---|---|---|---|---|
| AS NOTED | A2YF00 | 0 | CV | 0 | CF-01 | 02 | 1 |

DIST.CODE | WRK. PKG. | CADD FILE NO. | NRONSPEC | CONTRACT PKG.

MANUAL CHANGES MADE – YES ☐ NO ☐ DWG. FILE UPDATED – YES ☐ NO ☐ MODEL UPDATED – YES ☐ NO ☐




| REV. | DATE | REVISION DESCRIPTION | DRWN CHK. | LAYO MECH | CSA ELEC | ENGR REF. | DWG.NO. | REFERENCE DRAWINGS |
|---|---|---|---|---|---|---|---|---|
| 1 | 05AUG09 | PREVIOUSLY ISSUED AS A2YF00-0-CV-0-SD-SK-05 - ISSUED FOR CONSTRUCTION | DSF JD | WPC | JP | GHS | | |

RESERVED FOR PROFESSIONAL ENGINEER'S SEAL, IF APPLICABLE

STATE OF TEXAS — JOSEPH D. DAVIS — 90178 — REGISTERED PROFESSIONAL ENGINEER

FLUOR ENTERPRISES, Inc

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| | |
|---|---|
| DESIGNED BY | DATE |
| E.FOX | 7/15/08 |
| DRAWN BY | DATE |
| J.GERVAIS | 7/15/08 |
| CHECKED BY | DATE |
| E.FOX | 8/5/08 |
| APPROVED BY | DATE |
| J.WELLS | 8-5-08 |
| APPROVED BY | DATE |
| S.A. | 8/7/08 |
| APPROVED BY | DATE |
| A.WELLS | 8/12/08 |

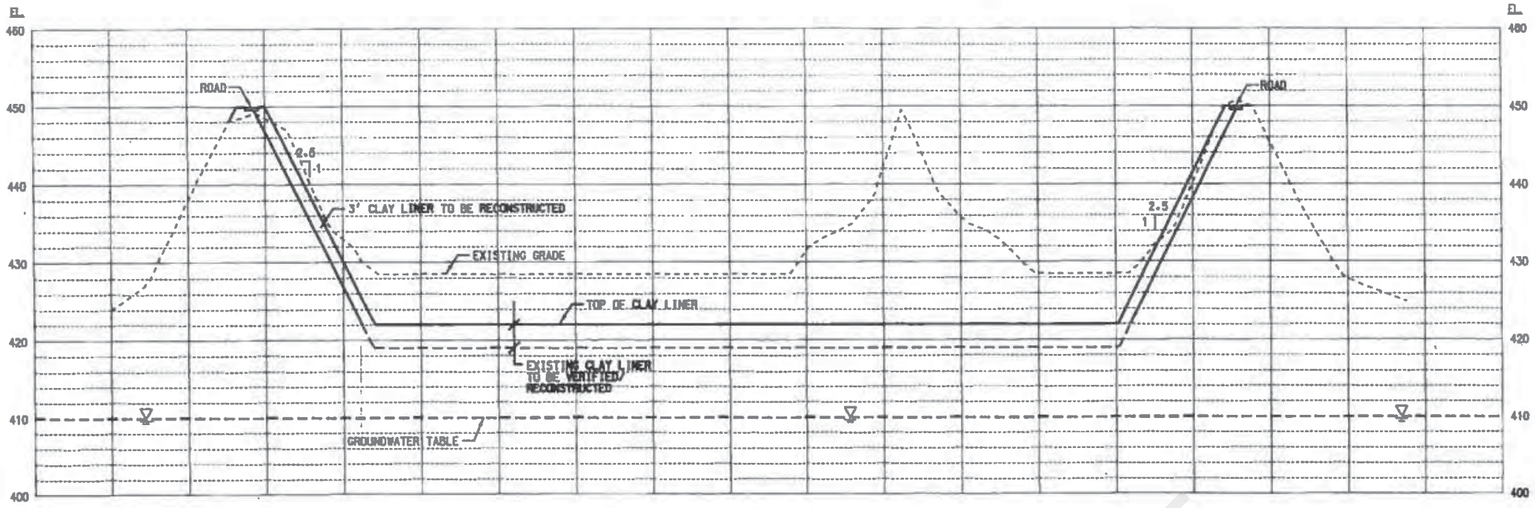
TXU

OAK GROVE MANAGEMENT COMPANY, LLC
OAK GROVE ELECTRIC STATION
ROBERTSON COUNTY, TX

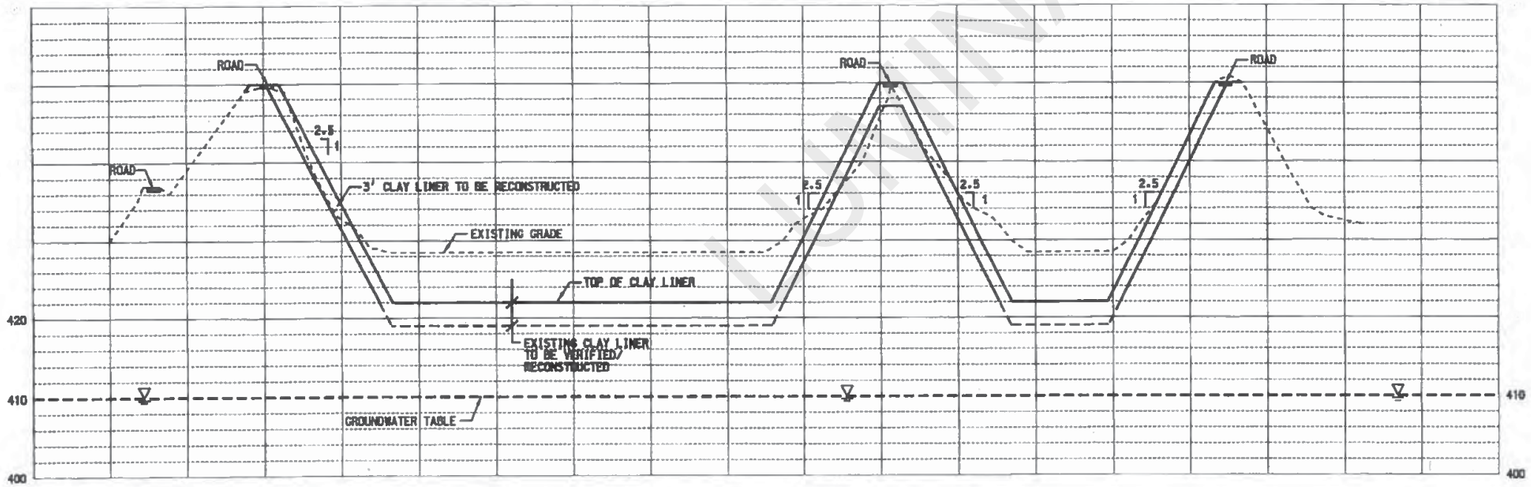
FIGURE 2-1
FGD SCRUBBER POND
LINER VERIFICATION SAMPLING PLAN

| SCALE | PROJECT NUMBER | UNIT No. | SYS. TYPE | PLANT | DRAWING NUMBER | SHT. No. | REV. |
|---|---|---|---|---|---|---|---|
| AS NOTED | A2YF00 | – 0 – | CV | –0– | CF–01 | – 03 – | 1 |

MANUAL CHANGES MADE – YES ☐ NO ☐ DWG. FILE UPDATED – YES ☐ NO ☐ MODEL UPDATED – YES ☐ NO ☐




SECTION A
SCALE: 1"=50' HORIZONTAL
1"=10' VERTICAL
CV-0-CF-01-03




SECTION B
SCALE: 1"=50' HORIZONTAL
1"=10' VERTICAL
CV-0-CF-01-03

PRELIMINARY NOT FOR CONSTRUCTION

| | DRWN | LAYO | CSA | ENGM |
|---|---|---|---|---|
| | CHK. | MECH | ELEC | REF. |
| ED FOR CONSTRUCTION | DRF | | | |
| | JD | | | |

DWG.NO.

REFERENCE DRAWINGS

RESERVED FOR PROFESSIONAL ENGINEER'S SEAL, IF APPLICABLE

STATE OF TEXAS
JOSEPH D. WELS
88178
PROFESSIONAL ENGINEER

**FLUOR ENTERPRISES, Inc**

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| | | |
|---|---|---|
| DRAWN BY | D.FOX | DATE/INITIALS 8/4/08 |
| CHECKED BY | J.GERVAIS | DATE/INITIALS 8/5/08 |
| APPROVED BY (ENGR) | | DATE/INITIALS 8/5/08 |
| APPROVED BY (OWNER) | | DATE/INITIALS |
| APPROVED BY (CSA) | J.WELS | DATE/INITIALS 8/5/08 |
| APPROVED BY (OWNER) | | DATE/INITIALS |
| (ENGINEERING MANAGER) | | DATE/INITIALS 8/5/08 |

OAK GROVE MANAGEMENT COMPANY, LLC
OAK GROVE ELECTRIC STATION
ROBERTSON COUNTY, TX

FGD SCRUBBER POND
CROSS SECTIONS

| SCALE | PROJECT NUMBER | UNIT No | DOC TYPE | FUNC | SUBJECT CODE | REV No | REV. |
|---|---|---|---|---|---|---|---|
| AS NOTED | A2YF00 | 0 | CV | 0 | 00.MD | 17 | 1 |

MANUAL CHANGES MADE – YES ☐ NO ☐ DWG. FILE UPDATED – YES ☐ NO ☐ MODEL UPDATED – YES ☐ NO ☐

DIST.CODE | WRK. PKG. | CADD FILE NO. | CONTRACT PKG.

**FDG B**
**DESIGN DRAWINGS**

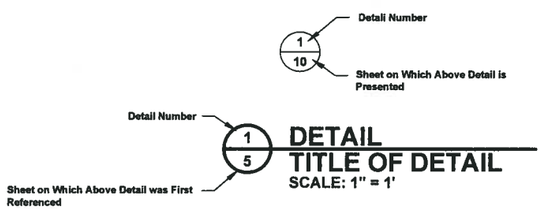
LUMINANT

Drawing File: J:_2011\113-94788 - Oak Grove_C - FGD Pond Option 3 \ 11394788C002.dwg | Layout: ANSI Full Bleed B (11.00 X 17.00 Inches) | Modified: 9/16/2011 3:37:36 PM VEstrada | Plotted: Wednesday, September 21, 2011 3:30:55 PM VEstrada

Luminant

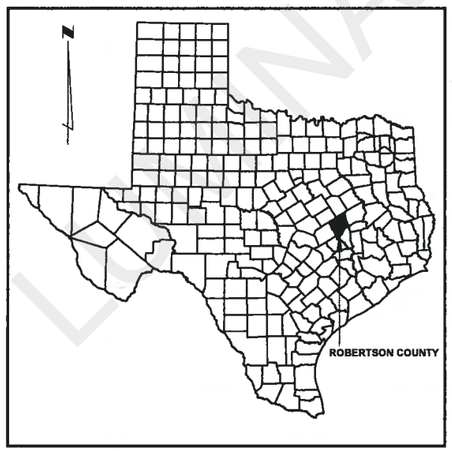
# OAK GROVE STEAM ELECTRIC STATION
# FGD - B POND CONSTRUCTION
# ROBERTSON COUNTY, TEXAS

## DETAIL IDENTIFICATION LEGEND




Example: Detail Number 1 Presented on Sheet No. 10 was Referenced for the First Time on Sheet No. 5.

NOTES: ABOVE REFERENCING SYSTEM ALSO APPLIES TO SECTION IDENTIFICATIONS.




SITE LOCATION MAP

## INDEX OF DRAWINGS


| SHEET NO. | TITLE | DRAWING NO. |
|---|---|---|
| 1 | COVER SHEET. | .11394788C002 |
| 2 | SITE LAYOUT PLAN. | .11394788C003 |
| 3 | SUBGRADE GRADING PLAN. | .11394788C004 |
| 4 | CLAY LINER GRADING PLAN. | .11394788C005 |
| 5 | PROTECTIVE COVER GRADING PLAN. | .11394788C006 |
| 6 | DETAILS AND CROSS SECTIONS I. | .11394788C007 |


All information contained herein and attached hereto is considered proprietary and confidential and is not to be displayed, copied or published in whole or in part without prior written consent from LUMINANT.

Prepared By:

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas USA 77073
Tel: (281) 821-6868
Texas Registration Number: F-2578

**SEPTEMBER 2011**
**113-94788**



**ISSUED FOR CONSTRUCTION**

Golder Associates

| REV | DATE | DES | REVISION DESCRIPTION | CED | CHK | RVW |
|---|---|---|---|---|---|---|
| 1 | 04/2011 | | South Berm Realignment | | | |

STATE OF TEXAS — CHARLES FRED ROCKERT — 62392 — LICENSED PROFESSIONAL ENGINEER — 9-21-11

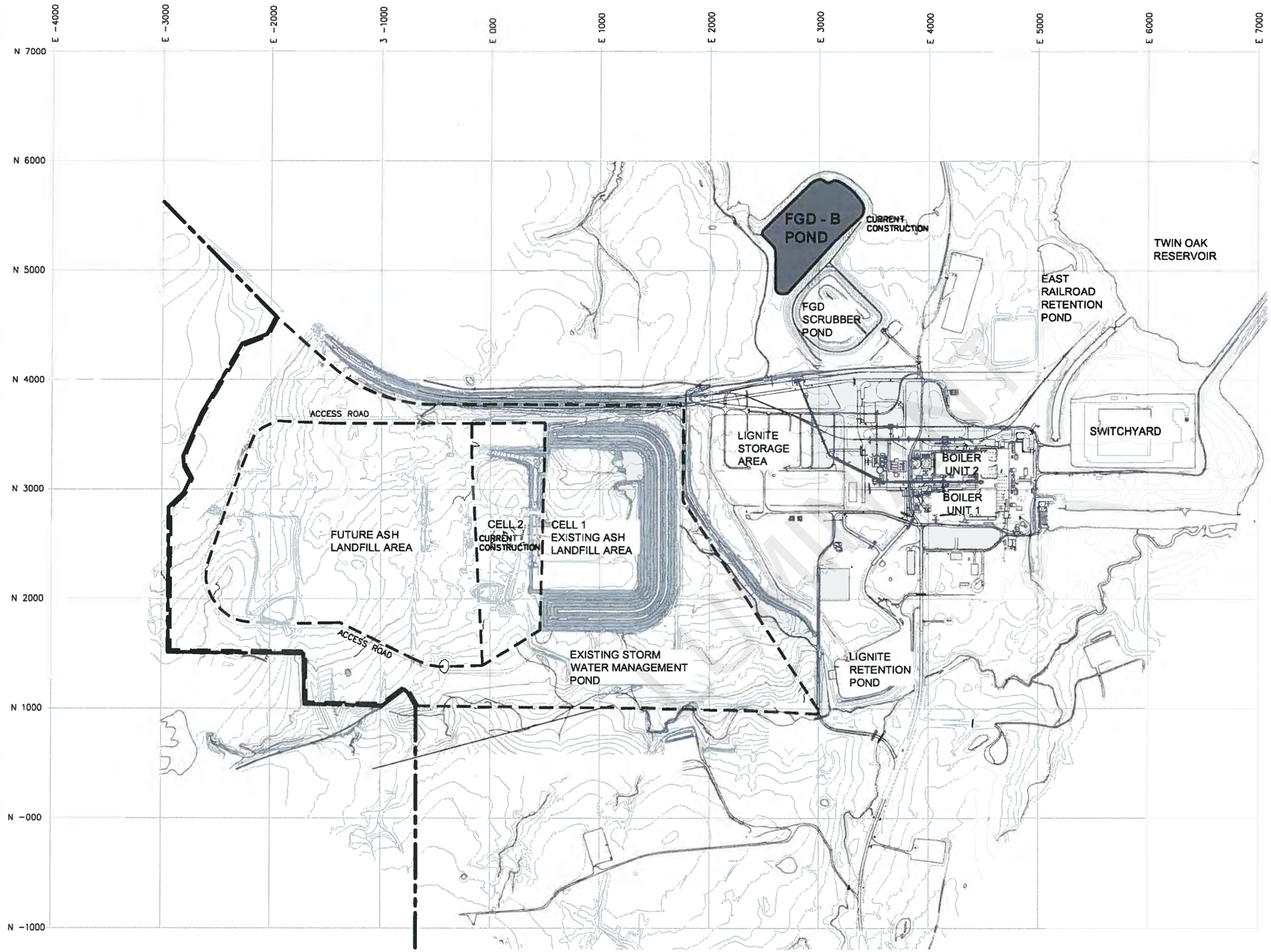
GOLDER ASSOCIATES INC. F-2578

PROJECT: LUMINANT FGD - B POND CONSTRUCTION ROBERTSON COUNTY, TEXAS

TITLE: COVER SHEET

| | | |
|---|---|---|
| PROJECT No. | | 113-94788 |
| FILE No. | | 11394788C 002 |
| SCALE | | NOT APPLICABLE |
| DESIGN | CEI | 08/2011 |
| CADD | VJE | 08/2011 |
| CHECK | JFR | 09/2011 |
| REVIEW | CED | 09/2011 |

1




PLANT GRID NORTH
33°08'05" GEODETIC NORTH

## LEGEND

- LIMIT OF 1987 REGISTERED LANDFILL AREA
- PROPERTY BOUNDARY
- EXISTING GROUND TOPOGRAPHY
- CURRENT POND CONSTRUCTION AREA

## NOTES

1. SITE LOCATION: ROBERTSON COUNTY, TEXAS.

## REFERENCES

1. EXISTING GROUND TOPOGRAPHY IN THE VICINITY OF THE ASH LANDFILL IS FROM AN AERIAL SURVEY PERFORMED BY GEODETIX, INC., ON MAY 27, 2010. EXISTING GROUND TOPOGRAPHY ELSEWHERE IS FROM FLUOR ENTERPRISES, INC., DRAWING A2YF00-0-CV-0-SW.PL.-01, AS PROVIDED BY LUMINANT.
2. COORDINATES ARE BASED ON OAK GROVE STEAM ELECTRIC STATION PLANT GRID SYSTEM.
3. ELEVATIONS ARE BASED ON MEAN SEA LEVEL DATUM.
4. CLAY MATERIAL AND STRUCTURAL FILL STOCKPILE AREAS NEED TO BE CLEARED AND GRUBBED PRIOR TO STOCKPILING ACTIVITIES.

1000 0 1000
SCALE FEET

Golder Associates

| REV | DATE | DES | REVISION DESCRIPTION | CED | CADD | CHK | RVW |
|---|---|---|---|---|---|---|---|
| 1 | 04/2011 | | South Berm Realignment | | | | |

STATE OF TEXAS
CHARLES FRED RICKERT
82392
LICENSED PROFESSIONAL ENGINEER
9-21-11

GOLDER ASSOCIATES INC.
F-2578

PROJECT
LUMINANT
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

TITLE
SITE LAYOUT PLAN

| | | |
|---|---|---|
| PROJECT No. | | 113-94788 |
| FILE No. | | 11394788C 003 |
| SCALE | | AS SHOWN |
| DESIGN | CEI | 08/2011 |
| CADD | VJE | 08/2011 |
| CHECK | CFR | 09/2011 |
| REVIEW | CEI | 09/2011 |

2

ISSUED FOR CONSTRUCTION



Drawing File: J:_2011\113-94788 - Oak Grove_C - FGD Pond Option 3 \ 11394788C003.dwg | Layout: ANSI Full Bleed B (17.00 X 11.00 Inches) | Modified: 9/16/2011 3:41:42 PM VEstrada | Plotted: Wednesday, September 21, 2011 3:28:24 PM VEstrada

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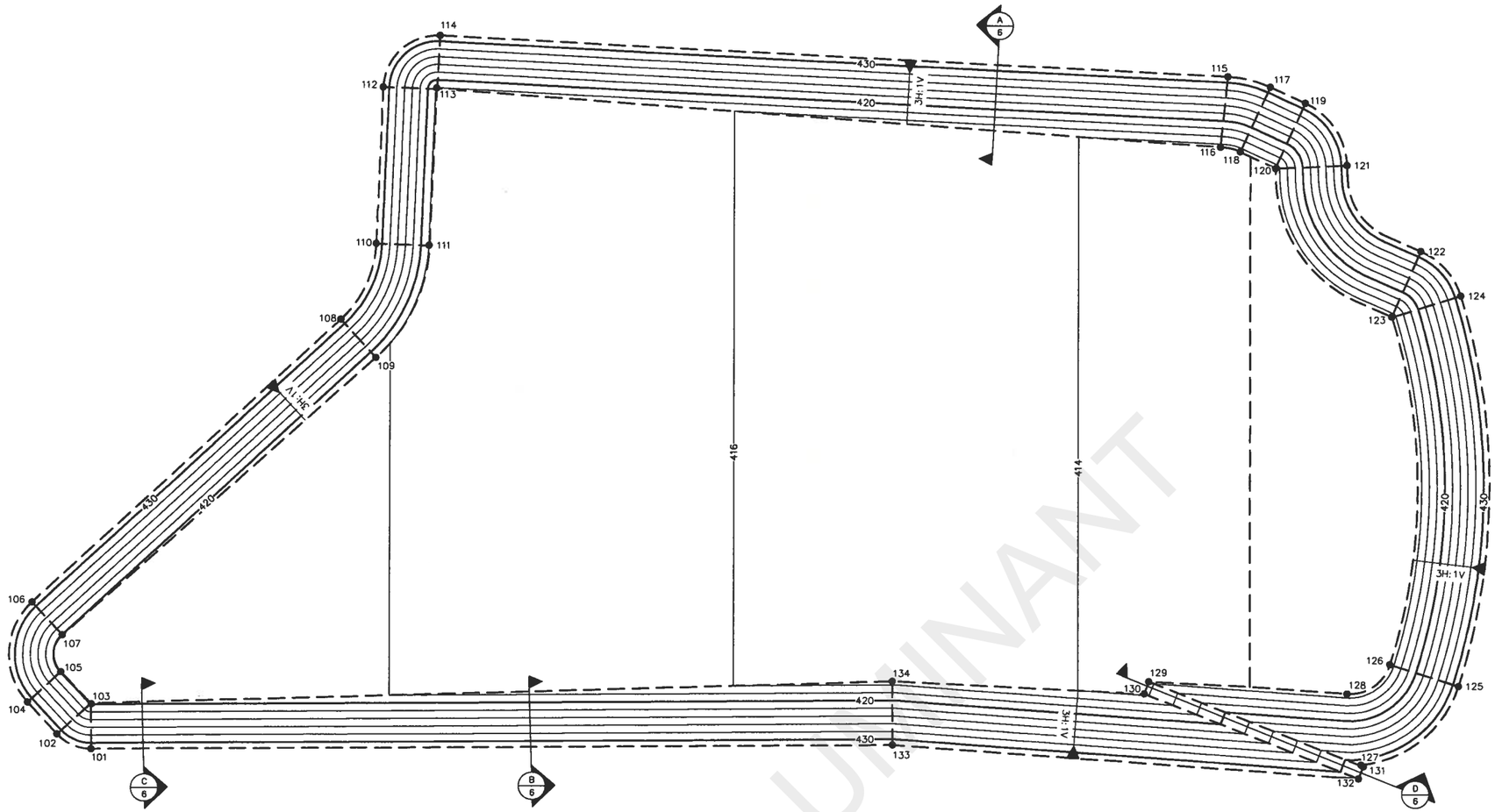
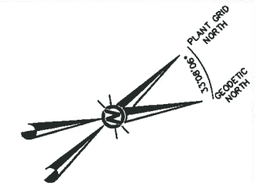



## LEGEND

- 430 SUBGRADE CONTOUR
- SUBGRADE GRADE BREAK
- 101 SUBGRADE CONTROL POINT

## NOTES

1. CONTOURS SHOWN ARE FOR SUBGRADE OF CELL.
2. EXCAVATED SOILS TO BE SEGREGATED AND STOCKPILED AT A LOCATION DESIGNATED BY OWNER.

100 0 100
SCALE FEET

| SUBGRADE CONTROL POINTS | | | |
|---|---|---|---|
| Point No. | Northing | Easting | Elevation |
| 101 | 4801.63 | 2715.01 | 431.50 |
| 102 | 4790.01 | 2688.69 | 431.50 |
| 103 | 4825.31 | 2689.48 | 419.89 |
| 104 | 4790.01 | 2655.00 | 431.50 |
| 105 | 4824.84 | 2655.09 | 419.90 |
| 106 | 4845.00 | 2600.01 | 431.50 |
| 107 | 4844.98 | 2634.84 | 419.89 |
| 108 | 5168.67 | 2600.01 | 431.50 |
| 109 | 5168.67 | 2640.27 | 418.08 |
| 110 | 5228.49 | 2575.24 | 431.50 |
| 111 | 5257.49 | 2603.98 | 417.89 |
| 112 | 5314.44 | 2489.29 | 431.50 |
| 113 | 5344.20 | 2518.00 | 417.90 |
| 114 | 5373.65 | 2489.65 | 431.50 |
| 115 | 5801.42 | 2927.83 | 431.50 |
| 116 | 5760.14 | 2964.25 | 413.17 |
| 117 | 5820.03 | 2956.03 | 431.50 |
| 118 | 5768.92 | 2977.21 | 413.06 |
| 119 | 5831.51 | 2983.74 | 431.50 |
| 120 | 5780.19 | 3005.33 | 413.00 |

| SUBGRADE CONTROL POINTS | | | |
|---|---|---|---|
| Point No. | Northing | Easting | Elevation |
| 121 | 5822.52 | 3041.22 | 431.50 |
| 122 | 5819.36 | 3128.97 | 431.50 |
| 123 | 5768.48 | 3151.14 | 413.00 |
| 124 | 5818.55 | 3175.36 | 431.50 |
| 125 | 5612.21 | 3396.96 | 431.50 |
| 126 | 5584.76 | 3348.73 | 413.00 |
| 127 | 5515.65 | 3390.73 | 431.50 |
| 128 | 5545.05 | 3342.82 | 413.00 |
| 129 | 5438.48 | 3231.50 | 413.59 |
| 130 | 5429.57 | 3236.06 | 413.61 |
| 131 | 5515.98 | 3392.98 | 431.50 |
| 132 | 5506.96 | 3397.31 | 431.50 |
| 133 | 5259.49 | 3132.82 | 431.50 |
| 134 | 5292.70 | 3096.44 | 415.08 |

LUMINANT

Golder Associates

| REV | DATE | DES | REVISION DESCRIPTION | CED | CHK | RVW |
|---|---|---|---|---|---|---|
| 1 | 04/2011 | | South Berm Realignment | | CADD | |

STATE OF TEXAS
CHARLES FRED RICKERT
82392
LICENSED PROFESSIONAL ENGINEER
9-21-11
GOLDER ASSOCIATES INC.
F-2578

PROJECT
LUMINANT
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

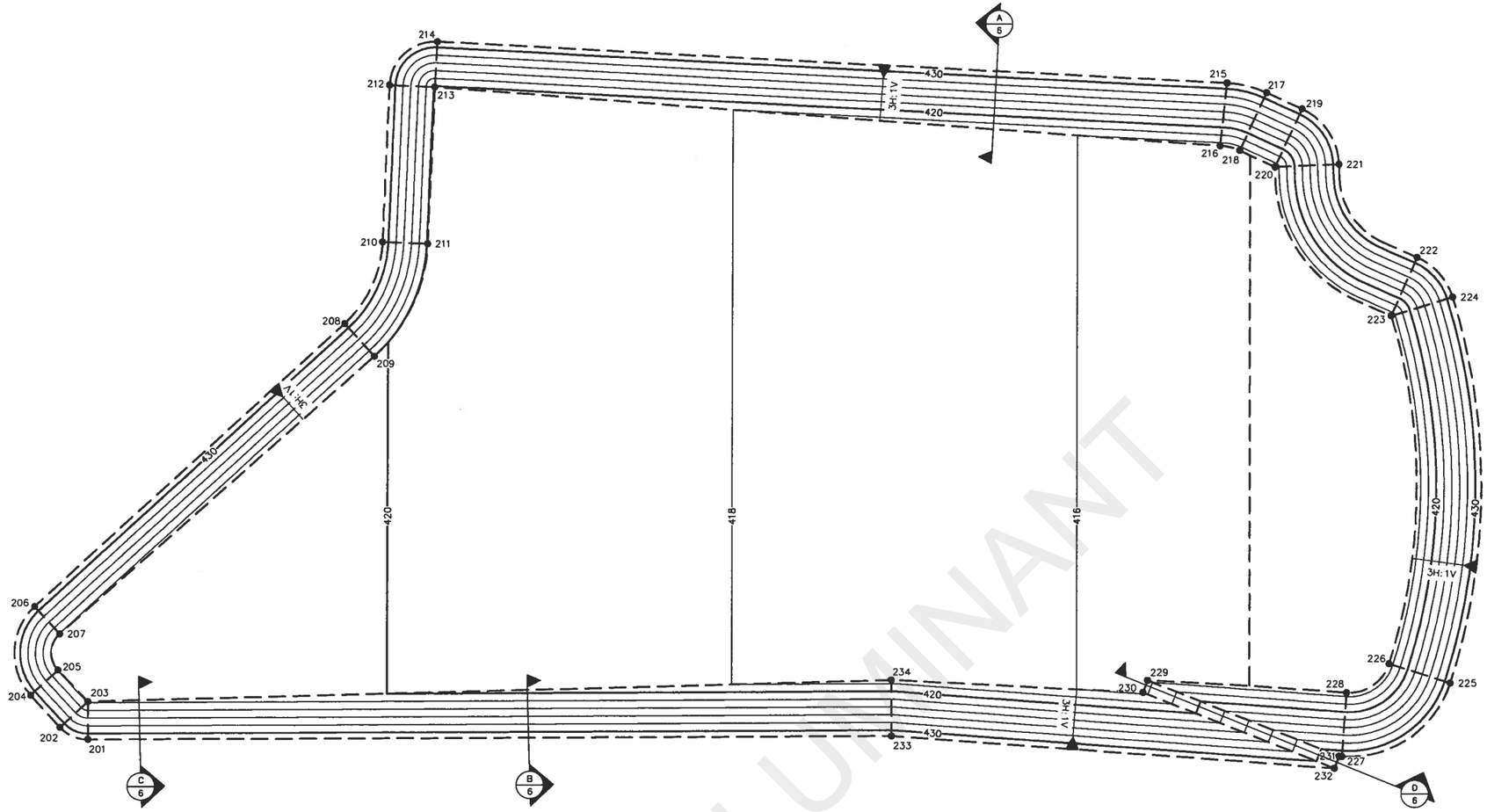
TITLE
SUBGRADE GRADING PLAN

| | | |
|---|---|---|
| PROJECT No. | | 113-94788 |
| FILE No. | | 11394788C 004 |
| SCALE | | AS SHOWN |
| DESIGN | CEI | 08/2011 |
| CADD | VJE | 08/2011 |
| CHECK | CFR | 09/2011 |
| REVIEW | CEI | 09/2011 |

3



ISSUED FOR CONSTRUCTION




PLANT GRID NORTH
37.08°
GEODETIC NORTH

## LEGEND

- 430 — CLAY CONTOUR
- CLAY GRADE BREAK
- ● 201 CLAY CONTROL POINT

## NOTES

1. CONTOURS SHOWN ARE FOR TOP OF CLAY OF FGD – B POND.

100 0 100
SCALE FEET

| CLAY CONTROL POINTS | | | |
|---|---|---|---|
| Point No. | Northing | Easting | Elevation |
| 201 | 4805.89 | 2710.34 | 431.50 |
| 202 | 4796.34 | 2688.69 | 431.50 |
| 203 | 4825.66 | 2688.69 | 421.73 |
| 204 | 4796.34 | 2655.00 | 431.50 |
| 205 | 4825.13 | 2655.00 | 421.90 |
| 206 | 4845.00 | 2606.34 | 431.50 |
| 207 | 4845.00 | 2635.16 | 421.89 |
| 208 | 5168.67 | 2606.34 | 431.50 |
| 209 | 5168.67 | 2640.60 | 420.08 |
| 210 | 5232.96 | 2579.71 | 431.50 |
| 211 | 5257.84 | 2604.59 | 419.77 |
| 212 | 5318.91 | 2493.76 | 431.50 |
| 213 | 5343.87 | 2518.72 | 419.73 |
| 214 | 5369.13 | 2494.07 | 431.50 |
| 215 | 5796.90 | 2932.24 | 431.50 |
| 216 | 5759.88 | 2964.44 | 415.17 |
| 217 | 5814.19 | 2958.46 | 431.50 |
| 218 | 5768.63 | 2977.34 | 415.06 |
| 219 | 5825.67 | 2986.16 | 431.50 |
| 220 | 5779.94 | 3005.12 | 415.00 |

| CLAY CONTROL POINTS | | | |
|---|---|---|---|
| Point No. | Northing | Easting | Elevation |
| 221 | 5817.69 | 3037.13 | 431.50 |
| 222 | 5813.56 | 3131.49 | 431.50 |
| 223 | 5768.19 | 3151.27 | 415.00 |
| 224 | 5812.84 | 3172.63 | 431.50 |
| 225 | 5609.08 | 3391.47 | 431.50 |
| 226 | 5584.59 | 3348.45 | 415.00 |
| 227 | 5509.01 | 3376.28 | 431.50 |
| 228 | 5545.16 | 3342.46 | 415.00 |
| 229 | 5438.71 | 3231.28 | 415.59 |
| 230 | 5429.81 | 3235.84 | 415.61 |
| 231 | 5507.56 | 3374.73 | 431.50 |
| 232 | 5498.54 | 3379.05 | 431.50 |
| 233 | 5263.94 | 3128.32 | 431.50 |
| 234 | 5293.11 | 3096.36 | 417.08 |

LUMINANT

Golder Associates

| REV | DATE | DES | REVISION DESCRIPTION | CED | CHK | RVW |
|---|---|---|---|---|---|---|
| A | 04/2011 | | South Berm Realignment | | CADD | |

STATE OF TEXAS
CHARLES FRED RICKERT
82392
LICENSED PROFESSIONAL ENGINEER
9-21-11

BORDER ASSOCIATES INC.
F - 2578

PROJECT
LUMINANT
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

TITLE
CLAY GRADING PLAN

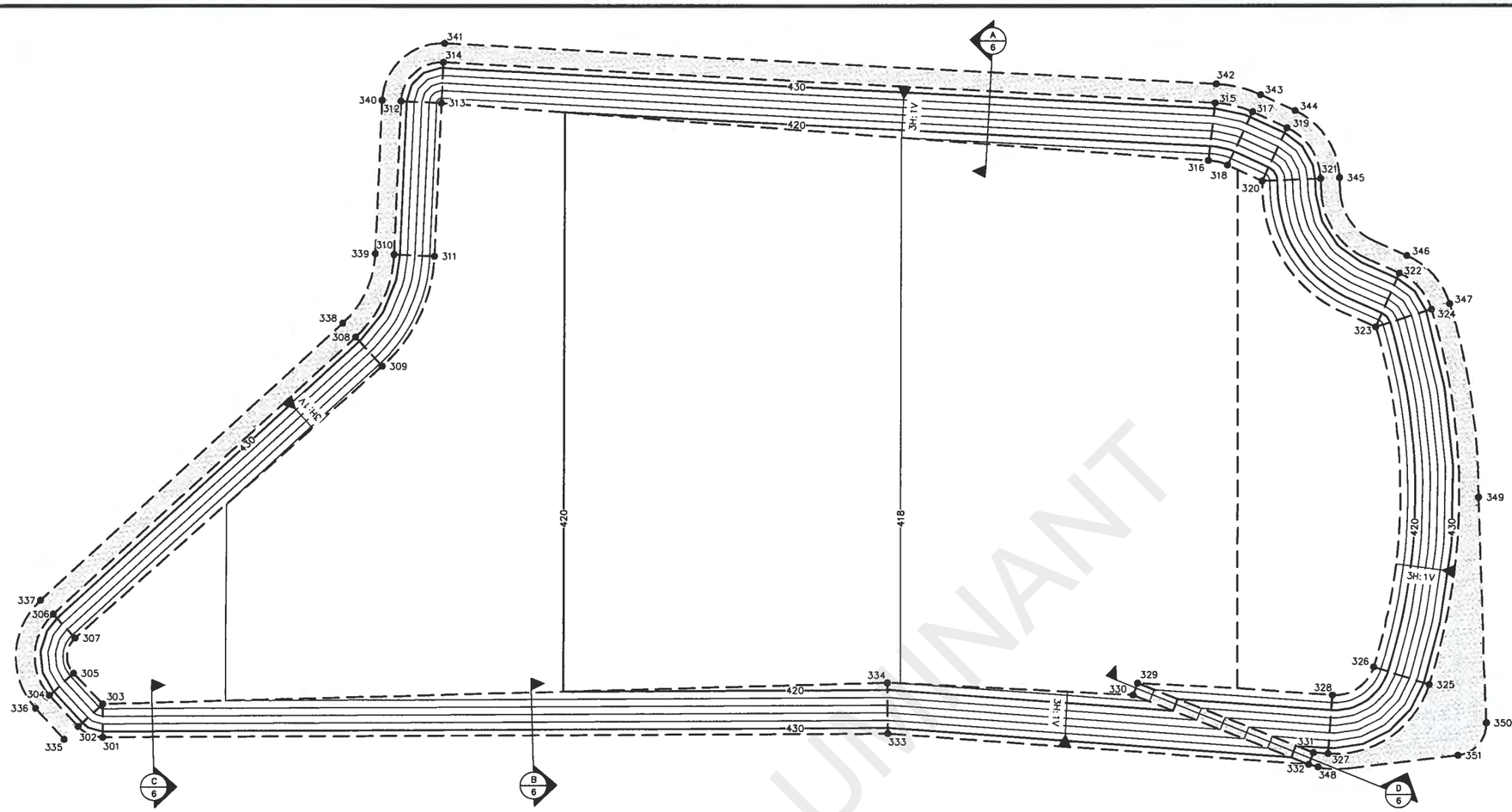
| | | |
|---|---|---|
| PROJECT No. | | 113-94788 |
| FILE No. | | 11394788C 005 |
| SCALE | | AS SHOWN |
| DESIGN | CEI | 08/2011 |
| CADD | VJE | 08/2011 |
| CHECK | CFR | 09/2011 |
| REVIEW | CEI | 09/2011 |

4



ISSUED FOR CONSTRUCTION

Drawing File: J:_2011\113-94788 - Oak Grove_C - FGD Pond Option 3 \ 11394788C005.dwg | Layout: ANSI Full Bleed B (11.00 X 17.00 Inches) | Modified: 9/16/2011 3:44:46 PM VEstrada | Plotted: Wednesday, September 21, 2011 3:24:18 PM VEstrada




PLANT GRID NORTH
37.08°
GEODETIC NORTH

## LEGEND

- 430 — PROTECTIVE COVER CONTOUR
- PROTECTIVE COVER GRADE BREAK
- ● 301 PROTECTIVE COVER CONTROL POINT

## NOTES

1. CONTOURS SHOWN ARE FOR TOP OF PROTECTIVE COVER OF FGD – B POND.

100 0 100
SCALE FEET

**PROTECTIVE COVER CONTROL POINTS**

| Point No. | Northing | Easting | Elevation |
|---|---|---|---|
| 301 | 4808.03 | 2708.01 | 431.50 |
| 302 | 4799.50 | 2688.69 | 431.50 |
| 303 | 4825.82 | 2688.61 | 422.73 |
| 304 | 4799.50 | 2655.00 | 431.50 |
| 305 | 4825.30 | 2655.00 | 422.90 |
| 306 | 4845.00 | 2609.50 | 431.50 |
| 307 | 4845.00 | 2635.32 | 422.89 |
| 308 | 5168.67 | 2609.50 | 431.50 |
| 309 | 5168.67 | 2640.76 | 421.08 |
| 310 | 5235.20 | 2581.95 | 431.50 |
| 311 | 5257.96 | 2604.71 | 420.77 |
| 312 | 5321.15 | 2496.00 | 431.50 |
| 313 | 5343.87 | 2518.96 | 420.73 |
| 314 | 5366.87 | 2496.28 | 431.50 |
| 315 | 5794.63 | 2934.45 | 431.50 |
| 316 | 5759.76 | 2964.55 | 416.17 |
| 317 | 5811.27 | 2959.67 | 431.50 |
| 318 | 5768.48 | 2977.40 | 416.06 |
| 319 | 5822.75 | 2987.38 | 431.50 |
| 320 | 5779.75 | 3005.09 | 416.00 |

**PROTECTIVE COVER CONTROL POINTS**

| Point No. | Northing | Easting | Elevation |
|---|---|---|---|
| 321 | 5815.28 | 3035.09 | 431.50 |
| 322 | 5810.66 | 3132.76 | 431.50 |
| 323 | 5768.01 | 3151.27 | 416.00 |
| 324 | 5809.99 | 3171.27 | 431.50 |
| 325 | 5607.51 | 3388.72 | 431.50 |
| 326 | 5584.52 | 3348.30 | 416.00 |
| 327 | 5511.31 | 3374.11 | 0.00 |
| 328 | 5545.27 | 3342.35 | 416.00 |
| 329 | 5438.82 | 3231.16 | 416.59 |
| 330 | 5429.92 | 3235.72 | 416.61 |
| 331 | 5503.35 | 3365.60 | 431.50 |
| 332 | 5494.33 | 3369.93 | 431.50 |
| 333 | 5266.17 | 3126.07 | 431.50 |
| 334 | 5293.11 | 3096.36 | 418.13 |
| 335 | 4784.50 | 2688.69 | 431.50 |
| 336 | 4784.50 | 2655.00 | 431.50 |
| 337 | 4845.00 | 2594.50 | 431.50 |
| 338 | 5168.67 | 2594.50 | 431.50 |
| 339 | 5224.59 | 2571.34 | 431.50 |
| 340 | 5310.54 | 2485.39 | 431.50 |

**PROTECTIVE COVER CONTROL POINTS**

| Point No. | Northing | Easting | Elevation |
|---|---|---|---|
| 341 | 5377.60 | 2485.80 | 431.50 |
| 342 | 5805.37 | 2923.98 | 431.50 |
| 343 | 5825.12 | 2953.92 | 431.50 |
| 344 | 5836.61 | 2981.63 | 431.50 |
| 345 | 5826.72 | 3044.79 | 431.50 |
| 346 | 5824.41 | 3126.76 | 431.50 |
| 347 | 5823.52 | 3177.74 | 431.50 |
| 348 | 5498.35 | 3376.49 | 431.50 |

APPENDIX E-Revision 1 November 21, 2022

ISSUED FOR CONSTRUCTION

Golder Associates

| REV | DATE | DES | REVISION DESCRIPTION | CED | CADD | CHK | RVW |
|---|---|---|---|---|---|---|---|
| 1 | 04/2011 | | South Berm Realignment | | | | |

STATE OF TEXAS
CHARLES FRED RICKERT
62392
REGISTERED PROFESSIONAL ENGINEER
9-21-11
GOLDER ASSOCIATES INC.
F-2578

PROJECT
LUMINANT
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

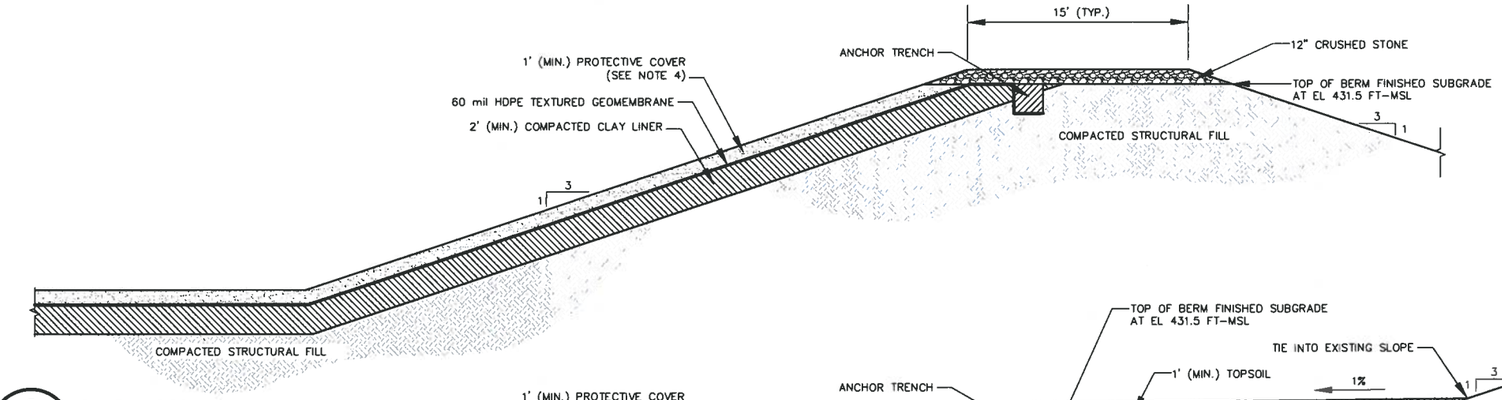
TITLE
PROTECTIVE COVER GRADING PLAN

| | | |
|---|---|---|
| PROJECT No. | | 113-94788 |
| FILE No. | | 113947880 006 |
| SCALE | | AS SHOWN |
| DESIGN | CEI | 08/2011 |
| CADD | VJE | 08/2011 |
| CHECK | CFR | 09/2011 |
| REVIEW | CEI | 09/2011 |

5

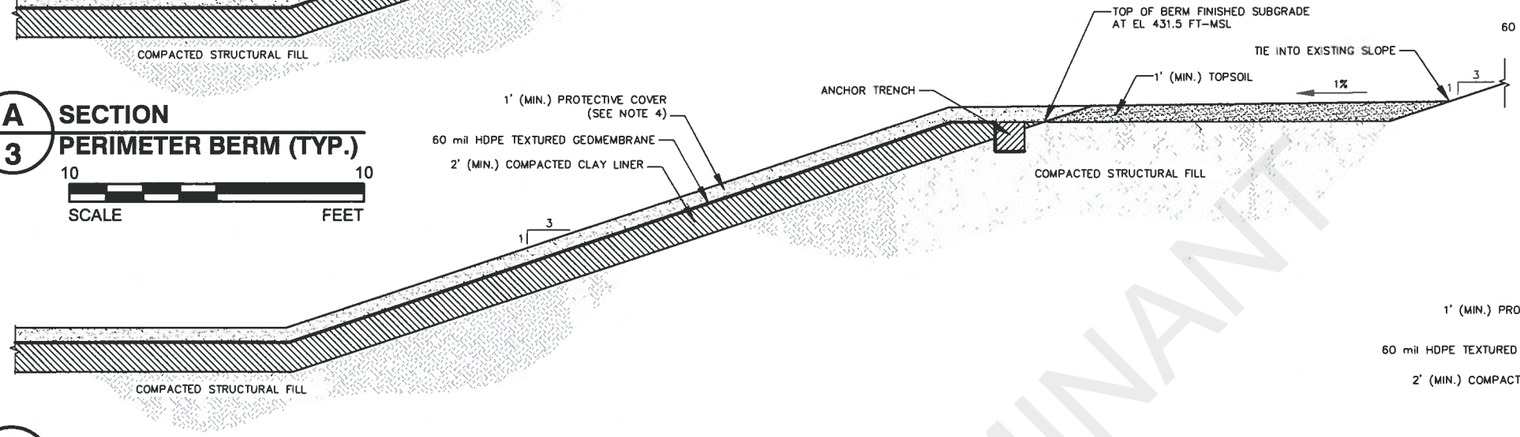
PRELIMINARY NOT FOR CONSTRUCTION

Drawing File: J:_2011\113-94788 - Oak Grove_C - FGD Pond Option 3 \ 113947880006.dwg | Layout: ANSI Full Bleed B (11.00 X 17.00 Inches) | Modified: 9/21/2011 3:20:26 PM VEstrada | Plotted: Wednesday, September 21, 2011 3:21:05 PM VEstrada



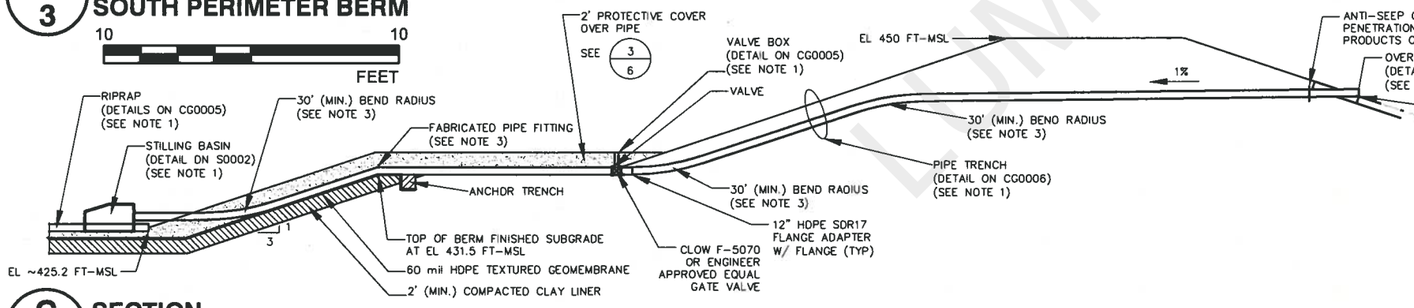

**A/3 SECTION — PERIMETER BERM (TYP.)**

10 10
SCALE FEET



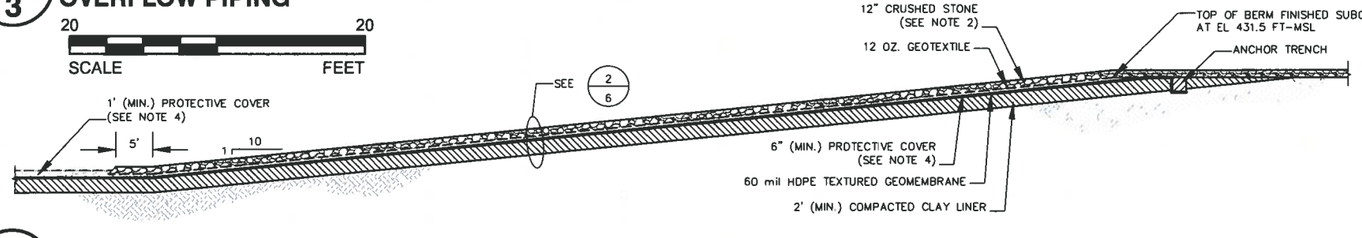

**B/3 SECTION — SOUTH PERIMETER BERM**

10 10
FEET



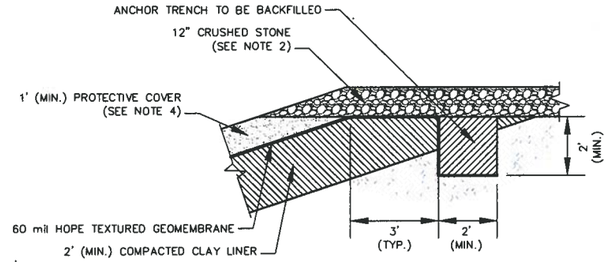

**C/3 SECTION — OVERFLOW PIPING**

20 20
SCALE FEET



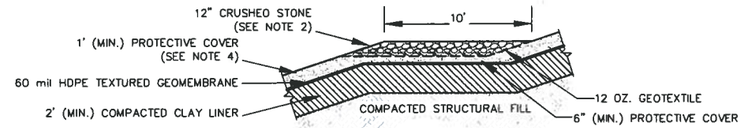

**D/3 SECTION — ACCESS ROAD**

20 20
SCALE FEET



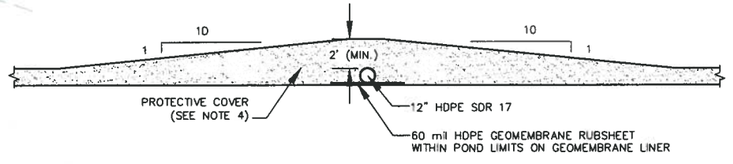

**1/6 DETAIL — ANCHOR TRENCH**

5 5
SCALE FEET




**2/6 DETAIL — ACCESS ROAD**

10 10
SCALE FEET




**3/6 SECTION — OVERFLOW PIPE COVER**

10 10
SCALE FEET

## NOTES

1. REFER TO BURNS & McDONNELL LUMINANT PROJECT 4159K004 "REFURBISH FGD-B POND" CONTRACT DRAWINGS.
2. COMPACTED CRUSHED STONE ROAD BASE
3. USE FABRICATED PIPE FITTINGS WHERE 30' (MIN.) BEND RADIUS IS EXCEEDED.
4. PROTECTIVE COVER WILL CONSIST OF ONSITE SOILS (COMPACT TO 95% MDD BENEATH ACCESS ROAD AND STILLING BASIN.)

**ISSUED FOR CONSTRUCTION**

PRELIMINARY

Golder Associates

| REV | DATE | DES | REVISION DESCRIPTION | CED | CHK | RVW |
|---|---|---|---|---|---|---|
| 1 | 04/2011 | | South Berm Realignment | | CADD | |

STATE OF TEXAS — CHARLES FRED ROGERT — 62392 — LICENSED PROFESSIONAL ENGINEER — 9-21-11
GOLDER ASSOCIATES INC. F-2578

PROJECT
LUMINANT
FGD - B POND CONSTRUCTION
ROBERTSON COUNTY, TEXAS

TITLE
DETAILS AND CROSS SECTIONS I

| | | |
|---|---|---|
| PROJECT No. | | 113-94788 |
| FILE No. | | 11394788C 007 |
| SCALE | | AS SHOWN |
| DESIGN | CEI | 08/2011 |
| CADD | VJE | 09/2011 |
| CHECK | CFR | 09/2011 |
| REVIEW | CEI | 09/2011 |

6

Drawing File: J:_2011\113-94788 - Oak Grove_C - FGD Pond Option 3 \ 11394788C007.dwg | Layout: ANSI Full Bleed B (11.00 X 17.00 Inches) | Modified: 9/21/2011 3:19:35 PM VEstrada | Plotted: Wednesday, September 21, 2011 3:51:34 PM VEstrada

**FDG C**
**DESIGN DRAWINGS**

LUMINANT

# OAK GROVE STEAM ELECTRIC STATION
# FGD-C POND
# ROBERTSON COUNTY, TEXAS

PREPARED FOR:

Luminant

PREPARED BY:

GOLDER ASSOCIATES INC.
500 CENTURY PLAZA DRIVE, SUITE 190
HOUSTON, TEXAS USA 77073

GENERAL LOCATION MAP

SITE LOCATION MAP

## Sheet List Table

| Luminant Drawing No. | Sheet Number | |
|---|---|---|
| A2YF00-0-CV-0-SW.PL-01 | 1 | TITLE SHEET |
| A2YF00-0-CV-0-SW.PL-02 | 2 | SITE OVERVIEW |
| A2YF00-0-CV-0-SW.PL-03 | 3 | SUBGRADE GRADING PLAN AND CONTAINMENT DIKE |
| A2YF00-0-CV-0-SW.PL-04 | 4 | CLAY LINER GRADING PLAN |
| A2YF00-0-CV-0-SW.PL-05 | 5 | PROTECTIVE COVER GRADING PLAN |
| A2YF00-0-CV-0-SW.PL-06 | 6 | PROFILES |
| A2YF00-0-CV-0-SW.PL-07 | 7 | DETAILS |

ISSUED FOR CONSTRUCTION

| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-04-29 | ISSUED FOR CONSTRUCTION | AA | CEI | CEI | JBF |
| B | 2015-04-23 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |
| A | 2015-03-20 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

JEFFREY B. FASSETT 85575 LICENSED PROFESSIONAL ENGINEER

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT: Luminant

CONSULTANT: Golder Associates

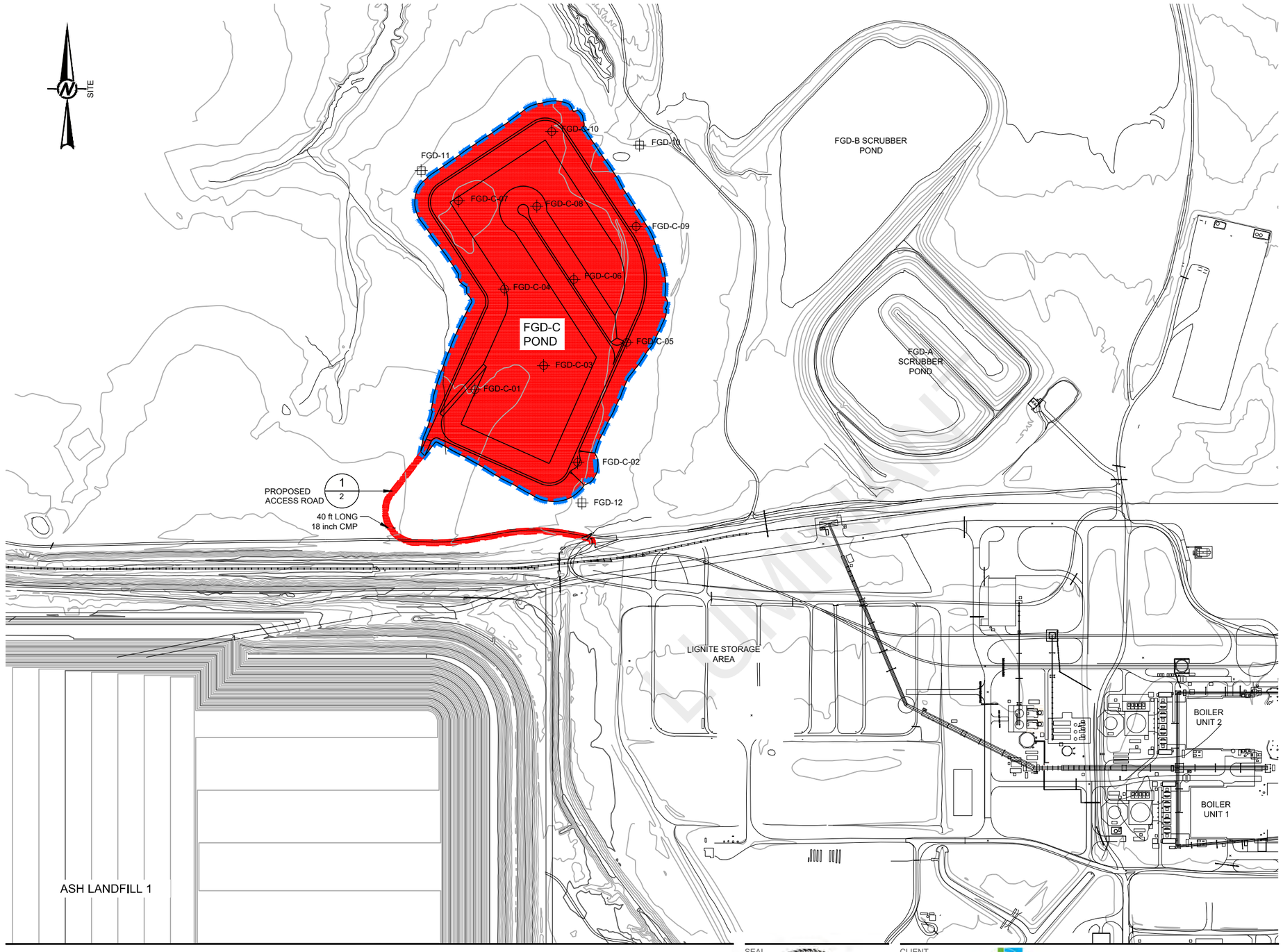
HOUSTON OFFICE
500 CENTURY PLAZA DR
HOUSTON, TEXAS 77073
USA
(281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-C POND
ROBERTSON COUNTY, TEXAS

TITLE
**TITLE SHEET**

| PROJECT No. | LUMINANT DRAWING NO | Rev. | | FIGURE |
|---|---|---|---|---|
| 1406296 | A2YF00-0-CV-0-SW.PL-01 | 0 | 1 of 7 | 1 |

Path: \\houston\drafting\, 20141406296 Luminant FGD-C\PRODUCTION\B - POND\ | File Name: 1406296B001.dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
0

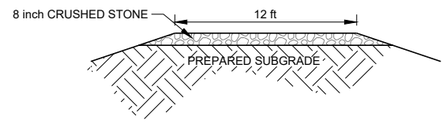



LEGEND

- 25 ft EXISTING CONTOUR
- 5 ft EXISTING CONTOUR
- CURRENT POND CONSTRUCTION AREA
- FGD-C-01 BOREHOLE
- FGD-01 MONITORING WELL

**NOTES**

1. EXISTING GROUND TOPOGRAPHY IS FROM AN AERIAL SURVEY PERFORMED BY GEODETIX, INC. ON MAY 27, 2010 AND GROUND SURVEY PERFORMED BY SAM INC. ON OCTOBER 23, 2014. EXISTING GROUND TOPOGRAPHY ELSEWHERE IS FROM FLOUR ENTERPRISE, INC. DRAWING A2YF00-0-CV-0-SW.PL.-01, AS PROVIDED BY LUMINANT.
2. COORDINATES ARE BASED ON OAK GROVE STEAM ELECTRIC STATION PLANT GRID SYSTEM.
3. ELEVATIONS ARE BASED ON MEAN SEA LEVEL DATUM.
4. CLAY MATERIAL AND STRUCTURAL FILL STOCKPILE AREAS NEED TO BE CLEARED AND GRUBBED PRIOR TO STOCKPILING ACTIVITIES.




SCALE 1" = 10' 1/2 ACCESS ROAD

ISSUED FOR CONSTRUCTION

SCALE 0 0.5 10 FEET

SCALE 0 200 400 FEET

| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-04-29 | ISSUED FOR CONSTRUCTION | AA | CEI | CEI | JBF |
| B | 2015-04-23 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |
| A | 2015-03-30 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

JEFFREY B. FASSETT 85675 LICENSED PROFESSIONAL ENGINEER

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT

Luminant

CONSULTANT

Golder Associates

HOUSTON OFFICE
500 CENTURY PLAZA DR
HOUSTON, TEXAS 77073
USA
(281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-C POND
ROBERTSON COUNTY, TEXAS

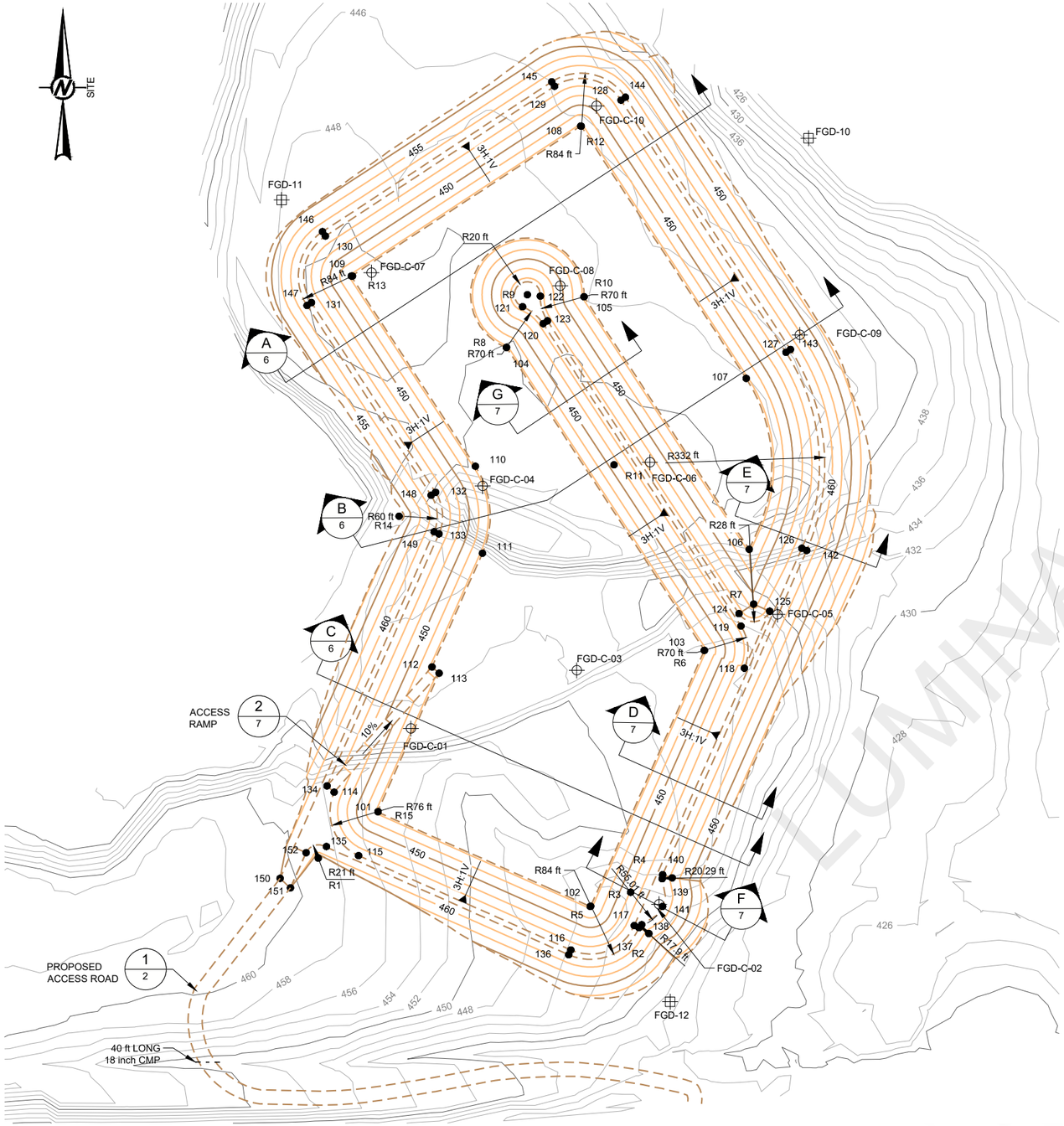
TITLE
**SITE OVERVIEW**

| PROJECT No. | LUMINANT DRAWING NO | Rev. | | FIGURE |
|---|---|---|---|---|
| 1406296 | A2YF00-0-CV-0-SW.PL-02 | 0 | 2 of 7 | 2 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in 0

Path: \\houston\drafting_2014\1406296 Luminant FGD-C\PRODUCTION\B - POND\ | File Name: 1406296B002.dwg




**CONTROL POINT TABLES**

| POINT | NORTHING | EASTING | ELEV. |
|---|---|---|---|
| 101 | 4377.31 | 1408.84 | 439.00 |
| 102 | 4228.15 | 1743.04 | 439.00 |
| 103 | 4631.40 | 1922.87 | 439.00 |
| 104 | 5108.52 | 1611.15 | 439.00 |
| 105 | 5188.44 | 1733.34 | 439.00 |
| 106 | 4790.57 | 1993.58 | 439.00 |
| 107 | 5059.86 | 1988.71 | 439.00 |
| 108 | 5457.08 | 1728.90 | 439.00 |
| 109 | 5221.15 | 1367.01 | 439.00 |
| 110 | 4921.44 | 1562.27 | 439.00 |
| 111 | 4784.47 | 1573.33 | 439.00 |
| 112 | 4605.44 | 1493.81 | 439.00 |
| 113 | 4595.52 | 1505.06 | 439.00 |
| 114 | 4408.02 | 1339.70 | 464.00 |
| 115 | 4308.17 | 1378.13 | 464.00 |
| 116 | 4159.60 | 1712.59 | 464.00 |
| 117 | 4198.03 | 1812.44 | 464.00 |
| 118 | 4603.38 | 1985.93 | 464.00 |
| 119 | 4669.78 | 1980.57 | 462.00 |
| 120 | 5146.12 | 1669.01 | 462.00 |
| 121 | 5172.70 | 1636.51 | 462.00 |
| 122 | 5189.50 | 1664.50 | 461.95 |
| 123 | 5150.50 | 1675.70 | 462.00 |
| 124 | 4689.24 | 1977.40 | 462.00 |
| 125 | 4693.15 | 2025.81 | 464.00 |
| 126 | 4792.28 | 2076.40 | 464.00 |

| POINT | NORTHING | EASTING | ELEV. |
|---|---|---|---|
| 127 | 5100.91 | 2051.47 | 464.00 |
| 128 | 5498.13 | 1791.66 | 464.00 |
| 129 | 5520.03 | 1686.95 | 464.00 |
| 130 | 5283.92 | 1325.96 | 464.00 |
| 131 | 5179.20 | 1304.05 | 464.00 |
| 132 | 4880.38 | 1499.50 | 464.00 |
| 133 | 4814.91 | 1504.79 | 464.00 |
| 134 | 4417.94 | 1328.45 | 464.00 |
| 135 | 4322.50 | 1327.50 | 464.00 |
| 136 | 4151.97 | 1709.20 | 464.00 |
| 137 | 4194.64 | 1820.07 | 464.00 |
| 138 | 4199.36 | 1824.24 | 464.00 |
| 139 | 4271.81 | 1856.42 | 464.00 |
| 140 | 4278.07 | 1857.13 | 464.00 |
| 141 | 4228.19 | 1856.99 | 464.00 |
| 142 | 4788.89 | 2084.04 | 464.00 |
| 143 | 5105.48 | 2058.46 | 464.00 |
| 144 | 5502.70 | 1798.65 | 464.00 |
| 145 | 5527.02 | 1682.37 | 464.00 |
| 146 | 5290.91 | 1321.38 | 464.00 |
| 147 | 5174.63 | 1297.07 | 464.00 |
| 148 | 4875.81 | 1492.51 | 464.00 |
| 149 | 4818.30 | 1497.16 | 464.00 |
| 150 | 4272.38 | 1254.66 | 460.79 |
| 151 | 4257.32 | 1270.95 | 460.36 |
| 152 | 4312.76 | 1295.57 | 464.00 |

| POINT | NORTHING | EASTING |
|---|---|---|
| R1 | 4304.21 | 1314.75 |
| R2 | 4185.34 | 1835.37 |
| R3 | 4250.52 | 1806.71 |
| R4 | 4273.17 | 1872.07 |
| R5 | 4228.48 | 1743.90 |
| R6 | 4631.40 | 1922.87 |
| R7 | 4704.38 | 2000.54 |
| R8 | 5108.52 | 1611.15 |
| R9 | 5191.60 | 1644.04 |
| R10 | 5188.41 | 1733.36 |
| R11 | 4923.70 | 1780.54 |
| R12 | 5457.34 | 1728.16 |
| R13 | 5220.99 | 1368.56 |
| R14 | 4842.79 | 1442.03 |
| R15 | 4377.31 | 1408.84 |

**LEGEND**

- SUBGRADE GRADE BREAK LINE
- 5 ft SUBGRADE CONTOUR
- 25 ft SUBGRADE CONTOUR
- 5 ft EXISTING CONTOUR
- 25 ft EXISTING CONTOUR
- 101 ● SURVEY CONTROL POINT
- FGD-C-01 BOREHOLE
- FGD-01 MONITORING WELL

**NOTES**

1. EXISTING GROUND TOPOGRAPHY IN THE VICINITY OF THE POND IS TAKEN FROM A GROUND SURVEY PERFORMED BY SAM, INC. ON OCTOBER 23, 2014 AND FEBRUARY 4, 2015.
2. PROPOSED CONTOURS SHOWN ARE TOP OF SUBGRADE AND CONTAINMENT DIKE.
3. EXCAVATED SOILS TO BE SEGREGATED AND STOCKPILED AT A LOCATION DESIGNATED BY OWNER.
4. COMPACTED FILL SHALL BE PLACED ON STABLE SUBGRADE FREE OF LOOSE OR ORGANIC MATERIAL. COMPACTED FILL SHALL BE PLACED AND TESTED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS. UNSTABLE SOILS SHALL BE OVEREXCAVATED AND REPLACED WITH COMPACTED FILL AS DEEMED APPROPRIATE BY THE OWNER OR ENGINEER.
5. CONTROL POINTS SHOWN ARE ON THE LOCAL COORDINATE PLANT GRID SYSTEM.

ISSUED FOR CONSTRUCTION

SCALE 0 100 200 FEET

| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-04-29 | ISSUED FOR CONSTRUCTION | AA | CEI | CEI | JBF |
| B | 2015-04-23 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |
| A | 2015-03-30 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

JEFFREY B. FASSETT 85675 LICENSED PROFESSIONAL ENGINEER

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
Luminant

CONSULTANT
Golder Associates

HOUSTON OFFICE
500 CENTURY PLAZA DR
HOUSTON, TEXAS 77073
USA
(281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-C POND
ROBERTSON COUNTY, TEXAS

TITLE
**SUBGRADE GRADING PLAN AND CONTAINMENT DIKE**

| PROJECT No. | LUMINANT DRAWING NO | Rev. | 3 of 7 | FIGURE |
|---|---|---|---|---|
| 1406296 | A2YF00-0-CV-0-SW.PL-03 | 0 | | 3 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in 0

Path: \\houston\drafting_2014\1406296_Luminant FGD-C\PRODUCTION\B - POND\ | File Name: 1406296B003.dwg

**CONTROL POINT TABLES**

| POINT | NORTHING | EASTING | ELEV. |
|---|---|---|---|
| 201 | 4313.95 | 1380.70 | 464.00 |
| 202 | 4165.38 | 1715.16 | 464.00 |
| 203 | 4200.60 | 1806.66 | 464.00 |
| 204 | 4603.52 | 1985.64 | 464.00 |
| 205 | 4669.61 | 1980.30 | 464.00 |
| 206 | 5145.94 | 1668.74 | 464.00 |
| 207 | 5172.40 | 1636.39 | 464.00 |
| 208 | 5188.63 | 1664.67 | 464.00 |
| 209 | 5150.68 | 1675.98 | 464.00 |
| 210 | 4689.42 | 1977.67 | 464.00 |
| 211 | 4693.28 | 2025.51 | 464.00 |
| 212 | 5097.45 | 2046.18 | 464.00 |
| 213 | 5494.67 | 1786.37 | 464.00 |
| 214 | 5514.74 | 1690.41 | 464.00 |
| 215 | 5278.62 | 1329.42 | 464.00 |
| 216 | 5182.66 | 1309.35 | 464.00 |
| 217 | 4883.85 | 1504.79 | 464.00 |

| POINT | NORTHING | EASTING | ELEV. |
|---|---|---|---|
| 218 | 4812.35 | 1510.57 | 464.00 |
| 219 | 4432.81 | 1341.98 | 464.00 |
| 220 | 4422.89 | 1353.23 | 464.00 |
| 221 | 4377.31 | 1339.52 | 464.00 |
| 222 | 4377.01 | 1408.71 | 441.00 |
| 223 | 4228.61 | 1743.60 | 441.00 |
| 224 | 4631.84 | 1922.55 | 441.00 |
| 225 | 5108.26 | 1610.94 | 441.00 |
| 226 | 5188.53 | 1733.66 | 441.00 |
| 227 | 4791.24 | 1993.52 | 441.00 |
| 228 | 5059.68 | 1988.44 | 441.00 |
| 229 | 5456.99 | 1728.18 | 441.00 |
| 230 | 5220.43 | 1367.09 | 441.00 |
| 231 | 4921.62 | 1562.54 | 441.00 |
| 232 | 4784.33 | 1573.63 | 441.00 |
| 233 | 4605.31 | 1494.11 | 441.00 |
| 234 | 4595.39 | 1505.36 | 441.00 |

| POINT | NORTHING | EASTING |
|---|---|---|
| R1 | 5220.61 | 1367.36 |
| R2 | 5191.33 | 1644.22 |
| R3 | 5457.05 | 1728.35 |
| R4 | 4923.70 | 1780.54 |
| R5 | 4704.11 | 2000.72 |
| R6 | 4631.39 | 1922.46 |
| R7 | 4228.44 | 1743.17 |
| R8 | 4377.31 | 1408.84 |
| R9 | 4842.52 | 1442.21 |
| R10 | 5108.26 | 1610.94 |
| R11 | 5188.63 | 1733.99 |

**LEGEND**

- CLAY LINER GRADE BREAK LINE
- 5 ft CLAY LINER CONTOUR
- 25 ft CLAY LINER CONTOUR
- 5 ft EXISTING CONTOUR
- 25 ft EXISTING CONTOUR
- 201 ● SURVEY CONTROL POINT
- FGD-C-01 BOREHOLE
- FGD-01 MONITORING WELL

**NOTES**

1. EXISTING GROUND TOPOGRAPHY IN THE VICINITY OF THE POND TAKEN FROM A GROUND SURVEY PERFORMED BY SAM, INC. ON OCTOBER 23, 2014 AND FEBRUARY 4, 2015.
2. PROPOSED CONTOURS SHOWN ARE TOP OF CLAY LINER.
3. A MINIMUM OF 2 ft OF COMPACTED CLAY LINER SHALL BE PLACED AND TESTED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
4. CONTROL POINTS SHOWN ARE ON THE LOCAL COORDINATE PLANT GRID SYSTEM.

ISSUED FOR CONSTRUCTION

SCALE 0 100 200 FEET

| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-04-29 | ISSUED FOR CONSTRUCTION | AA | CEI | CEI | JBF |
| B | 2015-04-23 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |
| A | 2015-03-30 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

JEFFREY B. FASSETT 85675 REGISTERED PROFESSIONAL ENGINEER

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
Luminant

CONSULTANT
Golder Associates

HOUSTON OFFICE
500 CENTURY PLAZA DR
HOUSTON, TEXAS 77073
USA
(281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-C POND
ROBERTSON COUNTY, TEXAS

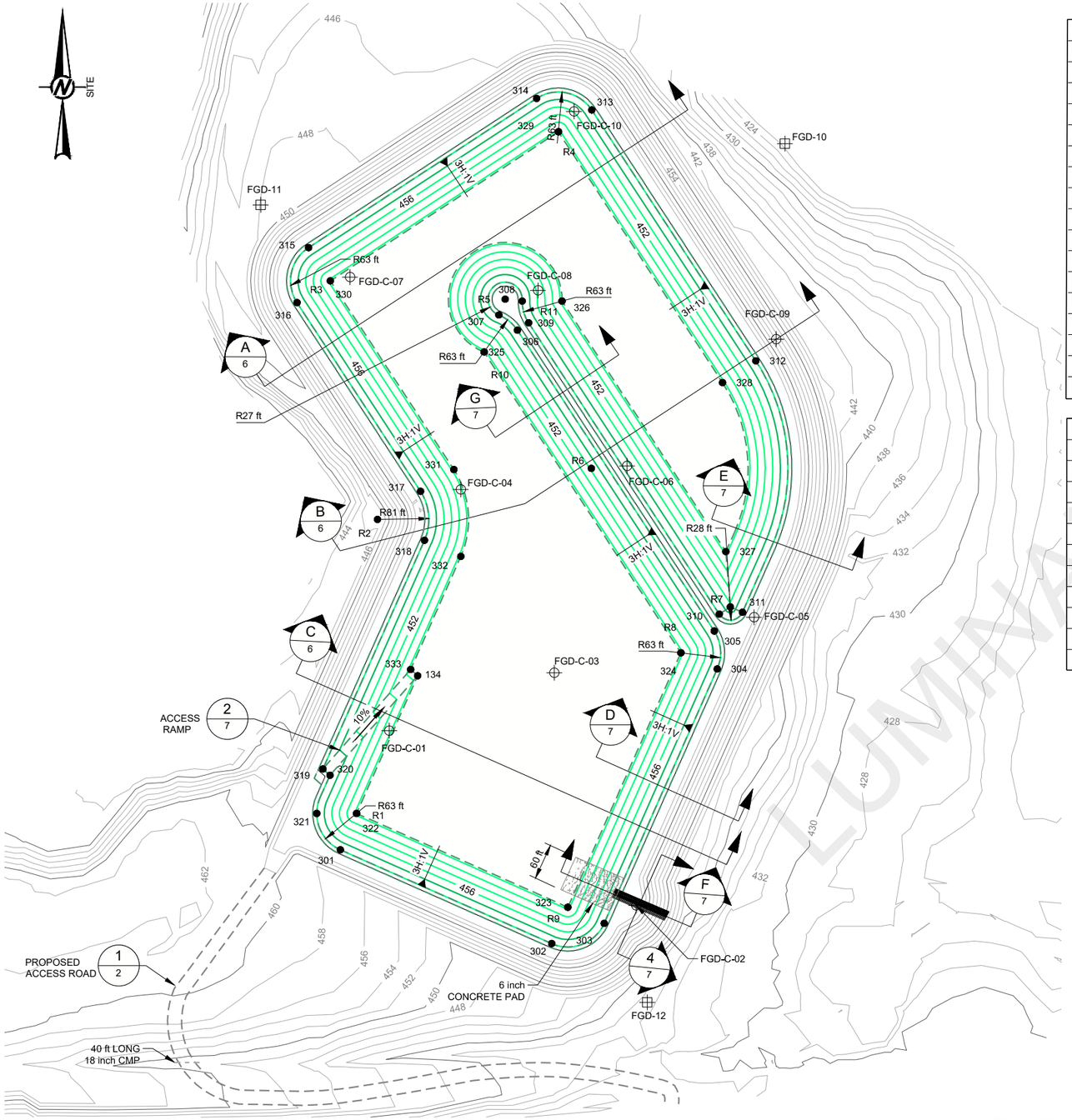
TITLE
**CLAY LINER GRADING PLAN**

| PROJECT No. | LUMINANT DRAWIGN NO | Rev. | | FIGURE |
|---|---|---|---|---|
| 1406296 | A2YF00-0-CV-0-SW.PL-04 | 0 | 4 of 7 | 4 |

Path: \\houston\drafting_2014\1406296_Luminant FGD-C\PRODUCTION\B - POND\ | File Name: 1406296B004.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in 0




**CONTROL POINT TABLES**

| POINT | NORTHING | EASTING | ELEV. |
|---|---|---|---|
| 301 | 4319.73 | 1383.26 | 464.00 |
| 302 | 4171.16 | 1717.73 | 464.00 |
| 303 | 4203.16 | 1800.88 | 464.00 |
| 304 | 4606.08 | 1979.86 | 464.00 |
| 305 | 4666.14 | 1975.00 | 464.00 |
| 306 | 5142.48 | 1663.44 | 464.00 |
| 307 | 5166.52 | 1634.04 | 464.00 |
| 308 | 5188.63 | 1670.99 | 464.00 |
| 309 | 5154.14 | 1681.27 | 464.00 |
| 310 | 4692.88 | 1982.96 | 464.00 |
| 311 | 4695.85 | 2019.73 | 464.00 |
| 312 | 5093.99 | 2040.89 | 464.00 |
| 313 | 5491.21 | 1781.08 | 464.00 |
| 314 | 5509.44 | 1693.87 | 464.00 |
| 315 | 5273.33 | 1332.88 | 464.00 |
| 316 | 5186.12 | 1314.64 | 464.00 |
| 317 | 4887.31 | 1510.09 | 464.00 |

| POINT | NORTHING | EASTING | ELEV. |
|---|---|---|---|
| 318 | 4809.78 | 1516.35 | 464.00 |
| 319 | 4447.68 | 1355.51 | 464.00 |
| 320 | 4437.76 | 1366.76 | 464.00 |
| 321 | 4377.31 | 1345.84 | 464.00 |
| 322 | 4377.31 | 1408.84 | 443.00 |
| 323 | 4228.74 | 1743.30 | 443.00 |
| 324 | 4631.66 | 1922.28 | 443.00 |
| 325 | 5108.00 | 1610.72 | 443.00 |
| 326 | 5188.63 | 1733.99 | 443.00 |
| 327 | 4791.92 | 1993.47 | 443.00 |
| 328 | 5059.50 | 1988.16 | 443.00 |
| 329 | 5456.72 | 1728.35 | 443.00 |
| 330 | 5220.61 | 1367.36 | 443.00 |
| 331 | 4921.79 | 1562.81 | 443.00 |
| 332 | 4784.20 | 1573.93 | 443.00 |
| 333 | 4605.18 | 1494.40 | 443.00 |

| POINT | NORTHING | EASTING |
|---|---|---|
| R1 | 4377.31 | 1408.84 |
| R2 | 4842.79 | 1442.03 |
| R3 | 5220.61 | 1367.36 |
| R4 | 5456.72 | 1728.35 |
| R5 | 5191.60 | 1644.04 |
| R6 | 4923.70 | 1780.54 |
| R7 | 4704.38 | 2000.54 |
| R8 | 4631.66 | 1922.28 |
| R9 | 4228.74 | 1743.30 |
| R10 | 5108.00 | 1610.72 |
| R11 | 5188.63 | 1733.99 |

**LEGEND**

- PROTECTIVE COVER GRADE BREAK LINE
- 5 ft PROTECTIVE COVER CONTOUR
- 25 ft PROTECTIVE COVER CONTOUR
- 5 ft EXISTING CONTOUR
- 25 ft EXISTING CONTOUR
- 301 ● SURVEY CONTROL POINT
- FGD-C-01 BOREHOLE
- FGD-01 MONITORING WELL

**NOTES**

1. EXISTING GROUND TOPOGRAPHY IN THE VICINITY OF POND IS TAKEN FROM A GROUND SURVEY PERFORMED BY SAM, INC. ON OCTOBER 23, 2014 FEBRUARY 4, 2015.
2. PROPOSED CONTOURS SHOWN ARE OF PROTECTIVE COVER .
3. A MINIMUM OF 2 ft OF PROTECTIVE COVER SHALL BE PLACED OVER SURVEYOR CERTIFIED TOP OF CLAY LINER IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
4. CONTROL POINTS SHOWN ARE ON THE LOCAL COORDINATE PLANT GRID SYSTEM.

ISSUED FOR CONSTRUCTION

0 100 200
SCALE FEET

| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-04-29 | ISSUED FOR CONSTRUCTION | AA | CEI | CEI | JBF |
| B | 2015-04-23 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |
| A | 2015-03-30 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL
STATE OF TEXAS
JEFFREY B. TASSETT
85575
LICENSED PROFESSIONAL ENGINEER
GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
Luminant

CONSULTANT
Golder Associates
HOUSTON OFFICE
500 CENTURY PLAZA DR
HOUSTON, TEXAS 77073
USA
(281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-C POND
ROBERTSON COUNTY, TEXAS

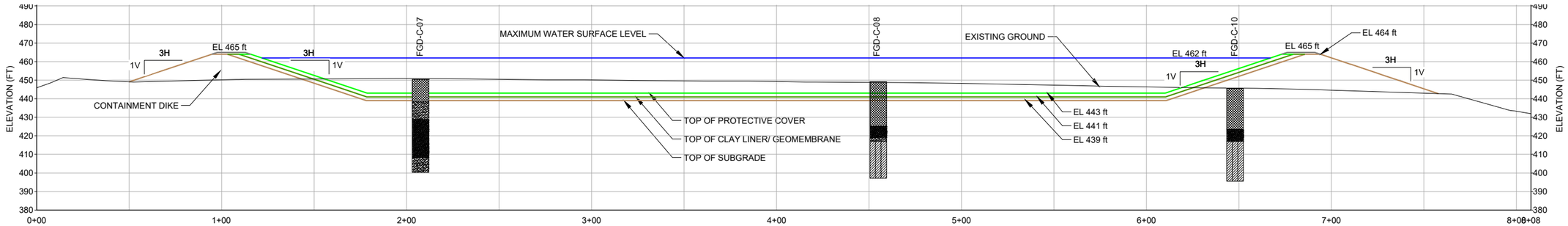
TITLE
**PROTECTIVE COVER GRADING PLAN**

| PROJECT No. | LUMINANT DRAWING NO | Rev. | 5 of 7 | FIGURE |
|---|---|---|---|---|
| 1406296 | A2YF00-00CV-0-SW.PL-05 | 0 | | 5 |

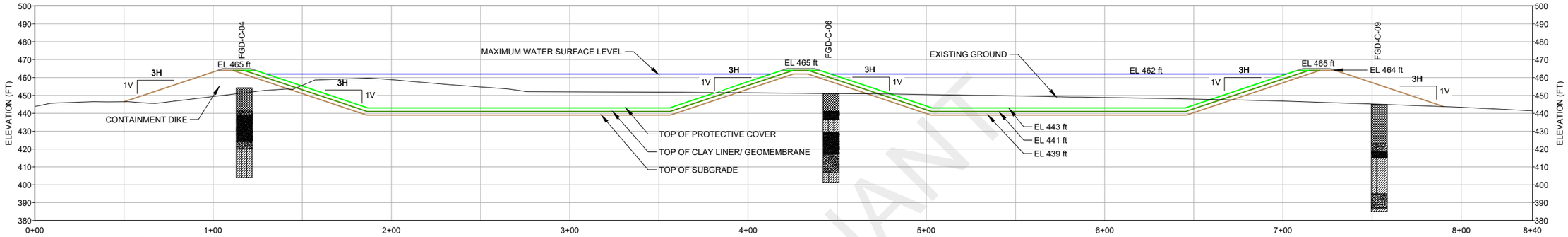
Path: \\houston\draftingj_2014\1406296_Luminant FGD-C\PRODUCTION\B - POND. | File Name: 1406296B005.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

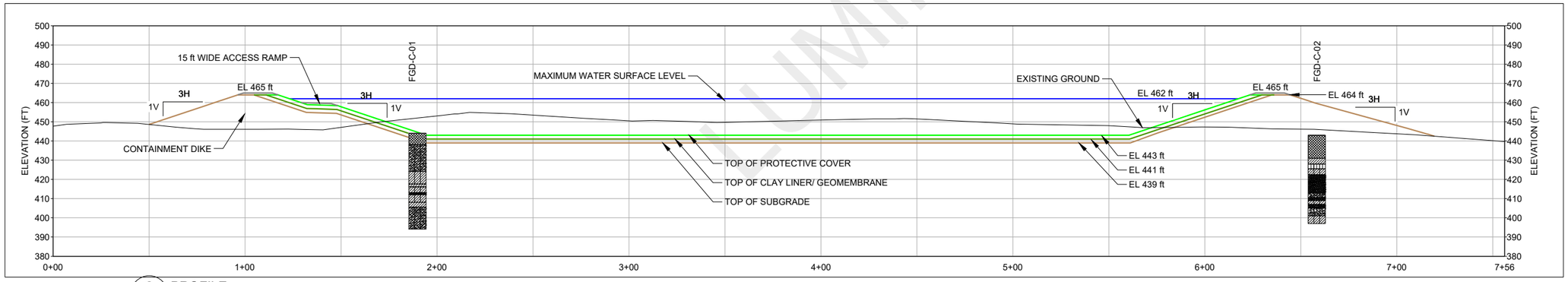
1 in
0




SCALE 1" = 60' A/6 PROFILE




SCALE 1" = 60' B/6 PROFILE




SCALE 1" = 60' C/6 PROFILE

**LEGEND**

- POSSIBLE FILL, VERY STIFF
- SILT
- SAND
- CLAY
- SILTY SAND
- SILTY CLAY
- SANDY SILT
- SANDY CLAY
- CLAYEY SAND
- CLAYEY SILT
- SANDY SILTY CLAY

ISSUED FOR CONSTRUCTION

SCALE 0 30 60 FEET

| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-04-29 | ISSUED FOR CONSTRUCTION | AA | CEI | CEI | JBF |
| B | 2015-04-23 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |
| A | 2015-03-30 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT: Luminant

CONSULTANT: Golder Associates

HOUSTON OFFICE
500 CENTURY PLAZA DR
HOUSTON, TEXAS 77073
USA
(281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-C POND
ROBERTSON COUNTY, TEXAS

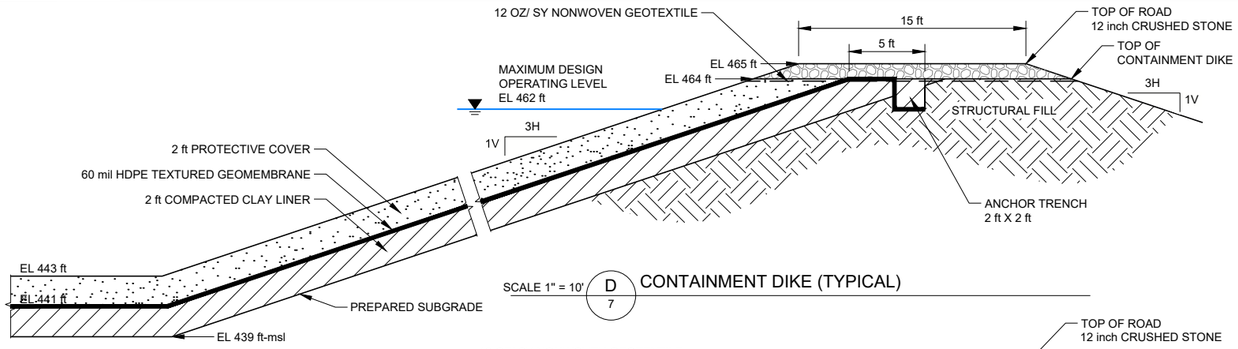
TITLE
**PROFILES**

| PROJECT No. | LUMINANT DRAWING NO | Rev. | | FIGURE |
|---|---|---|---|---|
| 1406296 | A2YF00-0-CV-0-SW.PL-06 | 0 | 6 of 7 | 6 |

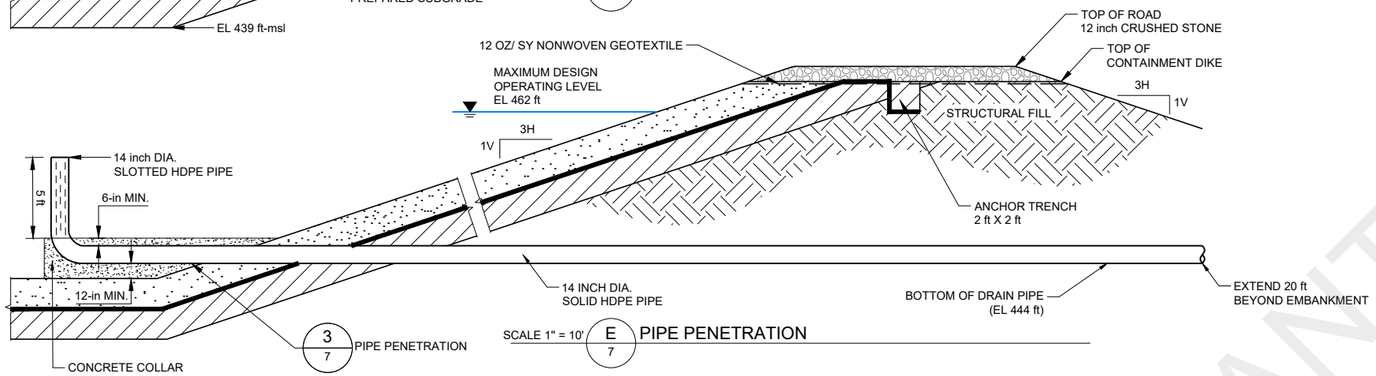
LUMINANT

Path: \\houston\drafting_20141406296_Luminant FGD-C\PRODUCTION\B - POND\ | File Name: 1406296B006.dwg

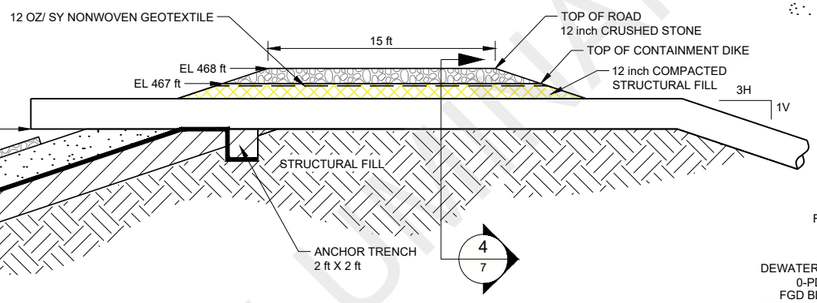
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
0



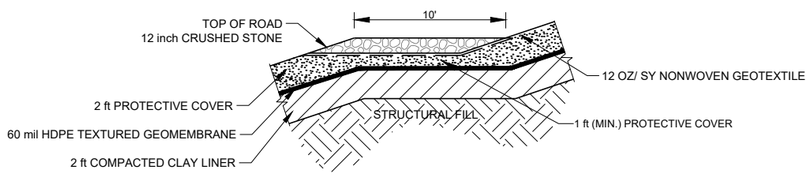

SCALE 1" = 10' D 7 CONTAINMENT DIKE (TYPICAL)



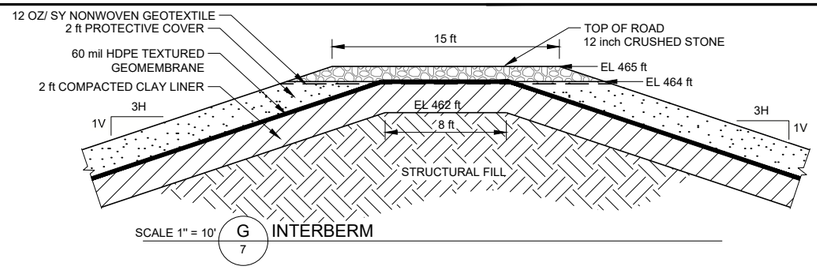

SCALE 1" = 10' E 7 PIPE PENETRATION



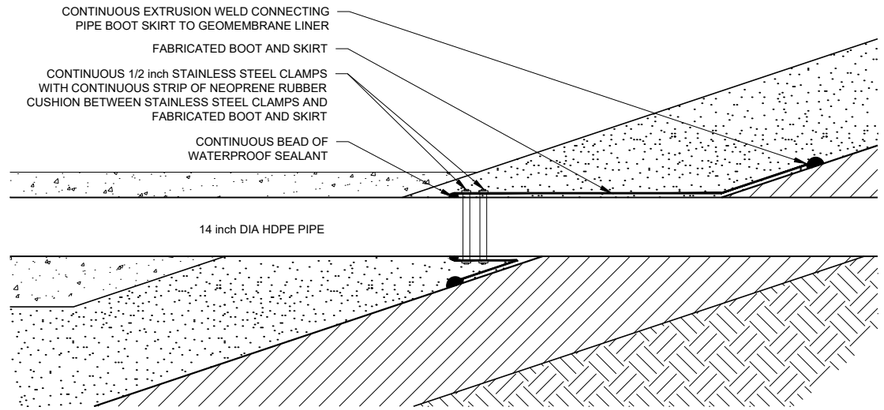

SCALE 1" = 10' F 7 INLET PIPING



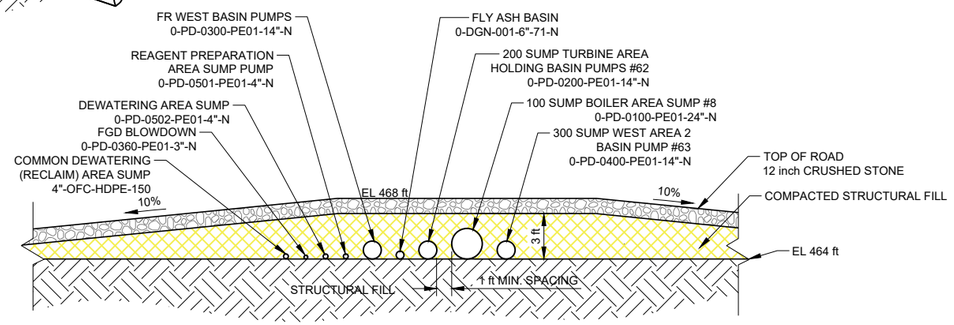

SCALE 1" = 10' 2 7 ACCESS RAMP




SCALE 1" = 10' G 7 INTERBERM




SCALE 1" = 3' 3 7 PIPE PENETRATION DETAIL




ISSUED FOR CONSTRUCTION

SCALE 1" = 10' 4 7 INLET PIPING

0 1.5 3
SCALE FEET

0 5 10
SCALE FEET

| Rev. | YYYY-MM-DD | DESCRIPTION | PREPARED | DESIGN | REVIEW | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2015-04-29 | ISSUED FOR CONSTRUCTION | AA | CEI | CEI | JBF |
| B | 2015-04-23 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |
| A | 2015-03-30 | ISSUED FOR CLIENT REVIEW | AA | CEI | CEI | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL
JEFFREY B. MASSEY 85575 LICENSED PROFESSIONAL ENGINEER

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
Luminant

CONSULTANT
Golder Associates

HOUSTON OFFICE
500 CENTURY PLAZA DR
HOUSTON, TEXAS 77073
USA
(281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-C POND
ROBERTSON COUNTY, TEXAS

TITLE
**DETAILS**

| PROJECT No. | LUMINANT DRAWING NO | Rev. | 7 of 7 | FIGURE |
|---|---|---|---|---|
| 1406296 | A2YF00-0-CV-0-SW.PL-07 | 0 | | 7 |

Path: \\houston\drafting_20141406296_Luminant FGD-C\PRODUCTION\B - POND | File Name: 1406296B007.dwg

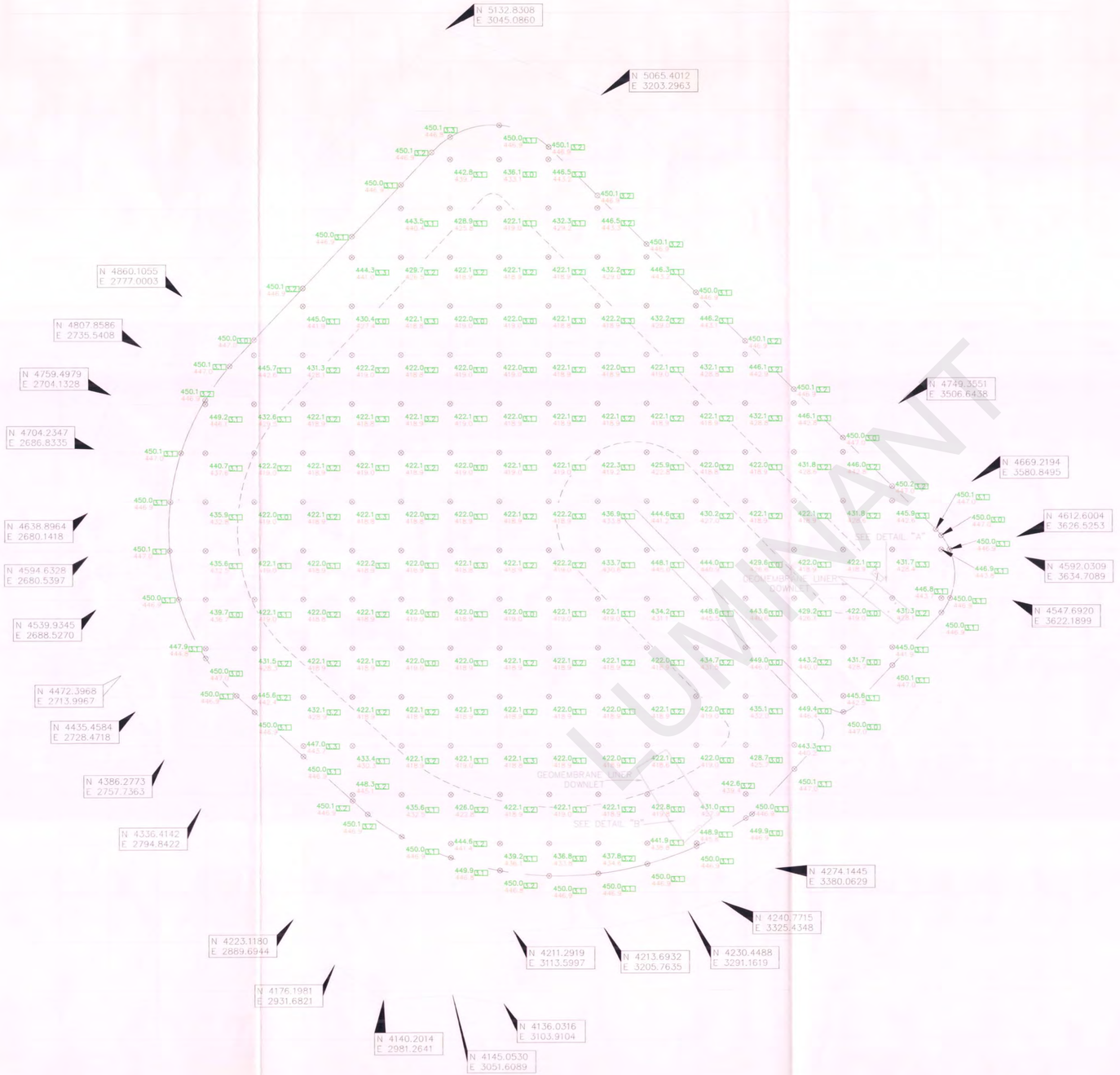
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in

LUMINANT

**FDG A**
**AS BUILT DRAWINGS**

LUMINANT



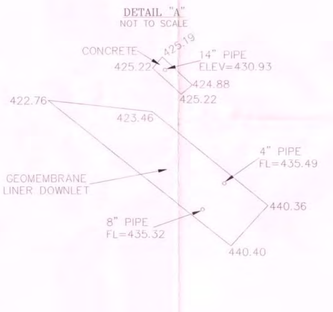


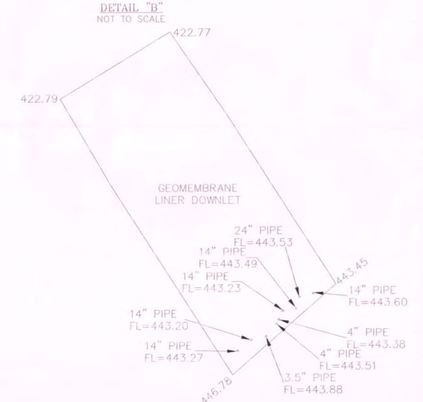


LEGEND

NORTHING N 10097536.58 | F.G.D. POND
EASTING E 3145808.31 | BOUNDARY

CERTIFIED CLAY LINER ELEVATION 547.0 | CLAY LINER THICKNESS
CERTIFIED SUBGRADE ELEVATION 545.0




LUMINANT

STATE OF TEXAS
REGISTERED
ROBERT E. BLAIR
6357
PROFESSIONAL
LAND SURVEYOR

| NO. | REVISIONS | BY | DATE |
|---|---|---|---|

PROJECT: JAMES CONSTRUCTION
OAK GROVE FGD POND
JOB NUMBER: 28172-09
DATE: NOVEMBER 19, 2008
SCALE: 1" = 60'
SURVEYOR: R.E.B.
TECHNICIAN: G.HANSON
DRAWING: OAK GROVE POND.DWG
FIELDNOTES: N/A
PARTYCHIEF: J.SANDOVAL
FIELDBOOKS: 5793

SAM INC.
SURVEYING•AERIAL MAPPING•ENGINEERING
5508 WEST HIGHWAY 290
BUILDING B
AUSTIN TEXAS, 78735
(512) 447-0575
Fax: (512) 326-3029
EMAIL: SAM@SAMINC.BIZ

# SUBGRADE AND CLAY LINER ELEVATIONS AS OF OCTOBER 23, 2008 OAK GROVE POWER PLANT – F.G.D. POND ROBERTSON COUNTY, TEXAS

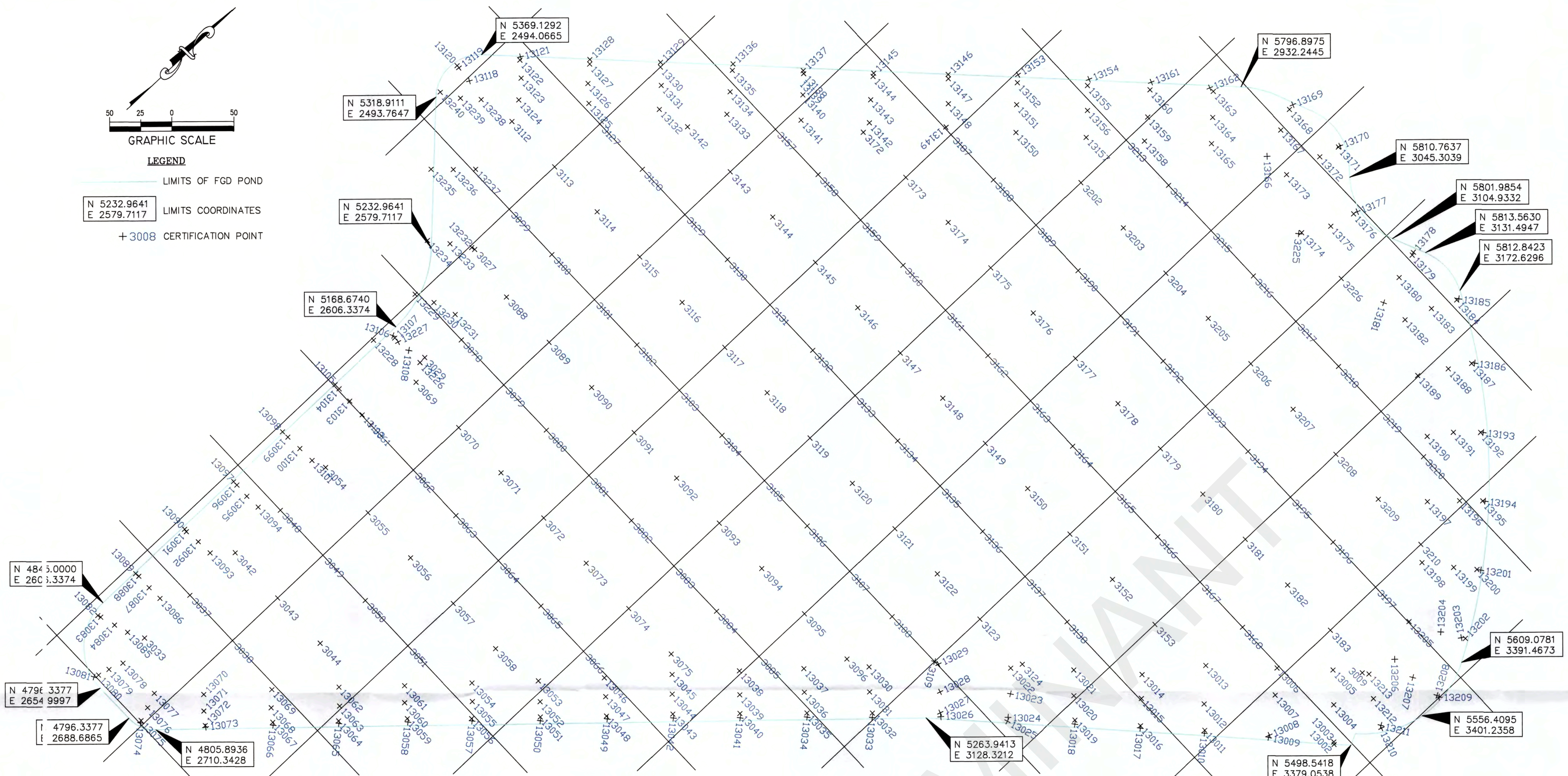
SHEET 1 OF 1

DWG. NO.:

NOVEMBER 19, 2008

**FDG B**
**AS BUILT DRAWINGS**

LUMINANT




| POINT | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | COVER THICK |
|---|---|---|---|---|---|---|---|
| 3009 | 554[illegible].05 | 3342.82 | 413.0 | 415.2 | 2.2 | 416.1 | 1.0 |
| 3027 | 525[illegible].61 | 2604.36 | 417.5 | 420.0 | 2.4 | 421.0 | 1.0 |
| 3029 | 516[illegible].67 | 2640.27 | 418.0 | 420.2 | 2.3 | 421.3 | 1.0 |
| 3033 | 4850.00 | 2650.00 | 419.7 | 422.0 | 2.3 | 423.0 | 1.0 |
| 3037 | 4900.00 | 2650.00 | 419.4 | 421.6 | 2.2 | 422.7 | 1.1 |
| 3038 | 4900.00 | 2700.00 | 419.2 | 421.3 | 2.1 | 422.4 | 1.2 |
| 3042 | 4950.00 | 2650.00 | 419.2 | 421.4 | 2.2 | 422.4 | 1.0 |
| 3043 | 4950.00 | 2700.00 | 419.0 | 421.1 | 2.1 | 422.2 | 1.1 |
| 3044 | 4950.00 | 2750.00 | 418.7 | 420.8 | 2.1 | 421.9 | 1.0 |
| 3048 | 5000.00 | 2650.00 | 418.9 | 421.1 | 2.2 | 422.1 | 1.1 |
| 3049 | 5000.00 | 2700.00 | 418.6 | 420.9 | 2.3 | 421.9 | 1.0 |
| 3050 | 5000.00 | 2750.00 | 418.2 | 420.6 | 2.3 | 421.6 | 1.0 |
| 3051 | 5000.00 | 2800.00 | 418.0 | 420.2 | 2.2 | 421.4 | 1.2 |
| 3054 | 5050.00 | 2650.00 | 418.4 | 420.8 | 2.4 | 421.9 | 1.0 |
| 3055 | 5050.00 | 2700.00 | 418.3 | 420.5 | 2.2 | 421.5 | 1.0 |
| 3056 | 5050.00 | 2750.00 | 418.1 | 420.2 | 2.1 | 421.4 | 1.2 |
| 3057 | 5050.00 | 2800.00 | 417.9 | 420.0 | 2.1 | 421.0 | 1.0 |
| 3058 | 5050.00 | 2850.00 | 417.5 | 419.7 | 2.2 | 420.9 | 1.1 |
| 3061 | 5100.00 | 2650.00 | 418.4 | 420.5 | 2.1 | 421.5 | 1.0 |
| 3062 | 5100.00 | 2700.00 | 417.9 | 420.1 | 2.3 | 421.3 | 1.2 |
| 3063 | 5100.00 | 2750.00 | 417.7 | 420.0 | 2.2 | 421.0 | 1.0 |
| 3064 | 5100.00 | 2800.00 | 417.4 | 419.7 | 2.4 | 420.9 | 1.2 |
| 3065 | 5100.00 | 2850.00 | 417.2 | 419.4 | 2.2 | 420.5 | 1.2 |
| 3066 | 5100.00 | 2900.00 | 416.9 | 419.1 | 2.3 | 420.2 | 1.0 |
| 3069 | 5150.00 | 2650.00 | 418.1 | 420.4 | 2.3 | 421.4 | 1.0 |
| 3070 | 5150.00 | 2700.00 | 417.7 | 419.9 | 2.2 | 421.1 | 1.1 |
| 3071 | 5150.00 | 2750.00 | 417.5 | 419.6 | 2.2 | 420.7 | 1.1 |
| 3072 | 5150.00 | 2800.00 | 417.3 | 419.5 | 2.2 | 420.5 | 1.0 |
| 3073 | 5150.00 | 2850.00 | 417.0 | 419.1 | 2.1 | 420.3 | 1.2 |
| 3074 | 5150.00 | 2900.00 | 416.8 | 418.8 | 2.0 | 419.9 | 1.1 |
| 3075 | 5150.00 | 2950.00 | 416.6 | 418.6 | 2.1 | 419.8 | 1.1 |
| 3078 | 5200.00 | 2650.00 | 417.7 | 419.9 | 2.2 | 421.1 | 1.2 |
| 3079 | 5200.00 | 2700.00 | 417.4 | 419.6 | 2.2 | 420.6 | 1.0 |
| 3080 | 5200.00 | 2750.00 | 417.1 | 419.4 | 2.3 | 420.5 | 1.2 |
| 3081 | 5200.00 | 2800.00 | 416.8 | 419.1 | 2.3 | 420.1 | 1.0 |
| 3082 | 5200.00 | 2850.00 | 416.7 | 418.9 | 2.2 | 419.9 | 1.1 |
| 3083 | 5200.00 | 2900.00 | 416.5 | 418.6 | 2.1 | 419.6 | 1.0 |
| 3084 | 5200.00 | 2950.00 | 416.1 | 418.4 | 2.3 | 419.5 | 1.1 |
| 3085 | 5200.00 | 3000.00 | 416.0 | 418.1 | 2.1 | 419.1 | 1.0 |
| 3088 | 5250.00 | 2650.00 | 417.4 | 419.7 | 2.3 | 420.8 | 1.0 |
| 3089 | 5250.00 | 2700.00 | 417.3 | 419.5 | 2.2 | 420.5 | 1.0 |
| 3090 | 5250.00 | 2750.00 | 417.0 | 419.1 | 2.1 | 420.1 | 1.0 |
| 3091 | 5250.00 | 2800.00 | 416.6 | 418.9 | 2.3 | 419.9 | 1.0 |
| 3092 | 5250.00 | 2850.00 | 416.3 | 418.6 | 2.3 | 419.6 | 1.0 |
| 3093 | 5250.00 | 2900.00 | 416.2 | 418.3 | 2.0 | 419.3 | 1.1 |
| 3094 | 5250.00 | 2950.00 | 415.8 | 418.1 | 2.3 | 419.1 | 1.1 |
| 3095 | 5250.00 | 3000.00 | 415.7 | 417.8 | 2.1 | 419.0 | 1.2 |
| 3096 | 5250.00 | 3050.00 | 415.5 | 417.6 | 2.1 | 419.0 | 1.4 |
| 3099 | 5300.00 | 2600.00 | 417.5 | 419.6 | 2.0 | 420.8 | 1.2 |
| 3100 | 5300.00 | 2650.00 | 417.2 | 419.5 | 2.3 | 420.4 | 1.0 |
| 3101 | 5300.00 | 2700.00 | 417.0 | 419.2 | 2.2 | 420.2 | 1.0 |
| 3102 | 5300.00 | 2750.00 | 416.8 | 418.9 | 2.1 | 419.9 | 1.0 |
| 3103 | 5300.00 | 2800.00 | 416.5 | 418.6 | 2.1 | 419.7 | 1.1 |
| 3104 | 5300.00 | 2850.00 | 416.1 | 418.3 | 2.2 | 419.6 | 1.3 |
| 3105 | 5300.00 | 2900.00 | 415.9 | 418.1 | 2.3 | 419.2 | 1.1 |
| 3106 | 5300.00 | 2950.00 | 415.5 | 417.8 | 2.2 | 418.7 | 1.0 |
| 3107 | 5300.00 | 3000.00 | 415.3 | 417.7 | 2.4 | 418.7 | 1.0 |
| 3108 | 5300.00 | 3050.00 | 415.2 | 417.3 | 2.0 | 418.3 | 1.1 |
| 3109 | 5300.00 | 3100.00 | 414.9 | 417.0 | 2.1 | 418.5 | 1.4 |
| 3112 | 5350.00 | 2550.00 | 417.3 | 419.6 | 2.3 | 420.8 | 1.2 |
| 3113 | 5350.00 | 2600.00 | 417.3 | 419.5 | 2.3 | 420.5 | 1.0 |

| POINT | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | COVER THICK |
|---|---|---|---|---|---|---|---|
| 3114 | 5350.00 | 2650.00 | 416.9 | 419.3 | 2.4 | 420.2 | 1.0 |
| 3115 | 5350.00 | 2700.00 | 416.6 | 418.9 | 2.3 | 419.9 | 1.1 |
| 3116 | 5350.00 | 2750.00 | 416.3 | 418.6 | 2.4 | 419.6 | 1.0 |
| 3117 | 5350.00 | 2800.00 | 416.2 | 418.3 | 2.0 | 419.3 | 1.0 |
| 3118 | 5350.00 | 2850.00 | 415.8 | 418.1 | 2.3 | 419.2 | 1.1 |
| 3119 | 5350.00 | 2900.00 | 415.6 | 417.9 | 2.3 | 418.9 | 1.0 |
| 3120 | 5350.00 | 2950.00 | 415.4 | 417.5 | 2.1 | 418.6 | 1.1 |
| 3121 | 5350.00 | 3000.00 | 415.0 | 417.4 | 2.3 | 418.3 | 1.0 |
| 3122 | 5350.00 | 3050.00 | 414.8 | 417.1 | 2.3 | 418.2 | 1.0 |
| 3123 | 5350.00 | 3100.00 | 414.7 | 416.8 | 2.1 | 417.8 | 1.0 |
| 3124 | 5350.00 | 3150.00 | 414.3 | 416.7 | 2.4 | 417.8 | 1.2 |
| 3127 | 5400.00 | 2600.00 | 416.9 | 419.1 | 2.2 | 420.1 | 1.0 |
| 3128 | 5400.00 | 2650.00 | 416.6 | 418.9 | 2.3 | 419.9 | 1.0 |
| 3129 | 5400.00 | 2700.00 | 416.2 | 418.6 | 2.4 | 419.6 | 1.0 |
| 3130 | 5400.00 | 2750.00 | 416.0 | 418.3 | 2.4 | 419.4 | 1.0 |
| 3131 | 5400.00 | 2800.00 | 415.8 | 418.1 | 2.3 | 419.1 | 1.0 |
| 3132 | 5400.00 | 2850.00 | 415.7 | 417.8 | 2.1 | 418.8 | 1.0 |
| 3133 | 5400.00 | 2900.00 | 415.3 | 417.6 | 2.3 | 418.6 | 1.0 |
| 3134 | 5400.00 | 2950.00 | 415.0 | 417.3 | 2.3 | 418.4 | 1.1 |
| 3135 | 5400.00 | 3000.00 | 414.9 | 417.0 | 2.1 | 418.0 | 1.0 |
| 3136 | 5400.00 | 3050.00 | 414.5 | 416.8 | 2.3 | 417.7 | 1.0 |
| 3137 | 5400.00 | 3100.00 | 414.3 | 416.4 | 2.2 | 417.5 | 1.1 |
| 3138 | 5400.00 | 3150.00 | 413.9 | 416.3 | 2.3 | 417.2 | 1.0 |
| 3142 | 5450.00 | 2650.00 | 416.4 | 418.6 | 2.2 | 419.7 | 1.1 |
| 3143 | 5450.00 | 2700.00 | 416.0 | 418.4 | 2.4 | 419.4 | 1.1 |
| 3144 | 5450.00 | 2750.00 | 415.9 | 418.0 | 2.1 | 419.1 | 1.2 |
| 3145 | 5450.00 | 2800.00 | 415.6 | 417.8 | 2.2 | 418.8 | 1.1 |
| 3146 | 5450.00 | 2850.00 | 415.2 | 417.5 | 2.3 | 418.5 | 1.0 |
| 3147 | 5450.00 | 2900.00 | 414.9 | 417.2 | 2.3 | 418.2 | 1.0 |
| 3148 | 5450.00 | 2950.00 | 414.8 | 417.0 | 2.2 | 418.0 | 1.0 |
| 3149 | 5450.00 | 3000.00 | 414.5 | 416.7 | 2.2 | 417.9 | 1.2 |
| 3150 | 5450.00 | 3050.00 | 414.2 | 416.5 | 2.4 | 417.7 | 1.2 |
| 3151 | 5450.00 | 3100.00 | 414.0 | 416.3 | 2.3 | 417.3 | 1.0 |
| 3152 | 5450.00 | 3150.00 | 413.7 | 415.9 | 2.2 | 417.1 | 1.2 |
| 3153 | 5450.00 | 3200.00 | 413.4 | 415.9 | 2.5 | 417.0 | 1.1 |
| 3157 | 5500.00 | 2700.00 | 415.8 | 418.1 | 2.3 | 419.2 | 1.0 |
| 3158 | 5500.00 | 2750.00 | 415.5 | 417.7 | 2.2 | 418.8 | 1.1 |
| 3159 | 5500.00 | 2800.00 | 415.4 | 417.5 | 2.1 | 418.6 | 1.2 |
| 3160 | 5500.00 | 2850.00 | 415.0 | 417.2 | 2.2 | 418.2 | 1.0 |
| 3161 | 5500.00 | 2900.00 | 414.7 | 417.1 | 2.4 | 418.1 | 1.0 |
| 3162 | 5500.00 | 2950.00 | 414.6 | 416.7 | 2.1 | 417.8 | 1.1 |
| 3163 | 5500.00 | 3000.00 | 414.2 | 416.5 | 2.3 | 417.4 | 1.0 |
| 3164 | 5500.00 | 3050.00 | 414.0 | 416.3 | 2.3 | 417.3 | 1.0 |
| 3165 | 5500.00 | 3100.00 | 413.8 | 415.9 | 2.1 | 417.0 | 1.1 |
| 3166 | 5500.00 | 3150.00 | 413.5 | 415.7 | 2.3 | 416.7 | 1.0 |
| 3167 | 5500.00 | 3200.00 | 413.1 | 415.4 | 2.3 | 416.5 | 1.1 |
| 3168 | 5500.00 | 3250.00 | 412.9 | 415.5 | 2.6 | 416.5 | 1.0 |
| 3172 | 5550.00 | 2750.00 | 415.3 | 417.6 | 2.3 | 418.5 | 1.0 |
| 3173 | 5550.00 | 2800.00 | 415.0 | 417.2 | 2.2 | 418.2 | 1.1 |
| 3174 | 5550.00 | 2850.00 | 414.7 | 416.9 | 2.2 | 418.0 | 1.1 |
| 3175 | 5550.00 | 2900.00 | 414.6 | 416.8 | 2.2 | 417.8 | 1.0 |
| 3176 | 5550.00 | 2950.00 | 414.1 | 416.4 | 2.3 | 417.5 | 1.1 |
| 3177 | 5550.00 | 3000.00 | 414.0 | 416.3 | 2.3 | 417.3 | 1.0 |
| 3178 | 5550.00 | 3050.00 | 413.8 | 416.0 | 2.1 | 417.0 | 1.0 |
| 3179 | 5550.00 | 3100.00 | 413.5 | 415.7 | 2.2 | 416.8 | 1.1 |
| 3180 | 5550.00 | 3150.00 | 413.2 | 415.4 | 2.2 | 416.4 | 1.0 |
| 3181 | 5550.00 | 3200.00 | 413.0 | 415.2 | 2.3 | 416.4 | 1.2 |
| 3182 | 5550.00 | 3250.00 | 412.8 | 415.1 | 2.3 | 416.1 | 1.0 |
| 3183 | 5550.00 | 3300.00 | 412.7 | 415.2 | 2.4 | 416.2 | 1.0 |
| 3187 | 5600.00 | 2800.00 | 414.7 | 417.0 | 2.3 | 418.1 | 1.1 |
| 3188 | 5600.00 | 2850.00 | 414.6 | 416.9 | 2.3 | 417.8 | 1.0 |

| POINT | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | COVER THICK |
|---|---|---|---|---|---|---|---|
| 3189 | 5600.00 | 2900.00 | 414.2 | 416.6 | 2.4 | 417.7 | 1.1 |
| 3190 | 5600.00 | 2950.00 | 413.9 | 416.2 | 2.2 | 417.2 | 1.1 |
| 3191 | 5600.00 | 3000.00 | 413.7 | 415.9 | 2.2 | 416.9 | 1.1 |
| 3192 | 5600.00 | 3050.00 | 413.4 | 415.6 | 2.3 | 416.6 | 1.0 |
| 3193 | 5600.00 | 3100.00 | 413.2 | 415.4 | 2.3 | 416.5 | 1.0 |
| 3194 | 5600.00 | 3150.00 | 413.1 | 415.2 | 2.1 | 416.2 | 1.0 |
| 3195 | 5600.00 | 3200.00 | 412.8 | 415.0 | 2.2 | 416.0 | 1.0 |
| 3196 | 5600.00 | 3250.00 | 412.9 | 415.1 | 2.2 | 416.1 | 1.0 |
| 3197 | 5600.00 | 3300.00 | 412.7 | 415.1 | 2.4 | 416.0 | 1.0 |
| 3202 | 5650.00 | 2900.00 | 413.9 | 416.2 | 2.2 | 417.2 | 1.0 |
| 3203 | 5650.00 | 2950.00 | 413.8 | 415.8 | 2.0 | 417.0 | 1.1 |
| 3204 | 5650.00 | 3000.00 | 413.4 | 415.6 | 2.2 | 416.6 | 1.0 |
| 3205 | 5650.00 | 3050.00 | 413.1 | 415.3 | 2.3 | 416.5 | 1.2 |
| 3206 | 5650.00 | 3100.00 | 412.9 | 415.1 | 2.3 | 416.2 | 1.0 |
| 3207 | 5650.00 | 3150.00 | 412.8 | 415.0 | 2.2 | 416.1 | 1.1 |
| 3208 | 5650.00 | 3200.00 | 412.9 | 415.1 | 2.1 | 416.1 | 1.0 |
| 3209 | 5650.00 | 3250.00 | 412.8 | 415.1 | 2.3 | 416.1 | 1.0 |
| 3210 | 5650.00 | 3300.00 | 412.8 | 415.0 | 2.3 | 416.1 | 1.0 |
| 3213 | 5700.00 | 2900.00 | 413.7 | 415.9 | 2.3 | 417.2 | 1.3 |
| 3214 | 5700.00 | 2950.00 | 413.3 | 415.7 | 2.4 | 416.7 | 1.0 |
| 3215 | 5700.00 | 3000.00 | 413.0 | 415.4 | 2.3 | 416.4 | 1.0 |
| 3216 | 5700.00 | 3050.00 | 412.8 | 415.1 | 2.3 | 416.2 | 1.0 |
| 3217 | 5700.00 | 3100.00 | 412.7 | 415.3 | 2.6 | 416.3 | 1.0 |
| 3218 | 5700.00 | 3150.00 | 412.9 | 415.0 | 2.1 | 416.1 | 1.1 |
| 3219 | 5700.00 | 3200.00 | 412.7 | 415.1 | 2.4 | 416.1 | 1.1 |
| 3220 | 5700.00 | 3250.00 | 412.9 | 415.0 | 2.1 | 416.0 | 1.0 |
| 3225 | 5750.00 | 3050.00 | 412.8 | 415.1 | 2.3 | 416.1 | 1.0 |
| 3226 | 5750.00 | 3100.00 | 412.8 | 415.2 | 2.4 | 416.2 | 1.0 |
| 13002 | 5489.11 | 3369.27 | 430.7 | 432.7 | 2.0 | 433.7 | 1.0 |
| 13003 | 5490.24 | 3367.64 | 428.3 | 430.4 | 2.1 | 431.7 | 1.3 |
| 13004 | 5510.72 | 3345.80 | 421.5 | 423.7 | 2.2 | 425.0 | 1.3 |
| 13005 | 5529.63 | 3324.87 | 412.9 | 415.0 | 2.1 | 416.2 | 1.3 |
| 13006 | 5498.03 | 3292.96 | 412.8 | 414.9 | 2.1 | 416.1 | 1.3 |
| 13007 | 5481.89 | 3307.88 | 419.8 | 422.1 | 2.3 | 423.6 | 1.6 |
| 13008 | 5456.25 | 3328.36 | 428.0 | 430.0 | 2.0 | 431.2 | 1.2 |
| 13009 | 5454.65 | 3329.13 | N/A | 430.6 | N/A | 431.7 | 1.1 |
| 13010 | 5419.19 | 3291.37 | N/A | 430.6 | N/A | 431.8 | 1.3 |
| 13011 | 5420.90 | 3289.73 | 427.8 | 429.9 | 2.1 | 431.0 | 1.1 |
| 13012 | 5435.08 | 3273.99 | 420.4 | 422.6 | 2.2 | 423.9 | 1.3 |
| 13013 | 5457.37 | 3252.18 | 413.3 | 415.5 | 2.2 | 417.0 | 1.5 |
| 13014 | 5414.87 | 3222.38 | 413.8 | 416.0 | 2.2 | 417.6 | 1.6 |
| 13015 | 5401.27 | 3236.12 | 420.1 | 422.1 | 2.0 | 423.7 | 1.6 |
| 13016 | 5385.62 | 3251.66 | 427.7 | 429.7 | 2.0 | 431.0 | 1.2 |
| 13017 | 5384.27 | 3252.95 | N/A | 430.3 | N/A | 431.4 | 1.2 |
| 13018 | 5348.17 | 3214.35 | N/A | 430.5 | N/A | 431.6 | 1.1 |
| 13019 | 5350.37 | 3211.99 | 426.8 | 429.0 | 2.2 | 430.7 | 1.8 |
| 13020 | 5363.21 | 3197.15 | 420.4 | 422.6 | 2.2 | 424.0 | 1.3 |
| 13021 | 5377.39 | 3181.89 | 414.2 | 416.2 | 2.0 | 417.7 | 1.6 |
| 13022 | 5341.06 | 3145.94 | 414.6 | 416.6 | 2.0 | 418.2 | 1.6 |
| 13023 | 5326.64 | 3160.93 | 421.1 | 423.1 | 2.0 | 424.8 | 1.8 |
| 13024 | 5312.32 | 3173.36 | 427.0 | 429.2 | 2.2 | 431.1 | 1.9 |
| 13025 | 5309.86 | 3175.27 | N/A | 431.1 | N/A | 432.1 | 1.0 |
| 13026 | 5273.20 | 3135.80 | N/A | 430.7 | N/A | 432.0 | 1.3 |
| 13027 | 5275.08 | 3133.23 | 427.0 | 429.2 | 2.2 | 431.0 | 1.8 |
| 13028 | 5286.48 | 3120.85 | 421.7 | 423.9 | 2.2 | 425.5 | 1.5 |
| 13029 | 5300.91 | 3103.69 | 415.1 | 417.1 | 2.0 | 418.7 | 1.6 |
| 13030 | 5258.72 | 3066.82 | 415.4 | 417.4 | 2.0 | 419.4 | 2.0 |
| 13031 | 5245.19 | 3081.78 | 421.7 | 423.8 | 2.1 | 425.2 | 1.5 |
| 13032 | 5235.16 | 3095.73 | 427.0 | 429.2 | 2.2 | 430.9 | 1.7 |
| 13033 | 5232.74 | 3098.31 | N/A | 431.0 | N/A | 432.1 | 1.1 |
| 13034 | 5194.57 | 3062.14 | N/A | 430.8 | N/A | 432.0 | 1.2 |

| POINT | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | COVER THICK |
|---|---|---|---|---|---|---|---|
| 13035 | 5196.60 | 3059.64 | 427.1 | 429.3 | 2.2 | 430.6 | 1.3 |
| 13036 | 5206.58 | 3046.01 | 421.4 | 423.5 | 2.1 | 424.8 | 1.3 |
| 13037 | 5219.37 | 3031.85 | 415.7 | 417.8 | 2.1 | 419.3 | 1.4 |
| 13038 | 5180.48 | 2997.71 | 416.1 | 418.3 | 2.2 | 419.6 | 1.3 |
| 13039 | 5167.40 | 3012.03 | 421.9 | 423.9 | 2.0 | 425.4 | 1.5 |
| 13040 | 5157.16 | 3023.08 | 426.8 | 429.0 | 2.2 | 430.4 | 1.4 |
| 13041 | 5154.94 | 3025.79 | N/A | 430.6 | N/A | 431.6 | 1.0 |
| 13042 | 5115.85 | 2988.94 | N/A | 430.4 | N/A | 431.5 | 1.0 |
| 13043 | 5117.68 | 2986.29 | 426.7 | 428.9 | 2.2 | 430.0 | 1.1 |
| 13044 | 5128.34 | 2974.26 | 421.3 | 423.5 | 2.2 | 424.9 | 1.4 |
| 13045 | 5139.19 | 2962.55 | 416.7 | 418.8 | 2.1 | 420.2 | 1.4 |
| 13046 | 5097.50 | 2927.25 | 417.0 | 419.2 | 2.2 | 420.3 | 1.1 |
| 13047 | 5087.79 | 2939.10 | 422.0 | 424.1 | 2.1 | 425.1 | 1.0 |
| 13048 | 5077.50 | 2950.93 | 427.0 | 429.1 | 2.1 | 430.7 | 1.6 |
| 13049 | 5076.49 | 2953.06 | N/A | 430.2 | N/A | 431.4 | 1.2 |
| 13050 | 5036.25 | 2917.19 | N/A | 430.7 | N/A | 431.7 | 1.1 |
| 13051 | 5038.30 | 2914.90 | 427.0 | 429.2 | 2.2 | 430.5 | 1.3 |
| 13052 | 5046.60 | 2905.90 | 423.0 | 425.2 | 2.2 | 426.4 | 1.2 |
| 13053 | 5057.12 | 2892.57 | 417.5 | 419.7 | 2.2 | 420.8 | 1.1 |
| 13054 | 5017.04 | 2857.04 | 417.8 | 420.1 | 2.3 | 421.3 | 1.3 |
| 13055 | 5007.05 | 2868.20 | 422.7 | 424.8 | 2.1 | 426.1 | 1.3 |
| 13056 | 4997.15 | 2877.75 | 427.2 | 429.4 | 2.2 | 431.0 | 1.6 |
| 13057 | 4996.21 | 2879.44 | N/A | 430.3 | N/A | 431.5 | 1.1 |
| 13058 | 4957.90 | 2845.02 | N/A | 430.5 | N/A | 431.4 | 1.0 |
| 13059 | 4959.30 | 2842.65 | 427.1 | 429.3 | 2.2 | 430.5 | 1.2 |
| 13060 | 4966.61 | 2831.80 | 422.8 | 424.9 | 2.1 | 426.2 | 1.2 |
| 13061 | 4976.05 | 2821.67 | 418.4 | 420.4 | 2.0 | 421.9 | 1.4 |
| 13062 | 4936.82 | 2786.19 | 418.5 | 420.6 | 2.1 | 422.1 | 1.5 |
| 13063 | 4926.59 | 2797.85 | 423.5 | 425.5 | 2.0 | 426.8 | 1.3 |
| 13064 | 4917.75 | 2806.02 | 427.4 | 429.6 | 2.0 | 431.1 | 1.5 |
| 13065 | 4916.68 | 2807.61 | N/A | 430.5 | N/A | 431.7 | 1.2 |
| 13066 | 4877.13 | 2772.34 | N/A | 430.8 | N/A | 431.9 | 1.0 |
| 13067 | 4878.40 | 2770.40 | 427.6 | 429.8 | 2.2 | 430.9 | 1.1 |
| 13068 | 4885.56 | 2761.00 | 423.5 | 425.6 | 2.1 | 427.0 | 1.5 |
| 13069 | 4896.14 | 2750.49 | 418.8 | 421.0 | 2.2 | 422.7 | 1.7 |
| 13070 | 4853.36 | 2715.90 | 418.9 | 421.1 | 2.2 | 423.8 | 2.6 |
| 13071 | 4844.19 | 2725.82 | 424.2 | 426.4 | 2.2 | 427.6 | 1.3 |
| 13072 | 4837.08 | 2735.05 | 427.9 | 430.1 | 2.2 | 431.6 | 1.6 |
| 13073 | 4836.35 | 2736.19 | N/A | 431.1 | N/A | 432.1 | 1.0 |
| 13074 | 4800.76 | 2697.82 | N/A | 430.8 | N/A | 431.8 | 1.0 |
| 13075 | 4802.14 | 2696.77 | 427.6 | 429.6 | 2.0 | 431.0 | 1.4 |
| 13076 | 4813.12 | 2692.83 | 423.5 | 425.7 | 2.2 | 427.2 | 1.5 |
| 13077 | 4825.16 | 2687.88 | 419.7 | 421.8 | 2.1 | 423.4 | 1.6 |
| 13078 | 4823.40 | 2652.82 | 420.4 | 422.4 | 2.0 | 423.7 | 1.3 |
| 13079 | 4811.75 | 2648.80 | 424.2 | 426.3 | 2.1 | 427.3 | 1.0 |
| 13080 | 4802.51 | 2646.35 | 427.2 | 429.4 | 2.2 | 430.8 | 1.5 |
| 13081 | 4798.79 | 2645.02 | N/A | 431.2 | N/A | 432.3 | 1.1 |
| 13082 | 4834.90 | 2611.00 | N/A | 430.5 | N/A | 431.5 | 1.0 |
| 13083 | 4835.68 | 2613.60 | 427.0 | 429.0 | 2.0 | 430.2 | 1.2 |
| 13084 | 4839.50 | 2625.88 | 422.6 | 424.7 | 2.1 | 426.1 | 1.4 |
| 13085 | 4843.14 | 2637.32 | 419.7 | 421.7 | 2.0 | 423.2 | 1.5 |
| 13086 | 4880.85 | 2635.29 | 419.5 | 421.7 | 2.2 | 423.1 | 1.4 |
| 13087 | 4880.37 | 2623.03 | 423.3 | 425.4 | 2.1 | 426.7 | 1.3 |
| 13088 | 4880.67 | 2610.56 | 427.6 | 429.8 | 2.2 | 430.9 | 1.1 |
| 13089 | 4880.21 | 2607.41 | N/A | 431.3 | N/A | 432.4 | 1.0 |
| 13090 | 4933.24 | 2608.28 | N/A | 431.0 | N/A | 432.1 | 1.0 |
| 13091 | 4933.03 | 2610.71 | 427.6 | 429.8 | 2.2 | 430.9 | 1.1 |
| 13092 | 4934.46 | 2623.14 | 423.7 | 425.7 | 2.0 | 426.8 | 1.1 |
| 13093 | 4935.15 | 2636.33 | 419.3 | 421.5 | 2.2 | 422.8 | 1.3 |
| 13094 | 4988.73 | 2635.89 | 419.4 | 421.5 | 2.1 | 422.7 | 1.2 |
| 13095 | 4988.09 | 2623.28 | 423.5 | 425.7 | 2.2 | 426.8 | 1.0 |

| POINT | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | COVER THICK |
|---|---|---|---|---|---|---|---|
| 13096 | 4988.43 | 2611.19 | 427.4 | 429.5 | 2.1 | 430.6 | 1.0 |
| 13097 | 4988.23 | 2607.41 | N/A | 431.2 | N/A | 432.2 | 1.0 |
| 13098 | 5044.42 | 2605.21 | N/A | 432.0 | N/A | 433.0 | 1.0 |
| 13099 | 5044.63 | 2611.31 | 427.3 | 429.3 | 2.0 | 430.8 | 1.4 |
| 13100 | 5045.26 | 2624.68 | 423.0 | 425.2 | 2.2 | 426.2 | 1.0 |
| 13101 | 5045.91 | 2638.39 | 418.8 | 421.0 | 2.2 | 422.1 | 1.1 |
| 13102 | 5100.54 | 2639.32 | 418.3 | 420.6 | 2.3 | 421.7 | 1.1 |
| 13103 | 5100.82 | 2624.34 | 423.0 | 425.0 | 2.0 | 426.1 | 1.1 |
| 13104 | 5101.38 | 2611.26 | 427.3 | 429.5 | 2.2 | 430.8 | 1.2 |
| 13105 | 5101.25 | 2606.63 | N/A | 431.4 | N/A | 432.4 | 1.0 |
| 13106 | 5162.12 | 2609.85 | 428.8 | 431.0 | 2.2 | 432.1 | 1.1 |
| 13107 | 5161.87 | 2612.30 | 426.9 | 429.1 | 2.2 | 430.4 | 1.3 |
| 13108 | 5163.35 | 2627.32 | 421.9 | 423.9 | 2.0 | 425.1 | 1.3 |
| 13118 | 5347.43 | 2502.58 | 422.6 | 424.8 | 2.2 | 426.2 | 1.4 |
| 13119 | 5348.58 | 2489.08 | 427.6 | 429.7 | 2.1 | 430.8 | 1.1 |
| 13120 | 5348.60 | 2486.78 | N/A | 430.2 | N/A | 431.3 | 1.1 |
| 13121 | 5390.59 | 2516.83 | N/A | 430.8 | N/A | 432.2 | 1.4 |
| 13122 | 5388.53 | 2518.46 | 428.0 | 430.1 | 2.1 | 431.3 | 1.2 |
| 13123 | 5379.27 | 2529.72 | 423.2 | 425.3 | 2.1 | 426.6 | 1.3 |
| 13124 | 5365.84 | 2541.20 | 417.7 | 419.9 | 2.2 | 421.3 | 1.4 |
| 13125 | 5404.94 | 2581.86 | 417.3 | 419.4 | 2.1 | 420.5 | 1.1 |
| 13126 | 5415.38 | 2569.66 | 422.6 | 424.7 | 2.1 | 425.8 | 1.1 |
| 13127 | 5427.07 | 2559.25 | 427.7 | 429.8 | 2.1 | 430.9 | 1.1 |
| 13128 | 5429.65 | 2556.66 | N/A | 431.1 | N/A | 432.1 | 1.0 |
| 13129 | 5469.68 | 2597.22 | N/A | 431.0 | N/A | 432.3 | 1.3 |
| 13130 | 5467.02 | 2599.97 | 427.6 | 429.7 | 2.1 | 431.0 | 1.2 |
| 13131 | 5457.39 | 2611.19 | 422.8 | 425.0 | 2.2 | 426.1 | 1.2 |
| 13132 | 5443.05 | 2624.17 | 416.6 | 418.8 | 2.2 | 419.9 | 1.1 |
| 13133 | 5479.76 | 2664.50 | 416.1 | 418.2 | 2.1 | 419.7 | 1.5 |
| 13134 | 5494.02 | 2653.10 | 421.8 | 423.9 | 2.1 | 425.2 | 1.3 |
| 13135 | 5507.16 | 2641.77 | 427.4 | 429.8 | 2.4 | 431.0 | 1.2 |
| 13136 | 5511.05 | 2638.36 | N/A | 431.2 | N/A | 432.3 | 1.1 |
| 13137 | 5548.52 | 2680.81 | N/A | 430.7 | N/A | 431.8 | 1.1 |
| 13138 | 5547.16 | 2682.84 | 427.3 | 429.6 | 2.3 | 431.0 | 1.4 |
| 13139 | 5547.11 | 2682.87 | 427.3 | 429.5 | 2.2 | 430.5 | 1.0 |
| 13140 | 5534.95 | 2694.88 | 421.9 | 424.0 | 2.1 | 425.2 | 1.3 |
| 13141 | 5519.94 | 2708.72 | 415.6 | 417.8 | 2.2 | 419.2 | 1.4 |
| 13142 | 5558.79 | 2747.85 | 415.4 | 417.4 | 2.0 | 418.7 | 1.3 |
| 13143 | 5572.25 | 2735.09 | 421.3 | 423.4 | 2.1 | 424.7 | 1.3 |
| 13144 | 5586.44 | 2722.79 | 427.5 | 429.6 | 2.1 | 430.9 | 1.3 |
| 13145 | 5588.58 | 2721.17 | N/A | 430.7 | N/A | 431.9 | 1.2 |
| 13146 | 5631.45 | 2763.20 | N/A | 430.9 | N/A | 432.2 | 1.4 |
| 13147 | 5629.27 | 2765.82 | 427.7 | 429.8 | 2.1 | 431.2 | 1.4 |
| 13148 | 5615.51 | 2780.42 | 420.9 | 423.1 | 2.2 | 424.5 | 1.4 |
| 13149 | 5601.22 | 2792.82 | 415.1 | 417.2 | 2.1 | 418.4 | 1.3 |
| 13150 | 5639.31 | 2834.64 | 414.5 | 416.5 | 2.0 | 417.9 | 1.4 |
| 13151 | 5654.98 | 2818.73 | 421.5 | 423.5 | 2.0 | 425.1 | 1.6 |
| 13152 | 5667.55 | 2806.33 | 427.3 | 429.3 | 2.0 | 430.9 | 1.6 |
| 13153 | 5672.32 | 2802.02 | N/A | 431.5 | N/A | 432.5 | 1.0 |
| 13154 | 5711.74 | 2843.81 | N/A | 431.5 | N/A | 432.5 | 1.0 |
| 13155 | 5707.37 | 2846.62 | 427.6 | 429.8 | 2.2 | 430.9 | 1.1 |
| 13156 | 5693.63 | 2861.24 | 421.0 | 423.1 | 2.1 | 424.2 | 1.1 |
| 13157 | 5678.04 | 2876.30 | 413.9 | 416.0 | 2.1 | 417.6 | 1.5 |
| 13158 | 5710.24 | 2910.70 | 413.6 | 415.8 | 2.2 | 417.1 | 1.3 |
| 13159 | 5725.27 | 2898.42 | 419.9 | 422.1 | 2.2 | 423.1 | 1.0 |
| 13160 | 5741.64 | 2883.69 | 427.1 | 429.2 | 2.1 | 430.4 | 1.3 |
| 13161 | 5746.66 | 2879.91 | N/A | 431.3 | N/A | 432.3 | 1.0 |
| 13162 | 5777.91 | 2915.60 | N/A | 430.6 | N/A | 431.8 | 1.3 |
| 13163 | 5778.03 | 2919.63 | 427.6 | 429.7 | 2.1 | 430.9 | 1.2 |
| 13164 | 5763.30 | 2934.55 | 420.7 | 422.7 | 2.0 | 423.8 | 1.1 |
| 13165 | 5748.21 | 2949.21 | 413.6 | 415.7 | 2.1 | 416.9 | 1.1 |
| 13166 | 5773.93 | 2987.40 | 412.8 | 414.9 | 2.1 | 416.6 | 1.6 |
| 13167 | 5796.64 | 2979.39 | 420.9 | 423.1 | 2.2 | 424.2 | 1.1 |
| 13168 | 5813.05 | 2972.08 | 427.2 | 429.4 | 2.2 | 430.3 | 1.0 |
| 13169 | 5817.66 | 2971.18 | N/A | 430.9 | N/A | 431.9 | 1.1 |
| 13170 | 5822.28 | 3021.53 | N/A | 429.7 | N/A | 431.3 | 1.6 |
| 13171 | 5820.84 | 3021.23 | 427.3 | 429.3 | 2.0 | 430.7 | 1.4 |
| 13172 | 5804.69 | 3016.51 | 421.6 | 423.6 | 2.0 | 425.2 | 1.6 |
| 13173 | 5775.44 | 3008.75 | 412.7 | 414.8 | 2.1 | 416.0 | 1.2 |
| 13174 | 5752.32 | 3051.07 | 412.7 | 414.9 | 2.2 | 416.2 | 1.3 |
| 13175 | 5772.74 | 3063.42 | 420.1 | 422.3 | 2.2 | 423.5 | 1.2 |
| 13176 | 5792.83 | 3068.98 | 427.0 | 429.2 | 2.2 | 430.4 | 1.2 |
| 13177 | 5796.14 | 3069.75 | N/A | 430.3 | N/A | 431.7 | 1.4 |
| 13178 | 5806.63 | 3124.66 | N/A | 430.0 | N/A | 431.2 | 1.2 |
| 13179 | 5804.34 | 3125.62 | 426.5 | 428.7 | 2.2 | 430.3 | 1.6 |
| 13180 | 5784.37 | 3131.51 | 420.2 | 422.2 | 2.0 | 423.4 | 1.2 |
| 13181 | 5761.42 | 3137.74 | 412.7 | 414.8 | 2.1 | 416.0 | 1.3 |
| 13182 | 5764.51 | 3159.55 | 412.9 | 415.1 | 2.2 | 416.1 | 1.0 |
| 13183 | 5786.13 | 3167.58 | 420.4 | 422.5 | 2.1 | 423.5 | 1.1 |
| 13184 | 5805.70 | 3176.50 | 427.3 | 429.4 | 2.1 | 430.8 | 1.4 |
| 13185 | 5807.57 | 3176.92 | N/A | 430.3 | N/A | 431.4 | 1.1 |
| 13186 | 5781.48 | 3223.31 | N/A | 430.1 | N/A | 431.4 | 1.3 |
| 13187 | 5779.47 | 3221.89 | 427.2 | 429.4 | 2.2 | 430.4 | 1.0 |
| 13188 | 5762.80 | 3212.20 | 421.0 | 423.0 | 2.0 | 424.1 | 1.1 |
| 13189 | 5741.18 | 3199.21 | 413.0 | 415.0 | 2.0 | 416.2 | 1.2 |
| 13190 | 5713.21 | 3240.19 | 412.9 | 415.0 | 2.1 | 416.7 | 1.7 |
| 13191 | 5730.81 | 3252.25 | 420.1 | 422.2 | 2.1 | 423.3 | 1.1 |
| 13192 | 5746.68 | 3267.31 | 426.8 | 428.9 | 2.1 | 430.7 | 1.7 |
| 13193 | 5748.35 | 3268.57 | N/A | 430.2 | N/A | 431.3 | 1.2 |
| 13194 | 5711.71 | 3309.87 | N/A | 430.3 | N/A | 431.5 | 1.2 |
| 13195 | 5710.27 | 3308.52 | 427.3 | 429.3 | 2.0 | 430.7 | 1.4 |
| 13196 | 5696.79 | 3295.75 | 421.4 | 423.6 | 2.2 | 424.6 | 1.0 |
| 13197 | 5677.41 | 3278.50 | 413.0 | 415.1 | 2.1 | 416.2 | 1.1 |
| 13198 | 5640.71 | 3311.27 | 412.8 | 415.0 | 2.2 | 416.1 | 1.2 |
| 13199 | 5656.58 | 3331.57 | 421.4 | 423.4 | 2.0 | 424.5 | 1.0 |
| 13200 | 5669.13 | 3345.56 | 427.2 | 429.2 | 2.0 | 430.9 | 1.7 |
| 13201 | 5671.09 | 3348.08 | N/A | 430.8 | N/A | 432.1 | 1.3 |
| 13202 | 5624.46 | 3379.57 | N/A | 430.6 | N/A | 431.6 | 1.0 |
| 13203 | 5622.49 | 3376.88 | 427.0 | 429.0 | 2.0 | 430.6 | 1.6 |
| 13204 | 5613.58 | 3362.23 | 421.5 | 423.5 | 2.0 | 424.7 | 1.1 |
| 13205 | 5600.72 | 3338.61 | 413.0 | 415.1 | 2.1 | 416.6 | 1.5 |
| 13206 | 5571.55 | 3352.81 | 412.9 | 415.0 | 2.1 | 416.7 | 1.7 |
| 13207 | 5572.02 | 3373.54 | 419.4 | 421.5 | 2.1 | 423.0 | 1.5 |
| 13208 | 5576.14 | 3397.52 | 427.4 | 429.5 | 2.1 | 431.0 | 1.5 |
| 13209 | 5576.49 | 3399.84 | N/A | 430.7 | N/A | 432.0 | 1.2 |
| 13210 | 5525.78 | 3386.03 | N/A | 430.5 | N/A | 431.5 | 1.0 |
| 13211 | 5526.93 | 3384.18 | 427.0 | 429.1 | 2.1 | 430.8 | 1.7 |
| 13212 | 5537.22 | 3364.36 | 419.6 | 421.8 | 2.2 | 423.1 | 1.3 |
| 13213 | 5548.26 | 3347.30 | 413.0 | 415.2 | 2.2 | 416.7 | 1.5 |
| 13226 | 5163.15 | 2640.63 | 419.7 | 421.8 | 2.1 | 422.8 | 1.0 |
| 13227 | 5161.70 | 2616.41 | 425.7 | 428.0 | 2.3 | 428.9 | 1.0 |
| 13228 | 5148.26 | 2601.86 | 430.1 | 432.1 | 2.0 | 433.1 | 1.0 |
| 13229 | 5197.99 | 2597.84 | 430.2 | 432.2 | 2.0 | 434.0 | 1.9 |
| 13230 | 5204.41 | 2613.15 | 424.9 | 427.1 | 2.2 | 428.1 | 1.0 |
| 13231 | 5210.27 | 2631.75 | 418.4 | 420.5 | 2.1 | 421.6 | 1.1 |
| 13232 | 5256.92 | 2601.58 | 418.3 | 420.4 | 2.1 | 422.0 | 1.6 |
| 13233 | 5246.25 | 2587.35 | 424.1 | 426.1 | 2.0 | 427.5 | 1.4 |
| 13234 | 5234.91 | 2573.04 | 430.2 | 432.3 | 2.1 | 433.3 | 1.0 |
| 13235 | 5276.18 | 2533.37 | 429.8 | 431.9 | 2.1 | 432.8 | 1.0 |
| 13236 | 5289.13 | 2545.58 | 424.0 | 426.0 | 2.0 | 427.4 | 1.4 |
| 13237 | 5302.35 | 2557.77 | 418.8 | 420.8 | 2.0 | 421.8 | 1.0 |
| 13238 | 5344.11 | 2520.06 | 419.8 | 422.1 | 2.3 | 423.2 | 1.1 |
| 13239 | 5332.64 | 2507.73 | 425.2 | 427.2 | 2.0 | 428.2 | 1.0 |
| 13240 | 5324.14 | 2493.17 | N/A | 430.7 | N/A | 432.0 | 1.3 |

Figure 12

| NO. | REVISIONS | BY | DATE |
|---|---|---|---|

PROJECT: GOLDER ASSOCIATES OAK GROVE FGD POND
JOB NUMBER: 31100-09
DATE: JANUARY 13, 2012
SCALE: 1" = 50'
SURVEYOR: G.VEDRO
TECHNICIAN: G.HANSON
DRAWING: FGD POND.DWG
FIELDNOTES: N/A
PARTYCHIEF: A.MANCERA
FIELDBOOKS: 811


SAM INC.
SURVEYING•AERIAL MAPPING•ENGINEERING
4801 SOUTHWEST PARKWAY
PARKWAY TWO, SUITE 100
AUSTIN TEXAS, 78735
(512) 447-0575
FAX: (512) 326-3029
EMAIL: SAM@SAMINC.BIZ


SUBGRADE, CLAY LINER, AND PROTECTIVE COVER
ELEVATIONS AS OF DECEMBER 7, 2011
OAK GROVE POWER PLANT
FGD POND
ROBERTSON COUNTY, TEXAS

SHEET 1 OF 1

DWG. NO.: G034-31100-09

JANUARY 13, 2012

**FDG C**
**AS BUILT DRAWINGS**

LUMINANT

APPENDIX E-Revision 1-November 21, 2022

| NO. | REVISIONS | BY | DATE |
|---|---|---|---|
| | | | |

PROJECT: GOLDER ASSOCIATES
OAK GROVE FGD POND C

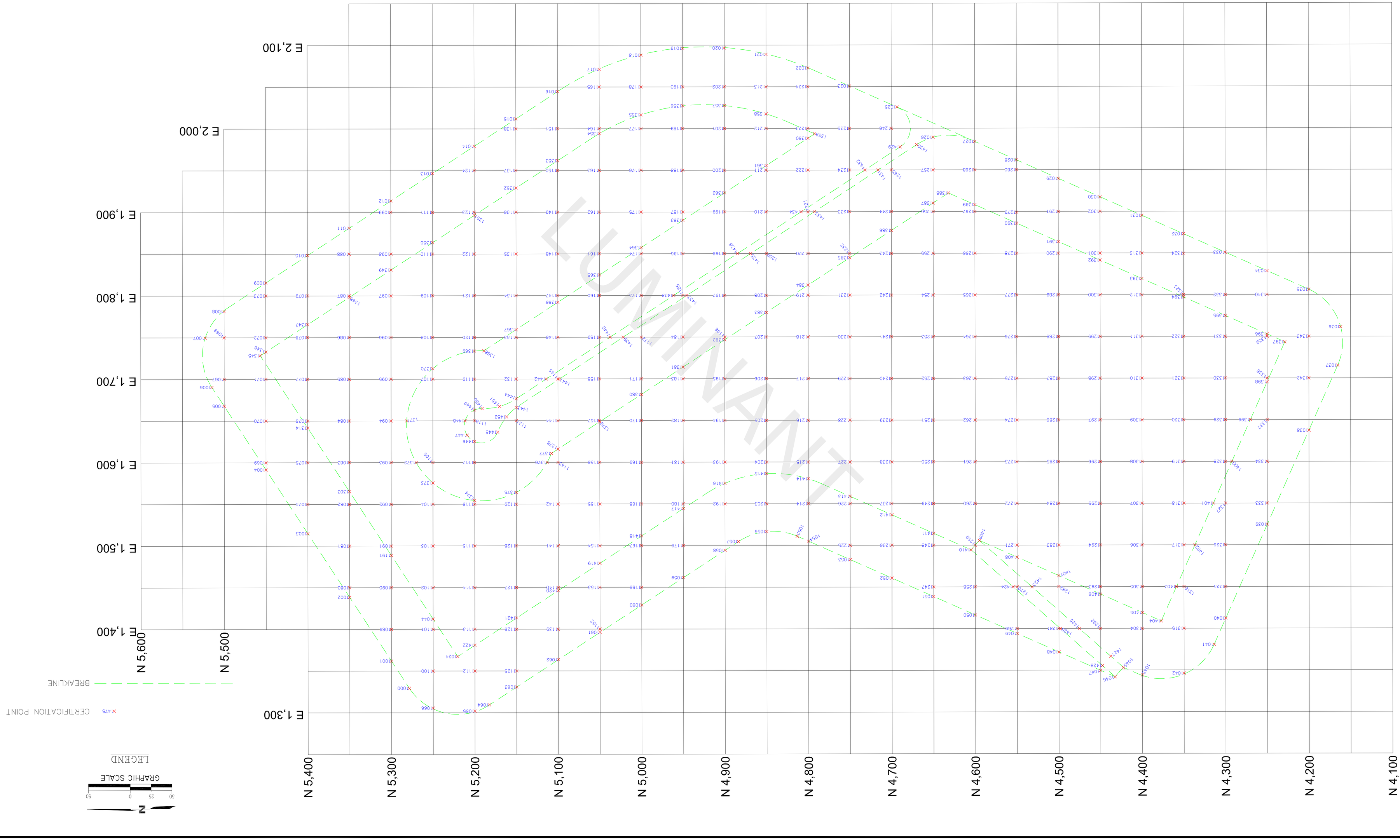
JOB NUMBER: 35813-09
DATE: AUGUST 18, 2016
SCALE: 1"=50'
SURVEYOR: S.K.W.
TECHNICIAN: W.G.H.
DRAWING: 35813 FGD POND C.DWG
FIELDNOTES: N/A
PARTYCHIEF: J.SANDOVAL
FIELDBOOKS: 9999

SURVEYING•AERIAL MAPPING•ENGINEERING
SAM
7101 ENVOY COURT
DALLAS, TEXAS 75247
(214) 631-7888
FAX: (214) 631-7103
EMAIL: SAM@SAM.BIZ

# SUBGRADE AND CLAY LINER ELEVATIONS
AS OF SEPTEMBER 29, 2015
FGD POND C
OAK GROVE POWER PLANT
ROBERTSON COUNTY, TEXAS

SHEET 1 OF 2

DWG. NO.:35813-09



| POINT No. | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | CERT THICK |
|---|---|---|---|---|---|---|---|
| 1000 | 5278.62 | 1329.42 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1001 | 5300.00 | 1362.10 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1002 | 5350.00 | 1438.54 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1003 | 5400.00 | 1514.99 | 461.7 | 464.0 | 2.4 | 464.1 | 0.1 |
| 1004 | 5450.00 | 1591.43 | 461.7 | 464.0 | 2.4 | 464.1 | 0.1 |
| 1005 | 5500.00 | 1667.88 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1006 | 5514.74 | 1690.41 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1007 | 5522.71 | 1749.59 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1008 | 5500.00 | 1781.41 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1009 | 5450.00 | 1815.59 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1010 | 5400.00 | 1848.29 | 461.9 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1011 | 5350.00 | 1880.99 | 461.7 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1012 | 5300.00 | 1913.70 | 461.7 | 464.1 | 2.3 | 464.1 | 0.1 |
| 1013 | 5250.00 | 1946.40 | 461.8 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1014 | 5200.00 | 1979.11 | 461.8 | 464.1 | 2.3 | 464.1 | 0.1 |
| 1015 | 5150.00 | 2011.81 | 461.8 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1016 | 5100.00 | 2044.51 | 461.9 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1017 | 5050.00 | 2071.01 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1018 | 5000.00 | 2088.08 | 461.8 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1019 | 4950.00 | 2096.34 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1020 | 4900.00 | 2096.53 | 461.7 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1021 | 4850.00 | 2088.74 | 461.8 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1022 | 4800.00 | 2072.44 | 461.7 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1023 | 4750.00 | 2050.70 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1024 | 5220.61 | 1367.36 | 439.0 | 441.1 | 2.1 | 444.8 | 3.7 |
| 1025 | 4693.29 | 2025.51 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1026 | 4650.00 | 1989.13 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1027 | 4600.00 | 1984.07 | 461.9 | 464.1 | 2.1 | 464.1 | 0.1 |
| 1028 | 4550.00 | 1961.86 | 462.0 | 464.2 | 2.2 | 464.2 | 0.0 |
| 1029 | 4500.00 | 1939.65 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1030 | 4450.00 | 1917.44 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1031 | 4400.00 | 1895.23 | 461.7 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1032 | 4350.00 | 1873.02 | 461.7 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1033 | 4300.00 | 1850.81 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1034 | 4250.00 | 1828.60 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1035 | 4200.00 | 1806.31 | 461.9 | 464.3 | 2.4 | 464.3 | 0.0 |
| 1036 | 4161.78 | 1761.27 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1037 | 4165.38 | 1715.16 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1038 | 4200.00 | 1637.23 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1039 | 4250.00 | 1524.67 | 461.8 | 464.0 | 2.2 | 464.1 | 0.0 |
| 1040 | 4300.00 | 1412.11 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1041 | 4313.95 | 1380.70 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1042 | 4350.00 | 1346.19 | 462.0 | 464.0 | 2.1 | 466.4 | 2.4 |
| 1043 | 4400.00 | 1344.10 | 462.0 | 464.0 | 2.1 | 466.1 | 2.1 |
| 1044 | 5250.00 | 1412.30 | 439.0 | 441.1 | 2.1 | 444.7 | 3.7 |
| 1045 | 4422.89 | 1353.23 | 462.0 | 464.1 | 2.2 | 466.2 | 2.0 |
| 1046 | 4432.81 | 1341.98 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1047 | 4450.00 | 1349.62 | 461.8 | 464.2 | 2.3 | 464.2 | 0.0 |
| 1048 | 4500.00 | 1371.83 | 461.8 | 464.1 | 2.2 | 464.1 | 0.1 |
| 1049 | 4550.00 | 1394.04 | 461.8 | 464.2 | 2.4 | 464.2 | 0.0 |
| 1050 | 4600.00 | 1416.25 | 461.7 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1051 | 4650.00 | 1438.46 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1052 | 4700.00 | 1460.67 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1053 | 4750.00 | 1482.88 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1054 | 4800.00 | 1505.09 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1055 | 4813.47 | 1511.06 | 461.7 | 464.0 | 2.3 | 464.1 | 0.1 |
| 1056 | 4850.00 | 1516.68 | 461.7 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1057 | 4883.85 | 1504.79 | 461.7 | 464.0 | 2.4 | 464.1 | 0.1 |
| 1058 | 4900.00 | 1494.23 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1059 | 4950.00 | 1461.52 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1060 | 5000.00 | 1428.82 | 461.7 | 464.1 | 2.4 | 464.1 | 0.0 |
| 1061 | 5050.00 | 1396.12 | 461.8 | 464.1 | 2.3 | 464.1 | 0.1 |
| 1062 | 5100.00 | 1363.41 | 461.7 | 464.2 | 2.5 | 464.2 | 0.0 |
| 1063 | 5150.00 | 1330.71 | 461.8 | 464.0 | 2.2 | 464.1 | 0.1 |
| 1064 | 5182.66 | 1309.35 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1065 | 5200.00 | 1301.82 | 461.8 | 464.1 | 2.3 | 464.1 | 0.0 |
| 1066 | 5250.00 | 1305.63 | 461.7 | 464.2 | 2.5 | 464.2 | 0.0 |
| 1067 | 5500.00 | 1700.00 | 456.1 | 458.3 | 2.2 | 460.6 | 2.3 |
| 1068 | 5500.00 | 1750.00 | 455.2 | 457.3 | 2.2 | 459.6 | 2.3 |
| 1069 | 5450.00 | 1600.00 | 460.2 | 462.5 | 2.3 | 464.7 | 2.2 |
| 1070 | 5450.00 | 1650.00 | 451.3 | 453.5 | 2.1 | 456.1 | 2.7 |
| 1071 | 5450.00 | 1700.00 | 442.2 | 444.3 | 2.1 | 447.7 | 3.4 |
| 1072 | 5450.00 | 1750.00 | 443.2 | 445.4 | 2.2 | 448.8 | 3.5 |
| 1073 | 5450.00 | 1800.00 | 457.6 | 459.7 | 2.1 | 461.7 | 2.0 |
| 1074 | 5400.00 | 1550.00 | 455.6 | 457.8 | 2.2 | 460.1 | 2.4 |
| 1075 | 5400.00 | 1600.00 | 446.5 | 448.6 | 2.1 | 451.9 | 3.3 |
| 1076 | 5400.00 | 1650.00 | 439.0 | 441.1 | 2.1 | 443.7 | 2.6 |
| 1077 | 5400.00 | 1700.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1078 | 5400.00 | 1750.00 | 438.9 | 441.0 | 2.1 | 443.0 | 2.0 |
| 1079 | 5400.00 | 1800.00 | 448.5 | 450.7 | 2.2 | 453.2 | 2.5 |
| 1080 | 5350.00 | 1450.00 | 459.9 | 462.0 | 2.1 | 464.3 | 2.3 |
| 1081 | 5350.00 | 1500.00 | 450.8 | 453.0 | 2.2 | 455.8 | 2.8 |
| 1082 | 5350.00 | 1550.00 | 441.7 | 443.8 | 2.1 | 447.4 | 3.6 |
| 1083 | 5350.00 | 1600.00 | 438.9 | 441.0 | 2.1 | 443.3 | 2.3 |
| 1084 | 5350.00 | 1650.00 | 439.0 | 441.2 | 2.3 | 443.4 | 2.2 |
| 1085 | 5350.00 | 1700.00 | 438.9 | 441.2 | 2.2 | 443.2 | 2.1 |
| 1086 | 5350.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.1 |
| 1087 | 5350.00 | 1800.00 | 439.4 | 441.6 | 2.2 | 444.9 | 3.3 |
| 1088 | 5350.00 | 1850.00 | 453.4 | 455.5 | 2.1 | 458.1 | 2.6 |
| 1089 | 5300.00 | 1400.00 | 455.1 | 457.1 | 2.0 | 459.9 | 2.7 |
| 1090 | 5300.00 | 1450.00 | 446.0 | 448.2 | 2.2 | 451.4 | 3.3 |
| 1091 | 5300.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 443.4 | 2.2 |
| 1092 | 5300.00 | 1550.00 | 439.0 | 441.0 | 2.1 | 443.7 | 2.7 |
| 1093 | 5300.00 | 1600.00 | 439.0 | 441.1 | 2.2 | 444.3 | 3.2 |
| 1094 | 5300.00 | 1650.00 | 439.0 | 441.1 | 2.1 | 443.6 | 2.5 |
| 1095 | 5300.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 444.0 | 2.8 |
| 1096 | 5300.00 | 1750.00 | 438.9 | 441.1 | 2.2 | 443.8 | 2.8 |
| 1097 | 5300.00 | 1800.00 | 438.9 | 441.0 | 2.2 | 443.3 | 2.3 |
| 1098 | 5300.00 | 1850.00 | 444.2 | 446.4 | 2.1 | 449.7 | 3.3 |
| 1099 | 5300.00 | 1900.00 | 458.2 | 460.4 | 2.2 | 462.7 | 2.3 |
| 1100 | 5250.00 | 1350.00 | 450.3 | 452.4 | 2.1 | 455.0 | 2.6 |
| 1101 | 5250.00 | 1400.00 | 441.2 | 443.5 | 2.3 | 446.7 | 3.3 |
| 1102 | 5250.00 | 1450.00 | 439.0 | 441.2 | 2.3 | 443.4 | 2.2 |
| 1103 | 5250.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 443.6 | 2.4 |
| 1104 | 5250.00 | 1550.00 | 438.9 | 441.1 | 2.2 | 443.9 | 2.8 |
| 1105 | 5250.00 | 1600.00 | 444.4 | 446.8 | 2.4 | 450.7 | 3.9 |
| 1106 | 5250.00 | 1700.00 | 441.8 | 444.0 | 2.2 | 447.3 | 3.3 |
| 1107 | 5250.00 | 1750.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1108 | 5250.00 | 1800.00 | 439.0 | 441.1 | 2.1 | 444.1 | 3.0 |
| 1109 | 5250.00 | 1850.00 | 438.9 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1110 | 5250.00 | 1900.00 | 449.1 | 451.2 | 2.1 | 454.3 | 3.0 |
| 1111 | 5250.00 | 1950.00 | 458.6 | 460.9 | 2.2 | 463.5 | 2.6 |
| 1112 | 5200.00 | 1350.00 | 447.5 | 449.7 | 2.2 | 452.9 | 3.2 |
| 1113 | 5200.00 | 1400.00 | 439.0 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1114 | 5200.00 | 1450.00 | 438.9 | 441.0 | 2.1 | 443.5 | 2.5 |
| 1115 | 5200.00 | 1500.00 | 439.0 | 441.0 | 2.1 | 443.8 | 2.8 |
| 1116 | 5200.00 | 1550.00 | 439.0 | 441.2 | 2.2 | 443.6 | 2.5 |
| 1117 | 5200.00 | 1600.00 | 453.7 | 456.0 | 2.3 | 458.0 | 2.0 |
| 1118 | 5200.00 | 1650.00 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1119 | 5200.00 | 1700.00 | 449.9 | 452.1 | 2.2 | 455.2 | 3.1 |
| 1120 | 5200.00 | 1750.00 | 438.9 | 441.1 | 2.1 | 443.2 | 2.2 |
| 1121 | 5200.00 | 1800.00 | 439.0 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1122 | 5200.00 | 1850.00 | 438.9 | 441.1 | 2.2 | 443.6 | 2.5 |

| POINT No. | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | CERT THICK |
|---|---|---|---|---|---|---|---|
| 1123 | 5200.00 | 1900.00 | 439.9 | 442.0 | 2.1 | 445.7 | 3.7 |
| 1124 | 5200.00 | 1950.00 | 453.9 | 456.1 | 2.2 | 459.0 | 2.9 |
| 1125 | 5150.00 | 1350.00 | 456.6 | 458.9 | 2.3 | 461.4 | 2.5 |
| 1126 | 5150.00 | 1400.00 | 442.7 | 444.9 | 2.2 | 448.1 | 3.2 |
| 1127 | 5150.00 | 1450.00 | 438.9 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1128 | 5150.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 443.8 | 2.6 |
| 1129 | 5150.00 | 1550.00 | 439.0 | 441.1 | 2.1 | 443.6 | 2.5 |
| 1131 | 5150.00 | 1650.00 | 458.3 | 460.5 | 2.2 | 463.5 | 3.0 |
| 1132 | 5150.00 | 1700.00 | 455.5 | 457.6 | 2.1 | 460.5 | 2.9 |
| 1133 | 5150.00 | 1750.00 | 441.5 | 443.6 | 2.1 | 447.4 | 3.8 |
| 1134 | 5150.00 | 1800.00 | 438.9 | 441.2 | 2.2 | 443.4 | 2.3 |
| 1135 | 5150.00 | 1850.00 | 438.9 | 441.1 | 2.2 | 443.9 | 2.8 |
| 1136 | 5150.00 | 1900.00 | 438.9 | 441.0 | 2.1 | 443.3 | 2.3 |
| 1137 | 5150.00 | 1950.00 | 444.8 | 447.0 | 2.2 | 450.4 | 3.4 |
| 1138 | 5150.00 | 2000.00 | 458.7 | 460.7 | 2.0 | 463.5 | 2.7 |
| 1139 | 5100.00 | 1400.00 | 451.8 | 454.0 | 2.1 | 456.7 | 2.8 |
| 1140 | 5100.00 | 1450.00 | 439.0 | 441.2 | 2.2 | 443.8 | 2.7 |
| 1141 | 5100.00 | 1500.00 | 438.9 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1142 | 5100.00 | 1550.00 | 439.0 | 441.1 | 2.1 | 444.1 | 3.0 |
| 1143 | 5100.00 | 1600.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1144 | 5100.00 | 1650.00 | 448.4 | 450.7 | 2.3 | 454.6 | 3.9 |
| 1145 | 5100.00 | 1700.00 | 462.0 | 464.1 | 2.1 | 464.1 | 0.0 |
| 1146 | 5100.00 | 1750.00 | 450.6 | 452.8 | 2.1 | 456.2 | 3.4 |
| 1147 | 5100.00 | 1800.00 | 439.0 | 441.2 | 2.2 | 443.4 | 2.2 |
| 1148 | 5100.00 | 1850.00 | 438.9 | 441.1 | 2.1 | 443.1 | 2.1 |
| 1149 | 5100.00 | 1900.00 | 439.0 | 441.1 | 2.1 | 444.1 | 3.1 |
| 1150 | 5100.00 | 1950.00 | 438.9 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1151 | 5100.00 | 2000.00 | 449.6 | 451.9 | 2.2 | 455.2 | 3.3 |
| 1152 | 5050.00 | 1400.00 | 460.9 | 463.0 | 2.1 | 464.1 | 1.1 |
| 1153 | 5050.00 | 1450.00 | 447.0 | 449.2 | 2.2 | 452.0 | 2.9 |
| 1154 | 5050.00 | 1500.00 | 439.0 | 441.2 | 2.3 | 443.4 | 2.2 |
| 1155 | 5050.00 | 1550.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1156 | 5050.00 | 1600.00 | 439.0 | 441.1 | 2.1 | 444.0 | 2.9 |
| 1157 | 5050.00 | 1650.00 | 439.3 | 441.6 | 2.3 | 446.2 | 4.5 |
| 1158 | 5050.00 | 1700.00 | 453.2 | 455.4 | 2.2 | 459.1 | 3.6 |
| 1159 | 5050.00 | 1750.00 | 459.7 | 461.8 | 2.1 | 464.0 | 2.2 |
| 1160 | 5050.00 | 1800.00 | 445.8 | 448.0 | 2.2 | 451.8 | 3.8 |
| 1161 | 5050.00 | 1850.00 | 439.0 | 441.0 | 2.1 | 443.2 | 2.2 |
| 1162 | 5050.00 | 1900.00 | 439.0 | 441.1 | 2.1 | 443.5 | 2.4 |
| 1163 | 5050.00 | 1950.00 | 439.0 | 441.1 | 2.1 | 443.6 | 2.6 |
| 1164 | 5050.00 | 2000.00 | 440.7 | 442.8 | 2.1 | 447.0 | 4.2 |
| 1165 | 5050.00 | 2050.00 | 455.6 | 457.7 | 2.1 | 460.6 | 3.0 |
| 1166 | 5000.00 | 1450.00 | 456.1 | 458.3 | 2.2 | 460.5 | 2.3 |
| 1167 | 5000.00 | 1500.00 | 442.2 | 444.3 | 2.2 | 447.4 | 3.0 |
| 1168 | 5000.00 | 1550.00 | 439.0 | 441.1 | 2.1 | 443.5 | 2.3 |
| 1169 | 5000.00 | 1600.00 | 438.9 | 441.2 | 2.3 | 443.7 | 2.5 |
| 1170 | 5000.00 | 1650.00 | 438.9 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1171 | 5000.00 | 1700.00 | 444.1 | 446.3 | 2.2 | 450.8 | 4.5 |
| 1172 | 5000.00 | 1750.00 | 457.9 | 460.4 | 2.4 | 462.5 | 2.2 |
| 1173 | 5000.00 | 1800.00 | 454.9 | 457.1 | 2.2 | 460.0 | 2.9 |
| 1174 | 5000.00 | 1850.00 | 441.0 | 443.2 | 2.2 | 447.1 | 4.0 |
| 1175 | 5000.00 | 1900.00 | 439.0 | 441.1 | 2.2 | 443.4 | 2.3 |
| 1176 | 5000.00 | 1950.00 | 439.0 | 441.0 | 2.0 | 444.0 | 3.0 |
| 1177 | 5000.00 | 2000.00 | 438.9 | 441.0 | 2.1 | 443.3 | 2.3 |
| 1178 | 5000.00 | 2050.00 | 449.6 | 451.8 | 2.2 | 455.3 | 3.4 |
| 1179 | 4950.00 | 1500.00 | 451.3 | 453.6 | 2.3 | 455.9 | 2.3 |
| 1180 | 4950.00 | 1550.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.1 |
| 1181 | 4950.00 | 1600.00 | 439.0 | 441.1 | 2.1 | 443.1 | 2.0 |
| 1182 | 4950.00 | 1650.00 | 438.9 | 441.1 | 2.2 | 444.0 | 2.8 |
| 1183 | 4950.00 | 1700.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1184 | 4950.00 | 1750.00 | 448.9 | 451.1 | 2.2 | 455.1 | 3.9 |
| 1185 | 4950.00 | 1800.00 | 461.9 | 464.0 | 2.1 | 464.1 | 0.1 |
| 1186 | 4950.00 | 1850.00 | 450.1 | 452.2 | 2.1 | 455.5 | 3.3 |
| 1187 | 4950.00 | 1900.00 | 439.0 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1188 | 4950.00 | 1950.00 | 438.9 | 441.1 | 2.1 | 444.2 | 3.1 |
| 1189 | 4950.00 | 2000.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1190 | 4950.00 | 2050.00 | 446.5 | 448.7 | 2.2 | 452.1 | 3.4 |
| 1191 | 5300.00 | 1488.75 | 439.0 | 441.1 | 2.2 | 445.0 | 3.9 |
| 1192 | 4900.00 | 1550.00 | 446.1 | 448.5 | 2.5 | 450.9 | 2.4 |
| 1193 | 4900.00 | 1600.00 | 438.9 | 441.2 | 2.2 | 443.2 | 2.0 |
| 1194 | 4900.00 | 1650.00 | 439.0 | 441.2 | 2.2 | 443.4 | 2.2 |
| 1195 | 4900.00 | 1700.00 | 438.9 | 441.1 | 2.2 | 443.1 | 2.0 |
| 1196 | 4900.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 446.4 | 4.3 |
| 1197 | 4900.00 | 1800.00 | 453.7 | 455.9 | 2.2 | 459.5 | 3.5 |
| 1198 | 4900.00 | 1850.00 | 459.2 | 461.3 | 2.1 | 463.9 | 2.5 |
| 1199 | 4900.00 | 1900.00 | 445.3 | 447.5 | 2.2 | 451.0 | 3.6 |
| 1200 | 4900.00 | 1950.00 | 438.9 | 441.0 | 2.1 | 443.5 | 2.5 |
| 1201 | 4900.00 | 2000.00 | 439.0 | 441.2 | 2.2 | 443.8 | 2.6 |
| 1202 | 4900.00 | 2050.00 | 446.5 | 448.6 | 2.1 | 452.0 | 3.4 |
| 1203 | 4850.00 | 1550.00 | 450.7 | 453.1 | 2.3 | 455.5 | 2.4 |
| 1204 | 4850.00 | 1600.00 | 439.0 | 441.2 | 2.2 | 443.4 | 2.1 |
| 1205 | 4850.00 | 1650.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1206 | 4850.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 443.9 | 2.8 |
| 1207 | 4850.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 443.4 | 2.3 |
| 1208 | 4850.00 | 1800.00 | 444.6 | 446.9 | 2.3 | 450.8 | 4.0 |
| 1209 | 4850.00 | 1850.00 | 458.6 | 460.8 | 2.3 | 463.9 | 3.1 |
| 1210 | 4850.00 | 1900.00 | 454.5 | 456.6 | 2.3 | 459.6 | 3.0 |
| 1211 | 4850.00 | 1950.00 | 440.4 | 442.7 | 2.3 | 446.4 | 3.7 |
| 1212 | 4850.00 | 2000.00 | 439.0 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1213 | 4850.00 | 2050.00 | 449.5 | 451.6 | 2.2 | 454.3 | 2.7 |
| 1214 | 4800.00 | 1550.00 | 448.3 | 450.5 | 2.2 | 453.3 | 2.8 |
| 1215 | 4800.00 | 1600.00 | 438.9 | 441.2 | 2.3 | 443.3 | 2.1 |
| 1216 | 4800.00 | 1650.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1217 | 4800.00 | 1700.00 | 438.9 | 441.2 | 2.3 | 443.9 | 2.7 |
| 1218 | 4800.00 | 1750.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.1 |
| 1219 | 4800.00 | 1800.00 | 438.9 | 441.2 | 2.3 | 443.3 | 2.1 |
| 1220 | 4800.00 | 1850.00 | 449.4 | 451.6 | 2.2 | 455.3 | 3.7 |
| 1221 | 4800.00 | 1900.00 | 461.9 | 464.1 | 2.2 | 464.1 | 0.0 |
| 1222 | 4800.00 | 1950.00 | 449.4 | 451.8 | 2.3 | 454.7 | 2.9 |
| 1223 | 4800.00 | 2000.00 | 439.9 | 442.0 | 2.1 | 446.0 | 4.0 |
| 1224 | 4800.00 | 2050.00 | 455.1 | 457.3 | 2.2 | 459.5 | 2.3 |
| 1225 | 4750.00 | 1500.00 | 456.8 | 458.9 | 2.1 | 461.0 | 2.0 |
| 1226 | 4750.00 | 1550.00 | 441.6 | 443.9 | 2.2 | 446.8 | 2.9 |
| 1227 | 4750.00 | 1600.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1228 | 4750.00 | 1650.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1229 | 4750.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 443.9 | 2.6 |
| 1230 | 4750.00 | 1750.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1231 | 4750.00 | 1800.00 | 438.9 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1232 | 4750.00 | 1850.00 | 440.4 | 442.5 | 2.1 | 446.7 | 4.1 |
| 1233 | 4750.00 | 1900.00 | 454.3 | 456.5 | 2.2 | 459.7 | 3.1 |
| 1234 | 4750.00 | 1950.00 | 458.6 | 460.9 | 2.2 | 463.5 | 2.6 |
| 1235 | 4750.00 | 2000.00 | 447.6 | 449.8 | 2.2 | 455.2 | 5.4 |
| 1236 | 4700.00 | 1500.00 | 450.1 | 452.2 | 2.1 | 454.8 | 2.6 |
| 1237 | 4700.00 | 1550.00 | 439.0 | 441.2 | 2.3 | 443.3 | 2.1 |
| 1238 | 4700.00 | 1600.00 | 438.9 | 441.2 | 2.3 | 443.3 | 2.1 |
| 1239 | 4700.00 | 1650.00 | 438.9 | 441.2 | 2.3 | 443.4 | 2.2 |
| 1240 | 4700.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 444.1 | 2.9 |
| 1241 | 4700.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1242 | 4700.00 | 1800.00 | 439.0 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1243 | 4700.00 | 1850.00 | 439.0 | 441.1 | 2.1 | 443.5 | 2.4 |
| 1244 | 4700.00 | 1900.00 | 445.2 | 447.5 | 2.3 | 451.2 | 3.7 |
| 1245 | 4700.00 | 1950.00 | 459.1 | 461.4 | 2.3 | 463.9 | 2.6 |

| POINT No. | NORTHING | EASTING | CERT SG | CERT CLAY | CLAY THICK | CERT COVER | CERT THICK |
|---|---|---|---|---|---|---|---|
| 1246 | 4700.00 | 2000.00 | 457.4 | 459.7 | 2.3 | 463.3 | 3.6 |
| 1247 | 4650.00 | 1450.00 | 458.5 | 460.7 | 2.3 | 462.8 | 2.0 |
| 1248 | 4650.00 | 1500.00 | 443.3 | 445.5 | 2.2 | 448.4 | 2.9 |
| 1249 | 4650.00 | 1550.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.2 |
| 1250 | 4650.00 | 1600.00 | 439.0 | 441.1 | 2.2 | 443.1 | 2.0 |
| 1251 | 4650.00 | 1650.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1252 | 4650.00 | 1700.00 | 438.9 | 441.1 | 2.2 | 443.8 | 2.7 |
| 1253 | 4650.00 | 1750.00 | 439.0 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1254 | 4650.00 | 1800.00 | 439.0 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1255 | 4650.00 | 1850.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.1 |
| 1256 | 4650.00 | 1900.00 | 438.9 | 441.1 | 2.2 | 443.6 | 2.4 |
| 1257 | 4650.00 | 1950.00 | 450.0 | 452.2 | 2.2 | 455.9 | 3.7 |
| 1258 | 4600.00 | 1450.00 | 451.7 | 453.9 | 2.2 | 456.0 | 2.1 |
| 1259 | 4600.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 444.9 | 3.7 |
| 1260 | 4600.00 | 1550.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1261 | 4600.00 | 1600.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.2 |
| 1262 | 4600.00 | 1650.00 | 438.9 | 441.0 | 2.1 | 443.1 | 2.1 |
| 1263 | 4600.00 | 1700.00 | 439.0 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1264 | 4600.00 | 1750.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.0 |
| 1265 | 4600.00 | 1800.00 | 439.0 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1266 | 4600.00 | 1850.00 | 439.0 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1267 | 4600.00 | 1900.00 | 439.0 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1268 | 4600.00 | 1950.00 | 451.6 | 453.8 | 2.2 | 456.2 | 2.4 |
| 1269 | 4550.00 | 1400.00 | 460.0 | 462.2 | 2.3 | 464.1 | 1.9 |
| 1270 | 4550.00 | 1450.00 | 446.1 | 448.4 | 2.3 | 451.5 | 3.1 |
| 1271 | 4550.00 | 1500.00 | 438.9 | 441.2 | 2.3 | 443.5 | 2.2 |
| 1272 | 4550.00 | 1550.00 | 438.9 | 441.1 | 2.1 | 443.1 | 2.1 |
| 1273 | 4550.00 | 1600.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.0 |
| 1274 | 4550.00 | 1650.00 | 439.0 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1275 | 4550.00 | 1700.00 | 439.0 | 441.2 | 2.2 | 443.2 | 2.0 |
| 1276 | 4550.00 | 1750.00 | 438.9 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1277 | 4550.00 | 1800.00 | 439.0 | 441.1 | 2.1 | 443.4 | 2.3 |
| 1278 | 4550.00 | 1850.00 | 439.0 | 441.1 | 2.1 | 443.6 | 2.4 |
| 1279 | 4550.00 | 1899.14 | 442.9 | 445.3 | 2.3 | 448.5 | 3.3 |
| 1280 | 4550.00 | 1950.00 | 458.4 | 460.5 | 2.2 | 462.6 | 2.1 |
| 1281 | 4500.00 | 1400.00 | 453.4 | 455.7 | 2.3 | 458.6 | 2.9 |
| 1282 | 4500.00 | 1450.32 | 443.0 | 445.4 | 2.4 | 448.3 | 2.9 |
| 1283 | 4500.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 443.5 | 2.3 |
| 1284 | 4500.00 | 1550.00 | 439.0 | 441.1 | 2.1 | 443.3 | 2.2 |
| 1285 | 4500.00 | 1600.00 | 439.0 | 441.1 | 2.1 | 444.5 | 3.4 |
| 1286 | 4500.00 | 1650.00 | 438.9 | 441.1 | 2.2 | 443.8 | 2.7 |
| 1287 | 4500.00 | 1700.00 | 438.9 | 441.1 | 2.1 | 443.2 | 2.1 |
| 1288 | 4500.00 | 1750.00 | 438.9 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1289 | 4500.00 | 1800.00 | 438.9 | 441.1 | 2.2 | 443.3 | 2.1 |
| 1290 | 4500.00 | 1850.00 | 439.0 | 441.1 | 2.1 | 443.1 | 2.0 |
| 1291 | 4500.00 | 1900.00 | 449.9 | 452.2 | 2.2 | 455.0 | 2.8 |
| 1292 | 4450.00 | 1400.00 | 451.4 | 453.6 | 2.2 | 456.2 | 2.7 |
| 1293 | 4450.00 | 1450.00 | 438.9 | 441.1 | 2.2 | 451.6 | 10.5 |
| 1294 | 4450.00 | 1500.00 | 439.0 | 441.2 | 2.2 | 452.3 | 11.1 |
| 1295 | 4450.00 | 1550.00 | 438.9 | 441.1 | 2.2 | 450.2 | 9.0 |
| 1296 | 4450.00 | 1600.00 | 439.0 | 441.1 | 2.1 | 445.1 | 4.1 |
| 1297 | 4450.00 | 1650.00 | 438.9 | 441.2 | 2.2 | 443.3 | 2.1 |
| 1298 | 4450.00 | 1700.00 | 439.0 | 441.1 | 2.1 | 443.1 | 2.1 |
| 1299 | 4450.00 | 1750.00 | 439.0 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1300 | 4450.00 | 1800.00 | 439.0 | 441.1 | 2.1 | 443.1 | 2.0 |
| 1301 | 4450.00 | 1850.00 | 441.5 | 443.8 | 2.2 | 446.8 | 3.1 |
| 1302 | 4450.00 | 1900.00 | 456.7 | 458.9 | 2.2 | 461.2 | 2.3 |
| 1303 | 5350.00 | 1565.19 | 439.0 | 441.1 | 2.2 | 444.8 | 3.7 |
| 1304 | 4400.00 | 1400.00 | 444.6 | 446.9 | 2.2 | 461.6 | 14.8 |
| 1305 | 4400.00 | 1450.00 | 439.0 | 441.2 | 2.2 | 457.8 | 16.6 |
| 1306 | 4400.00 | 1500.00 | 439.0 | 441.1 | 2.2 | 451.7 | 10.6 |
| 1307 | 4400.00 | 1550.00 | 439.0 | 441.2 | 2.1 | 444.4 | 3.3 |
| 1308 | 4400.00 | 1600.00 | 439.0 | 441.2 | 2.2 | 443.5 | 2.3 |
| 1309 | 4400.00 | 1650.00 | 438.9 | 441.1 | 2.2 | 443.2 | 2.1 |
| 1310 | 4400.00 | 1700.00 | 439

**ATTACHMENT 2**
**AREA CAPACITY CURVES**

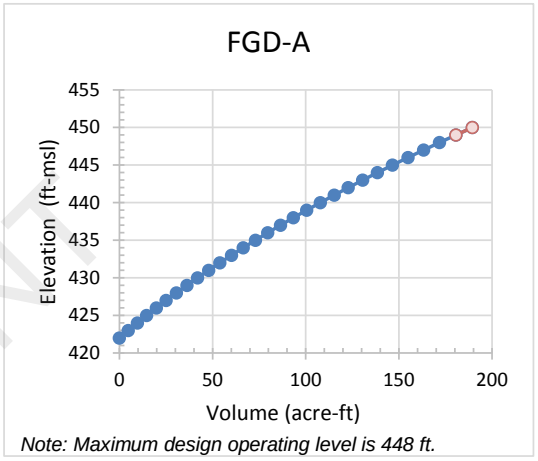
LUMINANT

Golder Associates

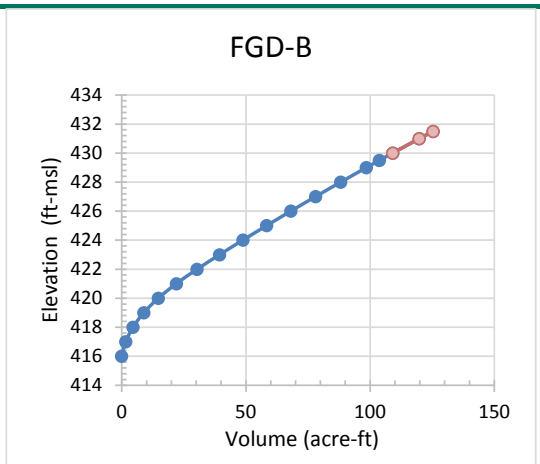
# CALCULATION

| | | | |
|---|---|---|---|
| **Date:** | July 5, 2016 | **Made by:** | AGM |
| **Project No.:** | 1648164 | **Checked by:** | VK |
| **Subject:** | FGD-A, FGD-B, FGD-C Area Capacity Curves | **Reviewed by:** | JBF |
| **Project Short Title:** | Luminant CCR Support | | |

| | Stage (ft) | Elevation (ft-msl) | Area ($ft^2$) | Incremental Volume (acre-ft) | Cumulative Volume (acre-ft) | Area Capacity Curve |
|---|---|---|---|---|---|---|
| FGD-A | 1 | 422 | 203733 | 0.0 | 0 | |
| | 2 | 423 | 209,836 | 4.7 | 5 | |
| | 3 | 424 | 215,986 | 4.9 | 10 | |
| | 4 | 425 | 222,184 | 5.0 | 15 | |
| | 5 | 426 | 228,431 | 5.2 | 20 | |
| | 6 | 427 | 234,727 | 5.3 | 25 | |
| | 7 | 428 | 241,063 | 5.5 | 31 | |
| | 8 | 429 | 247,456 | 5.6 | 36 | |
| | 9 | 430 | 253,888 | 5.8 | 42 | |
| | 10 | 431 | 260,372 | 5.9 | 48 | |
| | 11 | 432 | 266,886 | 6.1 | 54 | |
| | 12 | 433 | 273,441 | 6.2 | 60 | |
| | 13 | 434 | 280,042 | 6.4 | 66 | |
| | 14 | 435 | 286,685 | 6.5 | 73 | |
| | 15 | 436 | 293,375 | 6.7 | 80 | |
| | 16 | 437 | 300,109 | 6.8 | 86 | |
| | 17 | 438 | 306,888 | 7.0 | 93 | |
| | 18 | 439 | 313,712 | 7.1 | 101 | |
| | 19 | 440 | 320,580 | 7.3 | 108 | |
| | 20 | 441 | 327,492 | 7.4 | 115 | |
| | 21 | 442 | 334,451 | 7.6 | 123 | |
| | 22 | 443 | 341,453 | 7.8 | 131 | |
| | 23 | 444 | 348,499 | 7.9 | 139 | |
| | 24 | 445 | 355,584 | 8.1 | 147 | |
| | 25 | 446 | 362,726 | 8.2 | 155 | |
| | 26 | 447 | 369,907 | 8.4 | 163 | |
| | 27 | 448 | 377,132 | 8.6 | 172 | |
| | *28* | *449* | *384,402* | *8.7* | *181* | |
| | *29* | *450* | *391,789* | *8.9* | *190* | |
| FGD-B | 1 | 416 | 39958 | 0 | 0 | |
| | 2 | 417 | 98233 | 2 | 2 | |
| | 3 | 418 | 158638 | 3 | 5 | |
| | 4 | 419 | 220911 | 4 | 9 | |
| | 5 | 420 | 285836 | 6 | 15 | |
| | 6 | 421 | 347894 | 7 | 22 | |
| | 7 | 422 | 383271 | 8 | 30 | |
| | 8 | 423 | 403466 | 9 | 39 | |
| | 9 | 424 | 411926 | 9 | 49 | |
| | 10 | 425 | 420443 | 10 | 58 | |
| | 11 | 426 | 429015 | 10 | 68 | |
| | 12 | 427 | 437649 | 10 | 78 | |
| | 13 | 428 | 446337 | 10 | 88 | |
| | 14 | 429 | 455083 | 10 | 99 | |
| | 14.5 | 429.5 | 459629 | 5 | 104 | |
| | *15* | *430* | *463,885* | *5.3* | *109* | |
| | *16* | *431* | *472,743* | *10.8* | *120* | |
| | *16.5* | *431.5* | *486,669* | *5.5* | *125* | |




*Note: Maximum design operating level is 448 ft.*




*Note: Maximum design operating level is 429.5 ft.*

LUMINANT

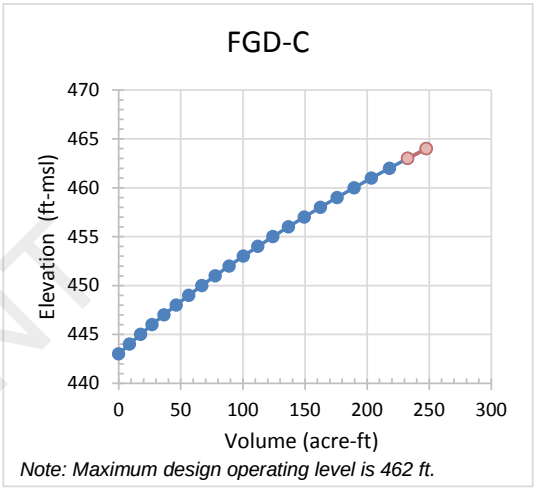
Golder Associates

# CALCULATION

| | | | |
|---|---|---|---|
| **Date:** | July 5, 2016 | **Made by:** | AGM |
| **Project No.:** | 1648164 | **Checked by:** | VK |
| **Subject:** | FGD-A, FGD-B, FGD-C Area Capacity Curves | **Reviewed by:** | JBF |
| **Project Short Title:** | Luminant CCR Support | | |

| | Stage (ft) | Elevation (ft-msl) | Area ($ft^2$) | Incremental Volume (acre-ft) | Cumulative Volume (acre-ft) |
|---|---|---|---|---|---|
| FGD-C | 1 | 443 | 369,540 | 0 | 0 |
| | 2 | 444 | 382,825 | 9 | 9 |
| | 3 | 445 | 396,177 | 9 | 18 |
| | 4 | 446 | 409,600 | 9 | 27 |
| | 5 | 447 | 423,093 | 10 | 36 |
| | 6 | 448 | 436,657 | 10 | 46 |
| | 7 | 449 | 450,291 | 10 | 56 |
| | 8 | 450 | 463,995 | 10 | 67 |
| | 9 | 451 | 477,769 | 11 | 78 |
| | 10 | 452 | 491,614 | 11 | 89 |
| | 11 | 453 | 505,529 | 11 | 100 |
| | 12 | 454 | 519,514 | 12 | 112 |
| | 13 | 455 | 533,570 | 12 | 124 |
| | 14 | 456 | 547,696 | 12 | 137 |
| | 15 | 457 | 561,892 | 13 | 149 |
| | 16 | 458 | 576,151 | 13 | 162 |
| | 17 | 459 | 590,467 | 13 | 176 |
| | 18 | 460 | 604,840 | 14 | 189 |
| | 19 | 461 | 619,269 | 14 | 204 |
| | 20 | 462 | 633,755 | 14 | 218 |
| | *21* | *463* | *648297* | *15* | *233* |
| | *22* | *464* | *662896* | *15* | *248* |

**Area Capacity Curve**




*Note: Maximum design operating level is 462 ft.*

LUMINANT

10/10/16

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

REPORT

# HISTORY OF CONSTRUCTION ADDENDUM NO. 1

*Oak Grove Steam Electric Station - FGD Ponds*
*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

Submitted by:

**WSP GOLDER**

1601 S MoPac Expressway
Suite 325D
Austin, Texas, USA 78746
+1 737 703 3900

31404097.007

November 2022

# PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by WSP Golder under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that Addendum No.1 to the History of Construction Report for the FGD Ponds at the Oak Grove Steam Electric Station has been prepared in accordance with the requirements of 40 C.F.R. §257.73(c).

Patrick J. Behling, P.E.
Principal Engineer
WSP Golder
Texas Firm Registration No. 22771

# Table of Contents

**DOCUMENT REVISION RECORD** ..... ii

**1.0 INTRODUCTION** ..... 1

**2.0 FGD POND WATERSHED AREAS** ..... 2

**3.0 RETROFIT OF FGD-A LINER SYSTEM** ..... 3

**4.0 REFERENCES** ..... 4

**FIGURES**

Figure 1 Site Location Map
Figure 2 Simplified Flow Diagram

**APPENDICES**

Appendix A FGD-A Liner Retrofit – Engineering Drawings
Appendix B FGD-A Liner Retrofit – As-Built Surveys

# DOCUMENT REVISION RECORD

| Issue No. | Date | Details of Revisions |
|---|---|---|
| **Revision 0** | October 2016 | Original Document |
| **Addendum 1** | November 2022 | Added FGD Pond watershed areas and retrofitted FGD-A liner system information |

# 1.0 INTRODUCTION

On behalf of Oak Grove Management Company LLC (Luminant), WSP Golder (Golder) has prepared this Addendum No. 1 to the History of Construction Report (HCR) for FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the "FGD Ponds") located at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas (hereafter, the "Site"). The FGD Ponds are regulated as Existing CCR Impoundments under 40 C.F.R. § 257, Subpart D (the "CCR Rule").

The original HCR for the Site was prepared in October 2016 in accordance with 40 C.F.R. §257.73(c) and placed in the OGSES operating record in accordance with 40 C.F.R. §257.105(h)(10) (Golder, 2016a). This Addendum No. 1 updates the HCR to reflect the following:

- Documentation of the watershed areas for the FGD Ponds in accordance with 40 C.F.R. § 257.73(c)(1)(iv); and
- Retrofit of the FGD-A liner system to comply with the requirements of 40 C.F.R. § 257.71(a)(1)(ii) completed in accordance 40 C.F.R. § 257.102(k).

## 2.0 FGD POND WATERSHED AREAS

The FGD Ponds are located approximately 2,500 feet northwest of the OGSES power generation units (see Figure 1). The impoundments are constructed above grade and are surrounded by engineered earthen dikes that extend to approximately 25 feet above surrounding ground level. The approximate surface area of each FGD Pond is as follows:

- FGD-A covers an area of approximately 9.4 acres;
- FGD-B covers an area of approximately 11.3 acres; and
- FGD-C covers an area of approximately 17 acres.

Figure 2 shows a simplified process flow schematic for the FGD Ponds. The FGD Ponds act as surge basins for the following water streams associated with the OGSES plant water system:

- wastewater from the FGD wet scrubber system blowdown,
- low volume wastewater,
- bottom ash contact water,
- storm water runoff from approximately 41 acres of the power plant, and
- direct precipitation on the ponds.

Water is pumped into either FGD-A or FGD-C under controlled conditions and a gravity overflow is used to transfer water from FGD-A to FGD-B. Water is pumped out of FGD-A, FGD-B and/or FGD-C and recycled as makeup water for the plant FGD scrubber system and related purposes. The are no spillways or other uncontrolled gravity flow releases from the FGD Ponds.

40 C.F.R. § 257.73(c)(1)(iv) requires that the watershed for each CCR unit be documented in the HCR. As described above, the FGD Ponds are constructed above grade; consequently, the “watershed” for each pond consists of direct precipitation on the pond surface itself. The watershed area of each FGD Pond is therefore as follows:

| Impoundment | Watershed Area |
|---|---|
| FGD-A | Approximately 9.4 acres |
| FGD-B | Approximately 11.3 acres |
| FGD-C | Approximately 17 acres |

# 3.0 RETROFIT OF FGD-A LINER SYSTEM

FGD-A was originally constructed with a 3-foot thick compacted clay liner exhibiting a hydraulic conductivity of no more than 1 x$10^{-7}$ cm/sec (Golder 2016b). FGD-A was formerly considered a lined CCR surface impoundment in accordance with 40 C.F.R. §257.71(a)(1)(i) of the CCR Rule; however, the impoundment was reclassified as an unlined impoundment based on the August 2018 DC Circuit Court Ruling. Luminant decided to retrofit the FGD-A liner system to satisfy the requirements of 40 C.F.R. §257.71(a)(1)(ii) and maintain compliance with the CCR Rule.

From September 2021 to July 2022, the liner system in FGD-A was retrofitted in accordance with 40 C.F.R. § 257.102(k). Liner Retrofit Plans for FGD-A were prepared in March 2020 and July 2021 in accordance with § 40 C.F.R. 257.102(k)(2) and placed in the OGSES operating record in accordance with 40 C.F.R. §257.105(h)(10) (Golder, 2020; Golder, 2021).

The FGD-A retrofit measures consisted of the following.

- Pumping of free water from FGD-A to FGD-B and FGD-C;
- Excavation of all CCR from FGD-A and placement in OGSES Ash Landfill 1;
- Excavation of approximately the upper 1 foot of the existing 3-foot thick clay liner and placement in OGSES Ash Landfill 1;
- Construction of a composite liner system meeting the requirements of 40 C.F.R. § 257.71(a)(1)(ii); and
- Incorporation of design improvements to facilitate sediment control and access for future CCR removal associated with operations.

The retrofitted liner system in FGD-A consists of the following (from bottom to top):

- Minimum 2-foot thick layer of compacted clay exhibiting a hydraulic conductivity of no more than 1 x$10^{-7}$ cm/sec (previous clay liner remaining after pond excavation);
- A geosynthetic clay liner (GCL) placed in areas of the pond where a minimum of 2-feet of compacted clay was not remaining after pond excavation was completed;
- A 60-mil HDPE geomembrane liner;
- A 1.5-foot thick layer of protective soil; and
- A concrete revetment mat placed over the upper portion of the pond side slopes.

Engineering drawings for the FGD-A Liner Retrofit and as-built survey drawings are reproduced in Appendix A and Appendix B of this Addendum.

The retrofitted liner system in FGD-A is an alternative composite liner meeting the requirements of 40 C.F.R. § 257.71(a)(1)(ii).

# 4.0 REFERENCES

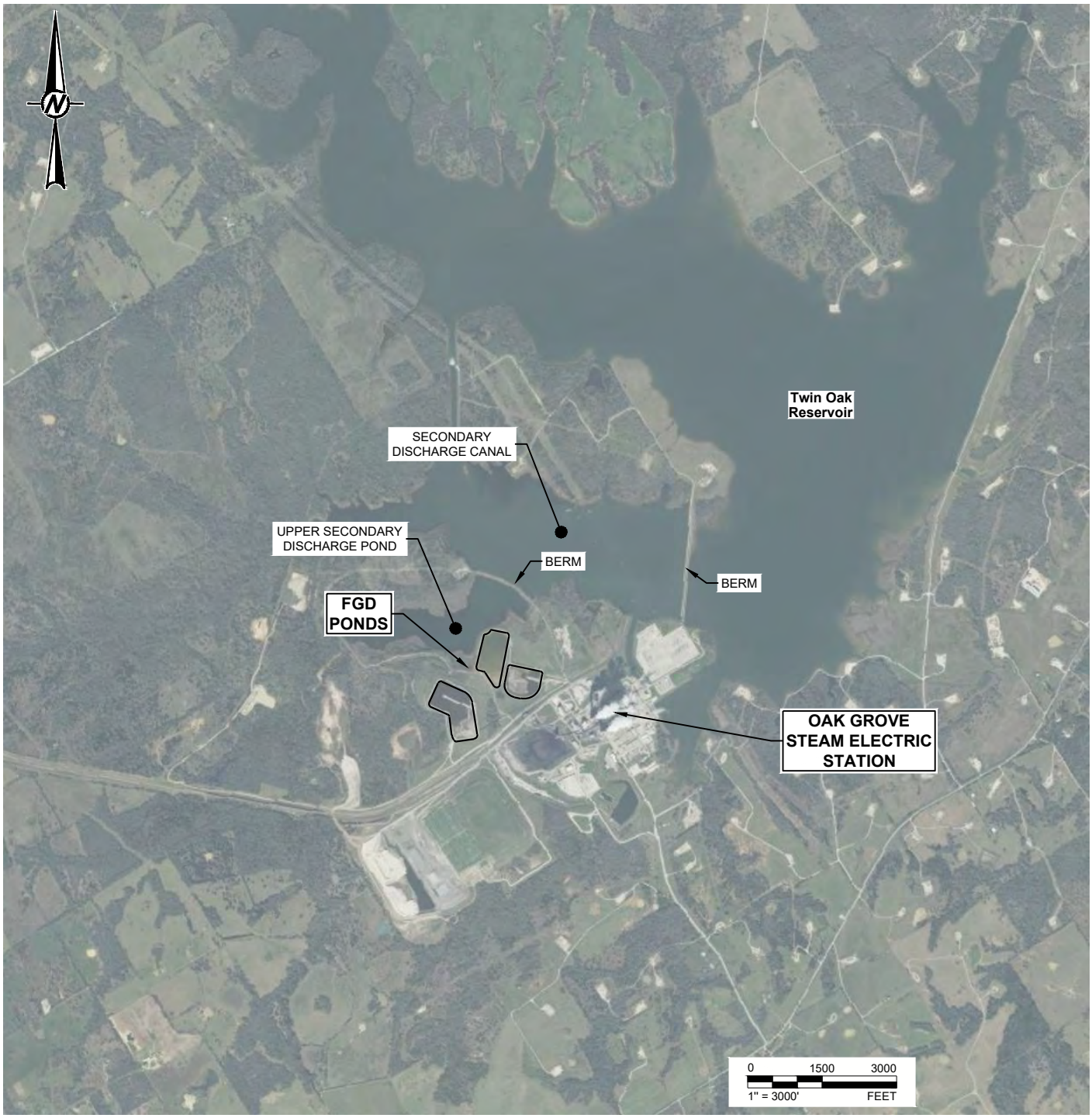
Golder, 2016a. History of Construction – CCR Surface Impoundments, Oak Grove Steam Electric Station. October.

Golder, 2016b. Certification of Lined Construction – CCR Surface Impoundments, Oak Grove Steam Electric Station. October.

Golder, 2020. Retrofit Plan for FGD-A, Oak Grove Steam Electric Station. March.

Golder, 2021. Retrofit Plan for FGD-A, Revision 1, Oak Grove Steam Electric Station. July.

# FIGURES




CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD PONDS
ADDENDUM NO.1 - HISTORY OF CONSTRUCTION

TITLE
**SITE LOCATION MAP**

CONSULTANT
WSP GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2022-11-01 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | PJB |
| APPROVED | PJB |

PROJECT NO. 31404097.007 | REV. 0 | FIGURE 1

**REFERENCE(S)**
BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 12/2/18.



Last Edited By: usad701305 Date: 2022-11-01 Time:1:46:21 PM | Printed By: USAD701305 Date: 2022-11-01 Time:1:55:45 PM
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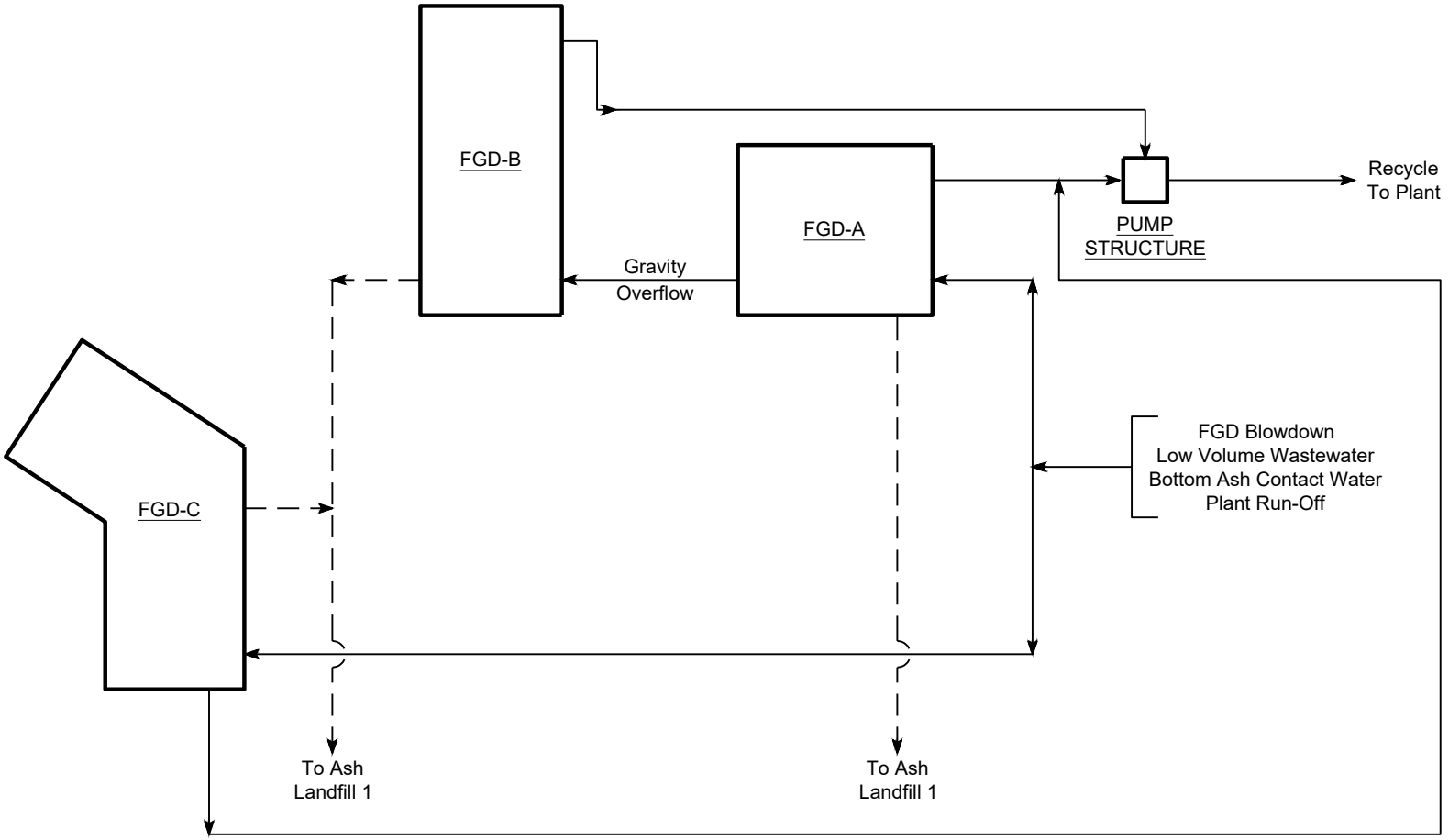


**LEGEND**

WATER

SOLIDS

CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

CONSULTANT
WSP GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2022-11-01 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | PJB |
| APPROVED | PJB |

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD PONDS
ADDENDUM NO. 1 - HISTORY OF CONSTRUCTION

TITLE
**SIMPLIFIED CCR SURFACE IMPOUNDMENT FLOW DIAGRAM**

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 31404097.007 | 0 | 2 |



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**APPENDIX A**

# FGD-A Liner Retrofit Engineering Drawings

# OAK GROVE STEAM ELECTRIC STATION
# FGD-A POND RETROFIT
# ROBERTSON COUNTY, TEXAS

| DRAWING LIST | | | |
|---|---|---|---|
| LUMINANT DRAWING NO. | SHEET NO. | SHEET TITLE | REVISION |
| | 1 | TITLE SHEET | 0 |
| | 2 | GENERAL NOTES | 0 |
| | 3 | SITE OVERVIEW | 0 |
| | 4 | EXISTING PIPING CONDITIONS | 0 |
| | 5 | AS-CONSTRUCTED CLAY PLAN | 0 |
| | 6 | TOP OF EXCAVATED CLAY GRADING PLAN | 0 |
| | 7 | TOP OF RECOMPACTED CLAY GRADING PLAN | 0 |
| | 8 | TOP OF PROTECTIVE COVER GRADING PLAN | 0 |
| | 9 | PROFILES | 0 |
| | 10 | GRADING DETAILS | 0 |
| | 11 | FGD-A POND TO PUMPS INTAKE | 0 |
| | 12 | FGD-A POND TO FGD-B POND CROSSOVER PIPELINE PLAN AND PROFILE | 0 |
| | 13 | FGD-A POND TO FGD-B POND CROSSOVER PIPELINE DETAILS | 0 |
| | 14 | FGD-A POND INLET DETAILS | 0 |
| | 15 | FGD-B POND TO PUMPS SUCTION PIPELINE PLAN AND PROFILE | 0 |
| | 16 | FGD-B POND TO PUMPS SUCTION PIPELINE INTAKE | 0 |
| | 17 | PUMP STRUCTURE PROPOSED PIPING | 0 |
| | 18 | PIPING DETAILS - I OF II | 0 |
| | 19 | PIPING DETAILS - II OF II | 0 |
| | 20 | AS-CONSTRUCTED CLAY POINT TABLE | 0 |
| | 21 | TOP OF EXCAVATED CLAY POINT TABLE | 0 |
| | 22 | TOP OF RECOMPACTED CLAY POINT TABLE | 0 |

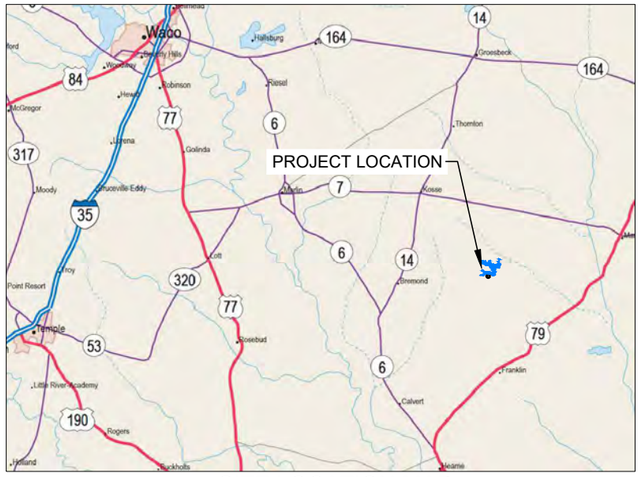
PREPARED FOR:

Luminant

PREPARED BY:

GOLDER ASSOCIATES INC.
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS USA 77032

GENERAL LOCATION MAP




SITE LOCATION MAP

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TITLE SHEET**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 1 of 22 | 1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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## GENERAL NOTES

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK. LUMINANT PROCEDURES SHALL BE USED FOR ALL EXCAVATIONS, HOT WORK, AND LOCK-OUT/TAG-OUT.
2. FOR THIS WORK, LUMINANT IS THE OWNER AND GOLDER ASSOCIATES INC. IS THE ENGINEER. THE COMPANY BIDDING THE WORK IS THE CONTRACTOR.
3. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES. ALL EXISTING UNDERGROUND UTILITIES SHOULD BE FIELD VERIFIED AND LOCATED BY POTHOLING PER LUMINANT REQUIREMENTS.
4. WORKERS SHALL BE AWARE OF ACTIVE EQUIPMENT IN THE VICINITY OF THE WORK AREA AND SHALL TAKE PRECAUTIONS NOT TO DISTURB OPERATING EQUIPMENT.
5. CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS PRIOR TO STARTING WORK, AND SHALL NOTIFY THE OWNER'S REPRESENTATIVE IF CONFLICTS EXIST ON THE DRAWINGS.
6. LOCATIONS AND DIMENSIONS OF EXISTING UTILITIES AND STRUCTURES ARE BASED ON DRAWINGS AND PARTIAL GROUND SURVEY PROVIDED BY LUMINANT AND SHOULD BE FIELD-VERIFIED.
7. CONTRACTOR SHALL PERFORM HOUSEKEEPING DUTIES ON A DAILY BASIS TO KEEP WORK AREAS CLEAN. HOUSEKEEPING SHALL BE PERFORMED AT THE COMPLETION OF THE WORK TO THE SATISFACTION OF THE OWNER.
8. CONTRACTOR SHALL STAGE EQUIPMENT AND MATERIALS ONLY IN AREAS APPROVED BY THE OWNER.
9. CONTRACTOR IS RESPONSIBLE FOR SURVEY CONTROL.
10. SPECIAL TOOLS AND OTHER REQUIRED INSTALLATION EQUIPMENT SUCH AS SLINGS, LEVER TOOLS, RATCHET JACKS, PULLING CABLES, ETC., FOR MAKEUP OF JOINTS SHALL BE FURNISHED BY THE CONTRACTOR.
11. TEST PLUGS, HYDROTEST PUMPS, GAUGES, RELIEF VALVES, AND ALL TESTING EQUIPMENT SHALL BE FURNISHED BY THE CONTRACTOR.
12. PIPING CROSSING UNDER ROADWAYS IS DESIGNED FOR AASHTO HS-20 LOADINGS. ALL PIPES SHALL HAVE A MINIMUM COVER DEPTH OF 2'-0" AS MEASURED FROM THE TOP OF THE PIPE UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
13. WHERE VERTICAL OR HORIZONTAL ALIGNMENT REQUIRES DEFLECTION FROM STRAIGHT LINE OR GRADE, SUCH DEFLECTION SHALL NOT EXCEED MAXIMUM DEFLECTION RECOMMEND BY THE PIPE MANUFACTURER. IF ALIGNMENT REQUIRES DEFLECTION EXCEEDING RECOMMENDED LIMITS, FURNISH SPECIAL BENDS TO PROVIDE ANGULAR DEFLECTIONS WITHIN THE ALLOWABLE LIMITS.
14. PIPE SHALL BE CUT NEATLY AND WITHOUT DAMAGE TO THE PIPE. UNLESS OTHERWISE RECOMMENDED BY THE PIPE MANUFACTURER, CUT PIPE WITH MECHANICAL CUTTER ONLY. CUT PLASTIC PIPE SQUARE, USING HAND SAW, AND REMOVE ALL BURRS.
15. APPROPRIATE PROVISIONS SHALL BE MADE TO PREVENT PIPE FLOTATION AND PREVENT FOREIGN MATERIAL FROM ENTERING PIPE OPENINGS. TEMPORARY BLINDS SHALL BE PLACED ON ALL PIPE ENDS AND STUB-UPS DURING INSTALLATION. BLINDS ARE NOT TO BE REMOVED UNTIL PERMANENT CONNECTIONS ARE MADE.
16. VALVE BODIES USED ON THE PROPOSED DRAIN LINES FROM FGD-A POND AND FGD-B POND SHALL BE SET ON A CONCRETE SUPPORT FOOTING AS APPROVED BY THE OWNER'S REPRESENTATIVE.
17. NEW WAFER KNIFE GATE VALVE WITHIN THE PUMP STRUCTURE WILL BE SUPPORTED BY EXISTING ADJACENT PIPING SUPPORTS.
18. IF DISTURBED DURING CONSTRUCTION, THE EXISTING GATE VALVE ON THE FGD-A TO FGD-B CROSSOVER PIPELINE SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL APPROVED BY THE OWNER'S REPRESENTATIVE AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE VALVE BODY. THE MATERIAL DIRECTLY ABOVE THE PIPE IN THE EMBEDMENT ZONE SHALL BE ONLY LIGHTLY COMPACTED TO AVOID DISTORTING THE PIPE.
19. CONFIGURATIONS AND DIMENSIONS SHOWN ARE BASED ON TYPICAL DIMENSIONS FOR FITTINGS AND VALVES. ACTUAL DIMENSIONS MAY VARY BY MANUFACTURER AND WILL REQUIRE FIELD ADJUSTMENTS.

## UNDERGROUND PIPE INSTALLATION

1. CONTRACTOR SHALL SUBMIT A TRENCHING SAFETY PLAN FOR REVIEW AND APPROVAL BY THE OWNER BEFORE ANY TRENCHING ACTIVITIES CAN BEGIN. THE PLAN SHALL INDICATE THE SYSTEMS, METHODS, AND TECHNIQUES TO BE USED TO ENSURE THAT ALL TRENCH SIDEWALLS WILL BE STABLE AND/OR GUARDED FOR THE PROTECTION OF PERSONNEL AND FACILITIES IN THE VICINITY OF THE WORK.
2. AS REQUIRED, CONTRACTOR SHALL PREPARE AND IMPLEMENT AN OWNER APPROVED PLAN TO CONTROL GROUNDWATER IN ALL DEVELOPED EXCAVATIONS (INCLUDING GROUNDWATER AND SURFACE WATER).
3. UNDERGROUND PIPE SHALL BE LOWERED INTO TRENCH BY MEANS OF DERRICK, ROPES, BELT SLINGS, OR OTHER EQUIPMENT RECOMMENDED BY THE PIPE SUPPLIER. TAKE SPECIAL CARE IN HANDLING PREFABRICATED SECTIONS OF HDPE PIPE - THE FUSED FITTINGS MAY NOT BE CAPABLE OF CARRYING THE WEIGHT OF ADJACENT PIPING. DO NOT DUMP OR DROP ANY MATERIALS INTO THE TRENCH.
4. FOR UNDERGROUND AND ON-GRADE HDPE PIPE, REST THE FULL LENGTH OF EACH SECTION OF THE PIPE SOLIDLY ON THE PIPE BED. DO NOT LAY PIPE IN WATER, OR WHEN FOUNDATION CONDITIONS ARE UNSUITABLE FOR THE WORK.
5. UNDERGROUND PIPING SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL APPROVED BY THE OWNER'S REPRESENTATIVE AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE MATERIAL DIRECTLY ABOVE THE PIPE IN THE EMBEDMENT ZONE SHALL BE ONLY LIGHTLY COMPACTED TO AVOID DISTORTING THE PIPE.
6. EMBANKMENT FILL (MORE THAN 12 INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING TEN (10) INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY.
7. FOR ALL UNDERGROUND PIPING, MARKING TAPE ENABLING DETECTION BY METAL DETECTOR (AS INDICATED IN THE SPECIFICATIONS) SHALL BE LOCATED ABOVE THE PIPE AT A DEPTH OF 1 TO 2 FEET BELOW THE FINISHED GRADE.

## HDPE PIPE INSTALLATION

1. FUSION MACHINE FOR BUTT FUSION OF HDPE PIPING SHALL BE FURNISHED BY THE CONTRACTOR.
2. ABOVE GRADE HDPE TO BE INSTALLED WITH AN EARTHEN BERM ANCHORAGE APPROXIMATELY EVERY 400 FEET WITH THE HDPE SNAKED BETWEEN ANCHORAGE POINTS APPROXIMATELY 20 FEET OFF A STRAIGHT LINE ALIGNMENT WITH 20 FEET HORIZONTAL CLEARANCE TO ALLOW THE HDPE PIPES TO EXPAND OR CONTRACT.
3. SECTIONS OF POLYETHYLENE PIPE SHOULD BE JOINED INTO CONTINUOUS LENGTHS ON THE JOBSITE ABOVE GROUND. THE JOINING METHOD SHALL BE THE BUTT FUSION METHOD AND SHALL BE PERFORMED IN STRICT ACCORDANCE WITH THE PIPE MANUFACTURER'S RECOMMENDATIONS BY CRAFT WORKERS CERTIFIED FOR THE FUSION MACHINE AND PIPING MATERIALS BEING UTILIZED. THE BUTT FUSION JOINING WILL PRODUCE A JOINT WITH WELD STRENGTH EQUAL TO OR GREATER THAN THE TENSILE STRENGTH OF THE PIPE ITSELF. ALL FIELD WELDS SHALL BE MADE WITH FUSION EQUIPMENT EQUIPPED WITH A DATA LOGGER. TEMPERATURE, FUSION PRESSURE AND A GRAPHIC REPRESENTATION OF THE FUSION CYCLE SHALL BE PART OF THE QUALITY CONTROL RECORDS.
4. MECHANICAL JOINING OF HDPE PIPE TO OTHER MATERIALS SHALL BE ACCOMPLISHED USING AN HDPE FLANGE ADAPTER WITH A DUCTILE IRON BACK-UP RING.
5. SOCKET FUSION, HOT GAS FUSION, THREADING, SOLVENTS, AND EPOXIES WILL NOT BE USED TO JOIN HDPE PIPE.
6. PRESSURE PIPING SYSTEMS CONSTRUCTED FROM HDPE MATERIAL SHALL BE LEAKAGE TESTED USING THE METHODOLOGY OUTLINED IN ASTM F2164, AND PER THE MANUFACTURER'S RECOMMENDATIONS AND THE PROJECT SPECIFICATIONS.

## STEEL PIPE INSTALLATION

1. COATING/PAINTING SHALL BE APPLIED AND TOUCHED UP AS DIRECTED BY THE OWNER.
2. ALL NEW PIPING WITHIN THE EXISTING PUMP STRUCTURE NEAR FGD-A POND SHALL BE SUPPORTED WITH MEMBERS CONSISTENT WITH THE EXISTING PIPE SUPPORTS IN THE STRUCTURE.
3. ALL WELDING SHALL BE COMPLETED BY QUALIFIED WELDERS.
4. ALL VALVES AND STEEL PIPING SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS

## SPECIFICATIONS

1. ALL MATERIALS AND INSTALLATION TO BE IN ACCORDANCE WITH THE SPECIFICATIONS OR OWNER APPROVED ALTERNATIVE SPECIFICATIONS.
2. CLAY LINER, GEOSYNTHETIC CLAY LINER (GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED IN ACCORDANCE WITH THE LINER QUALITY CONTROL PLAN.

## MATERIALS

1. CONTRACTOR IS RESPONSIBLE FOR PROCURING ADDITIONAL NEEDED QUANTITIES TO MAKE UP FOR SHORTAGES DUE TO LOSS, FIELD REVISIONS, WASTE, ETC.
2. CONTRACTOR TO FURNISH PLASTIC MARKING TAPE FOR NON-METALLIC UNDERGROUND PIPING IN ACCORDANCE WITH THE SPECIFICATION REQUIREMENTS.
3. ALL NEW SOLID WALL HDPE PIPING AND FITTINGS SHALL BE COMPOSED OF PE4710 RESIN CONSTRUCTED TO ASTM F714, OR ALTERNATE AS APPROVED BY THE OWNER'S REPRESENTATIVE.
4. ALL HDPE PIPING, FITTINGS, AND FLANGES SHALL HAVE IRON PIPE SIZING (IPS).
5. ALL NEW PERFORATED HDPE PIPING SHALL BE ADS N-12 PIPE.
6. ALL NEW STEEL PIPING AND FITTINGS SHALL BE ERW A53 STD SCHEDULE CARBON STEEL CONFORMING TO ASME 31.1 POWER PIPING.
7. ALL FLANGES SHALL CONFORM TO ASME B16.5 CLASS 150.
8. ALL PIPE, FITTINGS, FLANGES, AND VALVES FOR FGD-A TO PUMPS SUCTION LINE, FGD-B TO PUMPS SUCTION LINE, AND FGD-A TO FGD-B CROSSOVER LINE TO BE RATED FOR A 100 PSI DESIGN PRESSURE.
9. ALL THREADED FITTINGS SHALL HAVE NATIONAL PIPE THREAD (NPT) THREADS.
10. CONCRETE SHALL CONFORM TO ACI 318 AND ACI 301 AS APPLICABLE. THE CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE UTILIZED WITHIN THE FGD-A POND AND FGD-B POND SHALL BE SULFATE RESISTANT CONCRETE.
11. PIPE BEDDING AND EMBEDMENT SHALL CONSIST OF ON-SITE OR IMPORTED EARTHEN MATERIAL CLASSIFYING UNDER ASTM D2487 AS WELL-GRADED SAND (SW OR SW-SM) OR WELL-GRADED GRAVEL (GW OR GW-GM) OR AS OTHERWISE APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE. PIPE BEDDING SHALL CONTAIN NO PARTICLES LARGER THAN ½ INCH, AND FREE FROM ROOTS, DEBRIS, OR ANY OTHER SUBSTANCE THAT WOULD HARM THE PIPE OR MIGHT IMPAIR THE PERFORMANCE OF THE MATERIALS AS BEDDING OR EMBEDMENT FOR THE PIPE. FINAL MATERIAL SELECTION SHALL BE APPROVED BY THE OWNER'S REPRESENTATIVE.
12. CRUSHED STONE FOR ROADWAY SURFACING SHALL BE APPROVED BY OWNER'S REPRESENTATIVE.
13. WASHED GRAVEL FOR DRAIN LINE EMBEDMENT IN THE FGD-A POND AND FGD-B POND SHALL BE APPROVED BY OWNER'S REPRESENTATIVE.

## REFERENCES

1. SITE LOCATION: J. HENSLEY SURVEY, ABSTRACT NO. 395174, ROBERTSON COUNTY, TEXAS.
2. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020, AND FEBRUARY 17, 2020.
3. COORDINATES ARE BASED ON OAK GROVE STEAM ELECTRIC STATION PLANT GRID SYSTEM.
4. ELEVATIONS ARE BASED ON MEAN SEA LEVEL DATUM.
5. EXISTING PLANT DRAINS PIPELINE LOCATIONS ARE TAKEN FROM A GROUND SURVEY PERFORMED BY SAM, INC. ON OCTOBER 23, 2014. EXACT LOCATIONS OF EXISTING PIPES TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
6. EXISTING PUMP STRUCTURE DETAILS FROM DRAWING A2YF00-0-CD-1-YD.00.PL-08 REVISION 3 DATED AUGUST 28, 2008.
7. EXISTING PIPING DETAILS IN VICINITY OF THE PUMP STRUCTURE FROM PIPING ISOMETRIC DRAWINGS:
   a. A2YF0-IS-5-WR.0015-01 DATED JANUARY 11, 2008
   b. A2YF0-IS-5-WR.0020-01 DATED DECEMBER 16, 2008
   c. A2YF0-IS-5-WR.0020-02 DATED DECEMBER 16, 2008
   d. A2YF0-IS-5-WR.0030-01 DATED DECEMBER 16, 2008
   e. A2YF0-IS-5-WR.0030-02 DATED DECEMBER 16, 2008
   f. A2YF0-IS-5-WR.0040-01 DATED DECEMBER 16, 2008
   g. A2YF0-IS-5-WR.0050-01 DATED DECEMBER 16, 2008
   h. A2YF0-IS-5-WR.0050-02 DATED DECEMBER 16, 2008
   i. A2YF0-IS-5-WR.0050-03 DATED DECEMBER 16, 2008
   j. A2YF0-IS-5-WR.0060-01 DATED DECEMBER 16, 2008
   k. A2YF0-IS-5-WR.0060-02 DATED FEBRUARY 14, 2008
   l. A2YF0-IS-5-WR.0060-03 DATED FEBRUARY 29, 2008
   m. A2YF0-IS-5-WR.0065-01 DATED APRIL 9, 2008

## EXISTING PIPELINE SCHEDULE

| LINE CALLOUT | SOURCE | LINE ID | EXISTING LINE |
|---|---|---|---|
| PLANT DRAIN LINE #1 | 400 SUMP WEST AREA 2 BASIN PUMP #63 | 0-PD-0400-PE01-14"-N | 14 in HDPE DR-11 |
| PLANT DRAIN LINE #2 | 100 SUMP BOILER AREA SUMP #8 | 0-PD-0100-PE01-24"-N | 24 in HDPE DR-11 |
| PLANT DRAIN LINE #3 | 200 SUMP TURBINE AREA HOLDING BASIN PUMPS #62 | 0-PD-0200-PE01-14"-N | 14 in HDPE DR-11 |
| PLANT DRAIN LINE #4 | FLY ASH BASIN | 0 DGN-001-6"-71-N | 6 in HDPE DR-17 |
| PLANT DRAIN LINE #5 | 300 SUMP FR WEST BASIN PUMPS | 0-PD-0300-PE01-14"-N | 14 in HDPE DR-11 |
| PLANT DRAIN LINE #6 | REAGENT PREPARATION AREA SUMP PUMP | 0-PD-0501-PE01-4"-N | 4 in HDPE DR-11 |
| PLANT DRAIN LINE #7 | DEWATERING AREA SUMP | 0-PD-0502-PE01-4"-N | 4 in HDPE DR-11 |
| PLANT DRAIN LINE #8 | FGD BLOWDOWN | 0-PD-0360-PE01-3"-N | 3 in HDPE DR-11 |
| PLANT DRAIN LINE #9 | COMMON DEWATERING (RECLAIM) AREA SUMP | 4"-OFC-HDPE-150 | 4 in HDPE DR-9 |
| PLANT DRAIN LINE #10 | LIGNITE SETTLING POND | 14"- | 14 in HDPE DR-11 |
| PLANT DRAIN LINE #11 | HEAVY EQUIPMENT MAINTENANCE LINE | 4"- | 4 in HDPE DR-17 |
| PLANT DRAIN LINE #12 | LANDFILL LINE | 14"- | 14 in HDPE DR-17 |

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**GENERAL NOTES**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 2 of 22 | 2 |

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**LEGEND**

- LIMIT OF REGISTERED LANDFILL
- SOIL STOCKPILE AREA

ISSUED FOR CONSTRUCTION

0 300 600
1" = 600' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

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HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
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ROBERTSON COUNTY, TEXAS

TITLE
**SITE OVERVIEW**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
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| 19129621 | | 0 | 3 of 22 | 3 |

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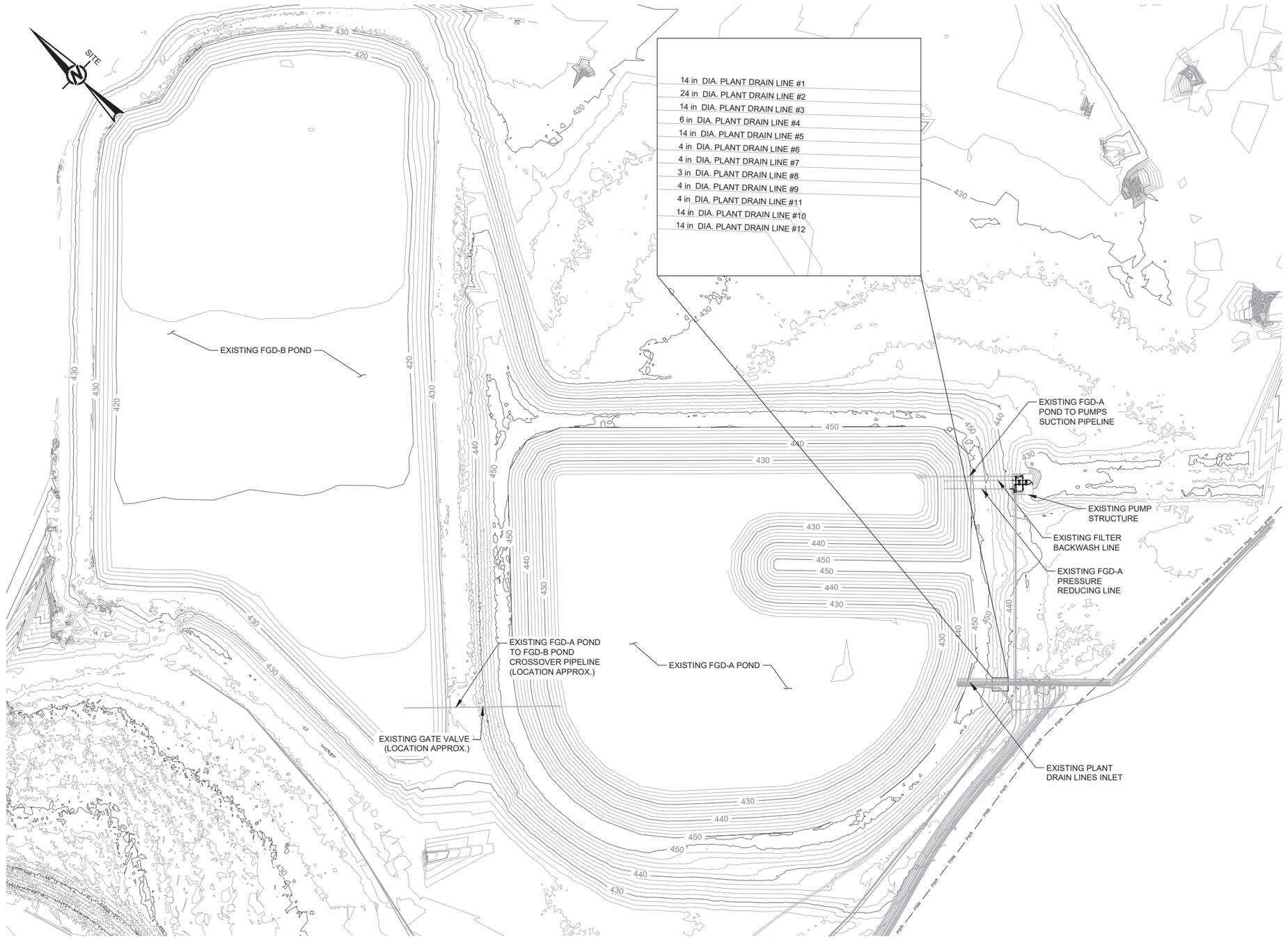


**LEGEND**

- 430 — EXISTING GRADES (REFERENCE 1 AND 2)
- PWR — PWR — EXISTING OVERHEAD POWER LINES
- EXISTING STEEL PIPING
- EXISTING HDPE PIPING

**NOTE(S)**

1. PLANT DRAINS PIPELINE ARRANGEMENT AND LABELING BASED ON DRAWING AYF00-0-PY-5-MS.00,00-01 DATED NOVEMBER 7, 2012.
2. EXISTING PLANT DRAINS PIPELINE LOCATIONS ARE TAKEN FROM A GROUND SURVEY PERFORMED BY SAM, INC. ON OCTOBER 23, 2014. EXACT LOCATIONS OF EXISTING PIPES TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

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0 80 160
1" = 80' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
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| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

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HOUSTON NORTH OFFICE
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HOUSTON, TEXAS 77032
USA
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www.golder.com

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OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**EXISTING PIPING CONDITIONS**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
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| 19129621 | | 0 | 4 of 22 | 4 |

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**LEGEND**

- AS-CONSTRUCTED TOP OF CLAY 10-FT MAJOR CONTOUR
- AS-CONSTRUCTED TOP OF CLAY 2-FT MINOR CONTOUR
- EXISTING GROUND 25-FT MAJOR CONTOUR
- EXISTING GROUND 5-FT MINOR CONTOUR

**POINT GROUPS**

- 1000 CERTIFIED TOP OF CLAY

**NOTES**

1. CERTIFIED TOP OF CLAY CONTROL POINTS CORRESPOND TO SUBGRADE CERTIFICATION POINTS SURVEYED BY SAM, INC. DURING THE CONSTRUCTION OF THE CLAY LINER IN 2008.

**REFERENCES**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 50 100
1" = 100' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
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HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

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ROBERTSON COUNTY, TEXAS

TITLE
**AS-CONSTRUCTED CLAY PLAN**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
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| 19129621 | | 0 | 5 of 22 | 5 |

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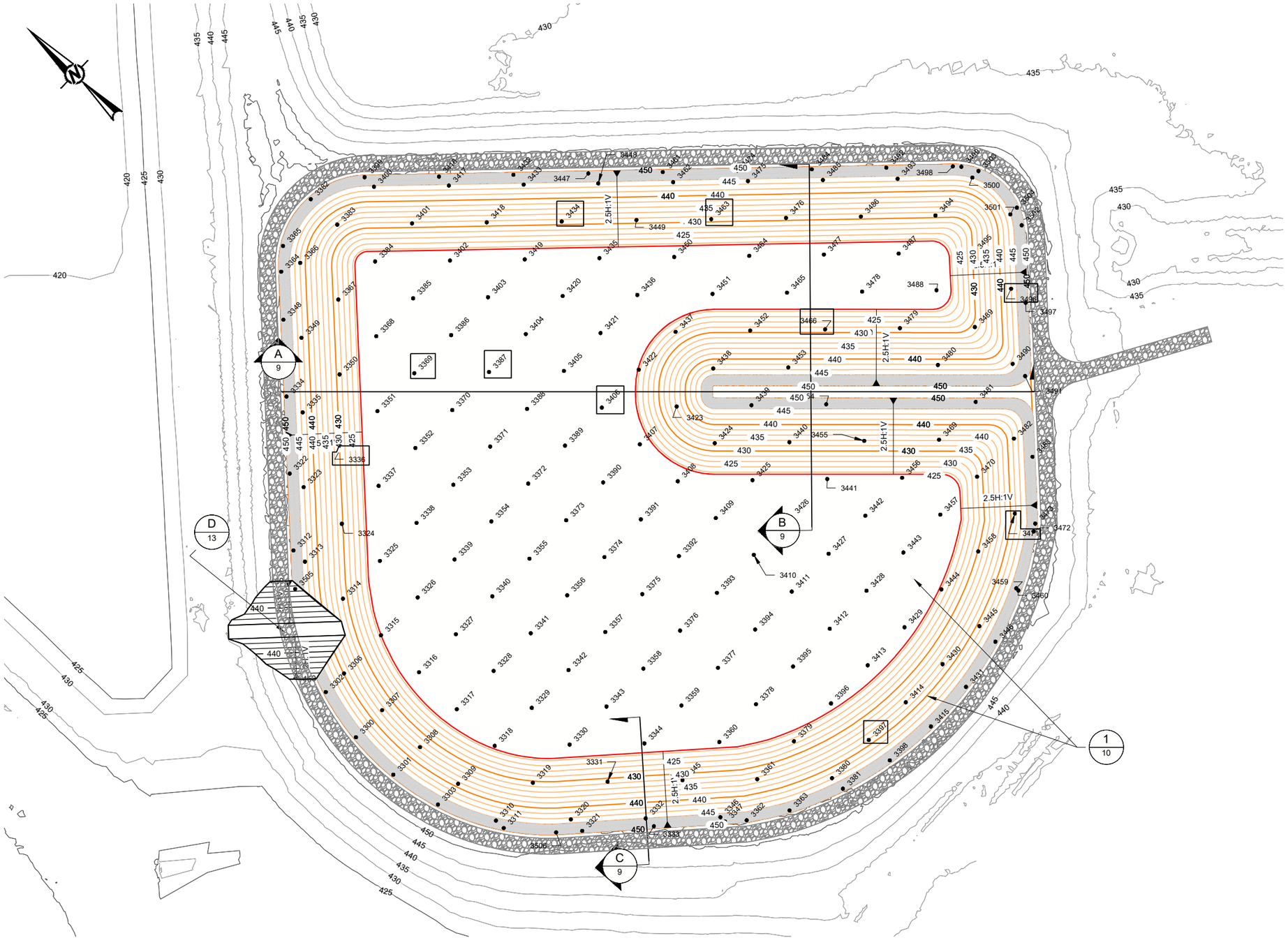


**LEGEND**

- PROPOSED TOP OF EXCAVATED CLAY BREAKLINE
- PROPOSED TOP OF EXCAVATED CLAY 10-FT MAJOR CONTOUR
- PROPOSED TOP OF EXCAVATED CLAY 2-FT MINOR CONTOUR
- EXISTING GROUND 25-FT MAJOR CONTOUR
- EXISTING GROUND 5-FT MINOR CONTOUR
- SEE NOTE 3

**POINT GROUPS**

- 3000 — TOP OF EXCAVATED CLAY
- 3387 — SEE NOTE 4

**NOTES**

1. CONTROL POINTS ARE SET TO GENERALLY PROVIDE A MINIMUM 2.2-FT THICK CLAY FOLLOWING EXCAVATION. A 0.2-FT BUFFER IS INCLUDED TO ACCOUNT FOR POTENTIAL CLAY LAYER THICKNESS REDUCTION DURING RECOMPACTION.
2. THE FLOOR SHALL BE EXCAVATED TO A UNIFORM ELEVATION OF 421.20 FT
3. THE UPPER PORTION OF THE EXISTING CLAY LINER HAS BEEN ERODED. SEE DRAWING 10.
4. ATTENTION IS DRAWN TO POINTS SHOWN INSIDE A BORDER. BASED ON AS-BUILT INFORMATION, THESE POINTS MAY HAVE LESS THAN A 0.2-FT OF BUFFER.
5. EXCAVATIONS THROUGH FGD-A POND EMBANKMENT SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT REQUIREMENTS.
6. PIPE INSTALLATION THROUGH THE FGD-A POND EMBANKMENT SHALL BE COMPLETED DURING THE LINER RETROFIT WORK. EMBANKMENT FILL (MORE THAN 12-INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING 10-INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY.
7. CLAY LINER (OR GENERAL FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED ON THE INSIDE FACE OF THE EMBANKMENT DURING THE LINER RETROFIT WORK IN ACCORDANCE WITH THE LINER QUALITY CONTROL PLAN.

**REFERENCES**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 50 100
1" = 100' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT

GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TOP OF EXCAVATED CLAY GRADING PLAN**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 6 of 22 | 6 |

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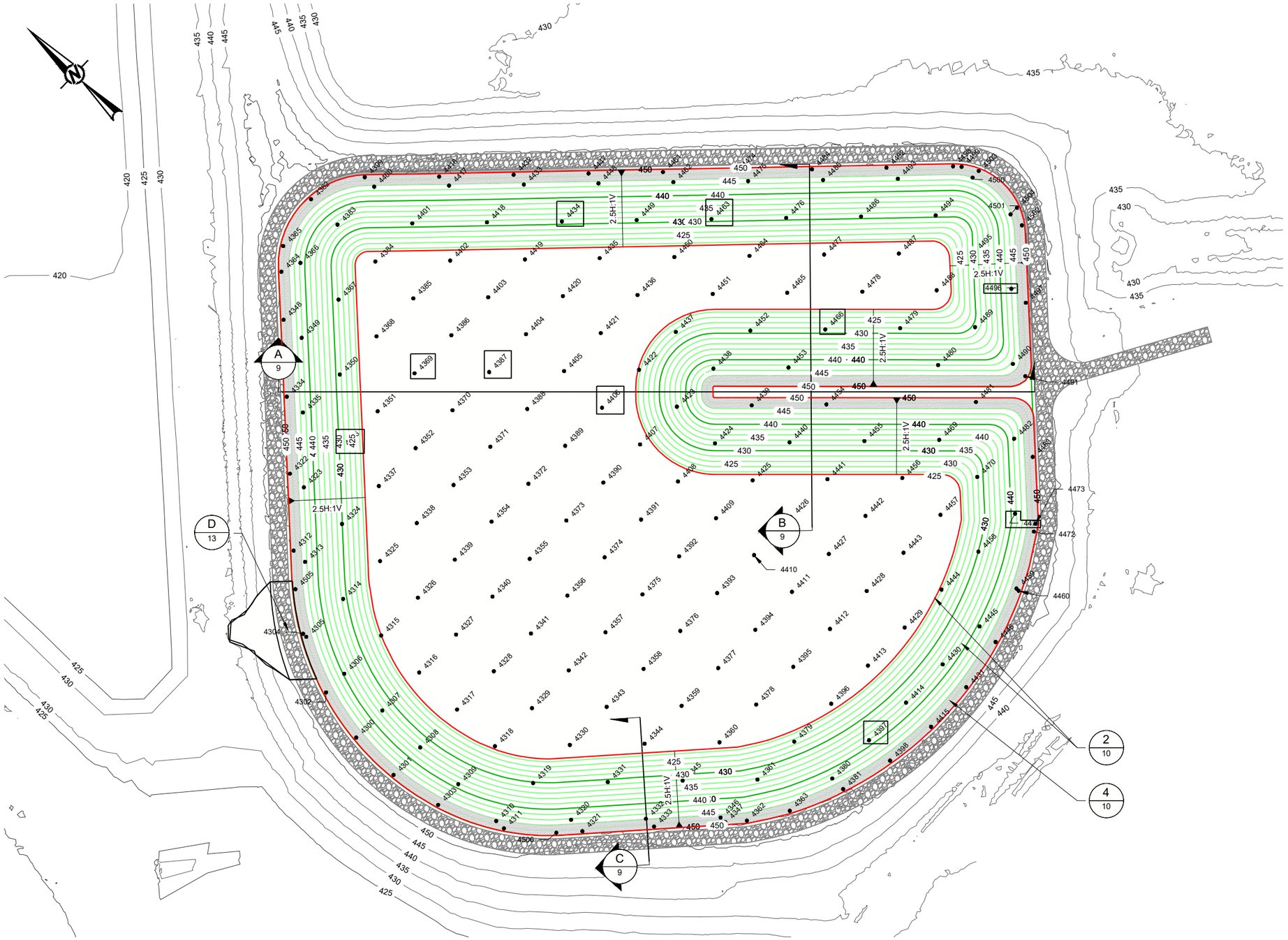
1 in
0




**LEGEND**

- PROPOSED TOP OF RECOMPACTED CLAY BREAKLINE
- PROPOSED TOP OF RECOMPACTED CLAY 10-FT MAJOR CONTOUR
- PROPOSED TOP OF RECOMPACTED CLAY 2-FT MINOR CONTOUR
- EXISTING GROUND 25-FT MAJOR CONTOUR
- EXISTING GROUND 5-FT MINOR CONTOUR
- SEE NOTE 3

**POINT GROUPS**

- 4000 — TOP OF RECOMPACTED CLAY
- 4466 — SEE NOTE 4

**NOTES**

1. CONTROL POINTS ARE SET TO PROVIDE A MINIMUM 2.0-FT THICK CLAY LAYER.
2. THE FLOOR ELEVATION IS SET AT A UNIFORM ELEVATION OF 421.0 FT.
3. THE UPPER PORTION OF THE EXISTING CLAY LINER HAS BEEN ERODED. SEE DRAWING 10.
4. ATTENTION IS DRAWN TO POINTS SHOWN INSIDE A BORDER. BASED ON AS-BUILT INFORMATION, THESE POINTS MAY HAVE LESS THAN A 0.2-FT OF BUFFER.
5. PIPE INSTALLATION THROUGH THE FGD-A POND EMBANKMENT SHALL BE COMPLETED DURING THE LINER RETROFIT WORK.
6. CLAY LINER (OR GENERAL FILL OVERLAID BY EQUIVALEMTN OWNER-APPROVED GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED ON THE INSIDE FACE OF THE RECOMPACTED EMBANKMENT EXCAVATED FOR PIPE INSTALLATION.

**REFERENCES**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 50 100
1" = 100' FEET

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MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TOP OF RECOMPACTED CLAY GRADING PLAN**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 7 of 22 | 7 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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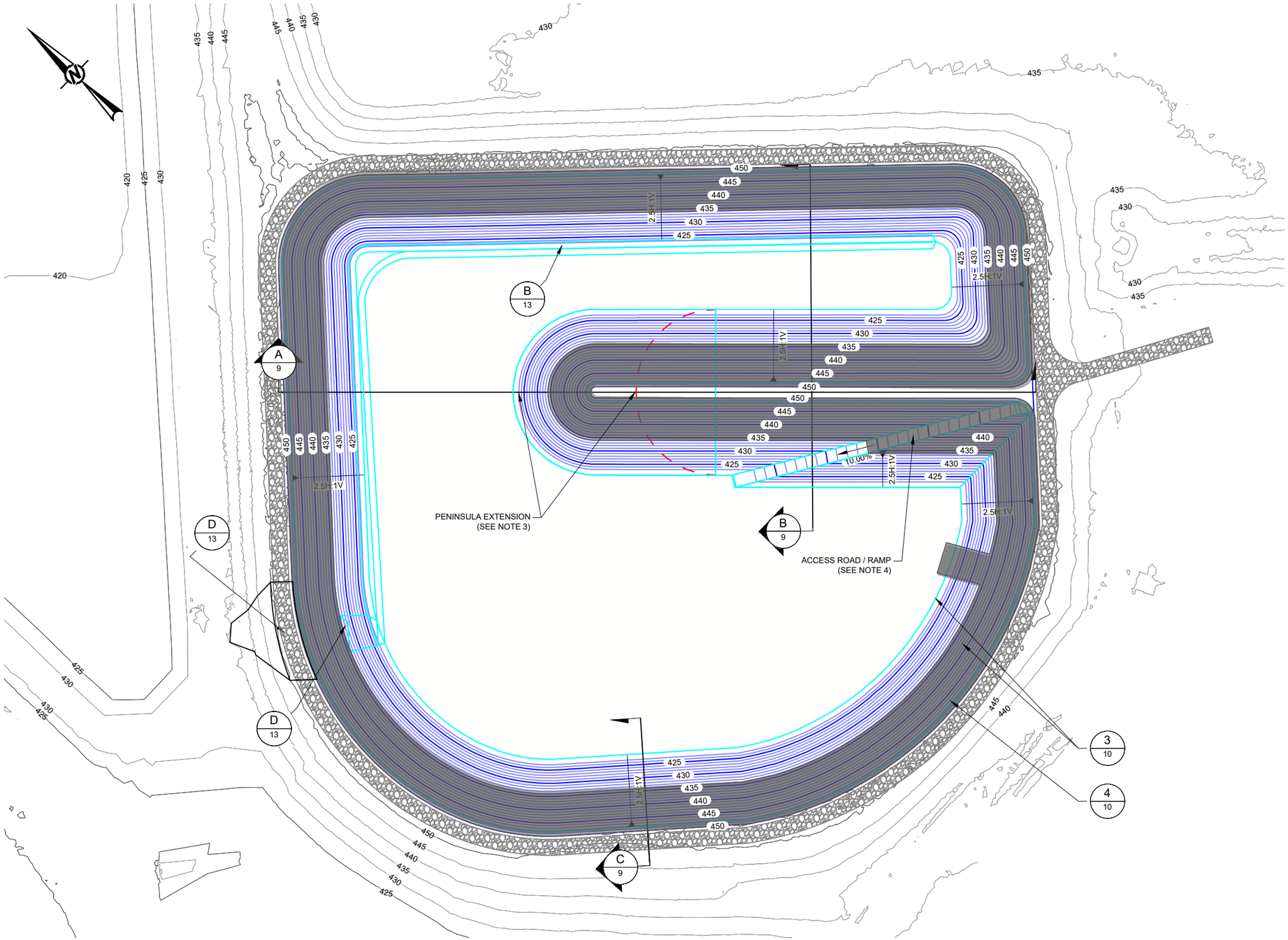


**LEGEND**

- PROPOSED TOP OF PROTECTIVE COVER BREAKLINE
- PROPOSED TOP OF PROTECTIVE COVER 5-FT MAJOR CONTOUR
- PROPOSED TOP OF PROTECTIVE COVER 1-FT MINOR CONTOUR
- EXISTING GROUND 25-FT MAJOR CONTOUR
- EXISTING GROUND 5-FT MINOR CONTOUR
- GROUT MATTRESS
- AGGREGATE SURFACE ROAD (SEE NOTE 8)

**NOTES**

1. THE FLOOR ELEVATION IS SET AT A UNIFORM ELEVATION OF 422.5 FT.
2. PROTECTIVE COVER TO BE PLACED 1.5-FT THICK OVER GEOMEMBRANE LINER ON THE FLOOR AS SHOWN ON DRAWING 10. PROTECTIVE COVER MATERIAL TO BE APPROVED BY OWNER'S REPRESENTATIVE.
3. PENINSULA SHALL BE EXTENDED APPROXIMATELY 120-FT. EXTENSION SHALL BE CONSTRUCTED USING CCR AS APPROVED BY OWNER'S REPRESENTATIVE.
4. ACCESS ROAD/RAMP SHALL BE 12-FT WIDE AND PROGRESS FROM THE CREST TO THE FLOOR AT A 10% MAXIMUM SLOPE. ACCESS ROAD / RAMP SHALL BE CONSTRUCTED USING CCR AS APPROVED BY OWNER'S REPRESENTATIVE. COMPACTED FILL OR CCR SHALL BE COVERED WITH PROTECTIVE COVER.
5. SEE LINER QUALITY CONTROL PLAN FOR REQUIREMENTS OF CCR PLACEMENT IN THE PENINSULA EXTENSION, ACCESS RAMP, AND AS PROTECTIVE COVER.
6. GROUT MATTRESS SHALL CONSIST OF HYDROTEX US600 WITH $\frac{1}{4}$ IN. DIA. CABLE IN LONGITUDINAL DIRECTION AT 3 FT. CENTERS.
7. THE GROUT MATTRESS SHALL EXTEND FROM ELEV. 434.0 THROUGH THE ANCHOR TRENCH.
8. THE AGGREGATE IN THE SURFACE ROAD SHALL CONFORM TO TXDOT ITEM 247, TYPE A, GRADE 1-2.

**REFERENCES**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 50 100
1" = 100' FEET

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|---|---|---|---|---|---|---|
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APPENDIX E-Revision 1 November 21, 2022

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CONSULTANT

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MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TOP OF PROTECTIVE COVER GRADING PLAN**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 8 of 22 | 8 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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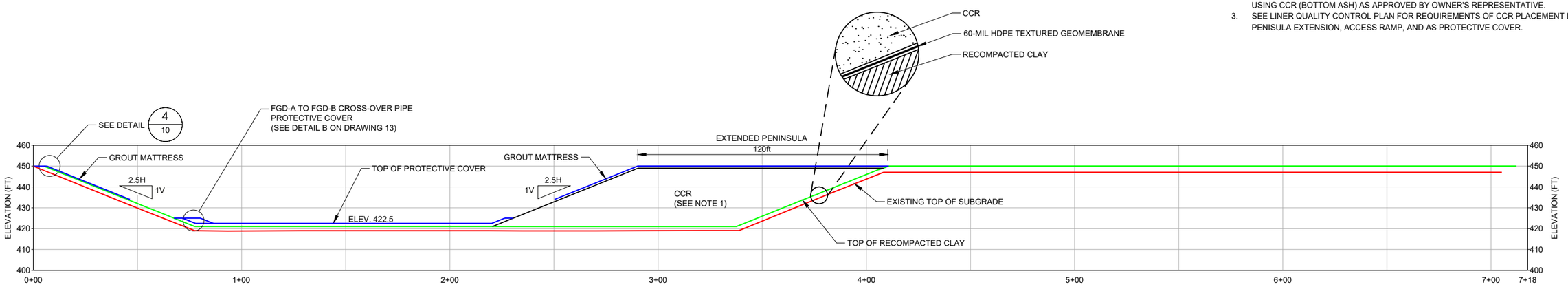
**LEGEND**

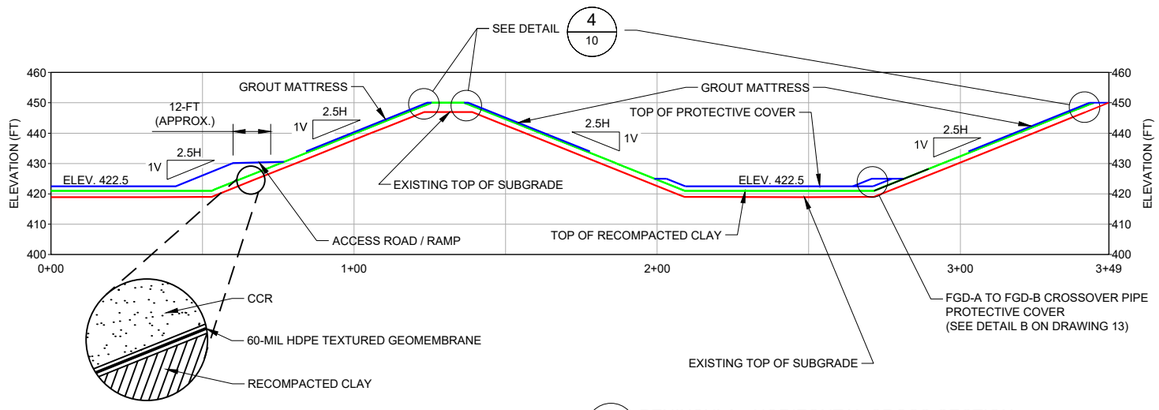
- PROPOSED TOP OF PROTECTIVE COVER
- PROPOSED TOP OF RECOMPACTED CLAY
- EXISTING TOP OF SUBGRADE
- 4/10 SEE LINER DETAIL IV

**NOTES**

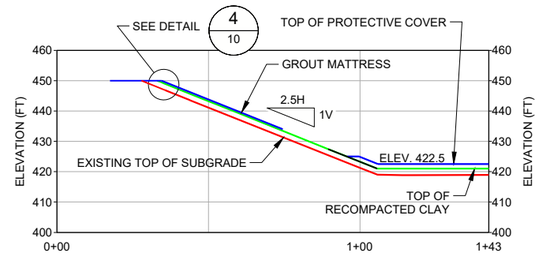
1. PENINSULA SHALL EXTEND BY APPROXIMATELY 120 FT. EXTENSION SHALL BE CONSTRUCTED USING CCR (BOTTOM ASH) AS APPROVED BY OWNER'S REPRESENTATIVE.
2. ACCESS ROAD / RAMP SHALL BE 12 FT WIDE AND PROGRESS FROM THE CREST TO THE FLOOR AT A 10% MAXIMUM SLOPE. ACCESS ROAD / RAMP SHALL BE CONSTRUCTED USING CCR (BOTTOM ASH) AS APPROVED BY OWNER'S REPRESENTATIVE.
3. SEE LINER QUALITY CONTROL PLAN FOR REQUIREMENTS OF CCR PLACEMENT IN THE PENISULA EXTENSION, ACCESS RAMP, AND AS PROTECTIVE COVER.




SCALE 1" = 50' A 9 PENINSULA - VERTICAL CROSS-SECTION




SCALE 1" = 50' B 9 PENINSULA - HORIZONTAL CROSS-SECTION




SCALE 1" = 50' C 9 WEST AREA CROSS-SECTION

ISSUED FOR CONSTRUCTION

0 25 50
1" = 50' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

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MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**PROFILES**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
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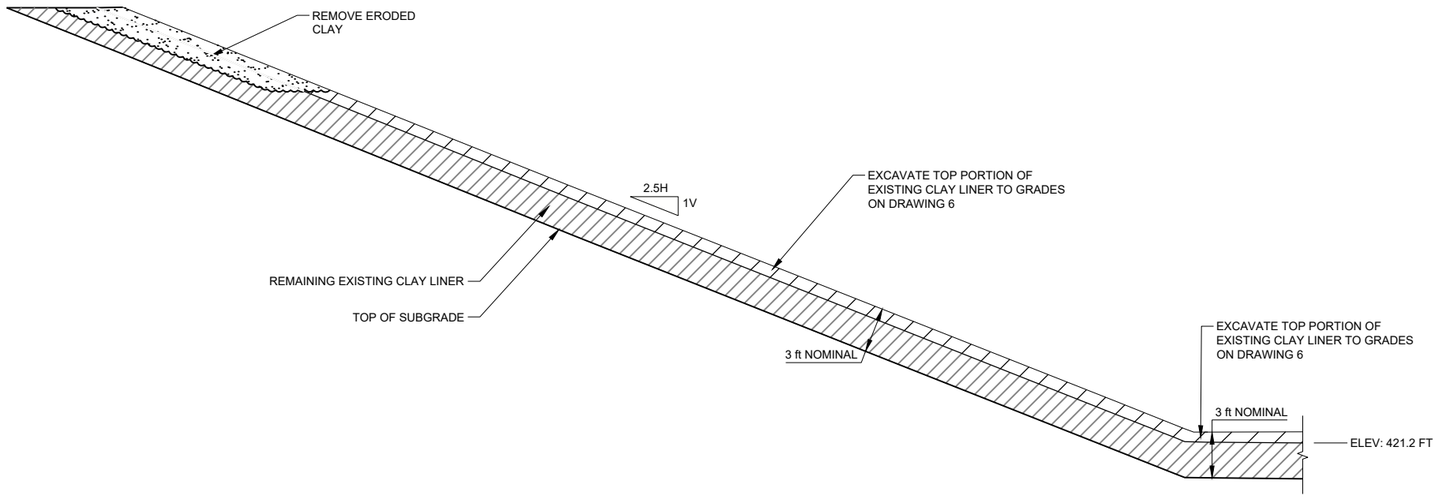
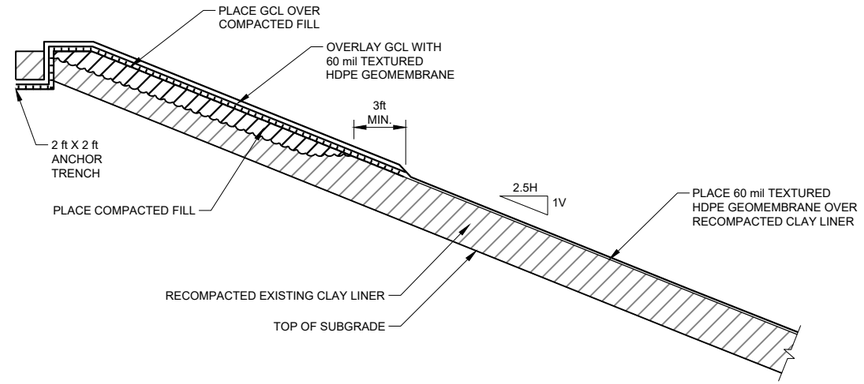



SCALE NTS 1/10 LINER DETAIL I

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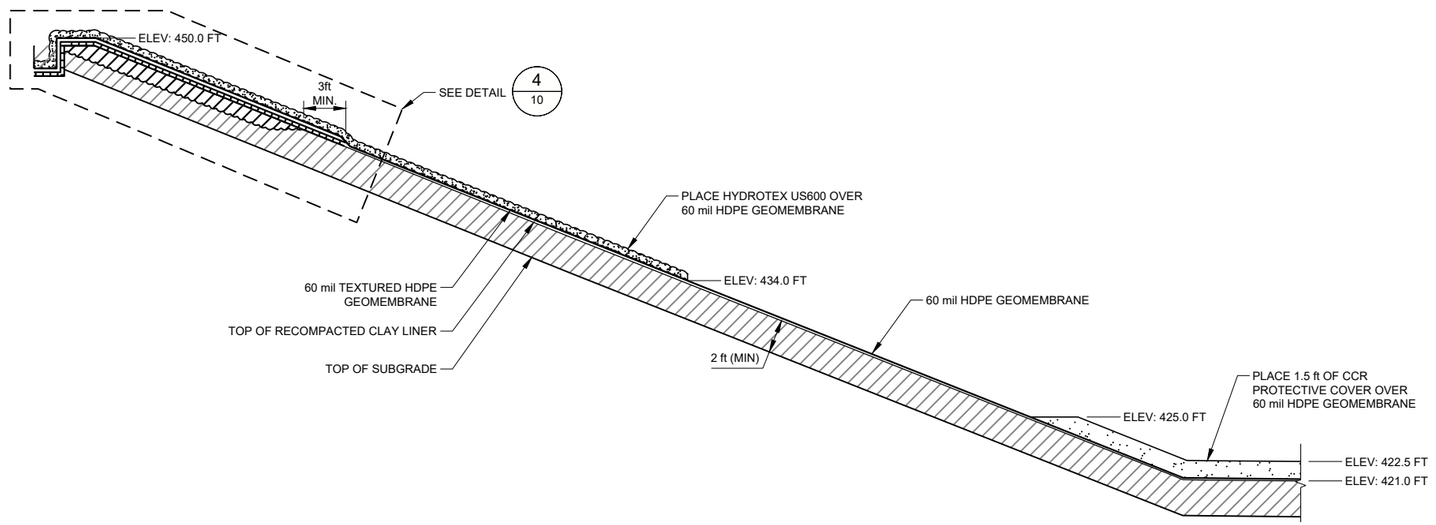


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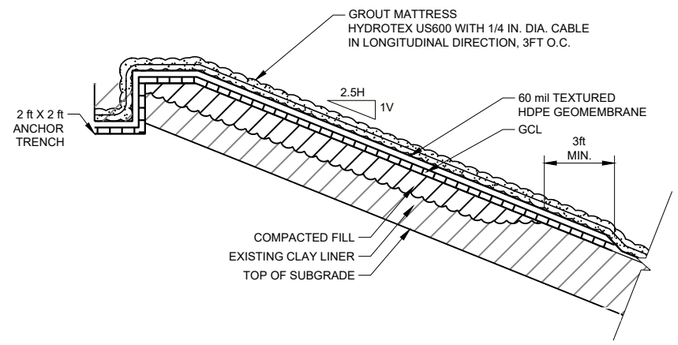


SCALE NTS 4/10 LINER DETAIL IV

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
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APPENDIX E-Revision 1 November 21, 2022

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HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
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PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**GRADING DETAILS**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 10 of 22 | 10 |

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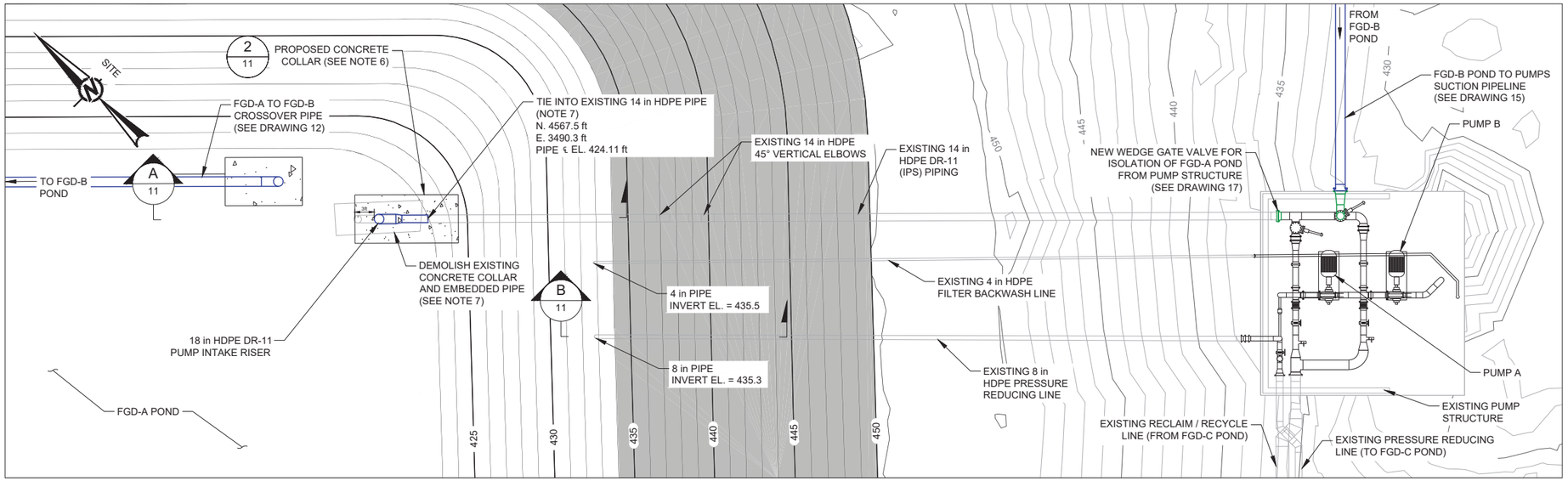



SCALE 1" = 10' 1/11 FGD-A POND TO PUMP SUCTION PIPELINE PLAN

**LEGEND**

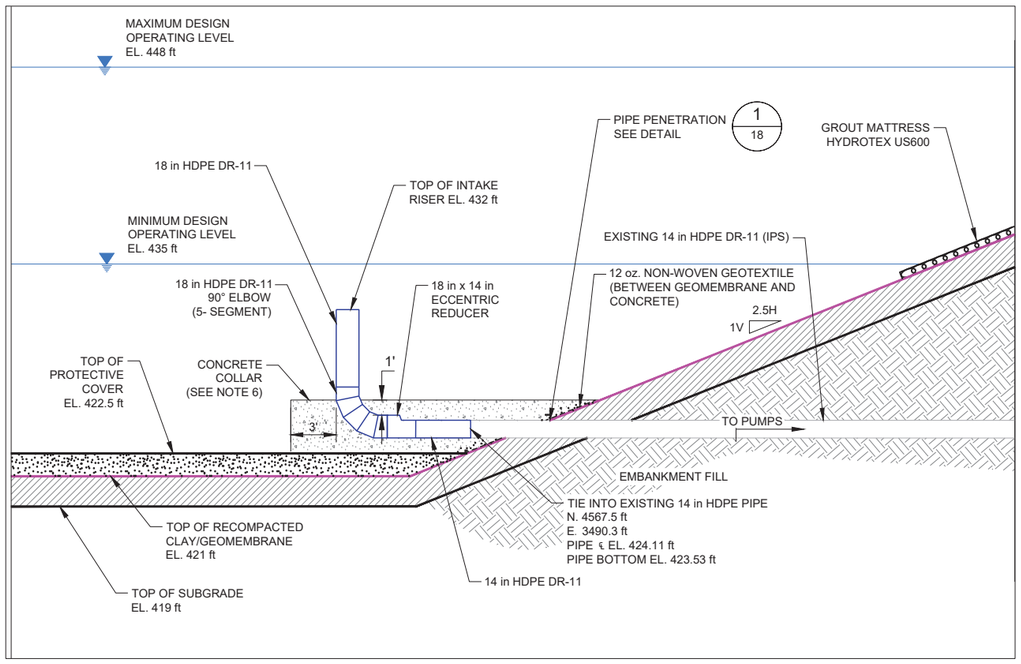
- 430 EXISTING GRADES (REFERENCE 1)
- 430 PROPOSED TOP OF PROTECTIVE COVER GRADES
- EXISTING STEEL PIPING
- EXISTING HDPE PIPING
- PROPOSED STEEL PIPING
- PROPOSED HDPE PIPING
- GROUT MATTRESS (HYDROTEX US600)

**NOTE(S)**

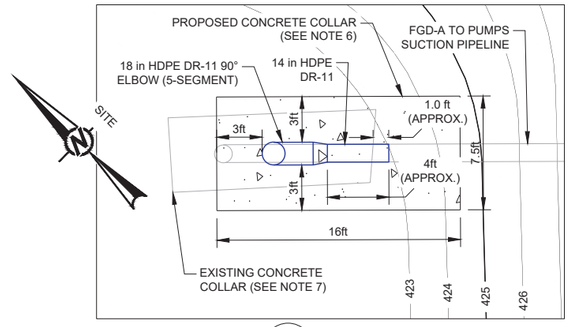
1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) DR-11 (IRON PIPE SIZING) SOLID WALL UNLESS OTHERWISE INDICATED.
4. UNDERGROUND PIPING SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE PROTECTIVE COVER, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.
5. NO PIPING OR CONCRETE SHOULD BE IN DIRECT CONTACT WITH THE GEOMEMBRANE. A 12-OZ NON-WOVEN GEOTEXTILE SHALL BE PLACED BETWEEN THE CONCRETE AND THE GEOMEMBRANE. A 60 mil HDPE GEOMEMBRANE RUB-SHEET SHALL BE TACK WELDED TO THE LINER IN AREAS WHERE PIPING IS RESTING ON THE LINER.
6. A SULFATE RESISTANT CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE COLLAR TO EXTEND APPROXIMATELY THREE (3) FEET AROUND THE RISER PIPE AND TO HAVE A MINIMUM OF 12 INCHES OF COVER ABOVE AND BELOW THE PIPE.
7. EXISTING 14 in HDPE PIPELINE SHALL BE CUT SQUARE APPROXIMATELY ONE (1) FOOT DOWNSTREAM OF THE EXISTING CONCRETE COLLAR. CONCRETE COLLAR AND EMBEDDED PIPING TO BE DEMOLISHED AND REMOVED. PROPOSED HDPE PIPING TO BE FUSION WELDED TO EXISTING PIPE
8. PIPE LENGTH FOR THE EXISTING 8 in HDPE PRESSURE REDUCING LINE AND THE 4 in HDPE FILTER BACKWASH LINE TO BE FIELD FIT AS REQUIRED TO ACHIEVE THE SPECIFIED PIPE PENETRATION INTO THE FGD-A POND.

**REFERENCE(S)**

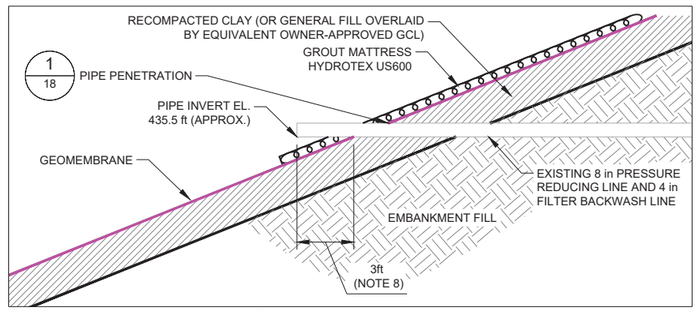
1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.




SCALE N.T.S. A/11 FGD-A POND TO PUMP SUCTION PIPELINE PROFILE VIEW




SCALE 1" = 5" 2/11 CONCRETE COLLAR




SCALE N.T.S. B/11 EXISTING 8 in PIPE PENETRATION

ISSUED FOR CONSTRUCTION

0 10 20
1" = 10' FEET

0 5 10
1" = 5' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
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PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-A POND TO PUMPS INTAKE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | 11 of 22 | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | | 11 |

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
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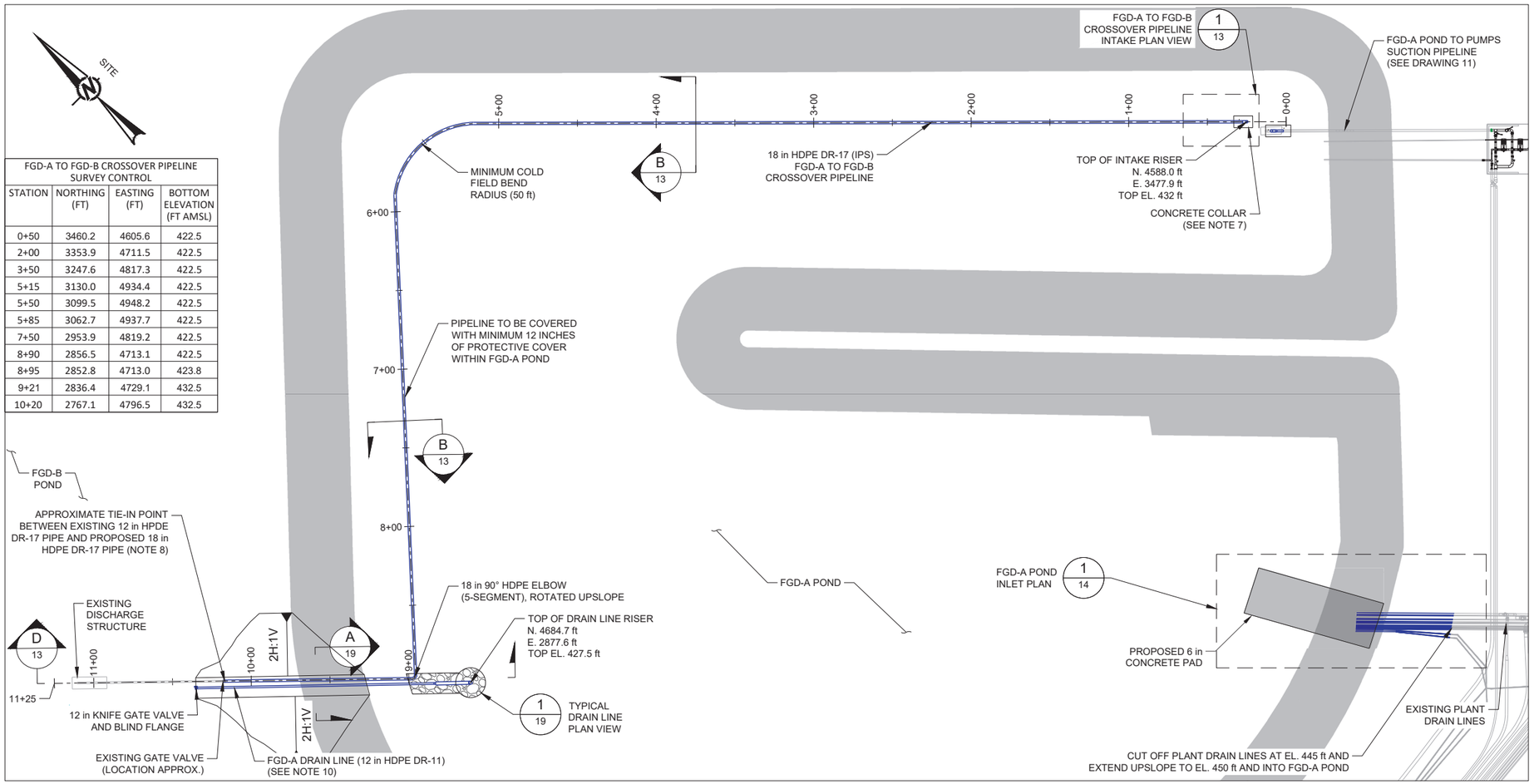
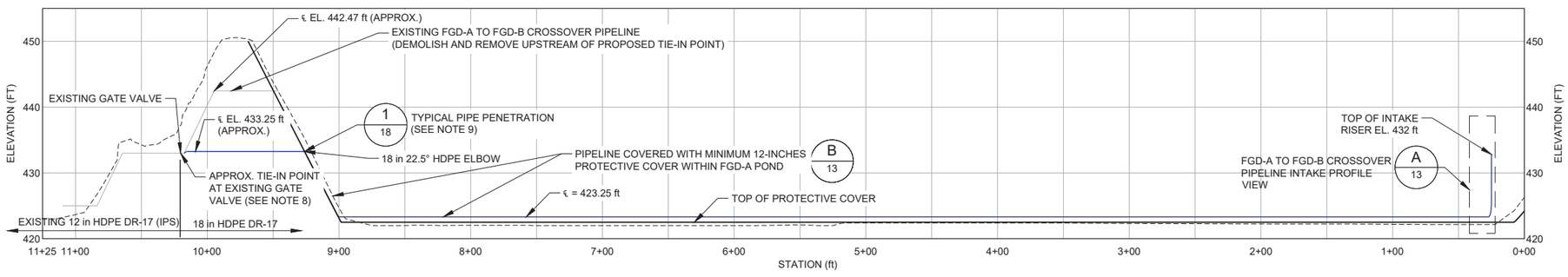



| FGD-A TO FGD-B CROSSOVER PIPELINE SURVEY CONTROL | | | |
|---|---|---|---|
| STATION | NORTHING (FT) | EASTING (FT) | BOTTOM ELEVATION (FT AMSL) |
| 0+50 | 3460.2 | 4605.6 | 422.5 |
| 2+00 | 3353.9 | 4711.5 | 422.5 |
| 3+50 | 3247.6 | 4817.3 | 422.5 |
| 5+15 | 3130.0 | 4934.4 | 422.5 |
| 5+50 | 3099.5 | 4948.2 | 422.5 |
| 5+85 | 3062.7 | 4937.7 | 422.5 |
| 7+50 | 2953.9 | 4819.2 | 422.5 |
| 8+90 | 2856.5 | 4713.1 | 422.5 |
| 8+95 | 2852.8 | 4713.0 | 423.8 |
| 9+21 | 2836.4 | 4729.1 | 432.5 |
| 10+20 | 2767.1 | 4796.5 | 432.5 |




0 50 100
1" = 50' FEET

SCALE 1" = 50'
5x VERTICAL EXAGGERATION

A 12 FGD-A TO FGD-B PIPELINE

**LEGEND**

- 430 EXISTING GRADES (REFERENCE 1)
- 430 PROPOSED TOP OF PROTECTIVE COVER GRADES
- EXISTING STEEL PIPING
- EXISTING HDPE PIPING
- PROPOSED STEEL PIPING
- PROPOSED HDPE PIPING
- GROUT MATTRESS (HYDROTEX US600)

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) DR-11 (IRON PIPE SIZING) SOLID WALL UNLESS OTHERWISE INDICATED.
4. EXCAVATION THROUGH THE FGD-A POND EMBANKMENT SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT REQUIREMENTS.
5. UNDERGROUND PIPING (THROUGH THE FGD-A POND EMBANKMENT) SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE PROTECTIVE COVER, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.
6. NO PIPING OR CONCRETE SHOULD BE IN DIRECT CONTACT WITH THE GEOMEMBRANE. A 12-OZ NON-WOVEN GEOTEXTILE SHALL BE PLACED BETWEEN THE CONCRETE AND THE GEOMEMBRANE. A 60 mil HDPE GEOMEMBRANE RUB-SHEET SHALL BE TACK WELDED TO THE LINER IN AREAS WHERE PIPING IS RESTING ON THE LINER.
7. A SULFATE RESISTANT CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE COLLAR TO EXTEND APPROXIMATELY THREE (3) FEET AROUND THE RISER PIPE AND TO HAVE A MINIMUM OF 12 INCHES OF COVER ABOVE THE PIPE.
8. CONTRACTOR TO FIELD IDENTIFY TIE-IN LOCATION AND INDICATE ANY PROPOSED CHANGES TO TIE-IN FOR OWNER'S APPROVAL.
9. PIPE INSTALLATION THROUGH THE FGD-A POND EMBANKMENT SHALL BE COMPLETED DURING THE LINER RETROFIT WORK. CLAY LINER (OR GENERAL FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED ON THE INSIDE FACE OF THE EMBANKMENT DURING THE LINER RETROFIT WORK IN ACCORDANCE WITH THE LINER QUALITY CONTROL PLAN. PIPING WITHIN FGD-A POND SHALL BE COMPLETED AFTER PROTECTIVE COVER PLACEMENT.
10. THE PROPOSED FGD-A POND DRAIN LINE TO FOLLOW THE SAME PROFILE AS THE PROPOSED FGD-A POND TO FGD-B POND CROSSOVER PIPELINE THROUGH THE EMBANKMENT WHICH SEPARATES THE TWO PONDS. THE FGD-A POND DRAIN LINE SHALL BE DAYLIGHTED NEAR THE EXISTING KNIFE GATE VALVE ON THE FGD-A POND TO FGD-B POND CROSSOVER PIPELINE AND TERMINATED WITH A KNIFE GATE VALVE AND BLIND FLANGE.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. AS-CONSTRUCTED SURVEY OF FGD-B POND PERFORMED BY SAM, INC. ON DECEMBER 7, 2011.
3. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 40 80
1" = 40' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

APPENDIX E-Revision 1 November 21, 2022

SEAL
JEFFREY B. TASSETT 86675 LICENSED PROFESSIONAL ENGINEER
GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER MEMBER OF WSP
HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-A POND TO FGD-B POND CROSSOVER PIPELINE PLAN AND PROFILE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 12 of 22 | 12 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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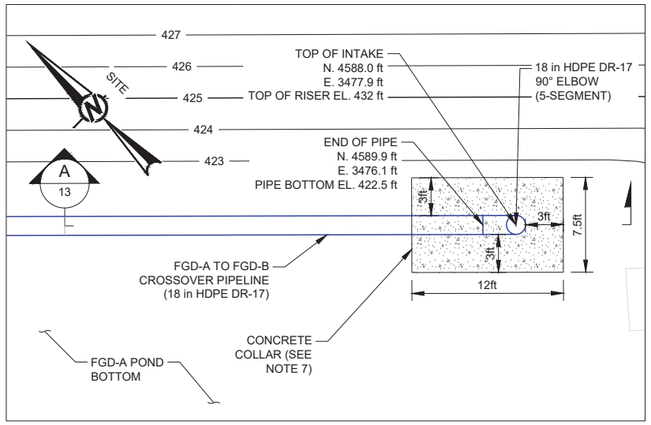
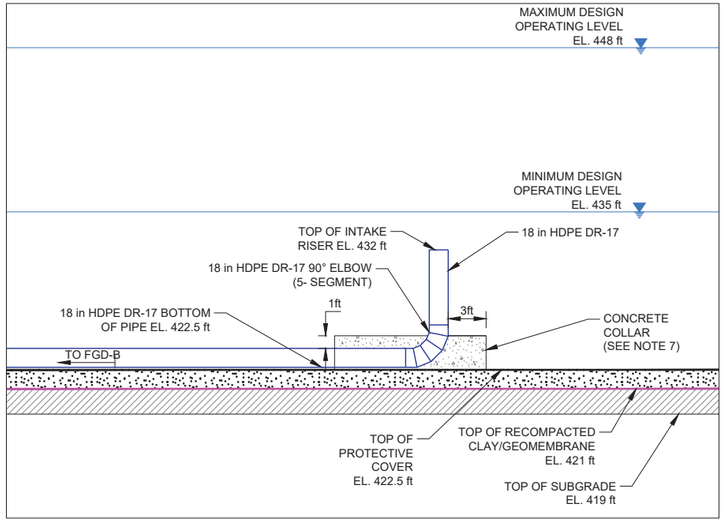
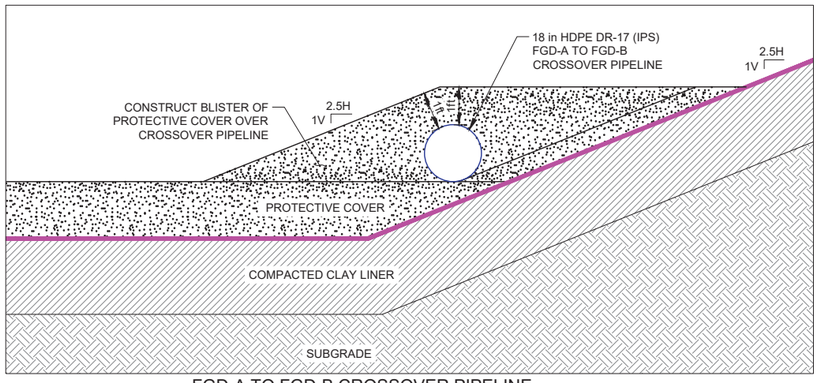


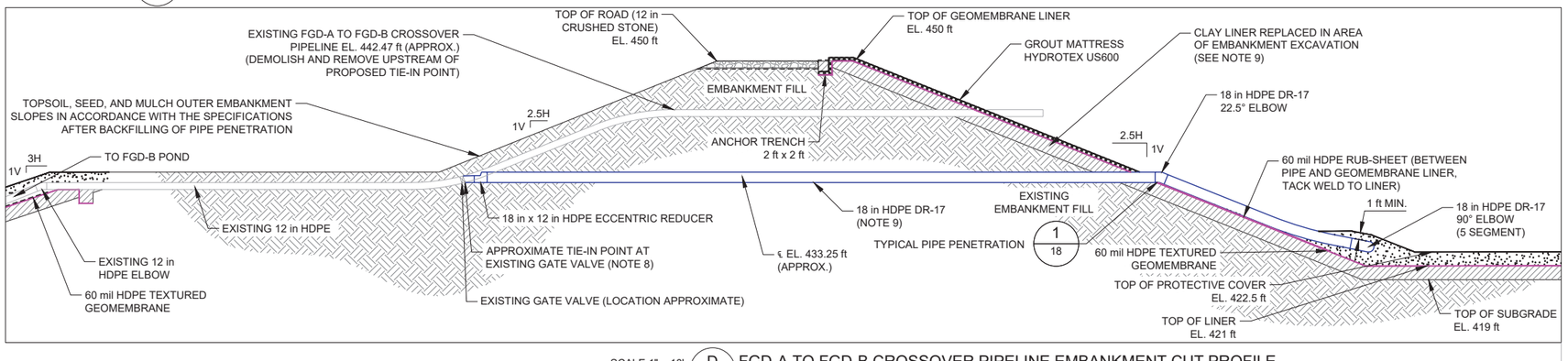

SCALE 1" = 6' 1/13 FGD-A TO FGD-B CROSSOVER PIPELINE INTAKE PLAN VIEW




SCALE 1" = 6' A/13 FGD-A TO FGD-B CROSSOVER PIPELINE INTAKE PROFILE VIEW




SCALE N.T.S. B/13 FGD-A TO FGD-B CROSSOVER PIPELINE PROTECTIVE COVER BLISTER




SCALE 1" = 10' D/13 FGD-A TO FGD-B CROSSOVER PIPELINE EMBANKMENT CUT PROFILE

**LEGEND**

430 PROPOSED TOP OF PROTECTIVE COVER GRADES
EXISTING HDPE PIPING
PROPOSED HDPE PIPING

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) DR-11 (IRON PIPE SIZING) SOLID WALL UNLESS OTHERWISE INDICATED.
4. EXCAVATIONS THROUGH FGD-A POND EMBANKMENT SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT REQUIREMENTS.
5. UNDERGROUND PIPING (THROUGH THE FGD-A POND EMBANKMENT) SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE PROTECTIVE COVER, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.
6. NO PIPING OR CONCRETE SHOULD BE IN DIRECT CONTACT WITH THE GEOMEMBRANE. A 12-OZ NON-WOVEN GEOTEXTILE SHALL BE PLACED BETWEEN THE CONCRETE AND THE GEOMEMBRANE. A 60 mil HDPE GEOMEMBRANE RUB-SHEET SHALL BE TACK WELDED TO THE LINER IN AREAS WHERE PIPING IS RESTING ON THE LINER.
7. A SULFATE RESISTANT CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE COLLAR TO EXTEND APPROXIMATELY THREE (3) FEET AROUND THE RISER PIPE AND TO HAVE A MINIMUM OF 12 INCHES OF COVER ABOVE THE PIPE.
8. CONTRACTOR TO FIELD IDENTIFY TIE-IN LOCATION AND INDICATE ANY PROPOSED CHANGES TO TIE-IN FOR OWNER'S APPROVAL.
9. PIPE INSTALLATION THROUGH THE FGD-A POND EMBANKMENT SHALL BE COMPLETED DURING THE LINER RETROFIT WORK. EMBANKMENT FILL (MORE THAN 12 INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING TEN (10) INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. CLAY LINER (OR GENERAL FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED ON THE INSIDE FACE OF THE EMBANKMENT DURING THE LINER RETROFIT WORK IN ACCORDANCE WITH THE LINER QUALITY CONTROL PLAN.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 6 12
1" = 6' FEET

0 10 20
1" = 10' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-A POND TO FGD-B POND CROSSOVER PIPELINE DETAILS**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | 13 of 22 | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | | 13 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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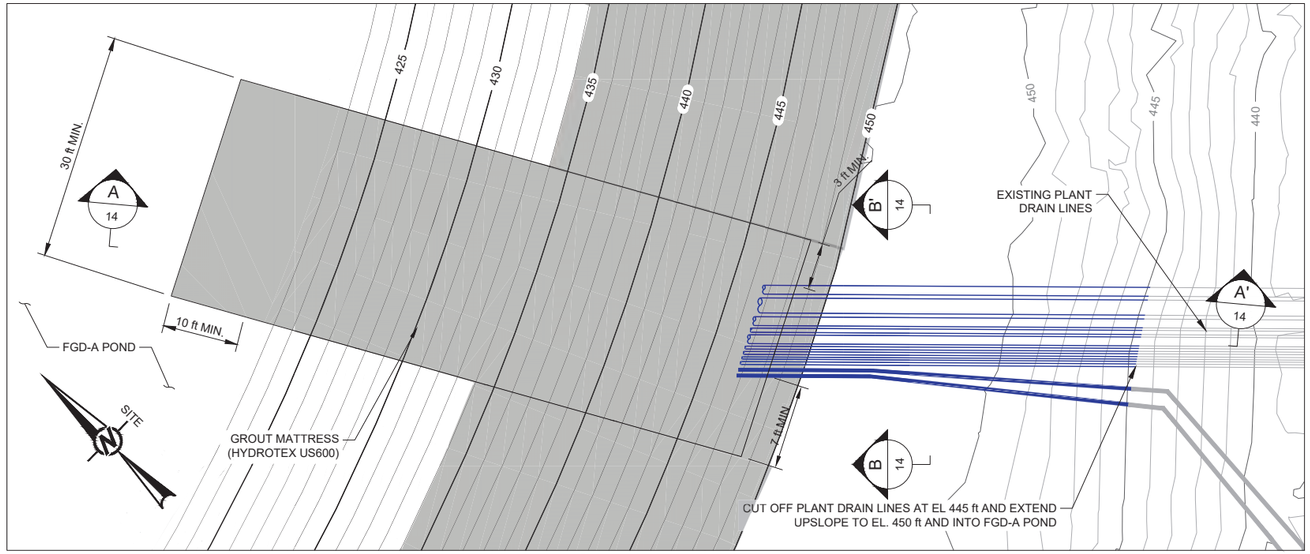
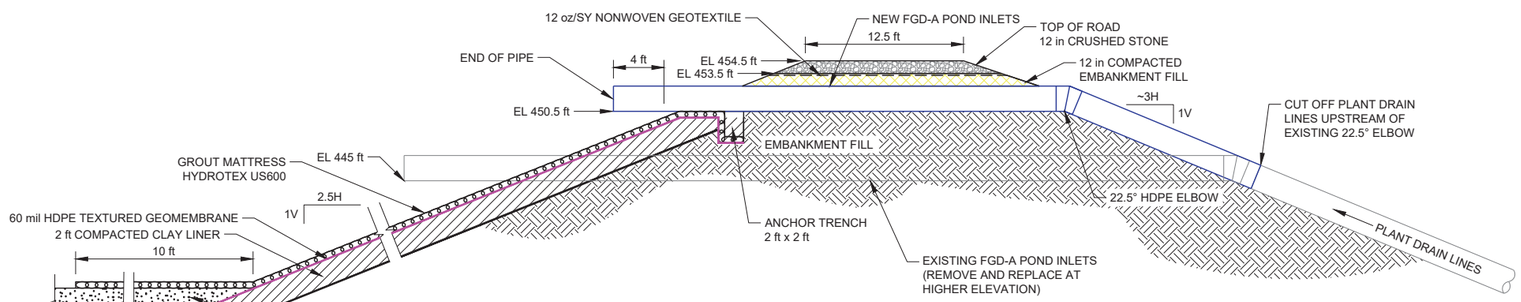
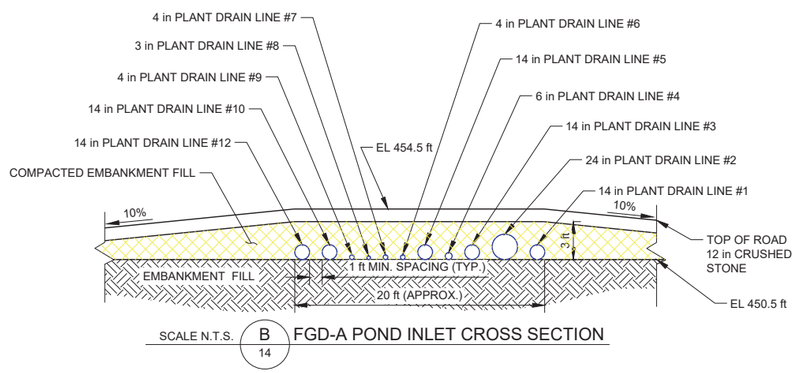



SCALE 1" = 10' 1/14 FGD-A POND INLET PLAN




SCALE N.T.S. A/14 FGD-A POND INLET PROFILE VIEW




SCALE N.T.S. B/14 FGD-A POND INLET CROSS SECTION

**LEGEND**

- 430 — EXISTING GRADES (REFERENCE 1)
- 430 — PROPOSED TOP OF PROTECTIVE COVER GRADES
- EXISTING HDPE PIPING
- PROPOSED HDPE PIPING
- GROUT MATTRESS (HYDROTEX US600)

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) AND SHALL MATCH THE EXISTING INLET LINES (SEE TABLE ON DRAWING 2).
4. EXCAVATIONS SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT STANDARDS.
5. UNDERGROUND PIPING (THROUGH THE FGD-A POND EMBANKMENT) SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE GROUT MATTRESS, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 10 20
1" = 10' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

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HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-A POND INLET DETAILS**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 14 of 22 | 14 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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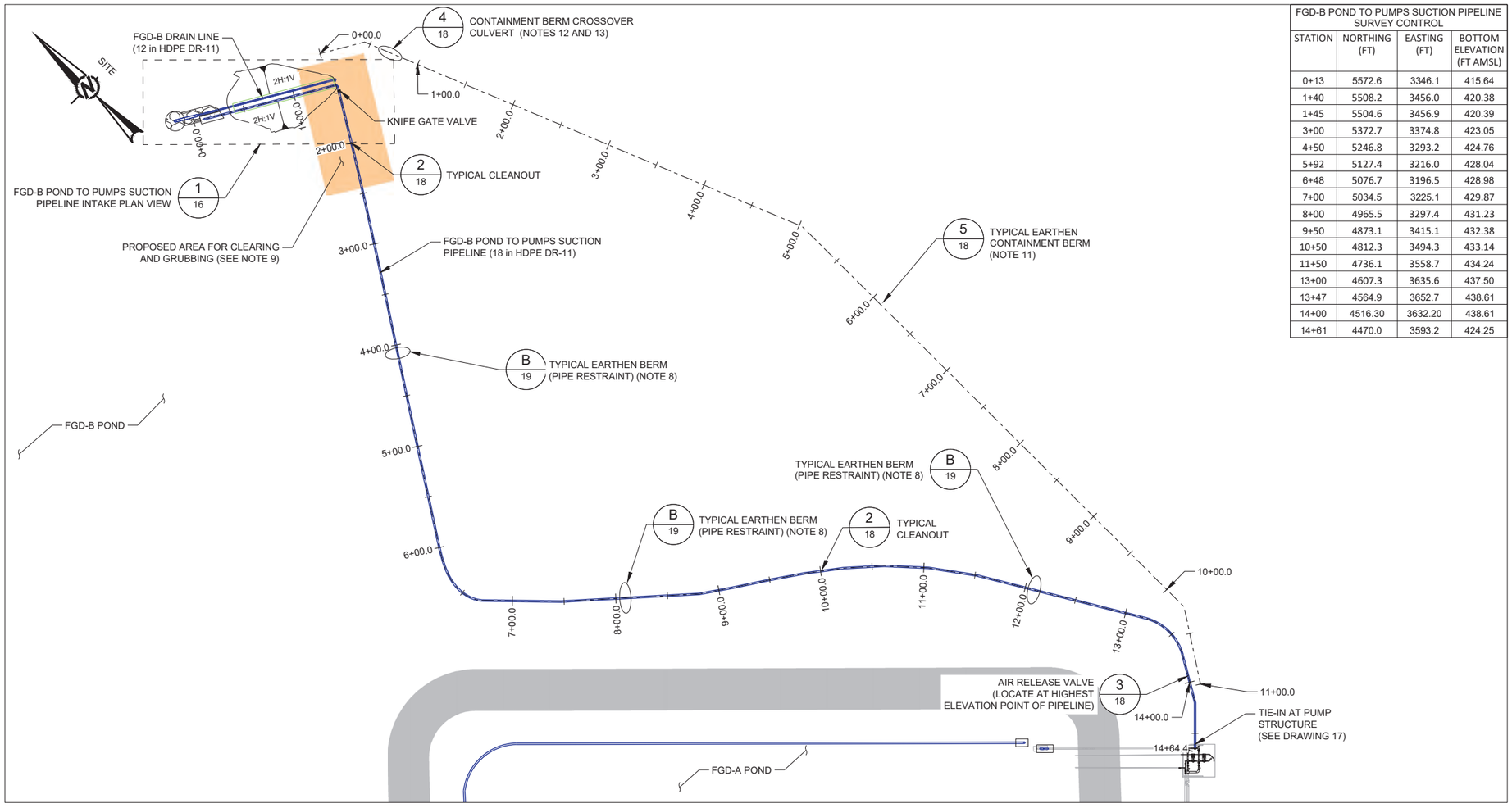



| FGD-B POND TO PUMPS SUCTION PIPELINE SURVEY CONTROL | | | |
|---|---|---|---|
| STATION | NORTHING (FT) | EASTING (FT) | BOTTOM ELEVATION (FT AMSL) |
| 0+13 | 5572.6 | 3346.1 | 415.64 |
| 1+40 | 5508.2 | 3456.0 | 420.38 |
| 1+45 | 5504.6 | 3456.9 | 420.39 |
| 3+00 | 5372.7 | 3374.8 | 423.05 |
| 4+50 | 5246.8 | 3293.2 | 424.76 |
| 5+92 | 5127.4 | 3216.0 | 428.04 |
| 6+48 | 5076.7 | 3196.5 | 428.98 |
| 7+00 | 5034.5 | 3225.1 | 429.87 |
| 8+00 | 4965.5 | 3297.4 | 431.23 |
| 9+50 | 4873.1 | 3415.1 | 432.38 |
| 10+50 | 4812.3 | 3494.3 | 433.14 |
| 11+50 | 4736.1 | 3558.7 | 434.24 |
| 13+00 | 4607.3 | 3635.6 | 437.50 |
| 13+47 | 4564.9 | 3652.7 | 438.61 |
| 14+00 | 4516.30 | 3632.20 | 438.61 |
| 14+61 | 4470.0 | 3593.2 | 424.25 |

**LEGEND**

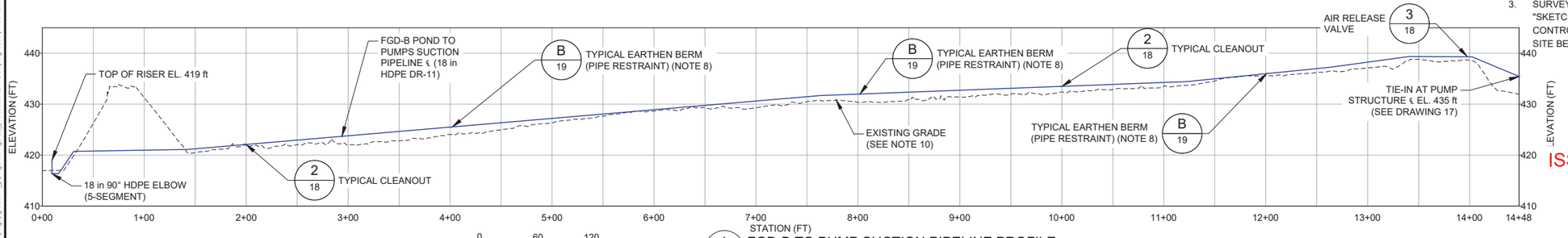
- 430 — EXISTING GRADES (REFERENCE 1 AND 2)
- 430 — PROPOSED TOP OF PROTECTIVE COVER GRADES
- EXISTING STEEL PIPING
- EXISTING HDPE PIPING
- PROPOSED HDPE PIPING

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) DR-11 (IRON PIPE SIZING) SOLID WALL UNLESS OTHERWISE INDICATED.
4. EXCAVATIONS THROUGH FGD-B POND EMBANKMENT SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT REQUIREMENTS. THE EXISTING GEOMEMBRANE LINER SHALL BE CLEANLY CUT AND GENTLY PEELED AWAY FROM THE PROPOSED EXCAVATION. FOLLOWING COMPLETION OF THE PIPELINE, EMBANKMENT FILL, AND CLAY LINER (OR EMBANKMENT FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL) CONSTRUCTION, THE GEOMEMBRANE SHALL BE LAID BACK AND WELDED USING GEOMEMBRANE CAPSTRIPS AS APPROPRIATE.
5. UNDERGROUND PIPING (THROUGH THE FGD-B POND EMBANKMENT) SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE PROTECTIVE COVER, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.
6. NO PIPING OR CONCRETE SHOULD BE IN DIRECT CONTACT WITH THE GEOMEMBRANE. A 12-OZ NON-WOVEN GEOTEXTILE SHALL BE PLACED BETWEEN THE CONCRETE AND THE GEOMEMBRANE. A 60 mil HDPE GEOMEMBRANE RUB-SHEET SHALL BE TACK WELDED TO THE LINER IN AREAS WHERE PIPING IS RESTING ON THE LINER.
7. A SULFATE RESISTANT CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE COLLAR TO EXTEND APPROXIMATELY THREE (3) FEET AROUND THE RISER PIPE AND TO HAVE A MINIMUM OF 12 INCHES OF COVER ABOVE THE PIPE.
8. EARTHEN BERM ANCHORAGES WILL BE PROVIDED AT APPROXIMATELY 400-FOOT INTERVALS ALONG THE FGD-B TO PUMPS SUCTION PIPELINE. PIPING BETWEEN THE EARTHEN BERMS SHALL BE SNAKED APPROXIMATELY 20 FEET OFF OF A STRAIGHT LINE ALIGNMENT WITH 20 FEET HORIZONTAL CLEARANCE TO ALLOW THE HDPE PIPES TO EXPAND OR CONTRACT.
9. CLEARING AND GRUBBING PLAN TO BE APPROVED BY OWNER.
10. LOCAL GRADING TO BE DONE ALONG THE ALIGNMENT TO MINIMIZE LOCALIZED HIGH AND LOW SPOTS.
11. EARTHEN CONTAINMENT BERM TO BE 4-FEET (MIN.) ABOVE EXISTING GRADES BETWEEN ALIGNMENT STATIONS 0+00 AND 2+50, AND TRANSITION TO BE 2-FEET (MIN.) ABOVE EXISTING GRADES BETWEEN ALIGNMENT STATIONS 2+50 AND 11+00.
12. CULVERT PIPING SHALL BE ADS N-12 ST IB HDPE PIPE OR EQUIVALENT APPROVED BY THE OWNER'S REPRESENTATIVE.
13. CULVERT THROUGH CONTAINMENT BERM SHALL BE SITUATED AT THE LOWEST ELEVATION ON THE UPSTREAM SIDE OF THE CONTAINMENT BERM AND SHALL BE ORIENTED TO ALLOW FOR DRAINAGE DURING PRECIPITATION EVENTS.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. AS-CONSTRUCTED SURVEY OF FGD-B POND PERFORMED BY SAM, INC. ON DECEMBER 7, 2011.
3. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.




0 60 120
1" = 60' FEET

SCALE 1" = 60'
5x VERTICAL EXAGGERATION

A
15

FGD-B TO PUMP SUCTION PIPELINE PROFILE

ISSUED FOR BIDDING PURPOSES ONLY

0 60 120
1" = 60' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-01-06 | ISSUED FOR BIDDING PURPOSES | BJP | KWG | AMS | TJS |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-B POND TO PUMPS SUCTION PIPELINE PLAN AND PROFILE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 15 of 22 | 15 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 1 in

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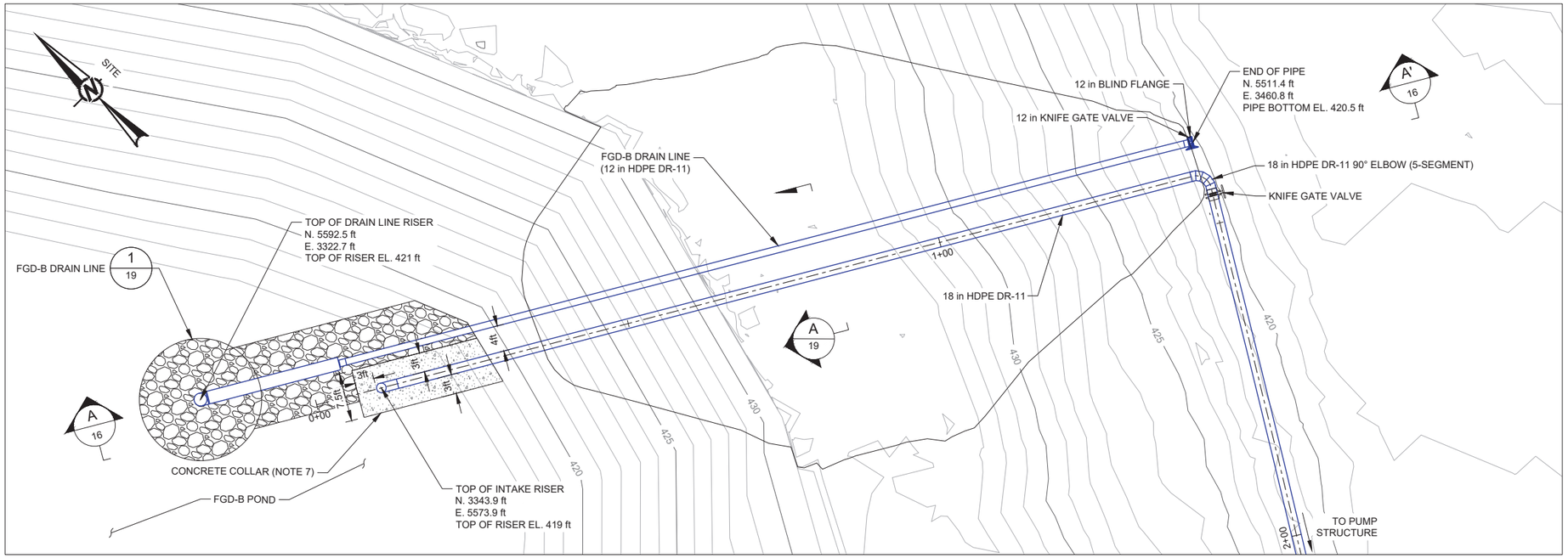
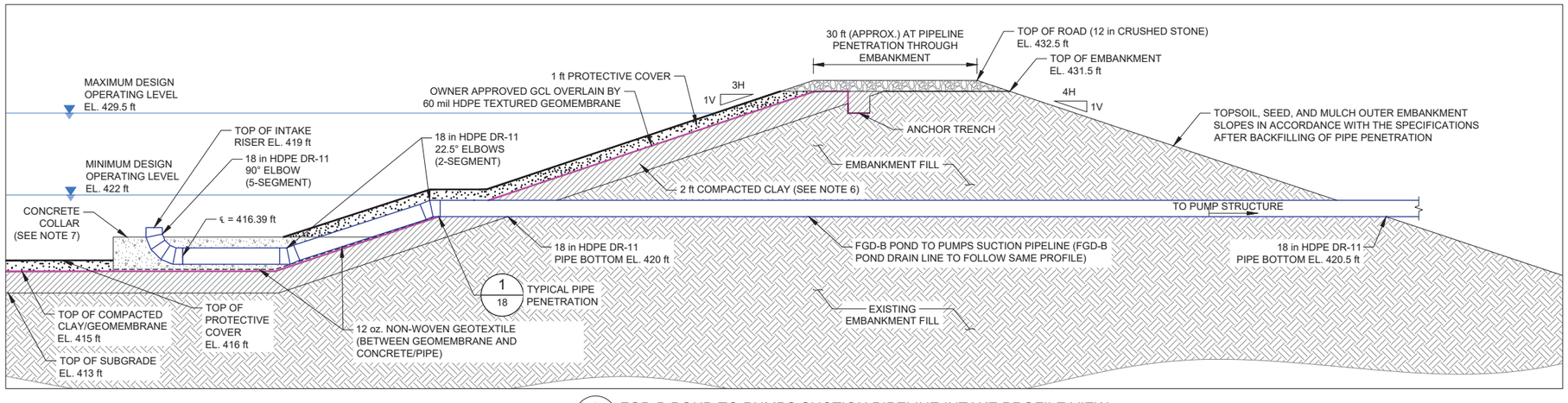



SCALE 1" = 10' 1/16 FGD-B POND TO PUMPS SUCTION PIPELINE INTAKE PLAN VIEW




SCALE 1" = 6' A/16 FGD-B POND TO PUMPS SUCTION PIPELINE INTAKE PROFILE VIEW

**LEGEND**

430 EXISTING GRADES (REFERENCE 1 AND 2)

PROPOSED HDPE PIPING

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) DR-11 (IRON PIPE SIZING) SOLID WALL UNLESS OTHERWISE INDICATED.
4. EXCAVATIONS THROUGH FGD-B POND EMBANKMENT SHALL BE COMPLETED AT MAXIMUM SLOPES OF 2H:1V IN ACCORDANCE WITH CROSS SECTION A ON DRAWING 19, OR AN ALTERNATE EXCAVATION CONFIGURATION THAT MEETS APPLICABLE OSHA AND LUMINANT REQUIREMENTS. THE EXISTING GEOMEMBRANE LINER SHALL BE CLEANLY CUT AND GENTLY PEELED AWAY FROM THE PROPOSED EXCAVATION. FOLLOWING COMPLETION OF THE PIPELINE, EMBANKMENT FILL, AND CLAY LINER (OR EMBANKMENT FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL) CONSTRUCTION, THE GEOMEMBRANE SHALL BE LAID BACK AND WELDED USING GEOMEMBRANE CAPSTRIPS AS APPROPRIATE.
5. UNDERGROUND PIPING (THROUGH THE FGD-B EMBANKMENT) SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE PIPE PENETRATION THROUGH THE PROTECTIVE COVER, THE COMPACTED CLAY LINER, AND THE FIRST FIVE (5) FEET OF EMBANKMENT FILL SHALL NOT HAVE GRANULAR BEDDING OR BACKFILL.
6. NO PIPING OR CONCRETE SHOULD BE IN DIRECT CONTACT WITH THE GEOMEMBRANE. A 12-OZ NON-WOVEN GEOTEXTILE SHALL BE PLACED BETWEEN THE CONCRETE AND THE GEOMEMBRANE.
7. A SULFATE RESISTANT CONCRETE MIX DESIGN APPROVED BY THE OWNER'S REPRESENTATIVE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,500 PSI. CONCRETE COLLAR TO EXTEND APPROXIMATELY THREE (3) FEET AROUND THE RISER PIPE AND TO HAVE A MINIMUM OF 12 INCHES OF COVER ABOVE THE PIPE.
8. EMBANKMENT FILL (MORE THAN 12 INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING TEN (10) INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. CLAY LINER (OR GENERAL FILL OVERLAID BY EQUIVALENT OWNER-APPROVED GCL), GEOMEMBRANE LINER, AND PROTECTIVE COVER SHALL BE PLACED ON THE INSIDE FACE OF THE EMBANKMENT IN ACCORDANCE WITH THE LINER QUALITY CONTROL PLAN AFTER CONSTRUCTING THE PIPELINES THROUGH THE EMBANKMENT.

**REFERENCE(S)**

1. EXISTING GROUND TOPOGRAPHY IS TAKEN FROM AERIAL SURVEYS PERFORMED BY LUMINANT MINING ON JANUARY 8, 2020 AND FEBRUARY 17, 2020.
2. AS-CONSTRUCTED SURVEY OF FGD-B POND PERFORMED BY SAM, INC. ON DECEMBER 7, 2011.
3. SURVEY CONTROL TAKEN FROM A DRAWING PREPARED BY SAM, INC. ENTITLED "SKETCH TO ACCOMPANY FIELD NOTE NO. 4851" SAM, INC. JOB NO. 26172-09. SITE CONTROL IS NAD83 TEXAS STATE PLANE CENTRAL ZONE. ELEVATIONS ARE BASED ON SITE BENCHMARKS AND ARE IN FEET-MEAN SEA LEVEL.

ISSUED FOR CONSTRUCTION

0 10 20
1" = 10' FEET

0 6 12
1" = 6' FEET

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

APPENDIX E-Revision 1 November 21, 2022

SEAL

JEFFREY B. FASSETT 85675 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS 9/16/21

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**FGD-B POND TO PUMPS SUCTION PIPELINE INTAKE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 16 of 22 | 16 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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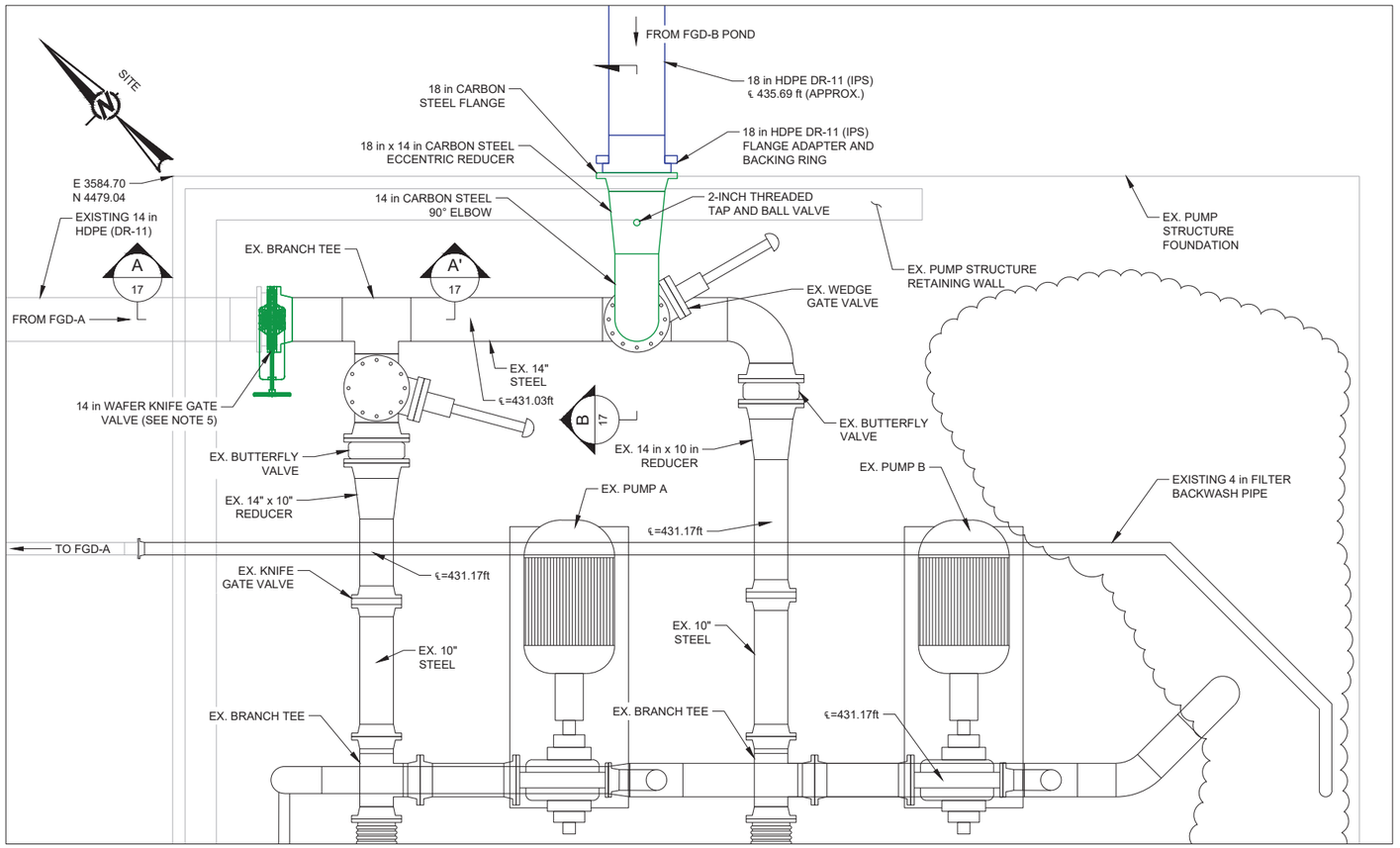
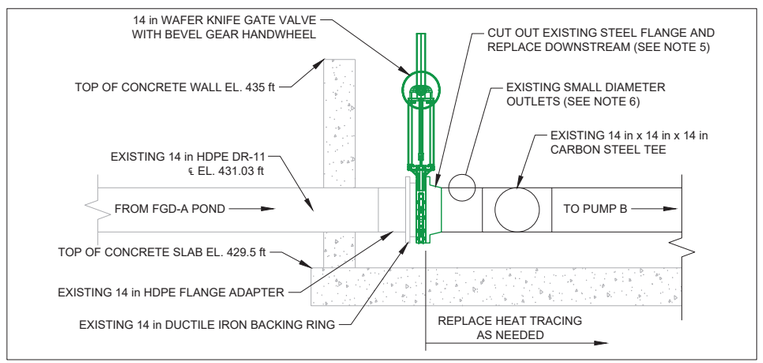



PUMP STRUCTURE PIPING PLAN VIEW
SCALE N.T.S.




SCALE SCALE A 17 SECTION A-A'

ISSUED FOR CONSTRUCTION

**LEGEND**

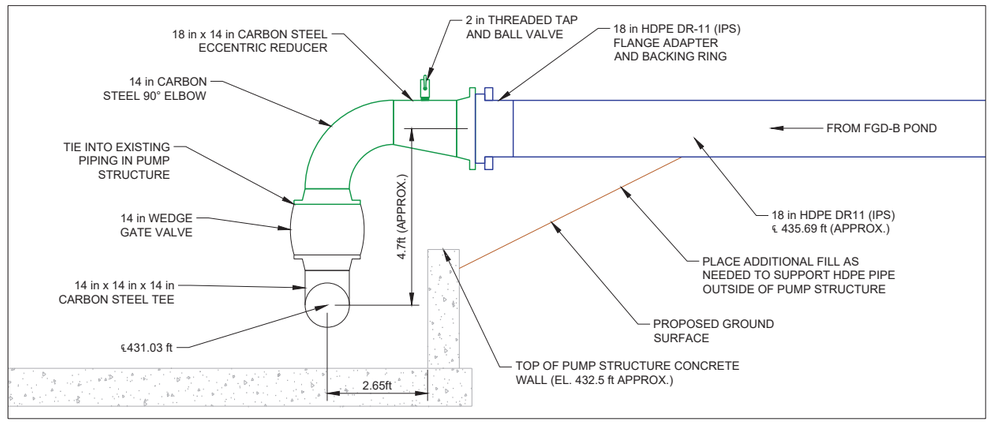
- EXISTING STEEL PIPING
- EXISTING HDPE PIPING
- PROPOSED STEEL PIPING
- PROPOSED HDPE PIPING

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND, ABOVE-GRADE, AND OVERHEAD UTILITIES.
3. ALL NEW PIPING WITHIN THE EXISTING PUMP STRUCTURE SHALL BE STD SCHEDULE ERW A53 CARBON STEEL.
4. TIE-IN CONFIGURATIONS AND DIMENSIONS SHOWN ARE BASED ON TYPICAL DIMENSIONS FOR FITTINGS AND VALVES. ACTUAL DIMENSIONS MAY VARY BY MANUFACTURER AND WILL REQUIRE FIELD ADJUSTMENTS.
5. CONTRACTOR SHALL CUT OUT EXISTING 14 in CARBON STEEL FLANGE AND APPROXIMATELY THREE (3) INCHES OF CARBON STEEL PIPE (LENGTH TO BE VERIFIED BY CONTRACTOR BASED ON ACTUAL 14 in WAFER KNIFE GATE VALVE PROCURED). A NEW 14 in CARBON STEEL FLANGE SHALL BE WELDED TO THE EXISTING PIPE TO ACCOMMODATE THE PROPOSED VALVE.
6. THE TWO (2) EXISTING SMALL DIAMETER (APPROXIMATELY 1-1/4 in) HEAT-TRACED OUTLETS EQUIPPED WITH BALL VALVES SHALL BE RELOCATED DOWNSTREAM APPROXIMATELY SIX (6) INCHES TO ALLOW THE EXISTING CARBON STEEL FLANGE TO BE MOVED DOWNSTREAM FOR THE PROPOSED 14 in WAFER KNIFE GATE VALVE. LOCATION OF THE RELOCATED OUTLETS TO BE APPROVED BY OWNER. OUTLETS SHALL BE HEAT-TRACED.

**REFERENCE(S)**

1. EXISTING PUMP STRUCTURE DETAILS FROM DRAWING A2YF00-0-CD-1-YD.00.PL-08 REVISION 3 DATED AUGUST 28, 1998.
2. EXISTING PIPING DETAILS FROM PIPING ISOMETRIC DRAWINGS:
   - 2.1. A2YF0-IS-5-WR.0015-01 DATED JANUARY 11, 2008
   - 2.2. A2YF0-IS-5-WR.0020-01 DATED DECEMBER 16, 2008
   - 2.3. A2YF0-IS-5-WR.0020-02 DATED DECEMBER 16, 2008
   - 2.4. A2YF0-IS-5-WR.0030-01 DATED DECEMBER 16, 2008
   - 2.5. A2YF0-IS-5-WR.0030-02 DATED DECEMBER 16, 2008
   - 2.6. A2YF0-IS-5-WR.0040-01 DATED DECEMBER 16, 2008
   - 2.7. A2YF0-IS-5-WR.0050-01 DATED DECEMBER 16, 2008
   - 2.8. A2YF0-IS-5-WR.0050-02 DATED DECEMBER 16, 2008
   - 2.9. A2YF0-IS-5-WR.0050-03 DATED DECEMBER 16, 2008
   - 2.10. A2YF0-IS-5-WR.0060-01 DATED DECEMBER 16, 2008
   - 2.11. A2YF0-IS-5-WR.0060-02 DATED FEBRUARY 14, 2008
   - 2.12. A2YF0-IS-5-WR.0060-03 DATED FEBRUARY 29, 2008
   - 2.13. A2YF0-IS-5-WR.0065-01 DATED APRIL 9, 2008




SCALE N.T.S. B 17 SECTION B-B'

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**PUMP STRUCTURE PROPOSED PIPING**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 17 of 22 | 17 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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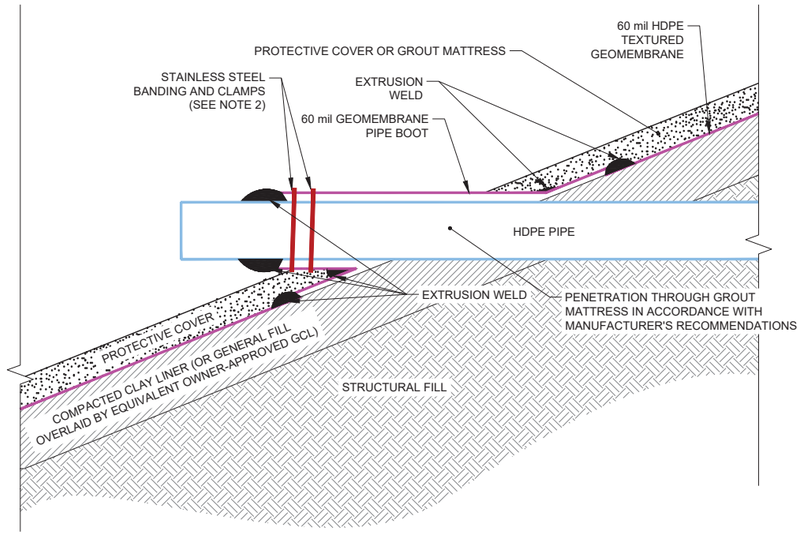
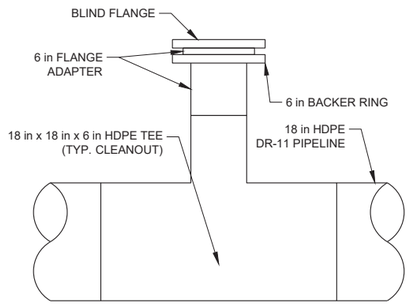


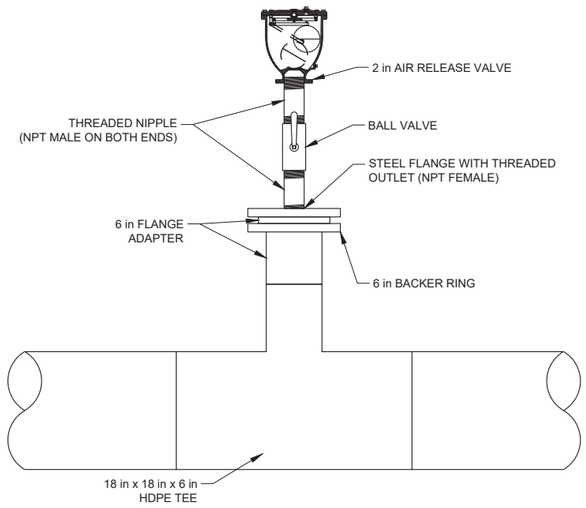

SCALE N.T.S. 1/18 TYPICAL PIPE PENETRATION



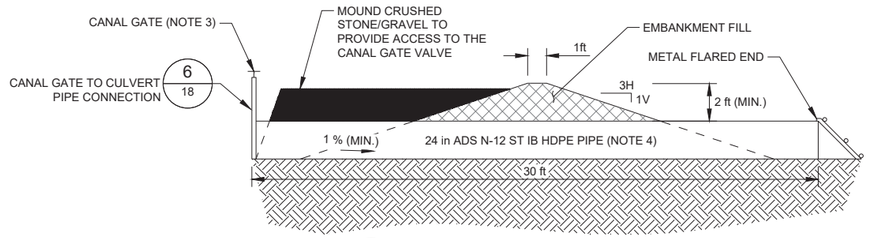

SCALE N.T.S. 2/18 TYPICAL CLEANOUT

**NOTE(S)**

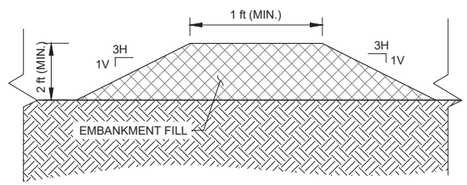
1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. CONTINUOUS ONE-HALF-INCH STAINLESS STEEL CLAMPS WITH A GASKET BETWEEN THE HDPE PIPE AND HDPE LINER BELOW THE STEEL CLAMPS, AND A CONTINUOUS STRIP OF NEOPRENE RUBBER CUSHION BETWEEN THE STAINLESS STEEL CLAMPS AND THE HDPE LINER.
3. THE CULVERT CANAL GATE VALVE SHALL BE A WATERMAN C-10 CANAL GATE WITH HDPE ADAPTER, TUBE SEAL, AND BACK FRAME ATTACHMENTS OR AN EQUIVALENT APPROVED BY THE OWNER'S REPRESENTATIVE. CANAL GATE VALVES AND FITTINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
4. CULVERT PIPING SHALL BE ADS N-12 ST IB HDPE PIPE OR EQUIVALENT APPROVED BY THE OWNER'S REPRESENTATIVE.
5. CULVERT FITTINGS (METAL FLARED END SECTIONS, ETC.) SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
6. CULVERT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
7. CONTRACTOR SHALL USE CARE WHEN COMPACTING EMBANKMENT FILL AROUND THE CULVERT AND SHALL USE HAND AND/OR REMOTE COMPACTION EQUIPMENT UNTIL THE PIPE HAS APPROXIMATELY 2-FEET OF COVER.



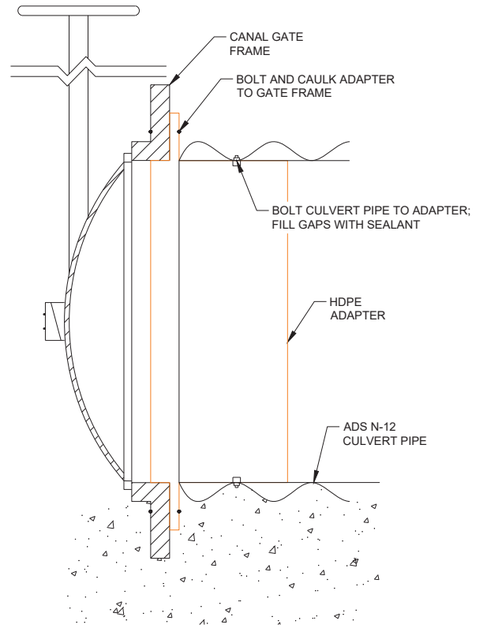

SCALE N.T.S. 3/18 TYPICAL AIR VALVE DETAIL




SCALE N.T.S. 4/18 CONTAINMENT BERM CROSSOVER CULVERT




SCALE N.T.S. 5/18 TYPICAL EARTHEN CONTAINMENT BERM




SCALE N.T.S. 6/18 CANAL GATE TO CULVERT PIPE CONNECTION

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**PIPING DETAILS - I OF II**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 18 of 22 | 18 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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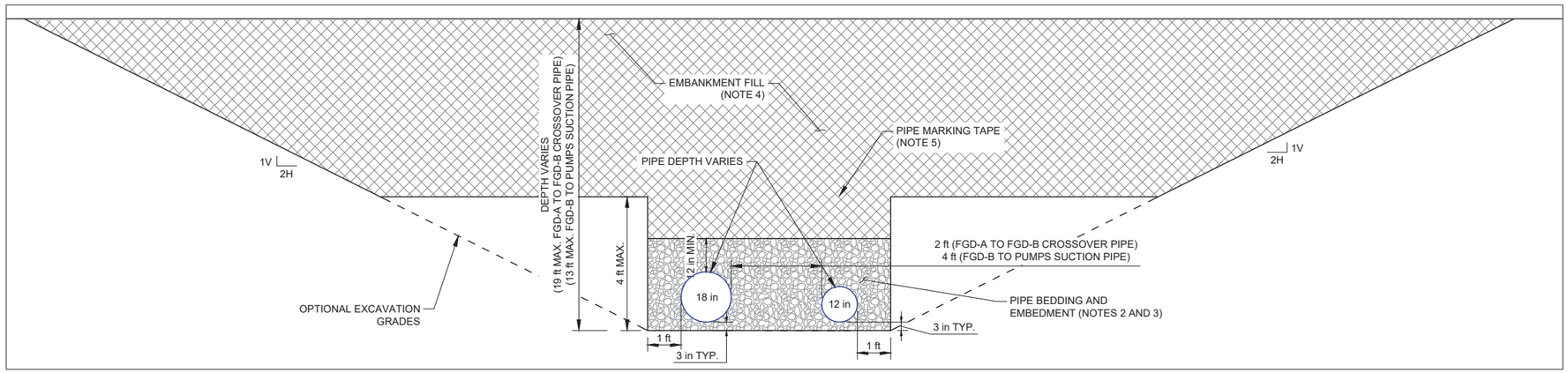
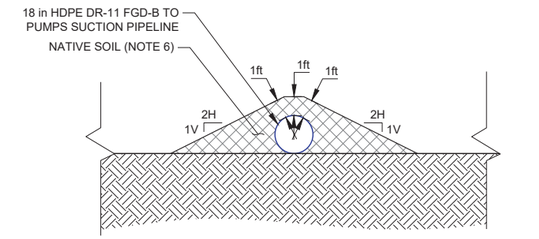
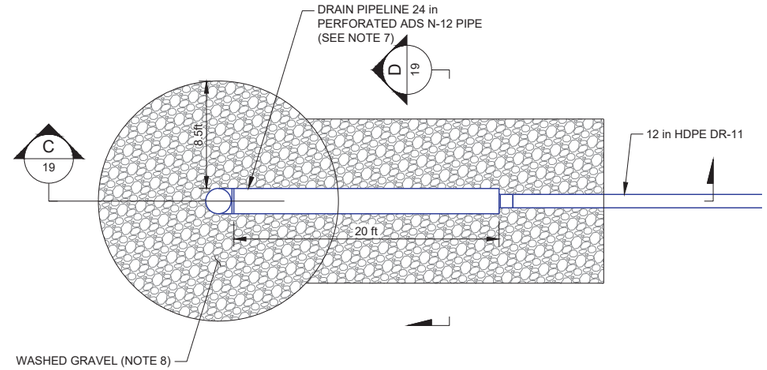



SCALE N.T.S. A 19 TYPICAL PIPE BACKFILL SECTION




SCALE N.T.S. B 19 TYPICAL EARTHEN BERM (PIPE RESTRAINT)

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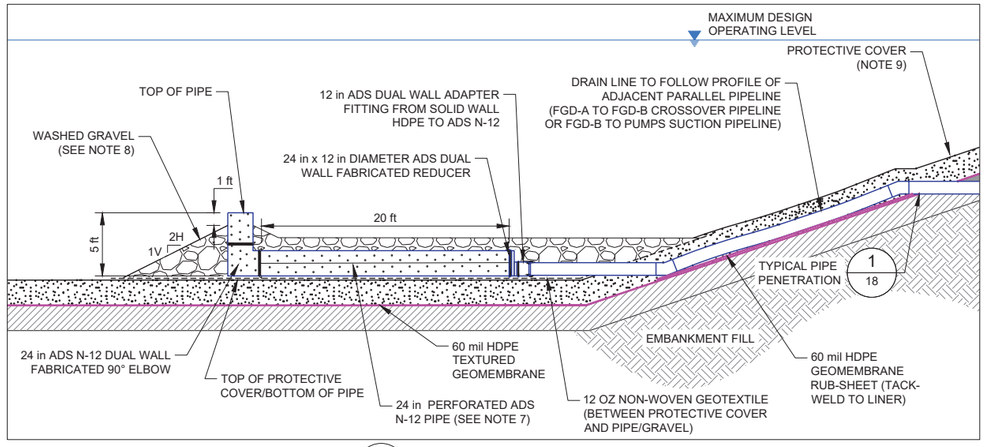
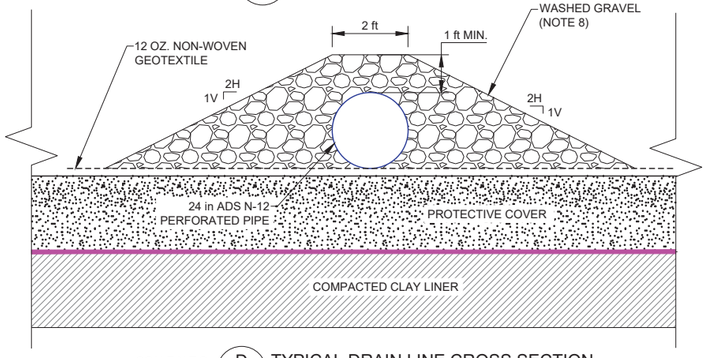



SCALE N.T.S. C 19 TYPICAL DRAIN LINE PROFILE




SCALE N.T.S. D 19 TYPICAL DRAIN LINE CROSS SECTION

**NOTE(S)**

1. ALL LUMINANT AND APPLICABLE OSHA HEALTH AND SAFETY REQUIREMENTS SHALL BE FOLLOWED DURING EXECUTION OF THE WORK.
2. PIPE BEDDING AND EMBEDMENT SHALL CONSIST OF ON-SITE OR IMPORTED EARTHEN MATERIAL CLASSIFYING UNDER ASTM D2487 AS WELL-GRADED SAND (SW OR SW-SM) OR WELL-GRADED GRAVEL (GW OR GW-GM) OR AS OTHERWISE APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE. PIPE BEDDING SHALL CONTAIN NO PARTICLES LARGER THAN 0.5-INCH, AND FREE FROM ROOTS, DEBRIS, OR ANY OTHER SUBSTANCE THAT WOULD HARM THE PIPE OR MIGHT IMPAIR THE PERFORMANCE OF THE MATERIAL AS BEDDING FOR THE PIPE. FINAL MATERIAL SELECTION SHALL BE APPROVED BY THE OWNER'S REPRESENTATIVE.
3. UNDERGROUND PIPING SHALL BE BEDDED ON THREE (3) INCHES OF GRANULAR PIPE BEDDING MATERIAL AND EMBEDDED IN THE SAME MATERIAL TO TWELVE (12) INCHES ABOVE THE TOP OF THE PIPING. THE MATERIAL DIRECTLY ABOVE THE PIPE IN THE EMBEDMENT ZONE SHALL BE ONLY LIGHTLY COMPACTED TO AVOID DISTORTING THE PIPE.
4. EMBANKMENT FILL (MORE THAN 12 INCHES ABOVE THE PIPE) SHALL CONSIST OF SOILS EXCAVATED AS PART OF THE WORK AS APPROVED BY THE OWNER'S REPRESENTATIVE. IF EXCAVATED SOILS ARE DEEMED UNSUITABLE, EMBANKMENT FILL SHALL CONSIST OF IMPORTED EARTHEN MATERIALS APPROVED BY THE OWNER'S REPRESENTATIVE. EMBANKMENT FILL SHALL BE PLACED IN HORIZONTAL LOOSE LIFTS NOT EXCEEDING TEN (10) INCHES IN THICKNESS AND MOISTURE CONDITIONED TO 1 PERCENT BELOW TO 3 PERCENT ABOVE STANDARD PROCTOR (ASTM D698) OPTIMUM MOISTURE CONTENT. EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY.
5. FOR ALL UNDERGROUND PIPING, MARKING TAPE ENABLING DETECTION BY METAL DETECTOR (AS INDICATED IN THE SPECIFICATIONS) SHALL BE LOCATED ABOVE THE PIPE AT A DEPTH OF 1 TO 2 FEET BELOW THE FINISHED GRADE.
6. MATERIAL FOR EARTHEN BERM USED TO ANCHOR HDPE PIPE TO BE SPECIFIED BY OWNER. EARTHEN BERM TO EXTEND 6 FEET ALONG LENGTH OF PIPE.
7. DRAIN LINE PIPING WITHIN BOTH PONDS TO BE PERFORATED 24 inch ADS N-12 ST IB (SOIL TIGHT) PIPE AND FITTINGS. ADS PIPE TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
8. PERFORATED DRAIN LINE PIPING WITHIN THE POND TO BE SURROUNDED WITH WASHED GRAVEL (GRAVEL TO BE APPROVED BY OWNER) AS SHOWN ON THE DRAWINGS (I.E. MINIMUM 12 INCHES AROUND THE DRAIN PIPE).
9. EXTEND PROTECTIVE COVER TO EMBANKMENT CREST IN FGD-B POND, PROTECTIVE COVER ENDS AT ELEV. 425.5 FT IN FGD-A POND.

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | BJP | KWG | AMS | TJS |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT

GOLDER
MEMBER OF WSP
HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY. SUITE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**PIPING DETAILS - II OF II**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 19 of 22 | 19 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

Path: \\denver\\aarar\VISTRA\OGSES\99_projects\19129621_fgd-api\pingupgrades\11_piping\drawings\02_production\DWG\in progress\ | File Name: 19129621-011AND012-DETAILS.dwg | Last Edited By: rsalazar Date: 2021-09-17 Time:10:28:08 AM | Printed By: RSalazar Date: 2021-09-17 Time:10:44:46 AM

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1300 | 4650.17 | 2764.40 | 450.0 |
| 1301 | 4599.87 | 2763.50 | 450.1 |
| 1302 | 4699.77 | 2775.42 | 450.1 |
| 1303 | 4550.07 | 2772.72 | 450.0 |
| 1304 | 4754.20 | 2800.00 | 450.1 |
| 1305 | 4750.14 | 2800.03 | 449.2 |
| 1306 | 4700.13 | 2800.05 | 440.6 |
| 1307 | 4650.11 | 2799.95 | 435.9 |
| 1308 | 4600.03 | 2800.07 | 435.6 |
| 1309 | 4550.20 | 2799.98 | 439.7 |
| 1310 | 4499.82 | 2799.80 | 447.9 |
| 1311 | 4490.14 | 2800.07 | 450.0 |
| 1312 | 4815.57 | 2850.04 | 450.0 |
| 1313 | 4799.98 | 2849.73 | 445.7 |
| 1314 | 4749.98 | 2849.97 | 432.6 |
| 1315 | 4699.95 | 2850.07 | 422.2 |
| 1316 | 4649.91 | 2850.00 | 422.0 |
| 1317 | 4600.10 | 2850.01 | 422.1 |
| 1318 | 4549.91 | 2850.01 | 422.1 |
| 1319 | 4499.96 | 2849.96 | 431.5 |
| 1320 | 4449.95 | 2849.86 | 445.6 |
| 1321 | 4434.75 | 2849.91 | 450.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1344 | 4450.05 | 2950.23 | 422.1 |
| 1345 | 4400.14 | 2949.99 | 433.4 |
| 1346 | 4349.82 | 2950.28 | 448.3 |
| 1347 | 4344.00 | 2950.08 | 450.1 |
| 1348 | 4974.17 | 3000.13 | 450.0 |
| 1349 | 4949.93 | 3000.02 | 443.5 |
| 1350 | 4900.18 | 2999.97 | 429.7 |
| 1351 | 4849.97 | 3000.13 | 422.1 |
| 1352 | 4800.05 | 2999.96 | 422.0 |
| 1353 | 4750.05 | 2999.91 | 422.1 |
| 1354 | 4700.05 | 2999.90 | 422.1 |
| 1355 | 4649.97 | 2999.99 | 422.0 |
| 1356 | 4599.94 | 3000.00 | 422.0 |
| 1357 | 4550.02 | 3000.14 | 422.0 |
| 1358 | 4500.13 | 2999.94 | 422.0 |
| 1359 | 4450.12 | 2999.99 | 422.1 |
| 1360 | 4400.07 | 2999.94 | 422.1 |
| 1361 | 4350.06 | 2999.95 | 435.6 |
| 1362 | 4330.05 | 2965.21 | 450.1 |
| 1363 | 4307.59 | 2999.88 | 450.0 |
| 1364 | 5007.18 | 3031.31 | 450.1 |
| 1365 | 5022.71 | 3050.00 | 450.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1388 | 4750.00 | 3099.93 | 422.0 |
| 1389 | 4699.99 | 3100.11 | 422.1 |
| 1390 | 4650.01 | 3099.95 | 422.1 |
| 1391 | 4599.80 | 3100.10 | 422.1 |
| 1392 | 4549.94 | 3099.90 | 422.0 |
| 1393 | 4500.08 | 3100.00 | 422.1 |
| 1394 | 4450.21 | 3099.91 | 422.1 |
| 1395 | 4399.86 | 3099.92 | 422.1 |
| 1396 | 4349.88 | 3099.92 | 422.1 |
| 1397 | 4300.15 | 3099.88 | 439.2 |
| 1398 | 4272.67 | 3099.86 | 450.0 |
| 1399 | 5012.69 | 3150.19 | 450.1 |
| 1400 | 5000.03 | 3149.86 | 446.5 |
| 1401 | 4949.91 | 3150.08 | 432.3 |
| 1402 | 4900.08 | 3150.00 | 422.1 |
| 1403 | 4849.97 | 3150.04 | 422.1 |
| 1404 | 4799.96 | 3149.87 | 422.1 |
| 1405 | 4749.94 | 3149.97 | 422.1 |
| 1406 | 4699.89 | 3149.98 | 422.1 |
| 1407 | 4650.25 | 3150.18 | 422.2 |
| 1408 | 4600.10 | 3150.23 | 422.2 |
| 1409 | 4549.82 | 3149.90 | 422.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1432 | 4913.14 | 3250.10 | 450.1 |
| 1433 | 4899.98 | 3249.85 | 446.3 |
| 1434 | 4850.06 | 3249.87 | 432.2 |
| 1435 | 4799.90 | 3249.95 | 422.1 |
| 1436 | 4750.09 | 3249.94 | 422.1 |
| 1437 | 4699.99 | 3250.13 | 425.9 |
| 1438 | 4649.99 | 3250.25 | 444.6 |
| 1439 | 4600.18 | 3250.06 | 448.1 |
| 1440 | 4550.06 | 3249.90 | 434.2 |
| 1441 | 4499.72 | 3250.10 | 422.0 |
| 1442 | 4449.97 | 3249.99 | 422.1 |
| 1443 | 4400.03 | 3250.01 | 422.1 |
| 1444 | 4349.99 | 3249.98 | 422.8 |
| 1445 | 4300.15 | 3249.95 | 441.9 |
| 1446 | 4278.95 | 3250.10 | 450.0 |
| 1447 | 4863.36 | 3299.92 | 450.0 |
| 1448 | 4849.93 | 3299.88 | 446.2 |
| 1449 | 4800.06 | 3300.17 | 432.1 |
| 1450 | 4749.89 | 3299.96 | 422.1 |
| 1451 | 4700.00 | 3300.08 | 422.0 |
| 1452 | 4650.18 | 3299.94 | 430.2 |
| 1453 | 4599.88 | 3299.95 | 444.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1476 | 4700.00 | 3399.71 | 431.8 |
| 1477 | 4650.04 | 3400.03 | 422.1 |
| 1478 | 4600.09 | 3400.10 | 422.2 |
| 1479 | 4550.14 | 3400.09 | 429.2 |
| 1480 | 4499.87 | 3400.10 | 443.2 |
| 1481 | 4450.09 | 3399.92 | 449.4 |
| 1482 | 4400.02 | 3399.94 | 443.3 |
| 1483 | 4375.39 | 3399.89 | 450.1 |
| 1484 | 4714.51 | 3449.91 | 450.0 |
| 1485 | 4700.06 | 3449.89 | 446.0 |
| 1486 | 4650.07 | 3450.02 | 431.8 |
| 1487 | 4600.03 | 3449.95 | 422.1 |
| 1488 | 4550.05 | 3450.13 | 422.0 |
| 1489 | 4499.96 | 3450.10 | 431.7 |
| 1490 | 4450.18 | 3450.08 | 445.6 |
| 1491 | 4433.76 | 3450.07 | 450.0 |
| 1492 | 4664.92 | 3499.94 | 450.2 |
| 1493 | 4649.88 | 3499.98 | 445.9 |
| 1494 | 4600.16 | 3499.92 | 431.7 |
| 1495 | 4550.19 | 3500.09 | 431.3 |
| 1496 | 4499.89 | 3500.02 | 445.0 |
| 1497 | 4481.43 | 3499.95 | 450.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1322 | 4868.56 | 2900.00 | 450.1 |
| 1323 | 4850.00 | 2899.87 | 445.0 |
| 1324 | 4800.20 | 2900.11 | 431.3 |
| 1325 | 4749.94 | 2899.92 | 422.1 |
| 1326 | 4700.03 | 2899.99 | 422.1 |
| 1327 | 4649.97 | 2900.08 | 422.1 |
| 1328 | 4600.07 | 2900.00 | 422.0 |
| 1329 | 4550.21 | 2900.09 | 422.0 |
| 1330 | 4499.98 | 2900.08 | 422.1 |
| 1331 | 4449.90 | 2899.80 | 432.1 |
| 1332 | 4399.76 | 2900.26 | 447.0 |
| 1333 | 4389.22 | 2899.91 | 450.0 |
| 1334 | 4921.29 | 2949.98 | 450.0 |
| 1335 | 4900.11 | 2949.92 | 444.3 |
| 1336 | 4849.87 | 2949.86 | 430.4 |
| 1337 | 4799.99 | 2949.93 | 422.2 |
| 1338 | 4750.26 | 2949.96 | 422.1 |
| 1339 | 4699.99 | 2950.07 | 422.1 |
| 1340 | 4650.13 | 2950.09 | 422.1 |
| 1341 | 4600.03 | 2950.03 | 422.2 |
| 1342 | 4549.85 | 2949.92 | 422.1 |
| 1343 | 4499.95 | 2950.14 | 422.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1366 | 5000.08 | 3049.94 | 442.8 |
| 1367 | 4949.98 | 3050.16 | 428.9 |
| 1368 | 4900.10 | 3050.17 | 422.1 |
| 1369 | 4850.14 | 3050.27 | 422.0 |
| 1370 | 4800.14 | 3049.86 | 422.0 |
| 1371 | 4749.91 | 3049.98 | 422.1 |
| 1372 | 4700.07 | 3050.19 | 422.0 |
| 1373 | 4650.04 | 3050.09 | 422.0 |
| 1374 | 4599.85 | 3050.16 | 422.1 |
| 1375 | 4549.78 | 3050.08 | 422.0 |
| 1376 | 4500.01 | 3050.00 | 422.0 |
| 1377 | 4450.08 | 3049.92 | 422.1 |
| 1378 | 4399.82 | 3049.99 | 422.1 |
| 1379 | 4350.12 | 3050.06 | 426.0 |
| 1380 | 4299.95 | 3050.19 | 444.6 |
| 1381 | 4285.70 | 3049.94 | 449.9 |
| 1382 | 5035.04 | 3099.88 | 450.0 |
| 1383 | 5000.20 | 3099.84 | 436.1 |
| 1384 | 4949.95 | 3099.98 | 422.1 |
| 1385 | 4899.91 | 3100.10 | 422.1 |
| 1386 | 4849.94 | 3099.95 | 422.0 |
| 1387 | 4800.11 | 3099.95 | 422.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1410 | 4499.87 | 3149.94 | 422.1 |
| 1411 | 4450.03 | 3149.98 | 422.0 |
| 1412 | 4400.13 | 3150.16 | 422.0 |
| 1413 | 4349.65 | 3149.80 | 422.1 |
| 1414 | 4299.98 | 3150.21 | 436.8 |
| 1415 | 4266.85 | 3149.88 | 450.0 |
| 1416 | 4962.89 | 3199.97 | 450.1 |
| 1417 | 4949.95 | 3199.98 | 446.5 |
| 1418 | 4899.96 | 3200.03 | 432.2 |
| 1419 | 4850.02 | 3199.95 | 422.2 |
| 1420 | 4799.94 | 3200.01 | 422.0 |
| 1421 | 4750.12 | 3200.09 | 422.1 |
| 1422 | 4699.93 | 3200.02 | 422.3 |
| 1423 | 4650.12 | 3200.18 | 436.9 |
| 1424 | 4599.99 | 3200.00 | 433.7 |
| 1425 | 4549.96 | 3200.14 | 422.1 |
| 1426 | 4499.99 | 3200.02 | 422.1 |
| 1427 | 4449.99 | 3199.87 | 422.0 |
| 1428 | 4400.15 | 3199.88 | 422.0 |
| 1429 | 4350.05 | 3200.03 | 422.1 |
| 1430 | 4299.90 | 3200.20 | 437.8 |
| 1431 | 4269.07 | 3199.96 | 450.0 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1454 | 4549.94 | 3300.05 | 448.6 |
| 1455 | 4499.96 | 3299.93 | 434.7 |
| 1456 | 4449.92 | 3300.11 | 422.0 |
| 1457 | 4400.26 | 3299.83 | 422.0 |
| 1458 | 4350.02 | 3300.08 | 431.0 |
| 1459 | 4299.91 | 3300.04 | 448.9 |
| 1460 | 4296.92 | 3299.90 | 450.0 |
| 1461 | 4813.80 | 3350.04 | 450.1 |
| 1462 | 4800.05 | 3350.08 | 446.1 |
| 1463 | 4749.84 | 3350.06 | 432.1 |
| 1464 | 4699.95 | 3350.17 | 422.0 |
| 1465 | 4649.96 | 3350.21 | 422.1 |
| 1466 | 4600.17 | 3350.01 | 429.6 |
| 1467 | 4550.05 | 3350.05 | 443.6 |
| 1468 | 4500.12 | 3350.13 | 449.0 |
| 1469 | 4449.97 | 3349.88 | 435.1 |
| 1470 | 4400.03 | 3349.86 | 428.7 |
| 1471 | 4350.07 | 3350.02 | 442.6 |
| 1472 | 4325.28 | 3349.95 | 449.9 |
| 1473 | 4329.35 | 3356.34 | 450.0 |
| 1474 | 4764.24 | 3399.84 | 450.1 |
| 1475 | 4750.01 | 3400.01 | 446.1 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 1498 | 4620.47 | 3544.63 | 450.1 |
| 1499 | 4614.43 | 3550.05 | 450.0 |
| 1500 | 4599.92 | 3550.00 | 446.9 |
| 1501 | 4550.16 | 3550.21 | 446.8 |
| 1502 | 4534.98 | 3550.17 | 450.0 |
| 1503 | 4600.17 | 3558.36 | 450.0 |
| 1504 | 4549.98 | 3558.82 | 450.0 |
| 1505 | 4788.76 | 2825.11 | 450.1 |
| 1506 | 4451.48 | 2831.62 | 450.0 |

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**AS-CONSTRUCTED CLAY POINT TABLE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 20 of 22 | 20 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3300 | 4649.98 | 2764.49 | 449.2 |
| 3301 | 4599.99 | 2763.63 | 449.2 |
| 3302 | 4700.09 | 2775.23 | 449.2 |
| 3303 | 4550.03 | 2772.71 | 449.2 |
| 3304 | 4754.21 | 2799.96 | 449.2 |
| 3305 | 4749.97 | 2800.01 | 448.3 |
| 3306 | 4700.06 | 2799.95 | 439.8 |
| 3307 | 4650.00 | 2800.03 | 435.1 |
| 3308 | 4600.03 | 2799.91 | 434.7 |
| 3309 | 4549.99 | 2800.05 | 438.7 |
| 3310 | 4500.06 | 2799.98 | 447.1 |
| 3311 | 4489.87 | 2800.05 | 449.2 |
| 3312 | 4815.30 | 2850.13 | 449.1 |
| 3313 | 4800.09 | 2850.04 | 444.9 |
| 3314 | 4749.95 | 2849.98 | 431.7 |
| 3315 | 4700.13 | 2850.15 | 421.3 |
| 3316 | 4649.95 | 2850.08 | 421.2 |
| 3317 | 4599.96 | 2849.86 | 421.2 |
| 3318 | 4550.08 | 2849.91 | 421.2 |
| 3319 | 4499.94 | 2850.00 | 430.6 |
| 3320 | 4450.05 | 2850.10 | 444.6 |
| 3321 | 4434.82 | 2849.80 | 449.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3344 | 4450.11 | 2950.03 | 421.2 |
| 3345 | 4400.08 | 2950.08 | 432.5 |
| 3346 | 4349.99 | 2949.97 | 447.4 |
| 3347 | 4343.90 | 2950.01 | 449.2 |
| 3348 | 4974.04 | 3000.18 | 449.1 |
| 3349 | 4949.87 | 2999.80 | 442.6 |
| 3350 | 4899.93 | 2999.98 | 428.8 |
| 3351 | 4850.01 | 2999.98 | 421.2 |
| 3352 | 4800.00 | 2999.95 | 421.2 |
| 3353 | 4749.99 | 2999.95 | 421.2 |
| 3354 | 4700.12 | 3000.05 | 421.2 |
| 3355 | 4649.75 | 2999.91 | 421.2 |
| 3356 | 4600.02 | 2999.78 | 421.2 |
| 3357 | 4549.97 | 2999.95 | 421.2 |
| 3358 | 4500.08 | 3000.16 | 421.2 |
| 3359 | 4449.98 | 3000.13 | 421.2 |
| 3360 | 4400.19 | 3000.28 | 421.2 |
| 3361 | 4350.01 | 3000.00 | 434.7 |
| 3362 | 4330.13 | 2965.15 | 449.2 |
| 3363 | 4307.50 | 3000.08 | 449.2 |
| 3364 | 5007.10 | 3031.27 | 449.2 |
| 3365 | 5022.88 | 3049.99 | 449.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3388 | 4749.95 | 3099.96 | 421.2 |
| 3389 | 4700.03 | 3099.98 | 421.2 |
| 3390 | 4649.91 | 3100.08 | 421.2 |
| 3391 | 4599.96 | 3099.81 | 421.2 |
| 3392 | 4549.96 | 3099.93 | 421.2 |
| 3393 | 4500.04 | 3100.03 | 421.2 |
| 3394 | 4449.97 | 3100.23 | 421.2 |
| 3395 | 4399.85 | 3100.03 | 421.2 |
| 3396 | 4349.86 | 3100.03 | 421.2 |
| 3397 | 4300.11 | 3100.06 | 438.3 |
| 3398 | 4272.46 | 3100.10 | 449.1 |
| 3399 | 5012.69 | 3150.30 | 449.2 |
| 3400 | 4999.99 | 3150.05 | 445.6 |
| 3401 | 4950.11 | 3150.20 | 431.5 |
| 3402 | 4899.87 | 3149.96 | 421.2 |
| 3403 | 4849.90 | 3150.03 | 421.2 |
| 3404 | 4800.03 | 3149.92 | 421.2 |
| 3405 | 4749.90 | 3149.97 | 421.2 |
| 3406 | 4700.06 | 3150.04 | 421.2 |
| 3407 | 4650.12 | 3150.17 | 421.2 |
| 3408 | 4600.02 | 3150.01 | 421.2 |
| 3409 | 4550.02 | 3150.04 | 421.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3432 | 4913.31 | 3249.92 | 449.2 |
| 3433 | 4899.87 | 3249.96 | 445.4 |
| 3434 | 4849.79 | 3249.97 | 431.2 |
| 3435 | 4800.06 | 3249.94 | 421.2 |
| 3436 | 4750.07 | 3249.82 | 421.2 |
| 3437 | 4699.85 | 3249.95 | 425.1 |
| 3438 | 4650.22 | 3249.88 | 443.6 |
| 3439 | 4600.03 | 3250.12 | 447.3 |
| 3440 | 4549.99 | 3249.93 | 433.3 |
| 3441 | 4500.06 | 3249.89 | 421.2 |
| 3442 | 4450.07 | 3249.98 | 421.2 |
| 3443 | 4400.05 | 3250.03 | 421.2 |
| 3444 | 4349.96 | 3250.03 | 422.0 |
| 3445 | 4300.02 | 3250.08 | 441.0 |
| 3446 | 4278.82 | 3250.03 | 449.2 |
| 3447 | 4863.33 | 3300.08 | 449.2 |
| 3448 | 4850.07 | 3299.94 | 445.4 |
| 3449 | 4800.01 | 3300.12 | 431.2 |
| 3450 | 4750.09 | 3299.88 | 421.2 |
| 3451 | 4699.74 | 3300.06 | 421.2 |
| 3452 | 4650.10 | 3299.89 | 429.3 |
| 3453 | 4599.94 | 3299.98 | 443.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3478 | 4599.76 | 3400.02 | 421.2 |
| 3479 | 4550.03 | 3400.07 | 428.3 |
| 3480 | 4500.04 | 3400.07 | 442.2 |
| 3481 | 4450.06 | 3399.93 | 448.6 |
| 3482 | 4399.93 | 3400.08 | 442.5 |
| 3483 | 4375.40 | 3400.07 | 449.2 |
| 3484 | 4714.37 | 3449.93 | 449.1 |
| 3485 | 4699.82 | 3449.99 | 445.0 |
| 3486 | 4649.98 | 3450.12 | 430.9 |
| 3487 | 4600.03 | 3449.92 | 421.2 |
| 3488 | 4550.17 | 3449.88 | 421.2 |
| 3489 | 4499.88 | 3450.11 | 430.9 |
| 3490 | 4450.02 | 3450.04 | 444.7 |
| 3491 | 4433.56 | 3449.95 | 449.2 |
| 3492 | 4664.93 | 3500.04 | 449.2 |
| 3493 | 4649.94 | 3500.02 | 445.0 |
| 3494 | 4600.07 | 3499.95 | 430.8 |
| 3495 | 4549.97 | 3499.88 | 430.4 |
| 3496 | 4500.56 | 3500.01 | 444.0 |
| 3497 | 4481.43 | 3500.05 | 449.2 |
| 3498 | 4620.63 | 3544.75 | 449.3 |
| 3499 | 4614.54 | 3550.07 | 449.3 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3322 | 4868.44 | 2899.84 | 449.3 |
| 3323 | 4850.02 | 2899.83 | 444.2 |
| 3324 | 4800.01 | 2900.05 | 430.4 |
| 3325 | 4749.78 | 2899.94 | 421.2 |
| 3326 | 4700.02 | 2899.99 | 421.2 |
| 3327 | 4649.94 | 2900.13 | 421.2 |
| 3328 | 4600.15 | 2900.02 | 421.2 |
| 3329 | 4550.01 | 2900.15 | 421.2 |
| 3330 | 4500.03 | 2900.01 | 421.2 |
| 3331 | 4449.97 | 2899.91 | 431.2 |
| 3332 | 4399.89 | 2900.01 | 446.0 |
| 3333 | 4389.16 | 2900.02 | 449.2 |
| 3334 | 4921.29 | 2950.05 | 449.2 |
| 3335 | 4899.93 | 2949.95 | 443.4 |
| 3336 | 4850.03 | 2949.92 | 429.6 |
| 3337 | 4800.05 | 2950.07 | 421.2 |
| 3338 | 4749.90 | 2949.86 | 421.2 |
| 3339 | 4700.03 | 2950.05 | 421.2 |
| 3340 | 4650.14 | 2949.85 | 421.2 |
| 3341 | 4599.76 | 2950.10 | 421.2 |
| 3342 | 4549.90 | 2949.96 | 421.2 |
| 3343 | 4500.06 | 2950.10 | 421.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3366 | 5000.02 | 3049.82 | 442.0 |
| 3367 | 4950.03 | 3050.04 | 428.0 |
| 3368 | 4900.06 | 3050.04 | 421.2 |
| 3369 | 4849.94 | 3049.97 | 421.2 |
| 3370 | 4799.94 | 3049.96 | 421.2 |
| 3371 | 4750.14 | 3050.06 | 421.2 |
| 3372 | 4700.05 | 3050.02 | 421.2 |
| 3373 | 4650.14 | 3050.11 | 421.2 |
| 3374 | 4599.86 | 3050.26 | 421.2 |
| 3375 | 4549.83 | 3050.00 | 421.2 |
| 3376 | 4500.11 | 3050.10 | 421.2 |
| 3377 | 4449.94 | 3049.83 | 421.2 |
| 3378 | 4400.20 | 3050.12 | 421.2 |
| 3379 | 4350.00 | 3049.94 | 425.1 |
| 3380 | 4299.92 | 3049.95 | 443.7 |
| 3381 | 4285.57 | 3049.92 | 449.2 |
| 3382 | 5034.77 | 3100.02 | 449.1 |
| 3383 | 5000.01 | 3100.13 | 435.3 |
| 3384 | 4950.02 | 3100.05 | 421.2 |
| 3385 | 4900.10 | 3100.09 | 421.2 |
| 3386 | 4849.98 | 3100.03 | 421.2 |
| 3387 | 4800.10 | 3099.98 | 421.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3410 | 4499.97 | 3150.05 | 421.2 |
| 3411 | 4450.05 | 3150.08 | 421.2 |
| 3412 | 4399.88 | 3149.97 | 421.2 |
| 3413 | 4349.99 | 3150.03 | 421.2 |
| 3414 | 4299.79 | 3149.95 | 436.1 |
| 3415 | 4266.81 | 3150.03 | 449.3 |
| 3416 | 4962.61 | 3199.66 | 449.0 |
| 3417 | 4949.98 | 3200.11 | 445.6 |
| 3418 | 4900.10 | 3200.07 | 431.4 |
| 3419 | 4849.92 | 3199.93 | 421.2 |
| 3420 | 4800.05 | 3200.02 | 421.2 |
| 3421 | 4749.98 | 3199.84 | 421.2 |
| 3422 | 4700.00 | 3200.07 | 421.5 |
| 3423 | 4649.93 | 3199.94 | 436.1 |
| 3424 | 4600.00 | 3200.15 | 432.9 |
| 3425 | 4550.07 | 3199.89 | 421.2 |
| 3426 | 4500.11 | 3199.99 | 421.2 |
| 3427 | 4449.95 | 3200.02 | 421.2 |
| 3428 | 4399.93 | 3199.87 | 421.2 |
| 3429 | 4350.02 | 3200.01 | 421.2 |
| 3430 | 4299.96 | 3200.05 | 436.9 |
| 3431 | 4269.09 | 3200.06 | 449.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3454 | 4549.94 | 3299.92 | 447.7 |
| 3455 | 4500.11 | 3300.07 | 433.8 |
| 3456 | 4450.05 | 3299.92 | 421.2 |
| 3457 | 4399.89 | 3300.08 | 421.2 |
| 3458 | 4350.00 | 3300.06 | 430.2 |
| 3459 | 4299.89 | 3300.04 | 448.1 |
| 3460 | 4296.96 | 3299.97 | 449.1 |
| 3461 | 4813.76 | 3350.05 | 449.2 |
| 3462 | 4800.05 | 3350.06 | 445.3 |
| 3463 | 4749.84 | 3349.96 | 431.0 |
| 3464 | 4699.89 | 3350.05 | 421.2 |
| 3465 | 4650.01 | 3349.83 | 421.2 |
| 3466 | 4600.05 | 3350.02 | 428.8 |
| 3469 | 4450.05 | 3350.07 | 434.3 |
| 3470 | 4399.90 | 3349.95 | 427.9 |
| 3471 | 4350.05 | 3349.92 | 441.6 |
| 3472 | 4325.46 | 3350.10 | 449.1 |
| 3473 | 4329.49 | 3356.46 | 449.1 |
| 3474 | 4764.16 | 3400.09 | 449.2 |
| 3475 | 4749.97 | 3399.91 | 445.1 |
| 3476 | 4699.92 | 3399.99 | 430.9 |
| 3477 | 4650.10 | 3400.08 | 421.2 |

## CONTROL POINT TABLE

| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
|---|---|---|---|
| 3500 | 4599.96 | 3549.94 | 446.1 |
| 3501 | 4549.99 | 3549.99 | 446.0 |
| 3502 | 4535.15 | 3550.06 | 449.2 |
| 3503 | 4600.09 | 3558.45 | 449.2 |
| 3504 | 4550.00 | 3558.84 | 449.2 |
| 3505 | 4788.77 | 2825.15 | 449.2 |
| 3506 | 4451.50 | 2831.59 | 449.2 |

NOTE:

1. CONTROL POINTS 3304 AND 3305 ARE WITHIN THE EXTENT OF FGD-A POND EMBANKMENT WHICH WILL BE REMOVED TO ACCOMODATE PIPE INSTALLATION.

ISSUED FOR CONSTRUCTION

| REV. | YYYY-MM-DD | DESCRIPTION | DESIGNED | PREPARED | REVIEWED | APPROVED |
|---|---|---|---|---|---|---|
| 0 | 2021-09-16 | ISSUED FOR CONSTRUCTION | JBF | RS | JBF | JBF |

APPENDIX E-Revision 1 November 21, 2022

SEAL

JEFFREY B. FASSETT 90078 LICENSED PROFESSIONAL ENGINEER 9/16/21

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT
LUMINANT POWER

CONSULTANT
GOLDER
MEMBER OF WSP

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD-A POND RETROFIT
ROBERTSON COUNTY, TEXAS

TITLE
**TOP OF EXCAVATED CLAY POINT TABLE**

| PROJECT NO. | LUMINANT DRAWING NO. | REV. | | DRAWING |
|---|---|---|---|---|
| 19129621 | | 0 | 21 of 22 | 21 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in

0

Path: \\golder.gds\complex\data\office\houston - north_luminant\OGSES\99_PROJ\19129621_fgda\02_PRODUCTION\ | File Name: 19129621-003.dwg | Last Edited By: rsalazar Date: 2021-09-16 Time:2:47:09 PM | Printed By: RSalazar Date: 2021-09-17 Time:9:21:46 AM

| CONTROL POINT TABLE | | | |
|---|---|---|---|
| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
| 4300 | 4649.98 | 2764.49 | 449.0 |
| 4301 | 4599.99 | 2763.63 | 449.0 |
| 4302 | 4700.09 | 2775.23 | 449.0 |
| 4303 | 4550.03 | 2772.71 | 449.0 |
| 4304 | 4754.21 | 2799.96 | 449.0 |
| 4305 | 4749.97 | 2800.01 | 448.1 |
| 4306 | 4700.06 | 2799.95 | 439.6 |
| 4307 | 4650.00 | 2800.03 | 434.9 |
| 4308 | 4600.03 | 2799.91 | 434.5 |
| 4309 | 4549.99 | 2800.05 | 438.5 |
| 4310 | 4500.06 | 2799.98 | 446.9 |
| 4311 | 4489.87 | 2800.05 | 449.0 |
| 4312 | 4815.30 | 2850.13 | 449.0 |
| 4313 | 4800.09 | 2850.04 | 444.8 |
| 4314 | 4749.95 | 2849.98 | 431.5 |
| 4315 | 4700.13 | 2850.15 | 421.1 |
| 4316 | 4649.95 | 2850.08 | 421.0 |
| 4317 | 4599.96 | 2849.86 | 421.0 |
| 4318 | 4550.08 | 2849.91 | 421.0 |
| 4319 | 4499.94 | 2850.00 | 430.4 |
| 4320 | 4450.05 | 2850.10 | 444.4 |
| 4321 | 4434.82 | 2849.80 | 449.0 |

| CONTROL POINT TABLE | | | |
|---|---|---|---|
| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
| 4344 | 4450.11 | 2950.03 | 421.0 |
| 4345 | 4400.08 | 2950.08 | 432.3 |
| 4346 | 4349.99 | 2949.97 | 447.2 |
| 4347 | 4343.90 | 2950.01 | 449.0 |
| 4348 | 4974.04 | 3000.18 | 448.9 |
| 4349 | 4949.87 | 2999.80 | 442.4 |
| 4350 | 4899.93 | 2999.98 | 428.6 |
| 4351 | 4850.01 | 2999.98 | 421.0 |
| 4352 | 4800.00 | 2999.95 | 421.0 |
| 4353 | 4749.99 | 2999.95 | 421.0 |
| 4354 | 4700.12 | 3000.05 | 421.0 |
| 4355 | 4649.75 | 2999.91 | 421.0 |
| 4356 | 4600.02 | 2999.78 | 421.0 |
| 4357 | 4549.97 | 2999.95 | 421.0 |
| 4358 | 4500.08 | 3000.16 | 421.0 |
| 4359 | 4449.98 | 3000.13 | 421.0 |
| 4360 | 4400.19 | 3000.28 | 421.0 |
| 4361 | 4350.01 | 3000.00 | 434.5 |
| 4362 | 4330.13 | 2965.15 | 449.0 |
| 4363 | 4307.50 | 3000.08 | 449.0 |
| 4364 | 5007.10 | 3031.27 | 449.0 |
| 4365 | 5022.88 | 3049.99 | 449.0 |

| CONTROL POINT TABLE | | | |
|---|---|---|---|
| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
| 4388 | 4749.95 | 3099.96 | 421.0 |
| 4389 | 4700.03 | 3099.98 | 421.0 |
| 4390 | 4649.91 | 3100.08 | 421.0 |
| 4391 | 4599.96 | 3099.81 | 421.0 |
| 4392 | 4549.96 | 3099.93 | 421.0 |
| 4393 | 4500.04 | 3100.03 | 421.0 |
| 4394 | 4449.97 | 3100.23 | 421.0 |
| 4395 | 4399.85 | 3100.03 | 421.0 |
| 4396 | 4349.86 | 3100.03 | 421.0 |
| 4397 | 4300.11 | 3100.06 | 438.1 |
| 4398 | 4272.46 | 3100.10 | 448.9 |
| 4399 | 5012.69 | 3150.30 | 449.0 |
| 4400 | 4999.99 | 3150.05 | 445.4 |
| 4401 | 4950.11 | 3150.20 | 431.3 |
| 4402 | 4899.87 | 3149.96 | 421.0 |
| 4403 | 4849.90 | 3150.03 | 421.0 |
| 4404 | 4800.03 | 3149.92 | 421.0 |
| 4405 | 4749.90 | 3149.97 | 421.0 |
| 4406 | 4700.06 | 3150.04 | 421.0 |
| 4407 | 4650.12 | 3150.17 | 421.0 |
| 4408 | 4600.02 | 3150.01 | 421.0 |
| 4409 | 4550.02 | 3150.04 | 421.0 |

| CONTROL POINT TABLE | | | |
|---|---|---|---|
| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
| 4432 | 4913.31 | 3249.92 | 449.0 |
| 4433 | 4899.87 | 3249.96 | 445.2 |
| 4434 | 4849.79 | 3249.97 | 431.0 |
| 4435 | 4800.06 | 3249.94 | 421.0 |
| 4436 | 4750.07 | 3249.82 | 421.0 |
| 4437 | 4699.85 | 3249.95 | 424.9 |
| 4438 | 4650.22 | 3249.88 | 443.4 |
| 4439 | 4600.03 | 3250.12 | 447.1 |
| 4440 | 4549.99 | 3249.93 | 433.1 |
| 4441 | 4500.06 | 3249.89 | 421.0 |
| 4442 | 4450.07 | 3249.98 | 421.0 |
| 4443 | 4400.05 | 3250.03 | 421.0 |
| 4444 | 4349.96 | 3250.03 | 421.8 |
| 4445 | 4300.02 | 3250.08 | 440.8 |
| 4446 | 4278.82 | 3250.03 | 449.0 |
| 4447 | 4863.33 | 3300.08 | 449.0 |
| 4448 | 4850.07 | 3299.94 | 445.2 |
| 4449 | 4800.01 | 3300.12 | 431.0 |
| 4450 | 4750.09 | 3299.88 | 421.0 |
| 4451 | 4699.74 | 3300.06 | 421.0 |
| 4452 | 4650.10 | 3299.89 | 429.1 |
| 4453 | 4599.94 | 3299.98 | 443.0 |

| CONTROL POINT TABLE | | | |
|---|---|---|---|
| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
| 4478 | 4599.76 | 3400.02 | 421.0 |
| 4479 | 4550.03 | 3400.07 | 428.1 |
| 4480 | 4500.04 | 3400.07 | 442.0 |
| 4481 | 4450.06 | 3399.93 | 448.4 |
| 4482 | 4399.93 | 3400.08 | 442.3 |
| 4483 | 4375.40 | 3400.07 | 449.0 |
| 4484 | 4714.37 | 3449.93 | 449.0 |
| 4485 | 4699.82 | 3449.99 | 444.8 |
| 4486 | 4649.98 | 3450.12 | 430.7 |
| 4487 | 4600.03 | 3449.92 | 421.0 |
| 4488 | 4550.17 | 3449.88 | 421.0 |
| 4489 | 4499.88 | 3450.11 | 430.7 |
| 4490 | 4450.02 | 3450.04 | 444.5 |
| 4491 | 4433.56 | 3449.95 | 449.0 |
| 4492 | 4664.93 | 3500.04 | 449.0 |
| 4493 | 4649.94 | 3500.02 | 444.8 |
| 4494 | 4600.07 | 3499.95 | 430.6 |
| 4495 | 4549.97 | 3499.88 | 430.2 |
| 4496 | 4500.56 | 3500.01 | 443.9 |
| 4497 | 4481.43 | 3500.05 | 449.0 |
| 4498 | 4620.63 | 3544.75 | 449.1 |
| 4499 | 4614.54 | 3550.07 | 449.1 |

| CONTROL POINT TABLE | | | |
|---|---|---|---|
| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
| 4322 | 4868.44 | 2899.84 | 449.1 |
| 4323 | 4850.02 | 2899.83 | 444.0 |
| 4324 | 4800.01 | 2900.05 | 430.2 |
| 4325 | 4749.78 | 2899.94 | 421.0 |
| 4326 | 4700.02 | 2899.99 | 421.0 |
| 4327 | 4649.94 | 2900.13 | 421.0 |
| 4328 | 4600.15 | 2900.02 | 421.0 |
| 4329 | 4550.01 | 2900.15 | 421.0 |
| 4330 | 4500.03 | 2900.01 | 421.0 |
| 4331 | 4449.97 | 2899.91 | 431.0 |
| 4332 | 4399.89 | 2900.01 | 445.8 |
| 4333 | 4389.16 | 2900.02 | 449.0 |
| 4334 | 4921.29 | 2950.05 | 449.0 |
| 4335 | 4899.93 | 2949.95 | 443.2 |
| 4336 | 4850.03 | 2949.92 | 429.5 |
| 4337 | 4800.05 | 2950.07 | 421.0 |
| 4338 | 4749.90 | 2949.86 | 421.0 |
| 4339 | 4700.03 | 2950.05 | 421.0 |
| 4340 | 4650.14 | 2949.85 | 421.0 |
| 4341 | 4599.76 | 2950.10 | 421.0 |
| 4342 | 4549.90 | 2949.96 | 421.0 |
| 4343 | 4500.06 | 2950.10 | 421.0 |

| CONTROL POINT TABLE | | | |
|---|---|---|---|
| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
| 4366 | 5000.02 | 3049.82 | 441.8 |
| 4367 | 4950.03 | 3050.04 | 427.8 |
| 4368 | 4900.06 | 3050.04 | 421.0 |
| 4369 | 4849.94 | 3049.97 | 421.0 |
| 4370 | 4799.94 | 3049.96 | 421.0 |
| 4371 | 4750.14 | 3050.06 | 421.0 |
| 4372 | 4700.05 | 3050.02 | 421.0 |
| 4373 | 4650.14 | 3050.11 | 421.0 |
| 4374 | 4599.86 | 3050.26 | 421.0 |
| 4375 | 4549.83 | 3050.00 | 421.0 |
| 4376 | 4500.11 | 3050.10 | 421.0 |
| 4377 | 4449.94 | 3049.83 | 421.0 |
| 4378 | 4400.20 | 3050.12 | 421.0 |
| 4379 | 4350.00 | 3049.94 | 424.9 |
| 4380 | 4299.92 | 3049.95 | 443.5 |
| 4381 | 4285.57 | 3049.92 | 449.0 |
| 4382 | 5034.77 | 3100.02 | 448.9 |
| 4383 | 5000.01 | 3100.13 | 435.1 |
| 4384 | 4950.02 | 3100.05 | 421.0 |
| 4385 | 4900.10 | 3100.09 | 421.0 |
| 4386 | 4849.98 | 3100.03 | 421.0 |
| 4387 | 4800.10 | 3099.98 | 421.0 |

| CONTROL POINT TABLE | | | |
|---|---|---|---|
| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
| 4410 | 4499.97 | 3150.05 | 421.0 |
| 4411 | 4450.05 | 3150.08 | 421.0 |
| 4412 | 4399.88 | 3149.97 | 421.0 |
| 4413 | 4349.99 | 3150.03 | 421.0 |
| 4414 | 4299.79 | 3149.95 | 435.9 |
| 4415 | 4266.81 | 3150.03 | 449.1 |
| 4416 | 4962.61 | 3199.66 | 448.9 |
| 4417 | 4949.98 | 3200.11 | 445.5 |
| 4418 | 4900.10 | 3200.07 | 431.2 |
| 4419 | 4849.92 | 3199.93 | 421.0 |
| 4420 | 4800.05 | 3200.02 | 421.0 |
| 4421 | 4749.98 | 3199.84 | 421.0 |
| 4422 | 4700.00 | 3200.07 | 421.3 |
| 4423 | 4649.93 | 3199.94 | 435.9 |
| 4424 | 4600.00 | 3200.15 | 432.7 |
| 4425 | 4550.07 | 3199.89 | 421.0 |
| 4426 | 4500.11 | 3199.99 | 421.0 |
| 4427 | 4449.95 | 3200.02 | 421.0 |
| 4428 | 4399.93 | 3199.87 | 421.0 |
| 4429 | 4350.02 | 3200.01 | 421.0 |
| 4430 | 4299.96 | 3200.05 | 436.7 |
| 4431 | 4269.09 | 3200.06 | 449.0 |

| CONTROL POINT TABLE | | | |
|---|---|---|---|
| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
| 4454 | 4549.94 | 3299.92 | 447.5 |
| 4455 | 4500.11 | 3300.07 | 433.6 |
| 4456 | 4450.05 | 3299.92 | 421.0 |
| 4457 | 4399.89 | 3300.08 | 421.0 |
| 4458 | 4350.00 | 3300.06 | 430.0 |
| 4459 | 4299.89 | 3300.04 | 447.9 |
| 4460 | 4296.96 | 3299.97 | 448.9 |
| 4461 | 4813.76 | 3350.05 | 449.0 |
| 4462 | 4800.05 | 3350.06 | 445.1 |
| 4463 | 4749.84 | 3349.96 | 430.8 |
| 4464 | 4699.89 | 3350.05 | 421.0 |
| 4465 | 4650.01 | 3349.83 | 421.0 |
| 4466 | 4600.05 | 3350.02 | 428.6 |
| 4469 | 4450.05 | 3350.07 | 434.1 |
| 4470 | 4399.90 | 3349.95 | 427.7 |
| 4471 | 4350.05 | 3349.92 | 441.4 |
| 4472 | 4325.46 | 3350.10 | 448.9 |
| 4473 | 4329.49 | 3356.46 | 448.9 |
| 4474 | 4764.16 | 3400.09 | 449.0 |
| 4475 | 4749.97 | 3399.91 | 444.9 |
| 4476 | 4699.92 | 3399.99 | 430.7 |
| 4477 | 4650.10 | 3400.08 | 421.0 |

| CONTROL POINT TABLE | | | |
|---|---|---|---|
| POINT NO. | NORTHING (FT) | EASTING (FT) | ELEVATION (FT) |
| 4500 | 4599.96 | 3549.94 | 445.9 |
| 4501 | 4549.99 | 3549.99 | 445.8 |
| 4502 | 4535.15 | 3550.06 | 449.0 |
| 4503 | 4600.09 | 3558.45 | 449.0 |
| 4504 | 4550.00 | 3558.84 | 449.0 |
| 4505 | 4788.77 | 2825.15 | 449.0 |
| 4506 | 4451.50 | 2831.59 | 449.0 |

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|---|---|---|---|---|---|---|
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HOUSTON, TEXAS 77032
USA
[+1] (281) 821-6868
www.golder.com

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ROBERTSON COUNTY, TEXAS

TITLE
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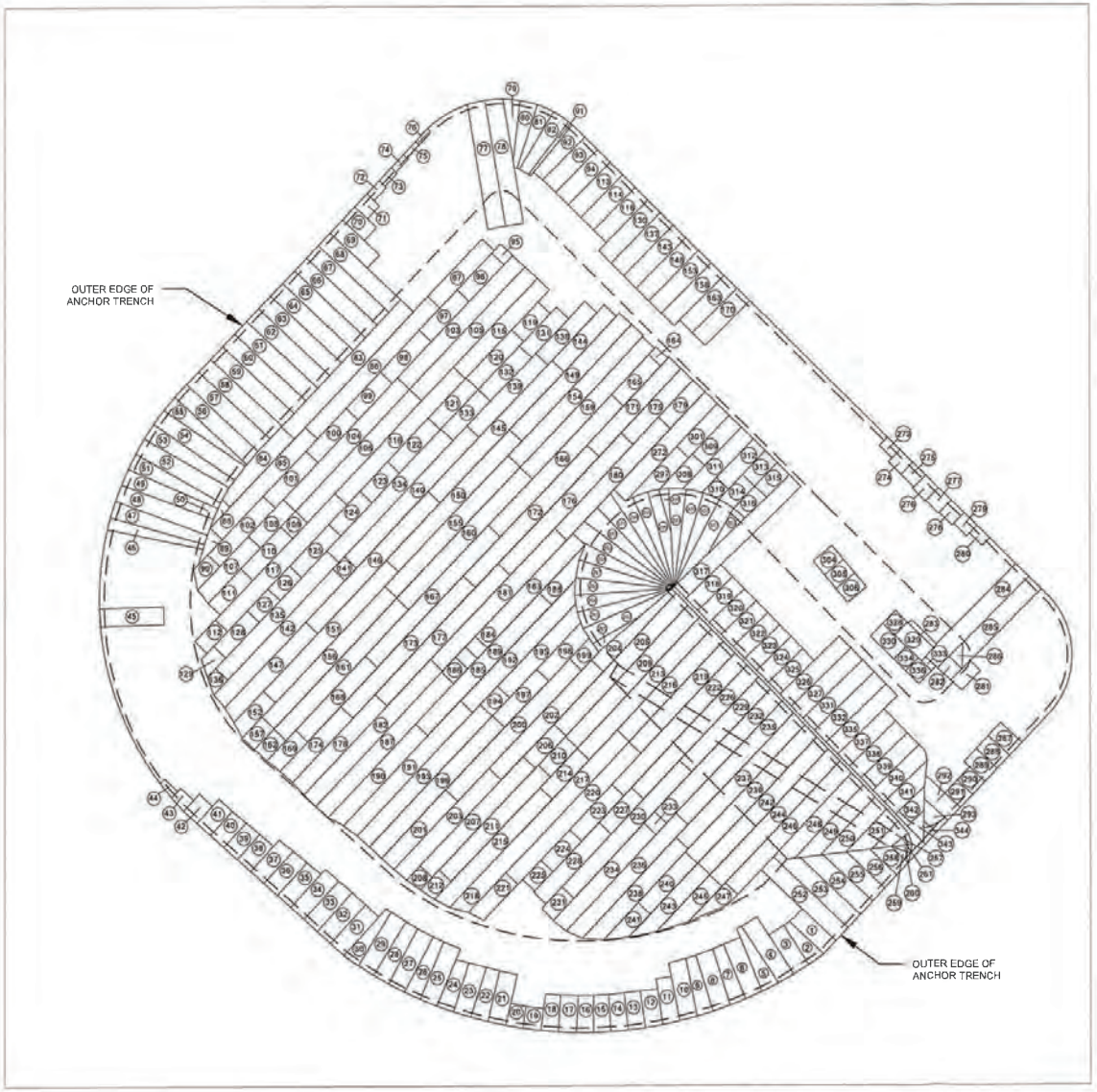
**APPENDIX B**

# FGD-A Liner Retrofit – As-Built Surveys




SCALE
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## LEGEND

- GCL PANEL
- (296) GCL PANEL NUMBER
- BREAKLINES

STATE OF TEXAS
SAMUEL A. FRANCO
137046
LICENSED
PROFESSIONAL ENGINEER
07-14-22

NOTE:

1. GCL PANEL PLACEMENT AS BUILT WAS PREPARED USING FIELD GEOSYNTHETIC INSTALLATION LOGS. GCL PANELS DO NOT REPRESENT SURVEYED LOCATIONS.

| REV | DATE | DESCRIPTION | BY |
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TEXAS BOARD OF PROFESSIONAL ENGINEERS REG. NO. F-3407

DRAWING TITLE: GCL PANEL PLACEMENT AS BUILT

PROJECT TITLE: FGD-A POND RETROFIT

CLIENT: OAK GROVE STEAM ELECTRIC STATION
LUMINANT
ROBERTSON COUNTY, TEXAS

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
1251 BRIAR FOREST, SUITE 205, HOUSTON, TX 77077
PH (281) 293-8485 FAX NO. (281) 293-7876

PROJ. NO. 27271045.010 | DES. BY: SF | DRAWN BY: SF | CHK. BY: JGM | QUALITY BY: JGM | APP. BY: JGM

CADD FILE: GCL PANEL PLACEMENT AS BUILT

DATE: 07/2021

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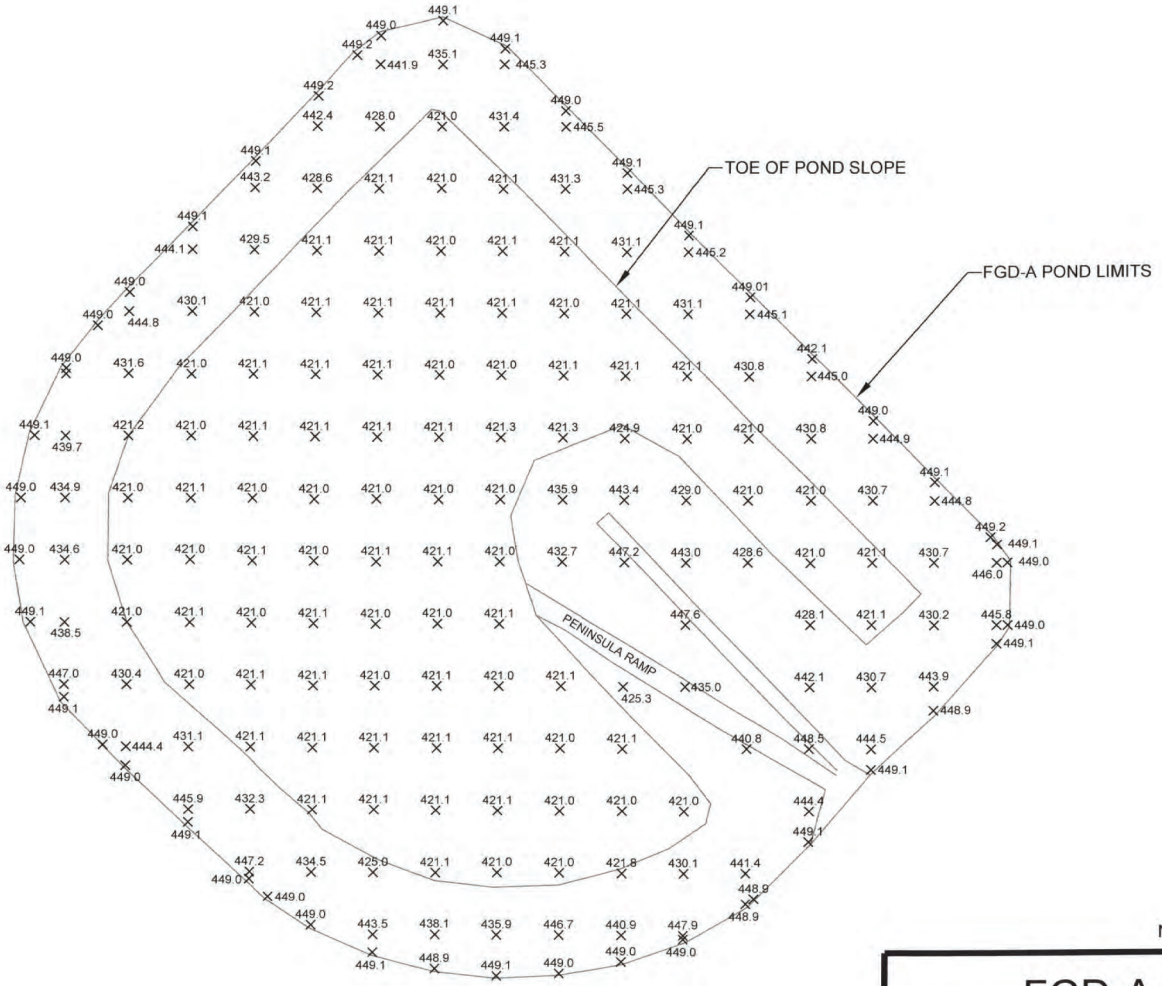
FIGURE NO. 1

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GRAPHIC SCALE: 1" = 100'

LEGEND

449.1 TOP OF SUBGRADE ELEVATION

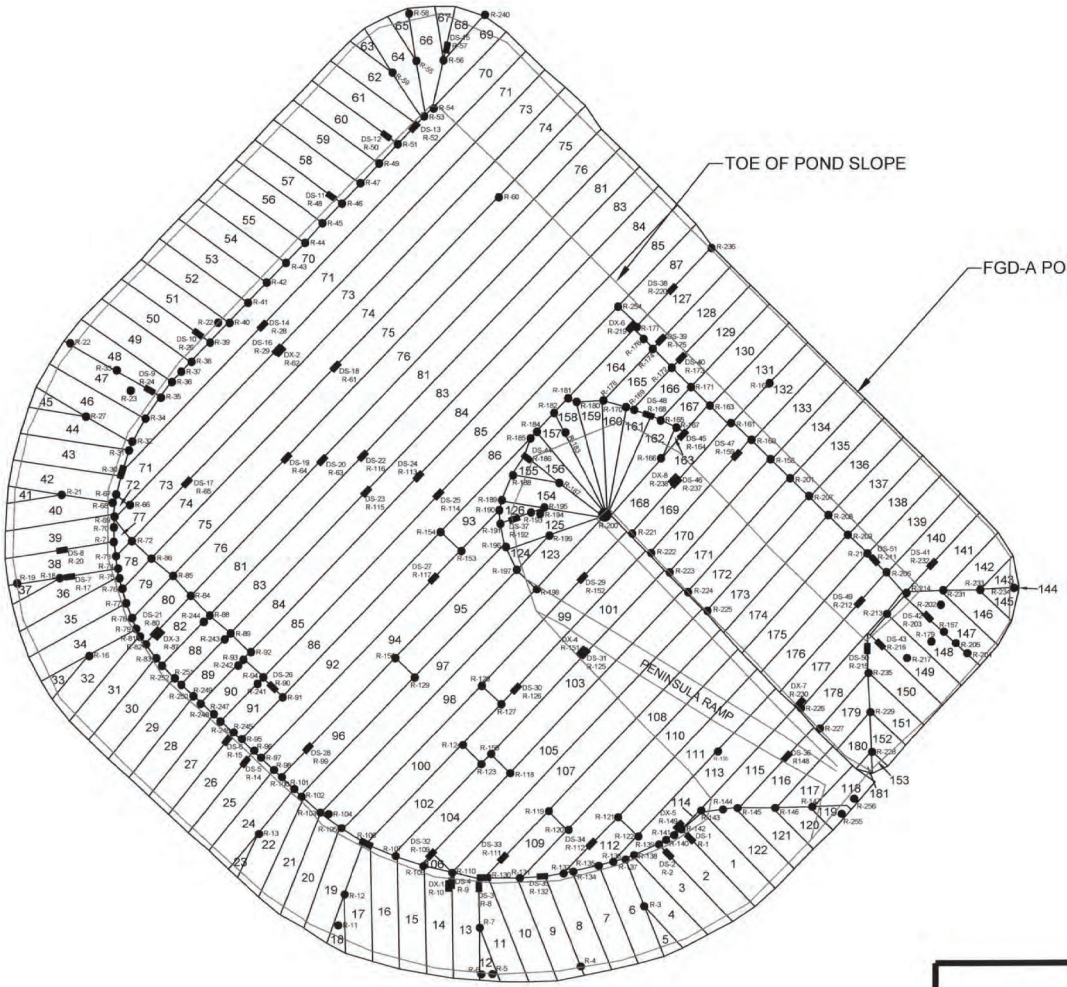
4/5/22

STATE OF TEXAS
REGISTERED
JEREMY R DAVIS
6259
PROFESSIONAL
LAND SURVEYOR

NOTE: SURVEY CONTROL BASED ON OAK GROVE PLANT CONTROL

# FGD-A POND TOP OF SUBGRADE AS-BUILT SURVEY

Ray W. Davis Consulting Engineers, Inc.
Civil Engineering/Land Surveying
208 CR 449 903.693.1711 (Ray)
Carthage, TX 75633 903.693.1269 (Jeremy)
Firm Reg. # - 10018000 (TBPLS)
Firm Reg. # - 8732 (TBPE)

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GRAPHIC SCALE: 1" = 100'

LEGEND

| | |
|---|---|
| 129 | PANEL NUMBER |
| DS-50 | DESTRUCTIVE LOCATION |
| R-10 | REPAIR LOCATION |

4/15/22

STATE OF TEXAS
REGISTERED
JEREMY R DAVIS
6259
PROFESSIONAL
LAND SURVEYOR

Jeremy R Davis

NOTE: SURVEY CONTROL BASED ON OAK GROVE PLANT CONTROL

# FGD-A POND GEOMEMBRANE LINER AS-BUILT SURVEY

Ray W. Davis Consulting Engineers, Inc.
Civil Engineering/Land Surveying
101 Bryanhurst St. 903.693.1269
Henderson, TX 75654
Firm Reg. # - 10018000 (TBPLS)
Firm Reg. # - 8732 (TBPE)

GOLDER
MEMBER OF WSP

**REPORT**

# Structural Stability Assessment 5-Year Update

*Oak Grove Steam Electric Station*
*FGD Ponds*
*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

6555 Sierra Drive
Irving, Texas 75039

Submitted by:

**Golder Associates Inc.**
14950 Heathrow Forest Parkway, Suite 280, Houston, Texas, USA 77032

+1 281 821-6868

21465177

October 2021

# PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the Structural Stability Assessment Update has been prepared in accordance with the requirements of 40 C.F.R. § 257.73(d) and 30 T.A.C. § 353.731.

Jeffrey B. Fassett, P.E.
Associate
Golder Associates Inc.
Firm Registration No. F-2578

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## FIGURES

Figure 1: Site Plan

# 1.0 INTRODUCTION

Oak Grove Management Company LLC (Oak Grove) owns and operates the Oak Grove Steam Electric Station (OGSES) located approximately ten miles north of Franklin in Robertson County, Texas. The power plant and related support areas are located along the south side of Twin Oak Reservoir (Figure 1). The OGSES consists of two lignite-fired units with a combined operating capacity of approximately 1,796 megawatts. Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operation. The CCRs are transported off-site for beneficial use by third-parties or are disposed at the OGSES Ash Landfill 1.

The U.S. Environmental Protection Agency promulgated 40 C.F.R. Part 257, Subpart D (the CCR Rule) and the Texas Commission on Environmental Quality (TCEQ) promulgated 30 T.A.C. Chapter 352 (which largely adopts the federal CCR Rule by reference) to establish technical requirements for new and existing CCR landfills and surface impoundments. On June 28, 2021, USEPA approved the majority of TCEQ's CCR program, which will now operate in lieu of the federal regulations. FGD-A, FGD-B, and FGD-C (collectively the "FGD Ponds") at the OGSES have been identified as Existing CCR Surface Impoundments regulated under the CCR Rule.

Section 257.73(d) specifies that periodic structural stability assessments must be conducted for each CCR surface impoundment and 30 T.A.C. 352.731 adopts this requirement by reference. In accordance with § 257.73(g), the initial Structural Stability Assessments for the FGD Ponds was completed and placed in the facility operating record in November 2016 (Golder, 2016). As specified in § 257.73(f)(3), the Structural Stability Assessment must be updated every five years from the completion date of the initial plan. Golder Associates Inc., member of WSP (Golder), was retained by Luminant to prepare this updated Structural Stability Assessment for the FGD Ponds.

## 1.1 Description of FGD Ponds

The FGD Ponds are located approximately 2,500 feet northwest of the OGSES power generation units (Figure 1) and are constructed above grade and surrounded by engineered earthen dikes that extend up to approximately 25 feet above surrounding grade.

The FGD Ponds receive wastewater from the FGD wet scrubber system blowdown, low volume wastewater, bottom ash contact water, and storm water runoff from approximately 41 acres of the power plant. All fluids are pumped into the FGD Ponds and there are no uncontrolled or gravity inflows into the ponds, with the exception of a gravity overflow from FGD-A to FGD-B. Process wastewater can be transferred between the FGD Ponds and is used as makeup water to the FGD scrubber system and related purposes. The are no spillways or other uncontrolled gravity flow releases from the ponds. Solids that accumulate in the FGD ponds are periodically removed and transported to OGSES Ash Landfill 1.

FGD-A covers an area of approximately 9.5 acres and was constructed in 2008. FGD-A is currently lined with a 3-foot thick compacted clay liner; however, FGD-A ceased receipt of waste by April 11, 2021, and Oak Grove has initiated the retrofit of FGD-A with a composite liner system meeting the requirements of § 257.71(a)(1)(ii).

FGD-B covers an area of approximately 12 acres and was constructed in 2011. FGD-B is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain be a 60-mil HDPE geomembrane liner, overlain by a 1-foot thick layer of protective soil. The composite liner system in FGD-B complies with the requirements of §257.71(a)(1)(ii).

FGD-C is approximately 25 acres and was constructed in 2016. FGD-C is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain by a 60-mil HDPE geomembrane liner,

overlain by a 2-foot thick soil/ash protective layer. The composite liner system in FGD-C complies with the requirements of §257.71(a)(1)(ii).

## 1.2 Previous Slope Stability Evaluations

The Initial Structural Assessment for the FGD Ponds was completed and placed in the OGSES operating record in October 2016 (Golder, 2016). No structural stability deficiencies were identified in the surface impoundments during the initial assessment.

In addition, Golder performed previous evaluations on the FGD-A, and FGD-B ponds as part of the below reports submitted to Luminant:

- FGD-B Slope Stability Investigation Report (Revised), Luminant Oak Grove SES, Robertson County, Texas, dated June 2010
- FGD-A Slope Stability Evaluation Report, Luminant Oak Grove SES, Robertson County, Texas, dated March 2011
- Addendum to Slope Stability Investigation Reports Luminant Oak Grove SES, Robertson County, Texas, March 2014

These studies found the pond slopes to be adequately stable.

Construction of FGD-C Pond was completed in 2016. During the design of FGD-C Pond, Golder evaluated the stability of the embankments.

# 2.0 SUBSURFACE CONDITIONS

## 2.1 Regional Geology

The OGSES site is located in the Sandy Hills physiographic province of Texas. Ground elevations range from 400 to 425 feet MSL (mean sea level), and the topography is characterized by low rolling hills and shallow stream valleys (Espey, Huston & Associates, 1987). The regional terrain consists of a thick series of unconsolidated sediments consisting of sand, silt, clay, and lignite. The major geologic units are the tertiary age 'bedrock' strata and the quaternary age fluviatile deposits. Eroded bedrock is overlain by alluvium and terraces along the valleys of larger streams. The approximate thickness of alluvium in the area of the site varies from 0 to 50 ft. The alluvium typically consists of sand, silt, silty clay and sandy clay and is not easily differentiated from the underlying bedrock strata in many instances.

## 2.2 Site Geology

### 2.2.1 Subsurface Investigations and Laboratory Testing

Information from previous subsurface investigations was used to characterize the subsurface site conditions. Golder conducted a subsurface investigation for the FGD-A Pond in July 2008, prior to construction of the clay liner within the pond. Golder completed nine borings within the pond footprint with boring depths ranging from 16 to 28 feet below ground surface (bgs) (Golder, 2008). Golder also conducted a subsurface investigation for the FGD-B Pond in March 2010 (Golder, 2010). In December 2014, Golder completed another subsurface investigation including ten geotechnical boreholes and installation of 3 groundwater monitoring wells, to facilitate design and construction of the FGD-C Pond. Appendix A of the initial Structural Stability Assessment (Golder2016) includes the boring location maps and select, representative boring logs.

For each investigation, laboratory testing was performed on selected samples, in accordance with commonly accepted methods and practices. Undisturbed and disturbed soil samples were tested to determine water content, Atterberg limits, grain size distribution, and shear strength. Water content determination was performed in accordance with ASTM D2216; Atterberg limits were determined in accordance with ASTM D4318; and grain size distribution was performed in accordance with ASTM D422. Shear strength testing consisted of unconsolidated-undrained (UU) and consolidated-undrained (CU) triaxial compression tests in general accordance with ASTM D2850 and D4767, respectively. Laboratory data are presented in Appendix B of the initial Structural Stability Assessment (Golder, 2016).

The findings from the above subsurface investigations were reviewed for their applicability to this study and are summarized in the following sections.

### 2.2.2 Subsurface Site Conditions

#### *2.2.2.1 FGD-A Pond*

The soils encountered under the FGD-A Pond consist of lean clays, sandy clays, silty clays, sands, silty sands, clayey sands, and sandy silts. The near surface soils under the pond generally consist of fine- grained soils extending to depths ranging from approximately 6 feet to more than 19 feet below the pond bottom. Coarse-grained soils (i.e., sands) were generally encountered at depths greater than 6 feet below the pond bottom. Sands were encountered at shallower depths in the northwest portion of the pond than in the southeast portion of the pond.

Historical monitoring well measurements near the FGD-A Pond indicate that the groundwater level is between approximately 406 and 411 ft-msl.

#### 2.2.2.2 FGD-B Pond

The soils encountered in the borings generally consisted of very stiff to hard clays and compact to very dense sands. The surficial soils were generally classified as very stiff to hard sandy (lean and fat) clay and ranged in thickness from 8 to 27 ft. The surficial clay stratum was underlain by layers of compact to very dense sand, clayey sand, silty sand, and/or very stiff to hard silty clay or clay.

Historical monitoring well measurements near FGD-B Pond indicate that the groundwater level is between approximately 405 and 411 ft-msl.

#### 2.2.2.3 FGD-C Pond

Based on the results of the geotechnical investigations at this facility, soils in the footprint of the FGD-C Pond in general comprise the following:

- Laminated clays, silty clays and sandy clays having low horizontal and vertical hydraulic conductivity;
- Thinly bedded clays, clayey silts, and silty sands characterized by low to moderate horizontal permeability and low net vertical permeability; and
- Bedded sands, silty sands, clayey sands, and silts of moderate to relatively high horizontal and moderate vertical permeability.

Based on monitoring well measurements near FGD-C, the groundwater level ranges from approximately 410 ft-msl to 413 ft-msl.

# 3.0 SITE RECONNAISSANCE

Following a review of the structural stability assessment and past inspection reports, Golder performed a site reconnaissance on October 7, 2021 to observe conditions at the crest, downstream slopes, and areas beyond the FGD Ponds. With the exception of portions of the FGD-A Pond where the CCR has been removed in preparation for retrofitting, it was not feasible to observe the conditions of the upstream slopes below the water level.

During the site visit no items of concern were noted.

# 4.0 UPDATED STRUCTURAL STABILITY ASSESSMENT - §257.73(d)(1)(i)-(vii)

The CCR rules require conducting periodic structural stability assessments by a qualified professional engineer to document whether the design, construction, operation and maintenance is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater that can be impounded therein.

## 4.1 Foundations and Abutments - §257.73(d)(1)(i)

As noted above, the foundation soils consist of native soils and fill. The foundation soils and abutments are stable.

## 4.2 Slope Protection - §257.73(d)(1)(ii)

The downstream slopes of the embankments in each FGD pond are protected from erosion and deterioration by the establishment of a vegetative cover. The vegetative cover is inspected weekly for erosion, signs of seepage, animal burrows, sloughing, and plants that could negatively impact the embankment.

## 4.3 Dikes (Embankment) - §257.73(d)(1)(iii)

Each of the embankments was constructed of compacted site soils. No construction testing of the original embankment fill in FGD-A and FGD-B Ponds are available.

As described in Section 4.6 (Hydraulic Structures), the retrofitting will include removal and replacement of crossover pipeline through the northern embankment of the FGD-A Pond and installation of a suction pipeline and drain line through the southeastern corner of the FGD-B Pond embankment. This will require removal and replacement of fill along embankments. The technical specifications for embankment fill require placement in loose horizontal lifts not exceeding 10 inches and compaction to 95% of the maximum dry density and within -1% to +3% of the optimum water content as determined by the standard Proctor test (ASTM D698).

In 2011, the base and embankment elevations of FGD-B Pond were raised, and the pond was lined with a composite geomembrane/clay liner system. The subgrade was raised 5 feet using structural fill to increase the separation depth from the groundwater. Approximately 150,000 cy of structural fill was placed in 6-inch lifts and compacted to 95% of the maximum standard Proctor dry density.

The FGD-C Pond embankment was constructed of compacted site soils, placed in 6-inch lifts compacted to 95% of the standard Proctor maximum dry density and within -1% to +3% of the standard Proctor optimum water content. FGD-C Pond is lined with a composite liner consisting of a 2-ft thick clay liner, a 60-mil HDPE geomembrane and a 2-ft thick soil/ash protective cover. The clay liner was placed in 6-inch thick lifts compacted to achieve a hydraulic conductivity of less than 1 x $10^{-7}$ cm/s.

Based on a review of past inspection reports and on recent observations, each of the embankments are sufficient to withstand the range of loading conditions they are subjected to.

## 4.4 Vegetated Slopes - §257.73(d)(1)(iv)

The exterior slopes of the surface impoundments at the OGSES are vegetated to control erosion. Luminant maintains the vegetation in a manner that ensures that the weekly inspections required under the CCR Rule can be conducted; however, the height of the vegetation varies depending on the frequency of maintenance.

The US Court of Appeals for the District of Columbia Circuit remanded and vacated the CCR Rule requirement that vegetation on the exterior portions of dikes on CCR surface impoundments be maintained not to exceed 6 inches in height. EPA proposed to address this requirement in 2018 but it has not finalized any new requirements.

## 4.5 Spillways - §257.73(d)(1)(v)

There are no spillways on any of the surface impoundments.

## 4.6 Hydraulic Structures - §257.73(d)(1)(v)

Sludge and waste water enter FGD-A Pond through high density polyethylene (HDPE) pipes near the southern portion of the eastern embankment. Water can be recycled from FGD-A Pond back to the SES through three pipes connecting to a reclaim/recycling pump station located near the northern portion of the eastern embankment. A 12-inch HDPE crossover pipeline located across the pond from the inlet pipes connects the FGD-A Pond to FGD-B Pond. Flow through this pipe is controlled with a valve located near the toe of the western embankment.

As part of the FGD-A Pond retrofitting, the HDPE inlet pipes will be removed, and new pipes will be installed near the crest of the embankment. In addition, the existing 12-inch crossover pipeline will be removed and replaced with an 18-inch diameter HPE crossover pipeline approximately 9 feet lower through the north embankment. The new pipeline will tie in to the existing gate valve.

Currently, there are no pipes that pass through or under the FGD-B embankment.

Sludge and waste water enter FGD-C through HDPE pipes passing above the embankment crest elevation near the southwestern corner of the pond. There are two pipes that pass through the embankment: a 24- inch diameter HDPE recycle/reclaim pipe and a 12-inch diameter drain pipe located near the middle of the eastern pond embankment. Water can be recycled from the FGD-C Pond back to the SES through the 24- inch diameter HDPE recycle/reclaim pipe that ties into the FGD-A Pond Pump station. The water in FGD- C can also be drained by the 12-inch diameter pipe which can be connected to the 24-inch diameter HDPE recycle/reclaim pipe when needed.

No significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris were observed that may negatively affect the operation of the surface impoundments.

## 4.7 Downstream Slopes Adjacent to Water Body - §257.73(d)(1)(vii)

The west side of the FGD-B Pond borders a cove off of the Twin Oak Reservoir. This man-made reservoir is designed for a maximum water surface at EL 410 ft-msl. The toe of the FGD-B west embankment is at an elevation of approximately 420 ft-msl; therefore, the embankment will likely never be inundated and never subjected to rapid drawdown.

## 4.8 Structural Stability Deficiencies - §257.73(d)(2)

No structural stability deficiencies were identified during this assessment.

# 5.0 CONCLUSIONS

Based on our review of the information provided by Oak Grove, on information prepared by Golder Associates Inc., and on our on-site observations, no structural stability deficiencies were identified in the surface impoundments during this assessment.

# 6.0 REFERENCES

Espey, Huston & Associates, Inc., 1987, Hydrogeologic Assessment of Proposed Surface Impoundment Areas, Twin Oak SES, Robertson County, Texas.

Golder Associates Inc. 2008, Data Report - Oak Grove SES, FGD Pond Subsurface Investigation, Robertson County, Texas.

Golder Associates Inc. 2010, FGD-B Slope Stability Investigation Report (Revised), Luminant Oak Grove SES, Robertson County, Texas.

Golder Associates Inc. 2011, FGD-A Slope Stability Evaluation Report, Luminant Oak Grove SES, Robertson County, Texas.

Golder Associates Inc. 2014, Addendum to Slope Stability Investigation Reports, Luminant Oak Grove SES, Robertson County, Texas.

Golder Associates Inc. 2016. Structural Stability Assessment Report, Luminant Oak Grove Steam Electric Station.

# Figures

CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD PONDS
STRUCTURAL STABILITY ASSESSMENT UPDATE

TITLE
**SITE PLAN**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
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| YYYY-MM-DD | 2021-10-04 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | JBF |
| APPROVED | JBF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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**REFERENCE(S)**
BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 12/2/18.



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**golder.com**

GOLDER
MEMBER OF WSP

**REPORT**

# Safety Factor Assessment 5-Year Update

*Oak Grove Steam Electric Station*
*FGD Ponds*
*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

6555 Sierra Drive
Irving, Texas 75039

Submitted by:

**Golder Associates Inc.**
14950 Heathrow Forest Parkway, Suite 280, Houston, Texas, USA 77032

+1 281 821-6868

21465177

October 2021

## PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the Factor of Safety Assessment Update has been prepared in accordance with the requirements of 40 C.F.R. § 257.73(e) and 30 T.A.C. § 353.731.

Jeffrey B. Fassett, P.E.
Associate
Golder Associates Inc.
Firm Registration No. F-2578

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Figure 1: Site Plan

## APPENDICES

**APPENDIX A**
Slope Stability Analysis Results

# 1.0 INTRODUCTION

Oak Grove Management Company LLC (Oak Grove) owns and operates the Oak Grove Steam Electric Station (OGSES) located approximately ten miles north of Franklin in Robertson County, Texas. The power plant and related support areas are located along the south side of Twin Oak Reservoir (Figure 1). The OGSES consists of two lignite-fired units with a combined operating capacity of approximately 1,796 megawatts. Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operation. The CCRs are transported off-site for beneficial use by third-parties or are disposed at the OGSES Ash Landfill 1.

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Section 257.73(e) of the CCR Rule specifies that periodic safety factor assessments must be conducted for each CCR surface impoundment and 30 T.A.C. 352.731 adopts this requirement by reference. In accordance with § 257.73(g), the initial Safety Factor Assessments for the FGD Ponds was completed and placed in the facility operating record in November 2016 (Golder, 2016). As specified in § 257.73(f)(3), the Safety Factor Assessment must be updated every five years from the completion date of the initial plan. Golder Associates Inc., member of WSP (Golder), was retained by Luminant to prepare this updated Safety Factor Assessment for the FGD Ponds.

## 1.1 Description of FGD Ponds

The FGD Ponds are located approximately 2,500 feet northwest of the OGSES power generation units (Figure 1) and are constructed above grade and surrounded by engineered earthen dikes that extend up to approximately 25 feet above surrounding grade.

The FGD Ponds receive wastewater from the FGD wet scrubber system blowdown, low volume wastewater, bottom ash contact water, and storm water runoff from approximately 41 acres of the power plant. All fluids are pumped into the FGD Ponds and there are no uncontrolled or gravity inflows into the ponds, with the exception of a gravity overflow from FGD-A to FGD-B. Process wastewater can be transferred between the FGD Ponds and is used as makeup water to the FGD scrubber system and related purposes. The are no spillways or other uncontrolled gravity flow releases from the ponds. Solids that accumulate in the FGD ponds are periodically removed and transported to OGSES Ash Landfill 1.

FGD-A covers an area of approximately 9.5 acres and was constructed in 2008. FGD-A is currently lined with a 3-foot thick compacted clay liner; however, FGD-A ceased receipt of waste by April 11, 2021, and Oak Grove has initiated the retrofit of FGD-A with a composite liner system meeting the requirements of § 257.71(a)(1)(ii).

FGD-B covers an area of approximately 12 acres and was constructed in 2011. FGD-B is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain be a 60-mil HDPE geomembrane liner, overlain by a 1-foot thick layer of protective soil. The composite liner system in FGD-B complies with the requirements of § 257.71(a)(1)(ii).

FGD-C is approximately 25 acres and was constructed in 2016. FGD-C is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain by a 60-mil HDPE geomembrane liner,

overlain by a 2-foot thick soil/ash protective layer. The composite liner system in FGD-C complies with the requirements of § 257.71(a)(1)(ii).

## 1.2 Previous Slope Stability Evaluations

As required under § 257.73(e)(1), the Initial Factor of Safety Assessment for the FGD Ponds was completed and placed in the OGSES operating record in October 2016 (Golder, 2016). The calculated factors of safety met the minimum criteria presented in § 257.73(e)(i) through (iv).

In addition, Golder performed previous evaluations on the FGD-A, and FGD-B ponds as part of the below reports submitted to Luminant:

- FGD-B Slope Stability Investigation Report (Revised), Luminant Oak Grove SES, Robertson County, Texas, dated June 2010
- FGD-A Slope Stability Evaluation Report, Luminant Oak Grove SES, Robertson County, Texas, dated March 2011
- Addendum to Slope Stability Investigation Reports Luminant Oak Grove SES, Robertson County, Texas, March 2014

These studies found the pond slopes to be adequately stable.

Construction of FGD-C Pond was completed in 2016. During the design of FGD-C Pond, Golder evaluated the stability of the embankments.

# 2.0 SUBSURFACE CONDITIONS

## 2.1 Regional Geology

The OGSES site is located in the Sandy Hills physiographic province of Texas. Ground elevations range from 400 to 425 feet MSL (mean sea level), and the topography is characterized by low rolling hills and shallow stream valleys (Espey, Huston & Associates, 1987). The regional terrain consists of a thick series of unconsolidated sediments consisting of sand, silt, clay, and lignite. The major geologic units are the tertiary age 'bedrock' strata and the quaternary age fluviatile deposits. Eroded bedrock is overlain by alluvium and terraces along the valleys of larger streams. The approximate thickness of alluvium in the area of the site varies from 0 to 50 ft. The alluvium typically consists of sand, silt, silty clay and sandy clay and is not easily differentiated from the underlying bedrock strata in many instances.

## 2.2 Site Geology

### 2.2.1 Subsurface Investigations and Laboratory Testing

Information from previous subsurface investigations was used to characterize the subsurface site conditions. Golder conducted a subsurface investigation for the FGD-A pond in July 2008, prior to construction of the clay liner within the pond. Golder completed nine borings within the pond footprint with boring depths ranging from 16 to 28 feet below ground surface (bgs) (Golder, 2008). Golder also conducted a subsurface investigation for FGD-B pond in March 2010 (Golder, 2010). In December 2014, Golder completed another subsurface investigation including ten geotechnical boreholes and installation of 3 groundwater monitoring wells, to facilitate design and construction of the FGD-C pond. Appendix A of the initial Factor of Safety Assessment (Golder, 2016) includes the boring location maps and select, representative boring logs.

For each investigation, laboratory testing was performed on selected samples, in accordance with commonly accepted methods and practices. Undisturbed and disturbed soil samples were tested to determine water content, Atterberg limits, grain size distribution, and shear strength. Water content determination was performed in accordance with ASTM D2216; Atterberg limits were determined in accordance with ASTM D4318; and grain size distribution was performed in accordance with ASTM D422. Shear strength testing consisted of unconsolidated-undrained (UU) and consolidated-undrained (CU) triaxial compression tests in general accordance with ASTM D2850 and D4767, respectively. Laboratory test results are presented in Appendix B of the initial Factor of Safety Assessment (Golder, 2016).

The findings from the above subsurface investigations were reviewed for their applicability to this study and are summarized in the following sections.

### 2.2.2 Subsurface Site Conditions

#### *2.2.2.1 FGD-A Pond*

The soils encountered under the FGD-A Pond consist of lean clays, sandy clays, silty clays, sands, silty sands, clayey sands, and sandy silts. The near surface soils under the pond generally consist of fine- grained soils extending to depths ranging from approximately 6 feet to more than 19 feet below the pond bottom. Coarse-grained soils (i.e., sands) were generally encountered at depths greater than 6 feet below the pond bottom. Sands were encountered at shallower depths in the northwest portion of the pond than in the southeast portion of the pond.

Historical monitoring well measurements near the FGD-A Pond indicate that the groundwater level is between approximately 406 and 411 ft-msl.

#### 2.2.2.2 FGD-B Pond

The soils encountered in the borings generally consisted of very stiff to hard clays and compact to very dense sands. The surficial soils were generally classified as very stiff to hard sandy (lean and fat) clay and ranged in thickness from 8 to 27 ft. The surficial clay stratum was underlain by layers of compact to very dense sand, clayey sand, silty sand, and/or very stiff to hard silty clay or clay.

Based on monitoring well measurements near FGD-B, the groundwater level ranges from approximately 405 to 411 ft-msl.

#### 2.2.2.3 FGD-C Pond

Based on the results of the geotechnical investigations at this facility, soils in the footprint of the FGD-C Pond in general comprise the following:

- Laminated clays, silty clays and sandy clays having low horizontal and vertical hydraulic conductivity;
- Thinly bedded clays, clayey silts, and silty sands characterized by low to moderate horizontal permeability and low net vertical permeability; and
- Bedded sands, silty sands, clayey sands, and silts of moderate to relatively high horizontal and moderate vertical permeability.

Based on monitoring well measurements near FGD-C, the groundwater level ranges from approximately 410 ft-msl to 413 ft-msl.

# 3.0 UPDATED STABILITY ANALYSIS - § 257.73(e)

## 3.1 Safety Factor Assessment

According to the CCR rules, structural stability factors of safety need to be evaluated for the critical cross- section of each CCR facility under static and seismic loading for “Maximum Storage Pool” (2 feet of freeboard for this facility) and “Maximum Surcharge Pool” conditions. Liquefaction potential analysis is only necessary when soil sampling, construction documentation or anecdotal evidence from personnel with knowledge about the facility, indicates that soils of the embankment are susceptible to liquefaction.

None of the FGD Ponds have downstream slopes that could be inundated by the pool of an adjacent water body; therefore, rapid-drawdown loading conditions were not evaluated.

Slope stability analyses were performed using a limit-equilibrium-based commercial computer program, Slide v7.0 by Rocscience. The analyses used a searching routine to identify the potential failure surface with minimum factor of safety for a given set of geometry, ground and groundwater conditions. The Spencer method of analysis was used in the analyses, while the Morgenstern-Price method was used for verification. The factors of safety of numerous potential failure surfaces were computed to establish minimum factors of safety. Circular failure surfaces were considered for all cases except for section B1-B1’ (discussed later) that has a thin layer of silt, and hence, a block failure produces a lower factor of safety. Stability analyses were performed for “Maximum Storage Pool” (freeboard of 2 feet) and “Maximum Surcharge Pool” (no freeboard) conditions for both the interior and exterior slopes of the ponds. In addition, the interior slopes were analyzed while the pond is empty. For each case, respective slopes were analyzed for both static and seismic loading conditions.

## 3.2 Cross-Sections Analyzed

After considering multiple cross-sections a critical cross-section was identified for each pond and used for the stability analysis. The critical cross-section was determined considering the geometry of the slopes, soil profile, phreatic surface and loading conditions. More than one cross-section was used when required. For example, the critical section for the interior slopes of FGD-B is located to the east bordering pond FGD-A. However, since FGD-A adjoins FGD-B here, the critical section for exterior slopes of FGD-B is not located on this section. Hence, another section is analyzed on the west side of FGD-B to evaluate the exterior slopes. The critical cross-sections analyzed – A-A’, B-B’, B1-B1’, C-C’ – for each pond are shown in Figure 1.

## 3.3 Material Properties

Based on the previous subsurface investigations, appropriate material properties were selected for use in the stability analysis. Table 1, Table 2, Table 3, and Table 4 summarize the material properties used in the stability analysis.

Espey, Huston & Associates, 1987 present boreholes drilled on the embankment of FGD-A composed of structural fill. The borings on the embankment crest and the slopes show high pocket penetrometer values of 4.5 tons/ft$^2$ or above, indicating considerably hard clays. Also, we reviewed the Atterberg limits on samples collected from fill at the FGD-C pond. Based on these values, a conservative shear strength was assumed for the structural fill as shown in the below tables.

**Table 1: Soil Properties for Section A-A'**

| Soil Material | Description | Moist Unit Weigh (lb./ft$^3$) | Saturated Unit Weigh (lb./ft$^3$) | Drained Soil Properties | |
|---|---|---|---|---|---|
| | | | | Cohesion, c'(lb./ft$^2$) | Friction Angle, ϕ'(°) |
| I | Sandy Clay | 127 | 132 | 270 | 26 |
| II | Silty Clay/ Clay | 127 | 132 | 0 | 26 |
| III | Clayey Sand | 127 | 132 | 0 | 32 |

**Table 2: Soil Properties for Section B-B'**

| Soil Material | Description | Moist Unit Weigh (lb./ft$^3$) | Saturated Unit Weigh (lb./ft$^3$) | Drained Soil Properties | |
|---|---|---|---|---|---|
| | | | | Cohesion, c'(lb./ft$^2$) | Friction Angle, ϕ'(°) |
| I | Clay/ Silty Clay/ Sandy Clay | 127 | 132 | 270 | 26 |
| II | Sandy Silt | 127 | 132 | 0 | 26 |
| III | Sand/ Silty Sand | 127 | 132 | 0 | 36 |
| | Structural Fill | 127 | 132 | 270 | 26 |

**Table 3: Soil Properties for Section B1-B1'**

| Soil Material | Description | Moist Unit Weigh (lb./ft$^3$) | Saturated Unit Weigh (lb./ft$^3$) | Drained Soil Properties | |
|---|---|---|---|---|---|
| | | | | Cohesion, c'(lb./ft$^2$) | Friction Angle, ϕ'(°) |
| I | Clay/ Silty Clay/ Sandy Clay | 127 | 132 | 270 | 26 |
| II | Sand/ Silty Sand | 127 | 132 | 0 | 36 |
| | Structural Fill | 127 | 132 | 270 | 26 |

**Table 4: Soil Properties for Section C-C'**

| Soil Material | Description | Moist Unit Weigh (lb./ft$^3$) | Saturated Unit Weigh (lb./ft$^3$) | Drained Soil Properties | |
|---|---|---|---|---|---|
| | | | | Cohesion, c'(lb./ft$^2$) | Friction Angle, ϕ'(°) |
| I | New Fill - compacted onsitelow to moderate plasticity clay soils | 125 | n/a | 200 | 26 |
| II | Existing Fill - stiffto very stiff clays | 125 | n/a | 150 | 24 |
| III | Very stiff Silty Clay | 127 | 132 | 270 | 26 |
| IV | Very dense Silty Sand | 120 | 130 | n/a | 34 |

## 3.4 Phreatic Surface

For the stability analysis, the location of the phreatic surface within the FGD-A Pond embankment was conservatively assumed to correspond to the water level in the pond and to the ground surface of the exterior slope of the embankment. The only exception to this is Case 5a and 5b for FGD-B, where the phreatic surface from the adjoining FGD-A embankment was assumed to slope at approximately 3H:1V. As noted previously, the retrofit of FGD-A Pond with a composite liner system is underway. This liner system will prevent seepage into the embankment; therefore, the stability analysis for FGD-A is conservative.

FGD-B and FGD-C Ponds are both lined with a composite geomembrane/clay liner; therefore, no phreatic surface is expected to develop within the embankments. The groundwater level below the FGD-B Pond was assumed to be at 410 ft-msl. The groundwater level near the cross-section analyzed for FGD-C Pond was assumed to be at 410 ft-msl, which is representative of the eastern portion of the pond.

## 3.5 Seismic Loading

Based on the "US Seismic Hazard 2014 Map" prepared by the United States Geologic Survey (USGS) and the "2008 Interactive Deaggregations" (USGS), the peak ground acceleration (PGA) for a 2% probability of exceedance in 50 years (return period of 2,475 years) is 0.06g for the site location (including amplification factors for site soil conditions). A horizontal seismic load coefficient equal to the PGA was conservatively used in the pseudostatic analysis.

## 3.6 Liquefaction Potential

Soil liquefaction describes a phenomenon whereby a saturated or partially saturated soil substantially loses strength and stiffness in response to an applied stress, usually earthquake shaking or other sudden change in stress condition, causing it to behave like a liquid. The phenomenon is most often observed in saturated, loose (low density or uncompacted), sandy soils.

The embankment soils of ponds FGD-A, FGD-B, and FGD-C are all composed of clayey materials with significant fines content. The immediate foundation materials are also composed of soils containing a significant portion of fines and are as well considerable dense. The subsurface investigations performed at each of the ponds do not indicate any soils in the embankment or its foundation, which are susceptible to liquefaction. Hence, failure of the pond slopes due to liquefaction is considered unlikely for the CCR surface impoundments at the OGSES.

## 3.7 Stability Analysis Results

Slope stability analyses were performed for long-term conditions for each of the critical cross-sections considered under static and seismic loading conditions. Both interior and exterior slopes were analyzed for “Maximum Storage Pool” (2 feet of freeboard) and “Maximum Surcharge Pool” (no freeboard) conditions. The interior slopes were analyzed for the condition where the pond is empty.

The results of the slope stability analysis cases are presented in Table 5, Table 6, and Table 7 for ponds FGD-A, FGD-B, and FGD- C, respectively. The corresponding analysis outputs can be found in Appendix A. The results indicate that the pond slopes are sufficiently stable under all considered loading scenarios.

**Table 5: Slope Stability Analysis Results – FGD-A**

| Cross-Section | Case # | Slope Location | Pond Pool Level | Loading Condition | Required Safety Factor (1) | Calculated Safety Factor |
|---|---|---|---|---|---|---|
| A-A' | 1a | Exterior | Storage | Static | 1.50 | 1.89 |
| | 1b | | | Pseudostatic | 1.00 | 1.61 |
| | 2a | | Surcharge | Static | 1.40 | 1.84 |
| | 2b | | | Pseudostatic | 1.00 | 1.56 |
| | 3a | Interior | Storage | Static | 1.50 | 4.72 |
| | 3b | | | Pseudostatic | 1.00 | 3.58 |
| | 4a | | Surcharge | Static | 1.40 | 5.20 |
| | 4b | | | Pseudostatic | 1.00 | 3.90 |
| | 5a | | Empty | Static | 1.50 | 2.15 |
| | 5b | | | Pseudostatic | 1.00 | 1.77 |

Note: (1) Required safety factors per §257.73(e)(i)-(iii)

**Table 6: Slope Stability Analysis Results – FGD-B**

| Cross-Section | Case # | Slope Location | Pond Pool Level | Loading Condition | Required Safety Factor (1) | Calculated Safety Factor |
|---|---|---|---|---|---|---|
| B-B' | 1a | Exterior | Storage | Static | 1.50 | 2.43 |
| | 1b | | | Pseudostatic | 1.00 | 2.07 |
| | 2a | | Surcharge | Static | 1.40 | 2.43 |
| | 2b | | | Pseudostatic | 1.00 | 2.07 |

| Cross-Section | Case # | Slope Location | Pond Pool Level | Loading Condition | Required Safety Factor (1) | Calculated Safety Factor |
|---|---|---|---|---|---|---|
| B1-B1' | 3a | Interior | Storage | Static | 1.50 | 1.51 |
| | 3b | | | Pseudostatic | 1.00 | 1.20 |
| | 4a | | Surcharge | Static | 1.40 | 1.55 |
| | 4b | | | Pseudostatic | 1.00 | 1.25 |
| | 5a | | Empty | Static | 1.50 | 2.20 |
| | 5b | | | Pseudostatic | 1.00 | 1.79 |

Note: (1) Required safety factors per §257.73(e)(i)-(iii)

**Table 7: Slope Stability Analysis Results - FCD-C**

| Cross-Section | Case # | Slope Location | Pond Pool Level | Loading Condition | Required Safety Factor (1) | Calculated Safety Factor |
|---|---|---|---|---|---|---|
| C-C' | 1a | Exterior | Storage | Static | 1.50 | 2.06 |
| | 1b | | | Pseudostatic | 1.00 | 1.72 |
| | 2a | | Surcharge | Static | 1.40 | 2.06 |
| | 2b | | | Pseudostatic | 1.00 | 1.72 |
| | 3a | Interior | Storage | Static | 1.50 | 5.53 |
| | 3b | | | Pseudostatic | 1.00 | 4.04 |
| | 4a | | Surcharge | Static | 1.40 | 6.19 |
| | 4b | | | Pseudostatic | 1.00 | 4.44 |
| | 5a | | Empty | Static | 1.50 | 2.16 |
| | 5b | | | Pseudostatic | 1.00 | 1.80 |

Note: (1) Required safety factors per §257.73(e)(i)-(iii)

# 4.0 CONCLUSIONS

Based on our review of the information provided by Oak Grove, on information prepared by Golder, and on our analyses, the calculated factors of safety through the critical cross sections in the surface exceed the values listed in § 257.73(e)(1)(i)-(iv).

# 5.0 REFERENCES

Espey, Huston & Associates, Inc., 1987, Hydrogeologic Assessment of Proposed Surface Impoundment Areas, Twin Oak SES, Robertson County, Texas.

Golder Associates Inc. 2008, Data Report - Oak Grove SES, FGD Pond Subsurface Investigation, Robertson County, Texas.

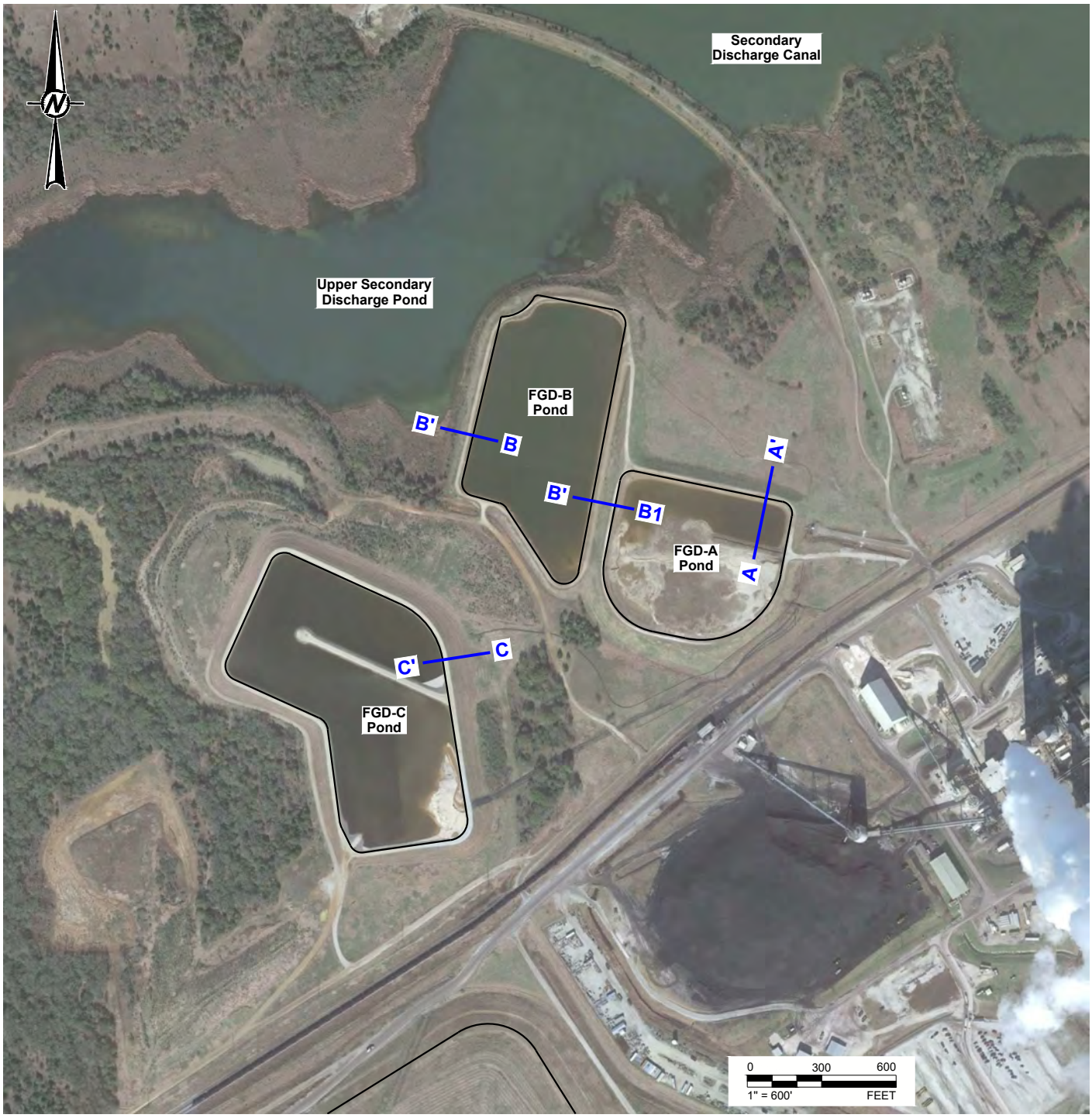
Golder Associates Inc. 2010, FGD-B Slope Stability Investigation Report (Revised), Luminant Oak Grove SES, Robertson County, Texas.

Golder Associates Inc. 2011, FGD-A Slope Stability Evaluation Report, Luminant Oak Grove SES, Robertson County, Texas.

Golder Associates Inc. 2014, Addendum to Slope Stability Investigation Reports, Luminant Oak Grove SES, Robertson County, Texas.

Golder Associates Inc. 2016. Factor of Safety Assessment Report, Luminant Oak Grove Steam Electric Station.

# Figures




**LEGEND**

A —— A' CRITICAL CROSS-SECTION

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 12/2/18.

CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

PROJECT
OAK GROVE STEAM ELECTRIC STATION
FGD PONDS
FACTOR OF SAFETY ASSESSMENT UPDATE

TITLE
**SITE PLAN**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2021-10-04 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | JBF |
| APPROVED | JBF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 21465177 | | 0 | 1 |



Last Edited By: adiamond Date: 2021-10-04 Time:1:51:45 PM | Printed By: adiamond Date: 2021-10-06 Time:4:17:15 PM
Path: \\golder.gds\complexdata\office\Texarkana\Projects - Round Rock_2021\21465177 - Luminant OGSES\PRODUCTION\E - 2021 FSA\ | File Name: 1-Site Plan (FGD Ponds).dwg
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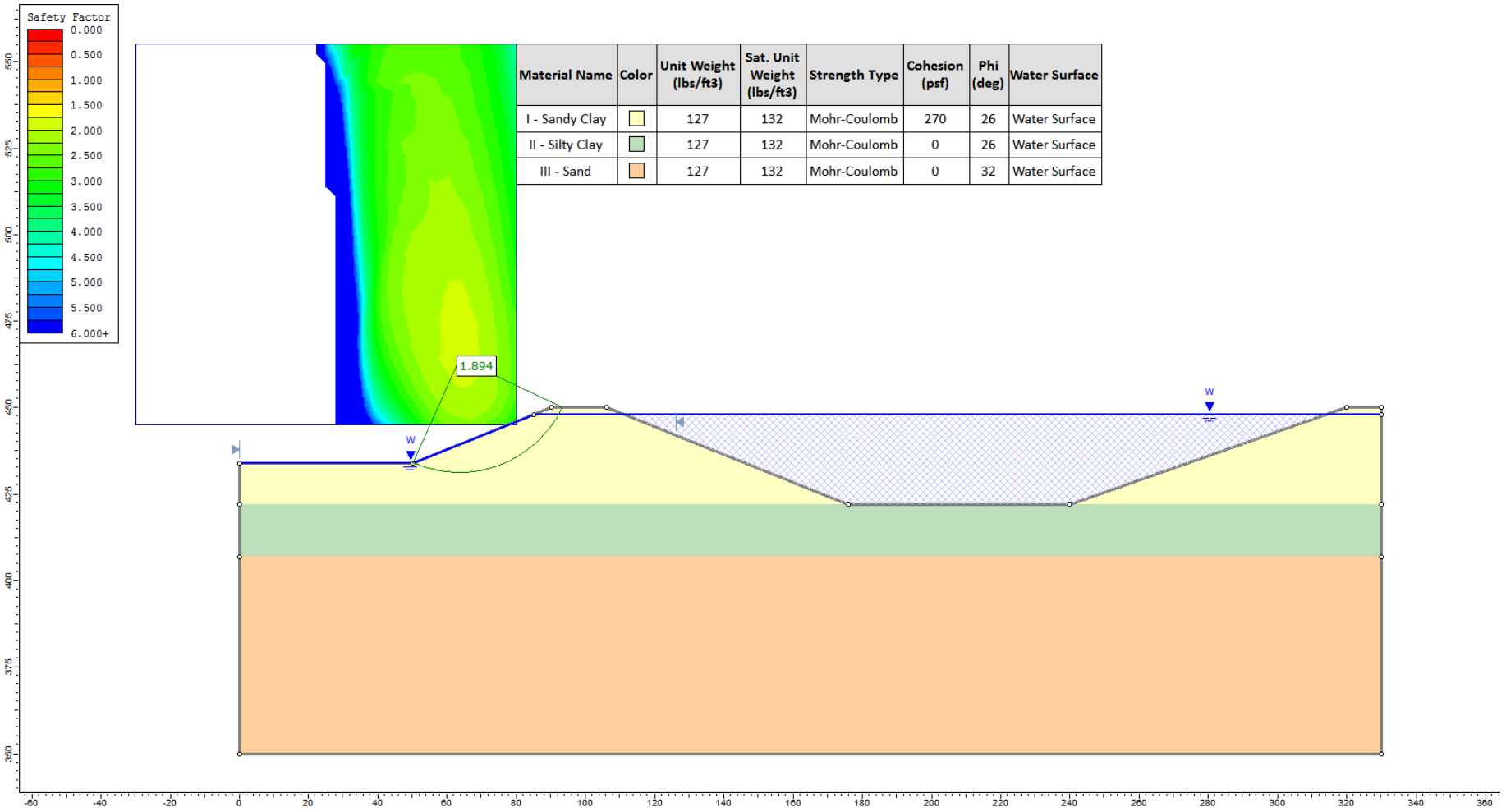
0 1 in

**APPENDIX A**

# Slope Stability Analysis Results

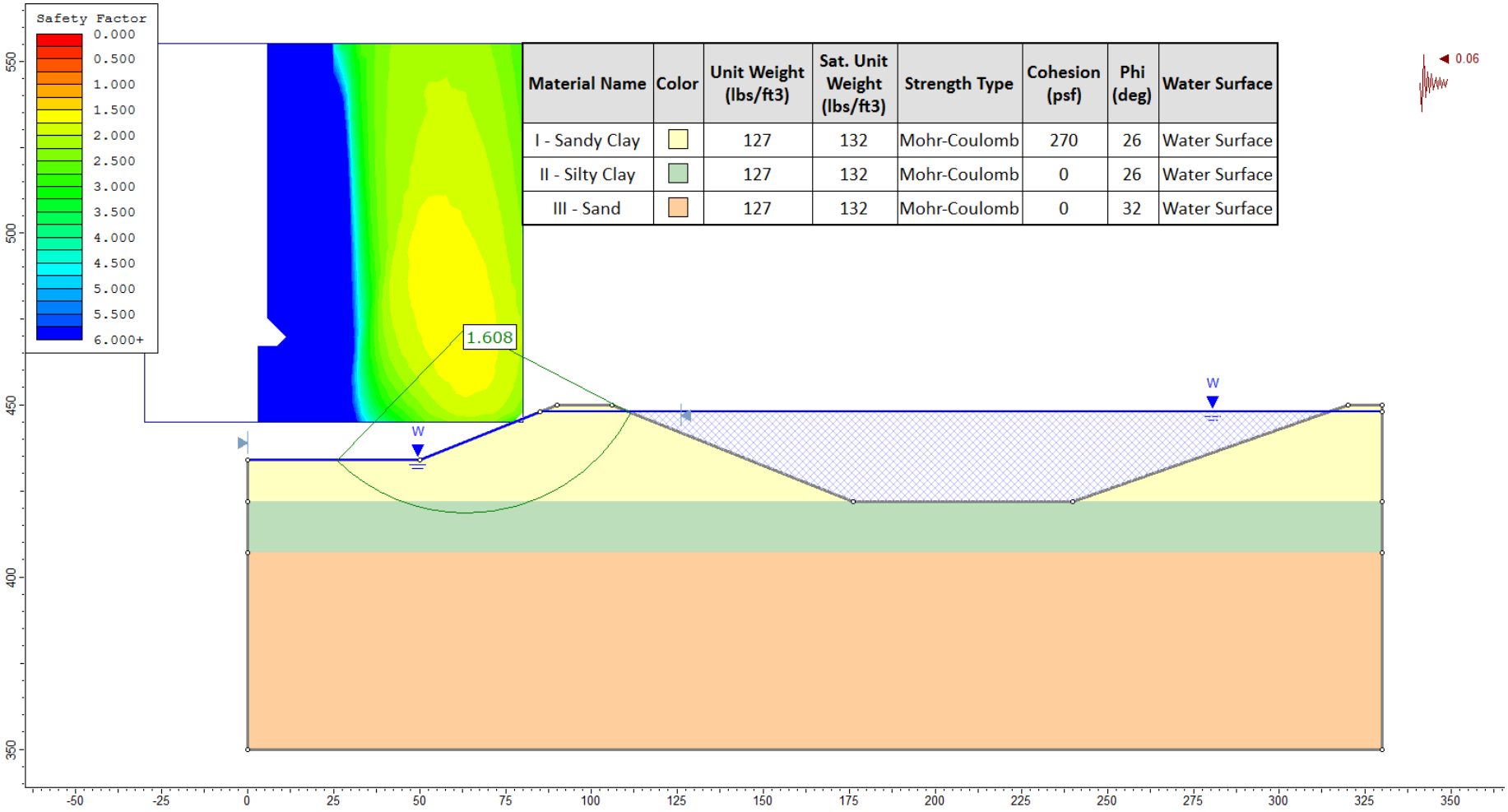



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| I - Sandy Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| II - Silty Clay | | 127 | 132 | Mohr-Coulomb | 0 | 26 | Water Surface |
| III - Sand | | 127 | 132 | Mohr-Coulomb | 0 | 32 | Water Surface |

FIGURE **C.1**

## Results of Stability Analysis − FGD−A: A−A' − Case 1a

Stability and Safety Factor Assessment, Oak Grove SES

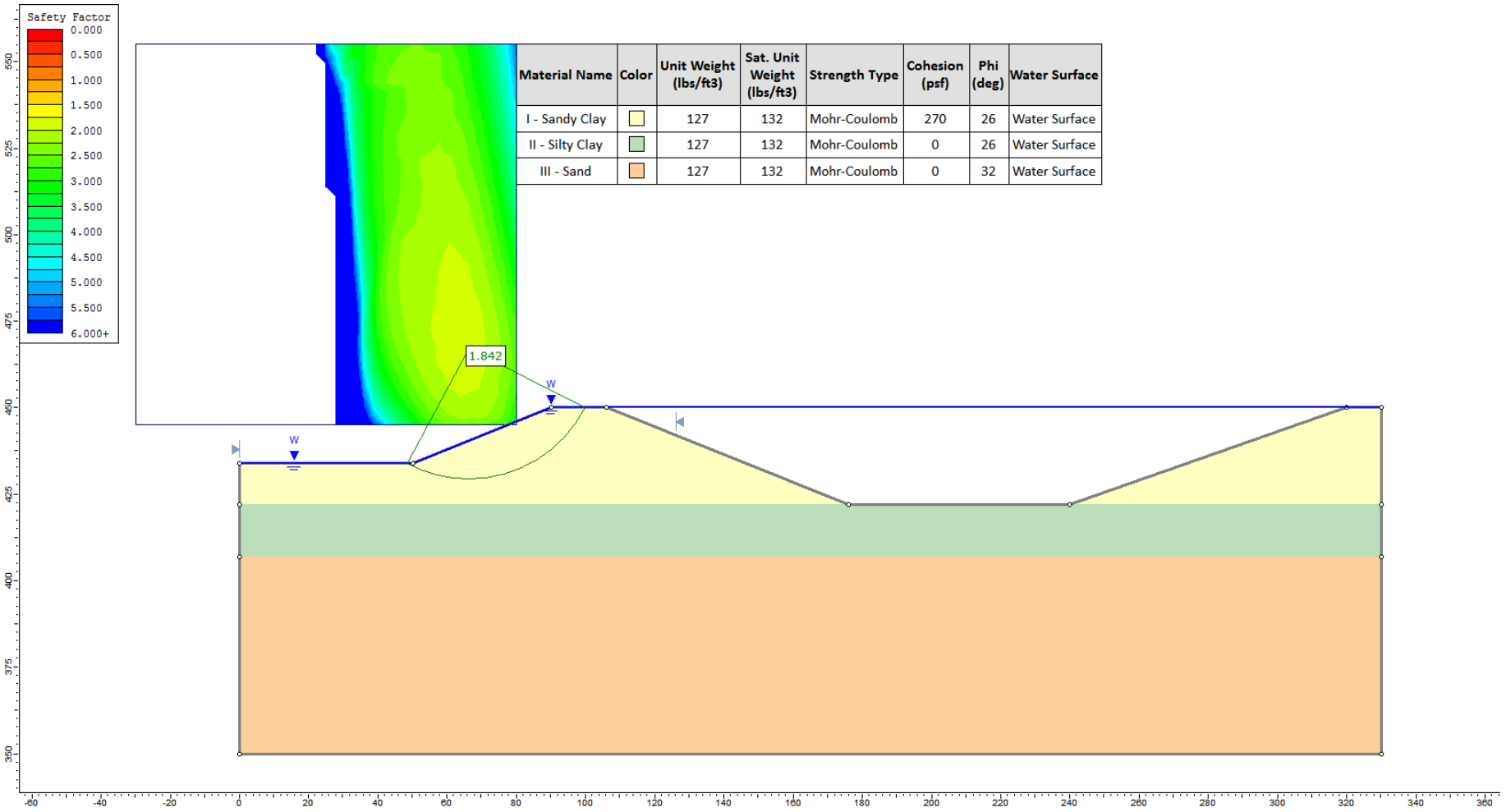



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| I - Sandy Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| II - Silty Clay | | 127 | 132 | Mohr-Coulomb | 0 | 26 | Water Surface |
| III - Sand | | 127 | 132 | Mohr-Coulomb | 0 | 32 | Water Surface |

FIGURE **C.2**

## Results of Stability Analysis − FGD−A: A−A' − Case 1b

Stability and Safety Factor Assessment, Oak Grove SES

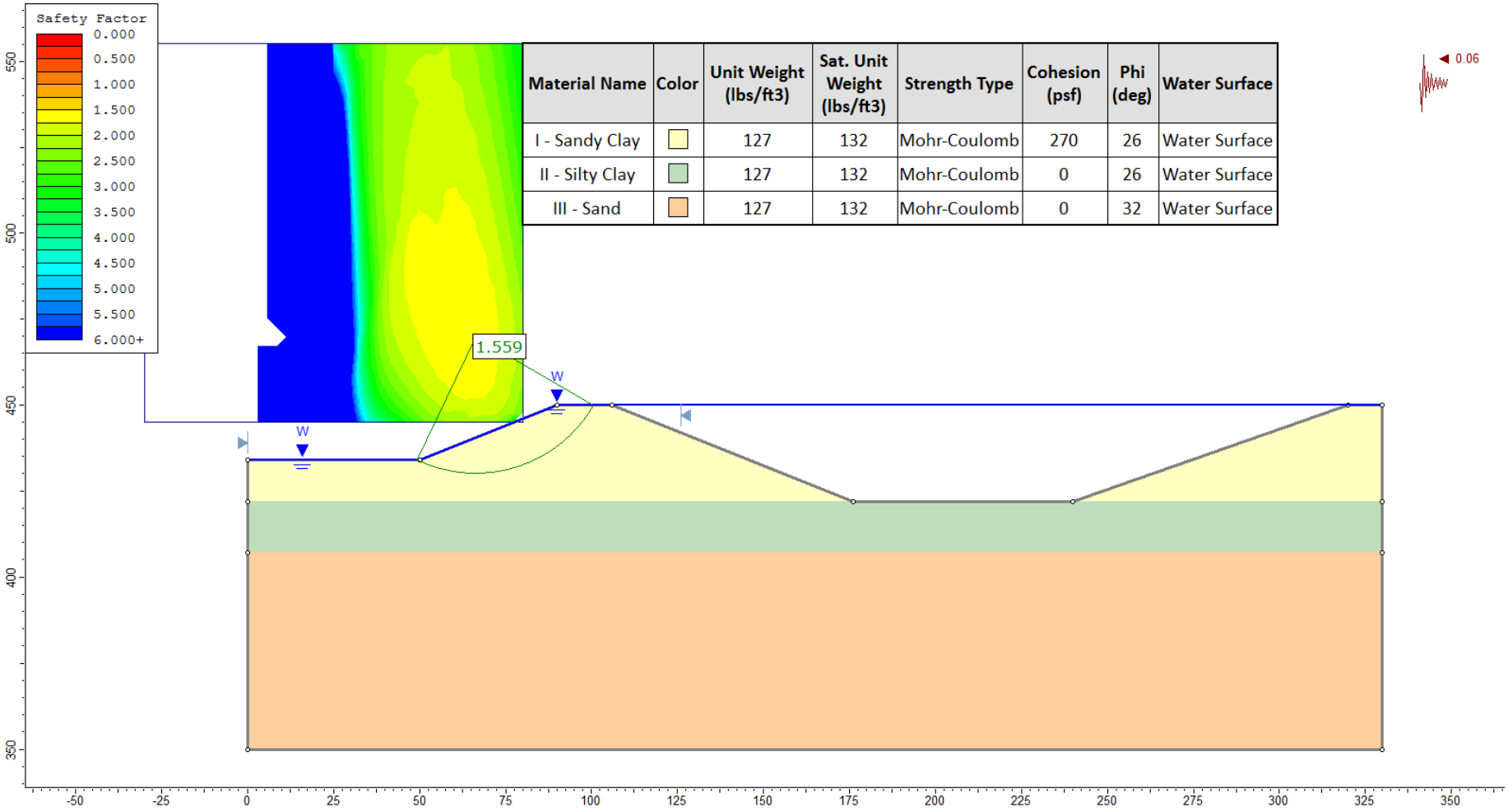



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| I - Sandy Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| II - Silty Clay | | 127 | 132 | Mohr-Coulomb | 0 | 26 | Water Surface |
| III - Sand | | 127 | 132 | Mohr-Coulomb | 0 | 32 | Water Surface |

FIGURE **C.3**

## Results of Stability Analysis − FGD−A: A−A' − Case 2a

Stability and Safety Factor Assessment, Oak Grove SES

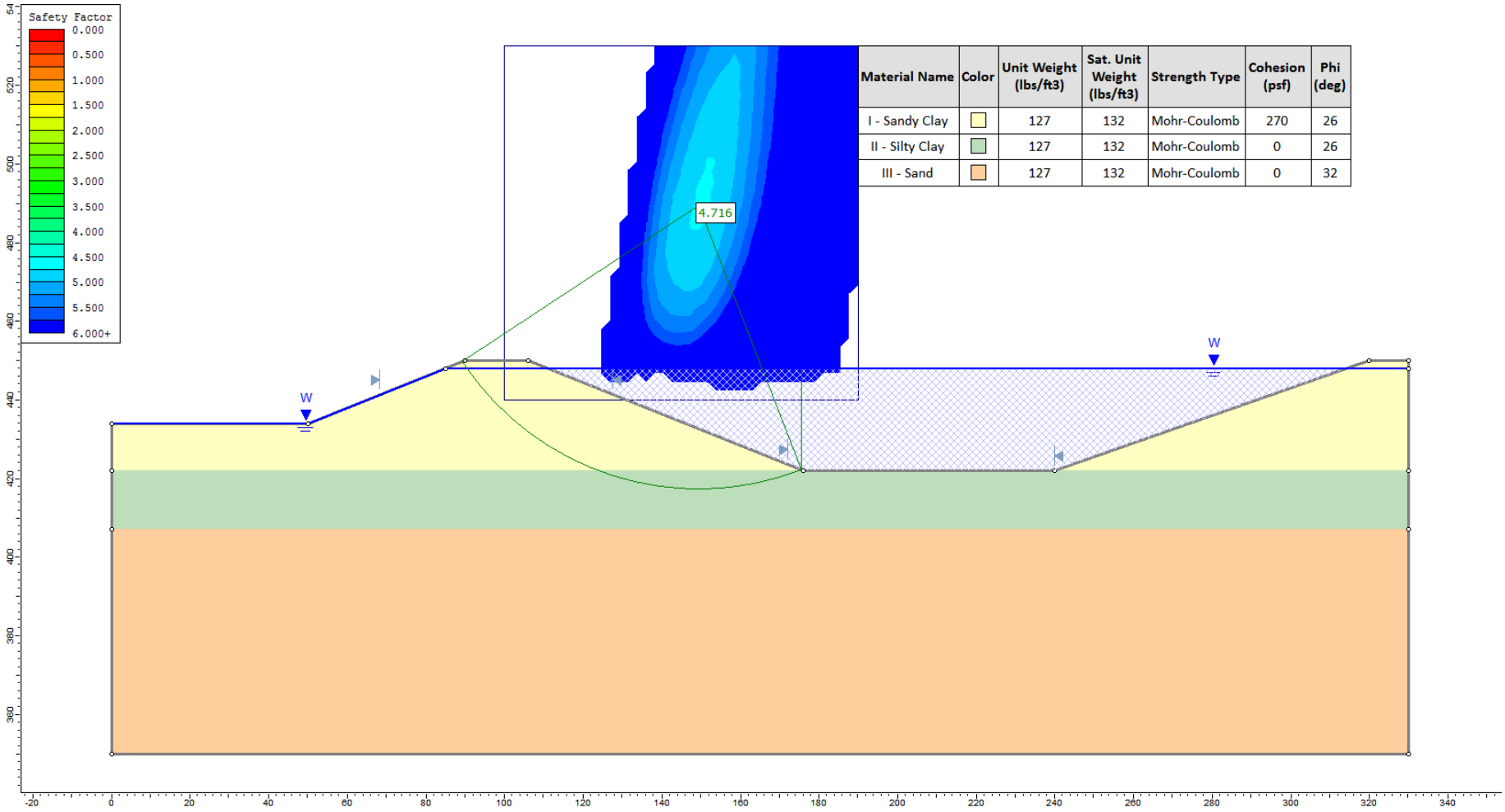



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| I - Sandy Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| II - Silty Clay | | 127 | 132 | Mohr-Coulomb | 0 | 26 | Water Surface |
| III - Sand | | 127 | 132 | Mohr-Coulomb | 0 | 32 | Water Surface |

FIGURE **C.4**

## Results of Stability Analysis − FGD−A: A−A' − Case 2b

Stability and Safety Factor Assessment, Oak Grove SES

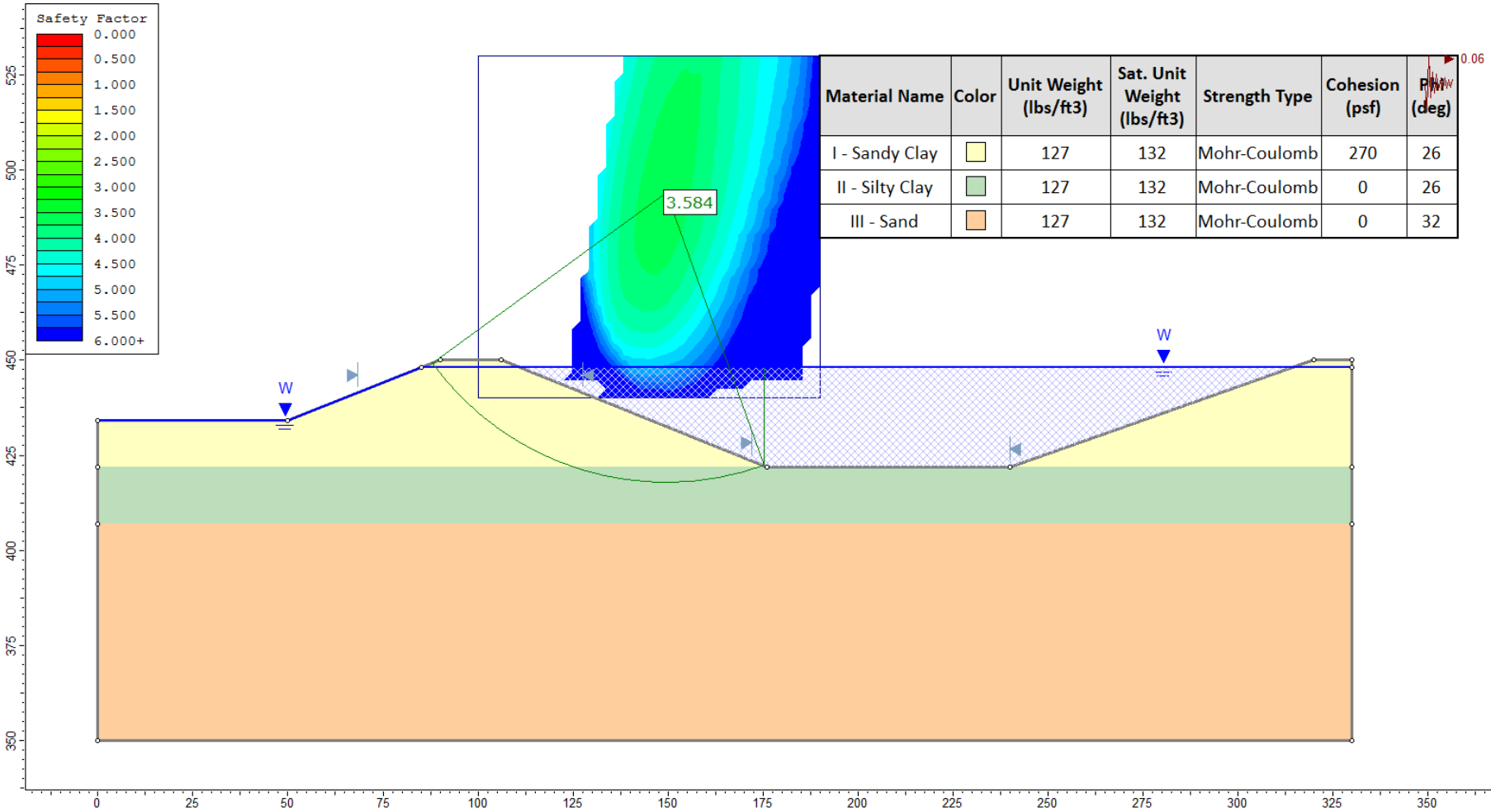



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) |
|---|---|---|---|---|---|---|
| I - Sandy Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 |
| II - Silty Clay | | 127 | 132 | Mohr-Coulomb | 0 | 26 |
| III - Sand | | 127 | 132 | Mohr-Coulomb | 0 | 32 |

FIGURE **C.5**

## Results of Stability Analysis − FGD−A: A−A' − Case 3a

Stability and Safety Factor Assessment, Oak Grove SES

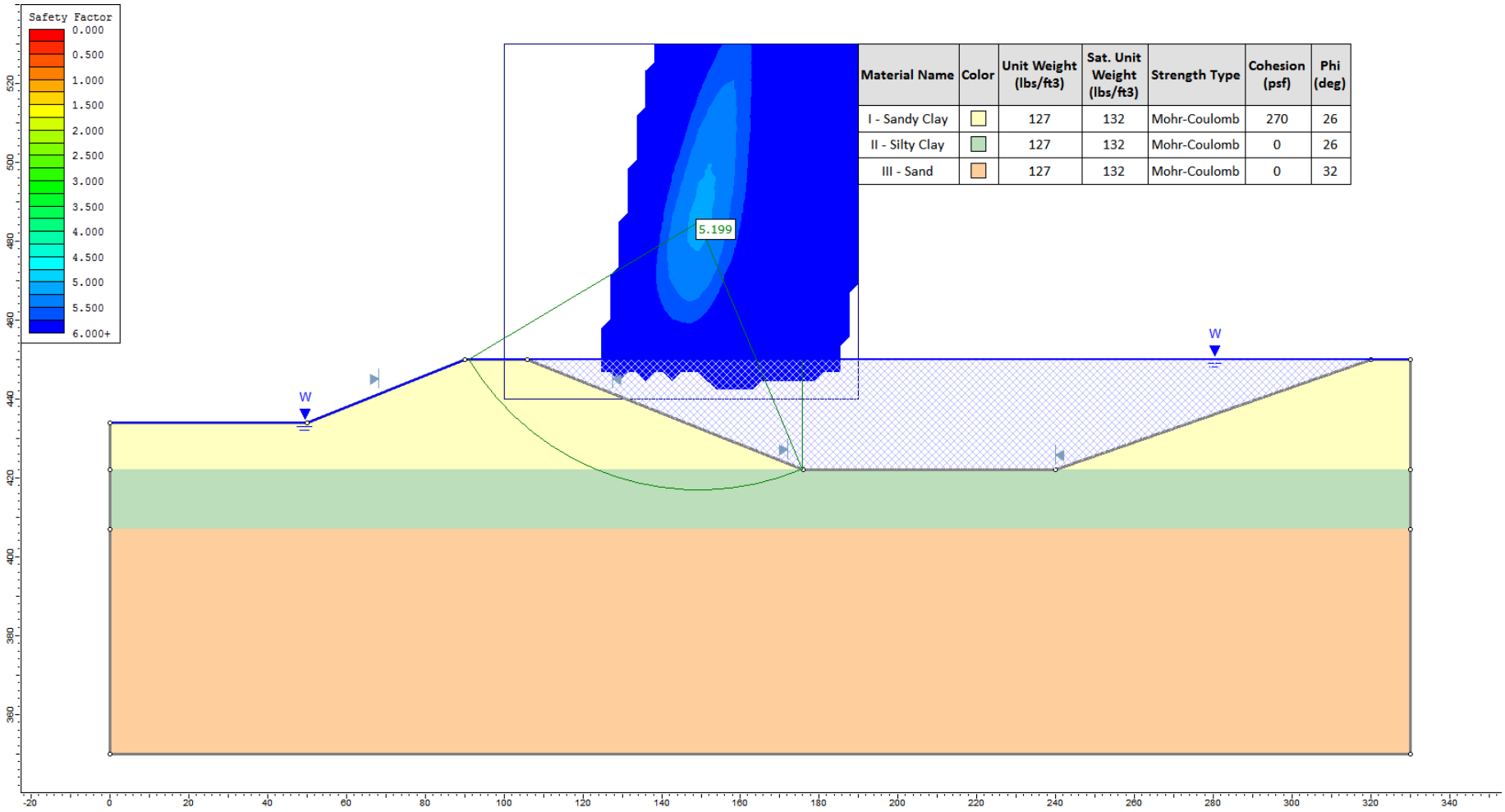



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) |
|---|---|---|---|---|---|---|
| I - Sandy Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 |
| II - Silty Clay | | 127 | 132 | Mohr-Coulomb | 0 | 26 |
| III - Sand | | 127 | 132 | Mohr-Coulomb | 0 | 32 |

FIGURE **C.6**

## Results of Stability Analysis − FGD−A: A−A' − Case 3b

Stability and Safety Factor Assessment, Oak Grove SES

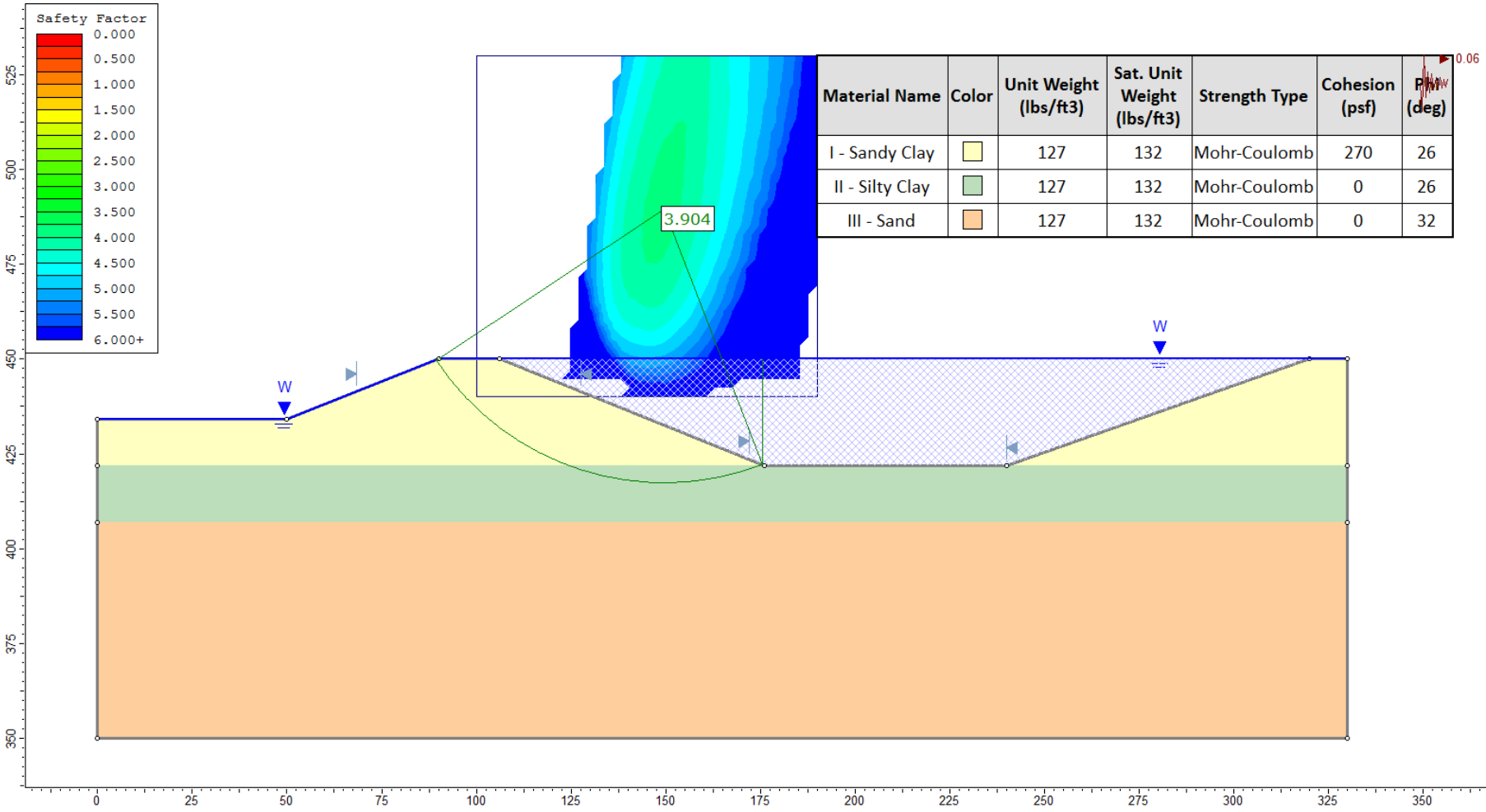



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) |
|---|---|---|---|---|---|---|
| I - Sandy Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 |
| II - Silty Clay | | 127 | 132 | Mohr-Coulomb | 0 | 26 |
| III - Sand | | 127 | 132 | Mohr-Coulomb | 0 | 32 |

FIGURE **C.7**

## Results of Stability Analysis − FGD−A: A−A' − Case 4a

Stability and Safety Factor Assessment, Oak Grove SES

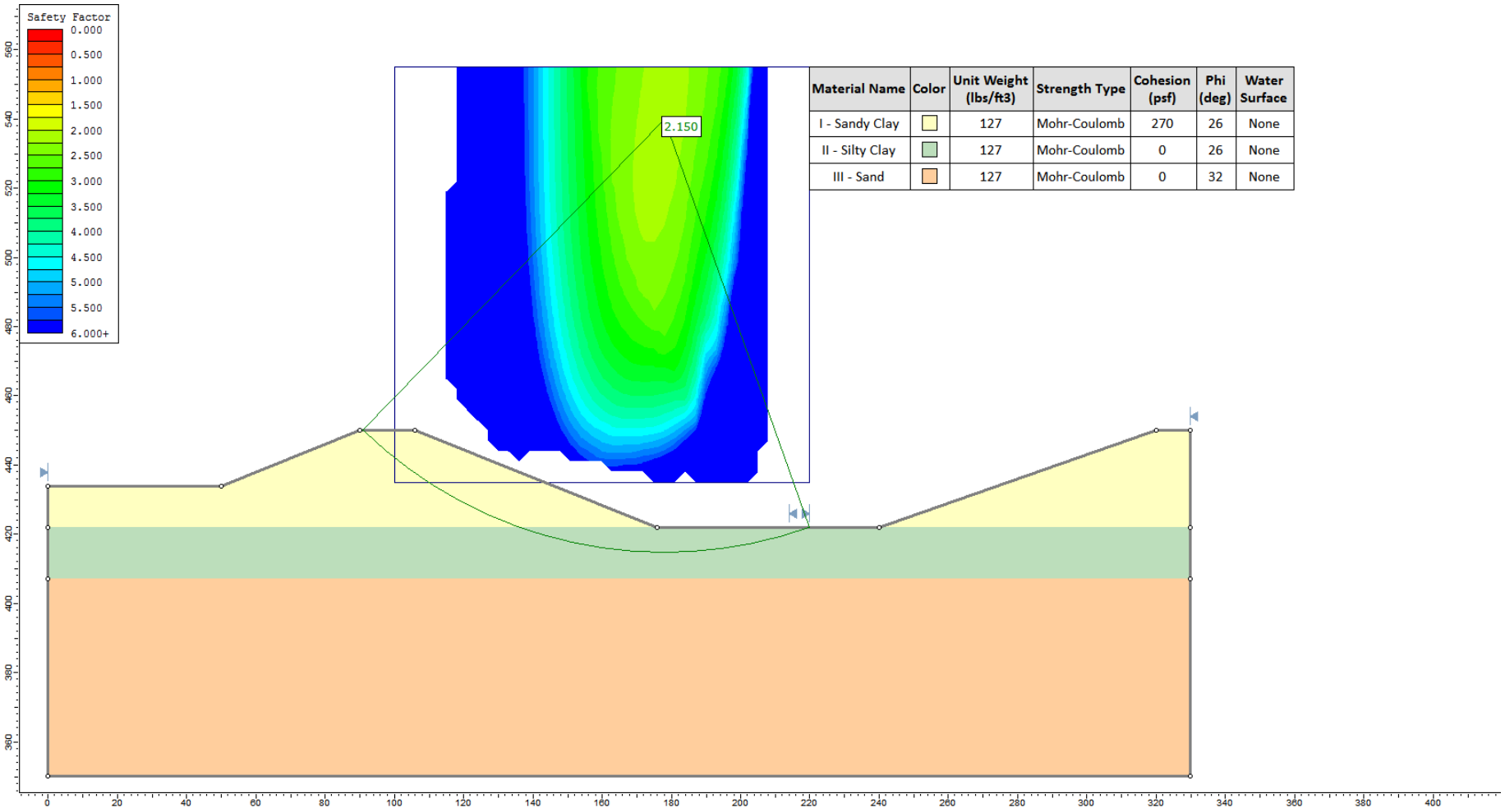



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) |
|---|---|---|---|---|---|---|
| I - Sandy Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 |
| II - Silty Clay | | 127 | 132 | Mohr-Coulomb | 0 | 26 |
| III - Sand | | 127 | 132 | Mohr-Coulomb | 0 | 32 |

FIGURE **C.8**

## Results of Stability Analysis − FGD−A: A−A' − Case 4b

Stability and Safety Factor Assessment, Oak Grove SES

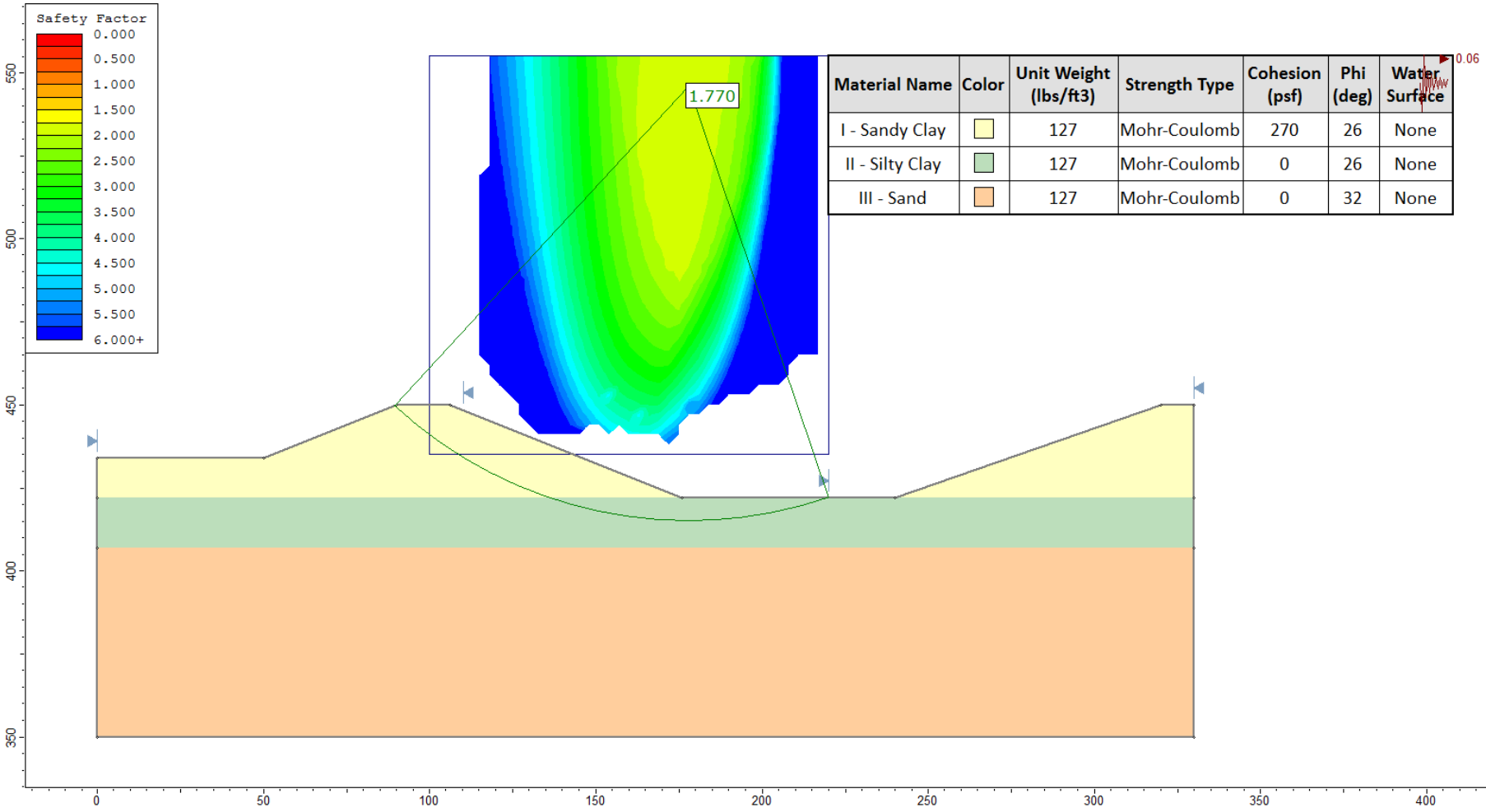



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|
| I - Sandy Clay | | 127 | Mohr-Coulomb | 270 | 26 | None |
| II - Silty Clay | | 127 | Mohr-Coulomb | 0 | 26 | None |
| III - Sand | | 127 | Mohr-Coulomb | 0 | 32 | None |

FIGURE **C.9**

## Results of Stability Analysis − FGD−A: A−A' − Case 5a

Stability and Safety Factor Assessment, Oak Grove SES

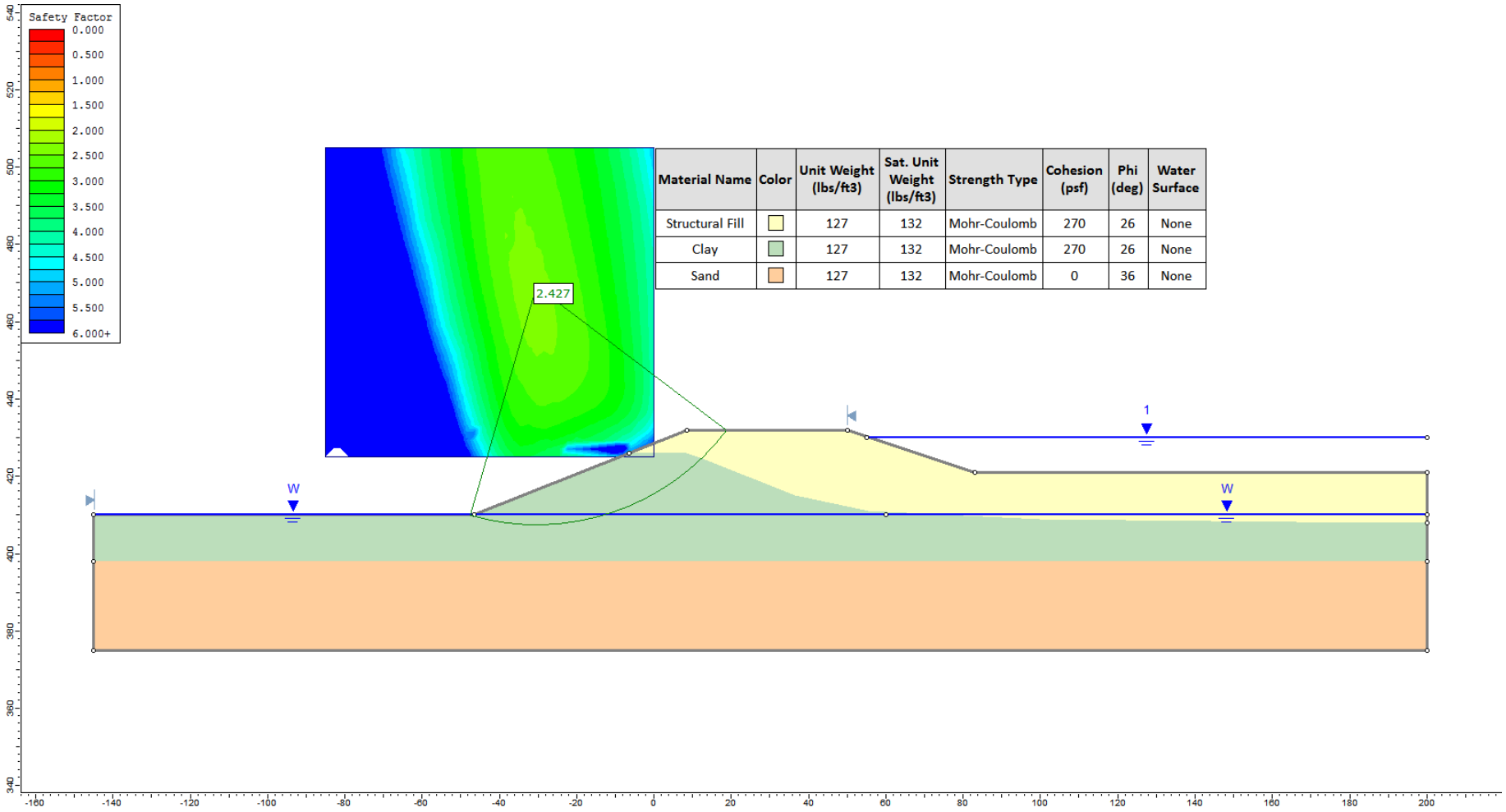



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|
| I - Sandy Clay | | 127 | Mohr-Coulomb | 270 | 26 | None |
| II - Silty Clay | | 127 | Mohr-Coulomb | 0 | 26 | None |
| III - Sand | | 127 | Mohr-Coulomb | 0 | 32 | None |

FIGURE **C.10**

**Results of Stability Analysis − FGD−A: A−A' − Case 5b**

Stability and Safety Factor Assessment, Oak Grove SES

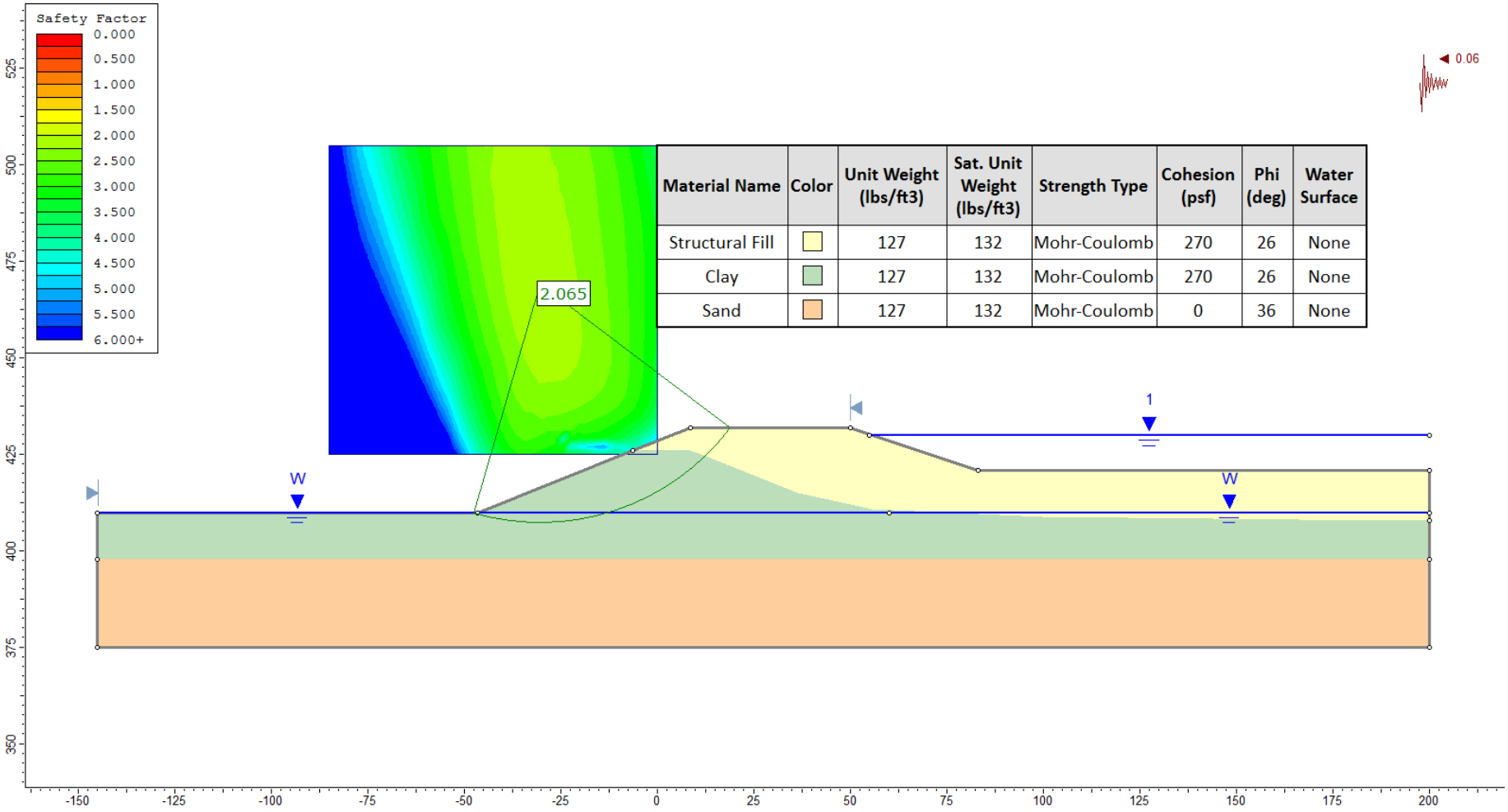



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| Structural Fill | | 127 | 132 | Mohr-Coulomb | 270 | 26 | None |
| Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | None |
| Sand | | 127 | 132 | Mohr-Coulomb | 0 | 36 | None |

FIGURE **C.11**

## Results of Stability Analysis − FGD−B: B−B' − Case 1a

Stability and Safety Factor Assessment, Oak Grove SES

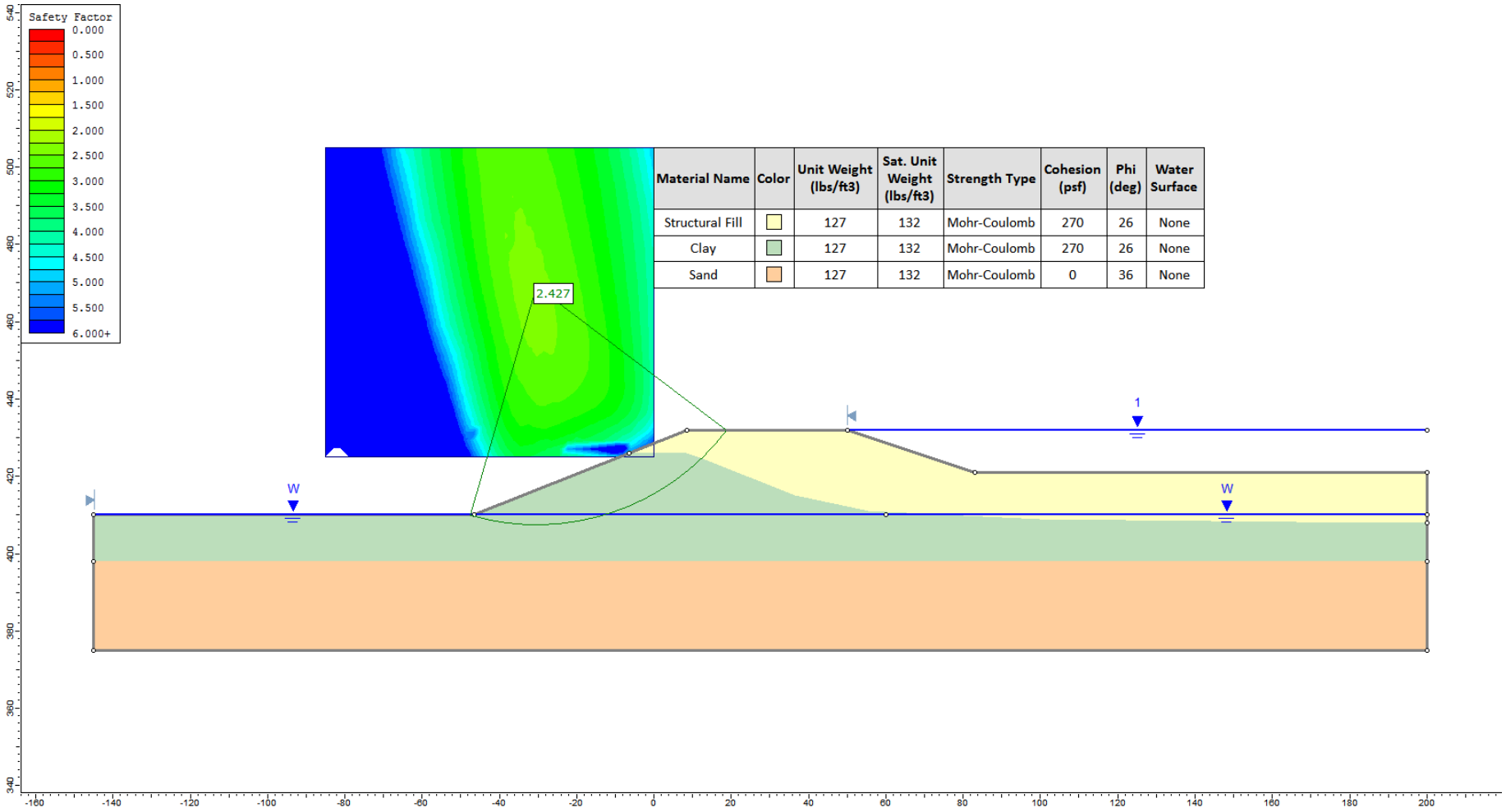



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| Structural Fill | | 127 | 132 | Mohr-Coulomb | 270 | 26 | None |
| Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | None |
| Sand | | 127 | 132 | Mohr-Coulomb | 0 | 36 | None |

FIGURE **C.12**

**Results of Stability Analysis − FGD−B: B−B' − Case 1b**

Stability and Safety Factor Assessment, Oak Grove SES

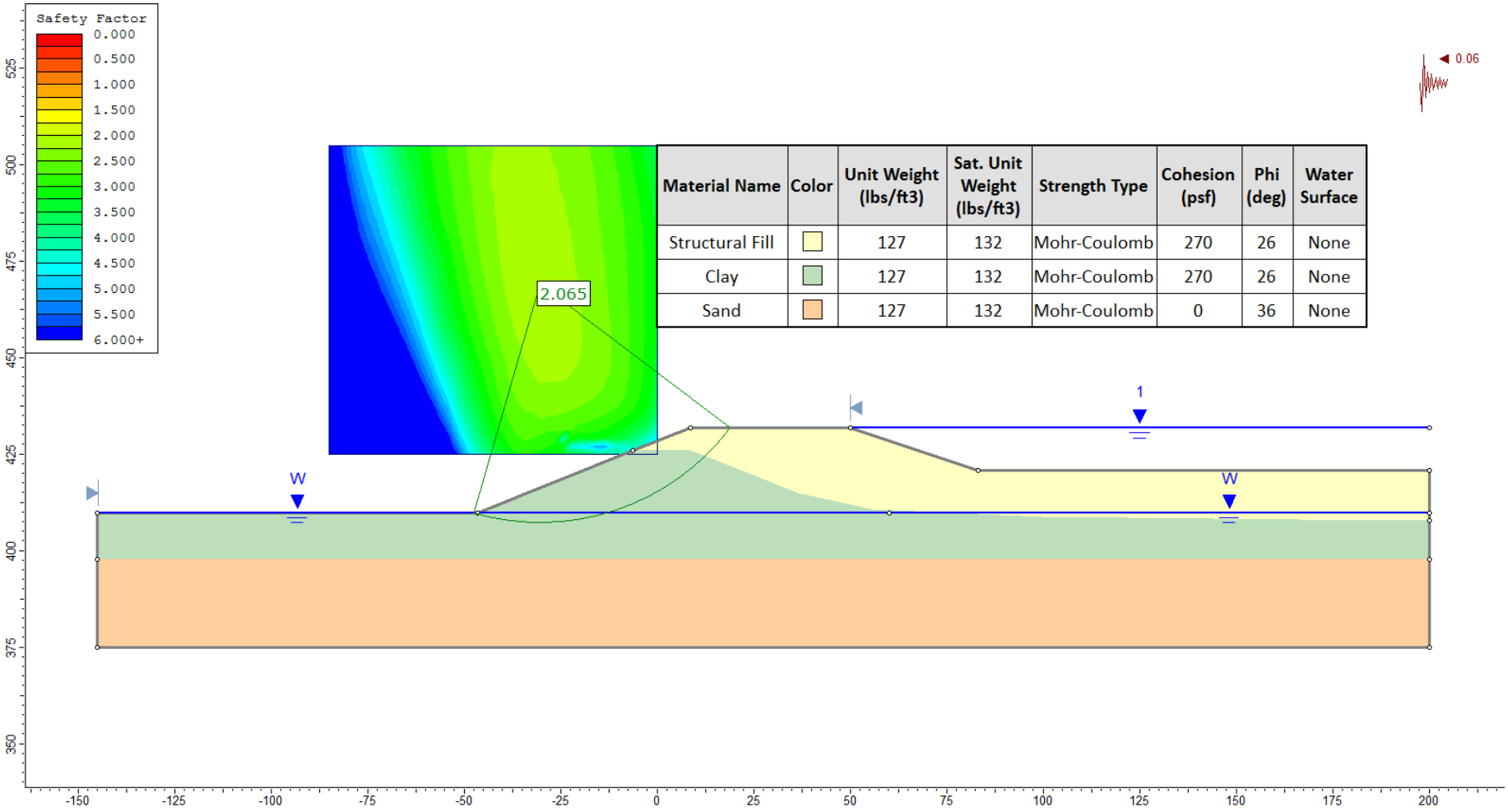



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| Structural Fill | | 127 | 132 | Mohr-Coulomb | 270 | 26 | None |
| Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | None |
| Sand | | 127 | 132 | Mohr-Coulomb | 0 | 36 | None |

FIGURE **C.13**

## Results of Stability Analysis − FGD−B: B−B' − Case 2a

Stability and Safety Factor Assessment, Oak Grove SES

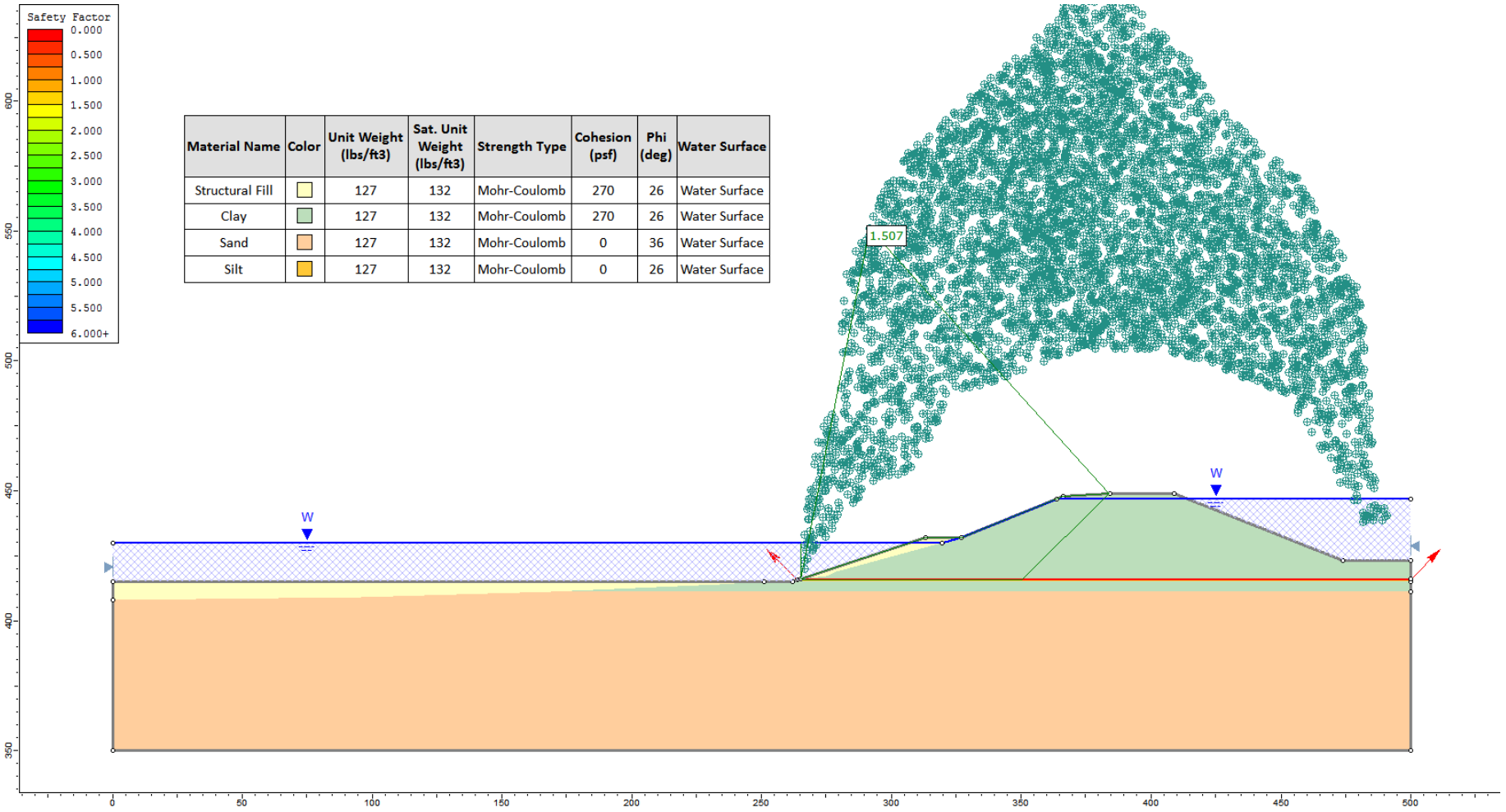



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| Structural Fill | | 127 | 132 | Mohr-Coulomb | 270 | 26 | None |
| Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | None |
| Sand | | 127 | 132 | Mohr-Coulomb | 0 | 36 | None |

FIGURE **C.14**

**Results of Stability Analysis – FGD–B: B–B' – Case 2b**

Stability and Safety Factor Assessment, Oak Grove SES

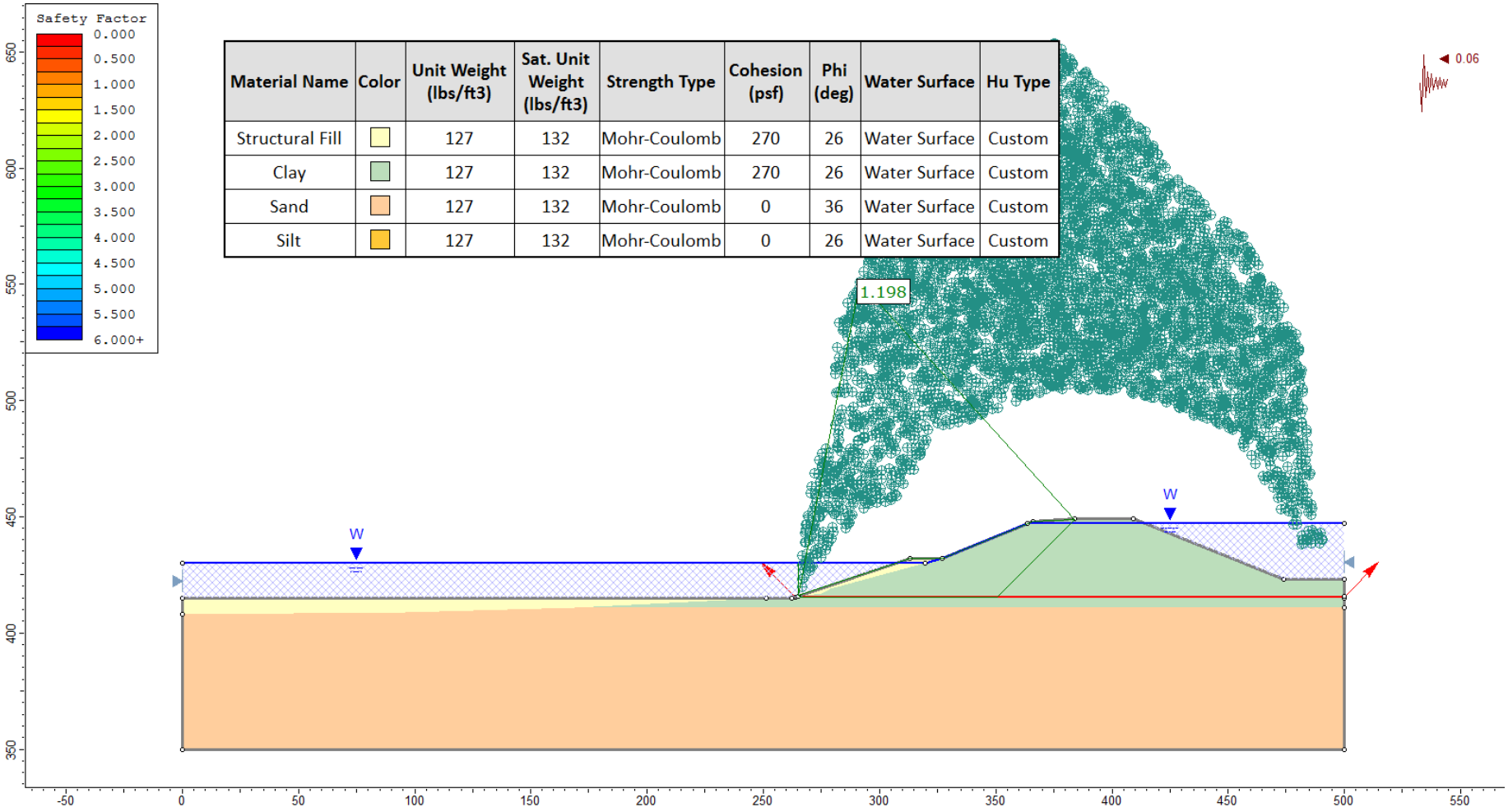



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| Structural Fill | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| Sand | | 127 | 132 | Mohr-Coulomb | 0 | 36 | Water Surface |
| Silt | | 127 | 132 | Mohr-Coulomb | 0 | 26 | Water Surface |

FIGURE **C.15**

## Results of Stability Analysis − FGD−B: B1−B1' − Case 3a

Stability and Safety Factor Assessment, Oak Grove SES

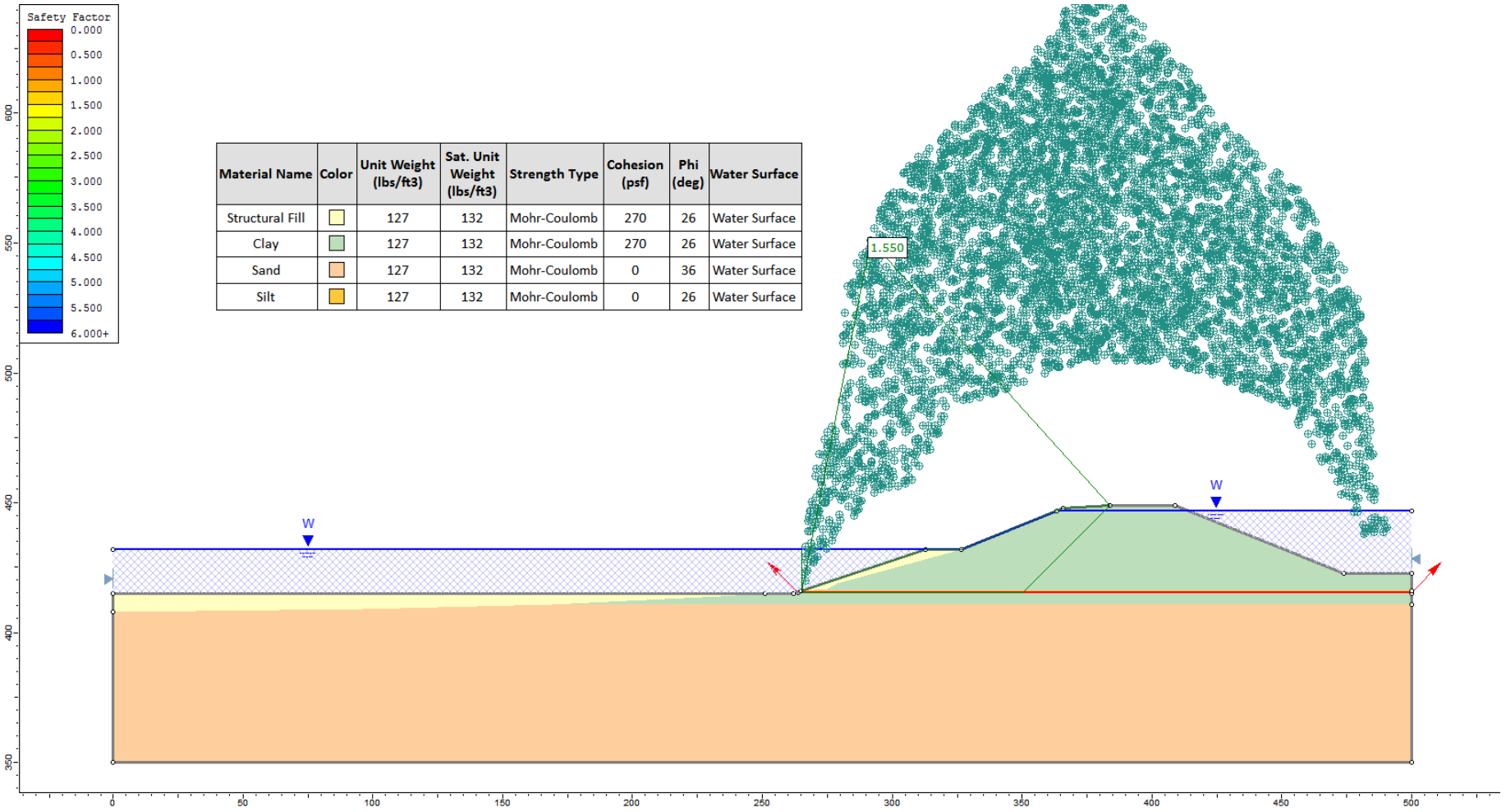



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Hu Type |
|---|---|---|---|---|---|---|---|---|
| Structural Fill | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface | Custom |
| Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface | Custom |
| Sand | | 127 | 132 | Mohr-Coulomb | 0 | 36 | Water Surface | Custom |
| Silt | | 127 | 132 | Mohr-Coulomb | 0 | 26 | Water Surface | Custom |

FIGURE **C.16**

**Results of Stability Analysis − FGD−B: B1−B1' − Case 3b**

Stability and Safety Factor Assessment, Oak Grove SES

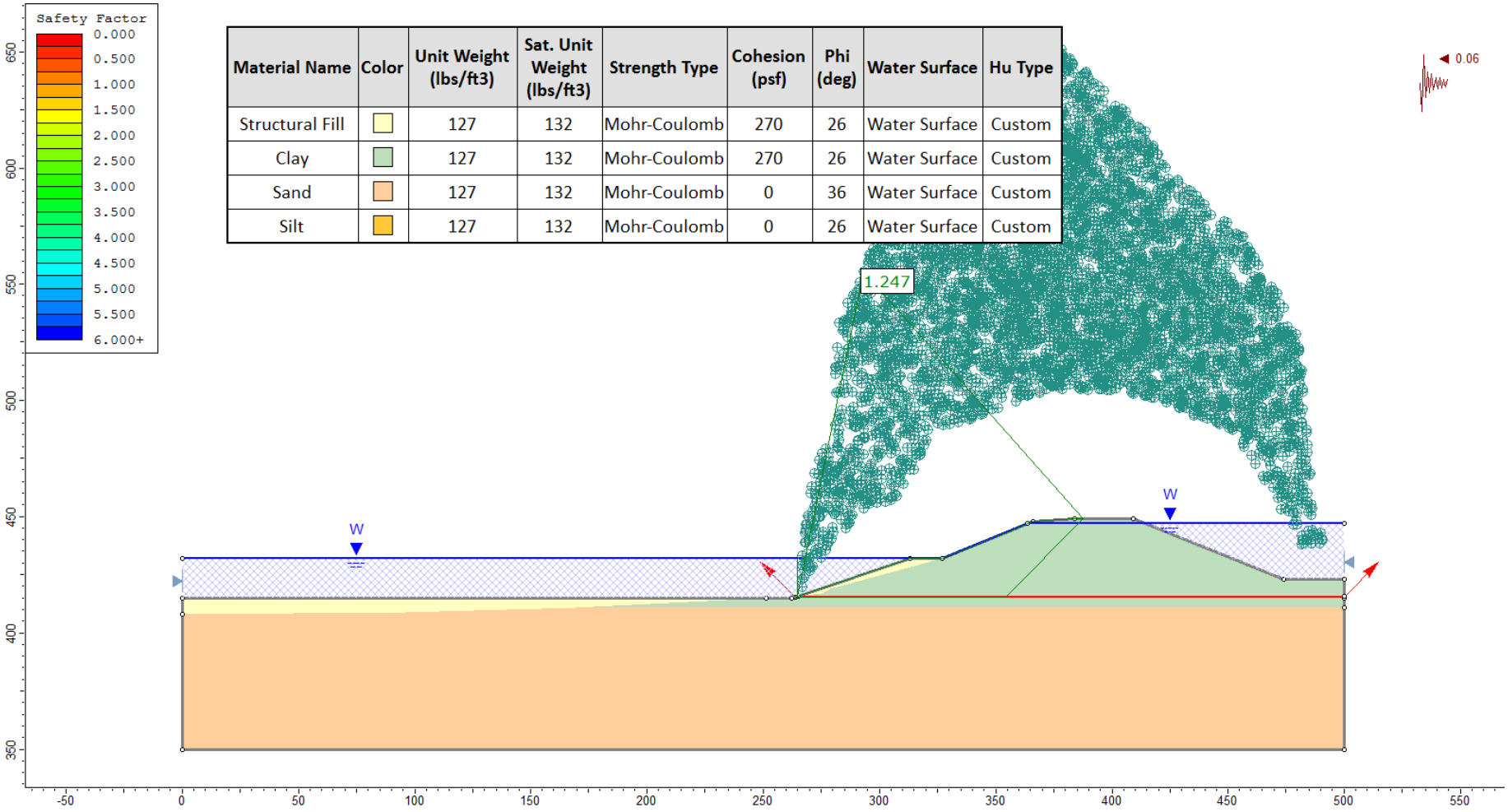



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| Structural Fill | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| Sand | | 127 | 132 | Mohr-Coulomb | 0 | 36 | Water Surface |
| Silt | | 127 | 132 | Mohr-Coulomb | 0 | 26 | Water Surface |

FIGURE **C.17**

**Results of Stability Analysis – FGD–B: B1–B1' – Case 4a**

Stability and Safety Factor Assessment, Oak Grove SES

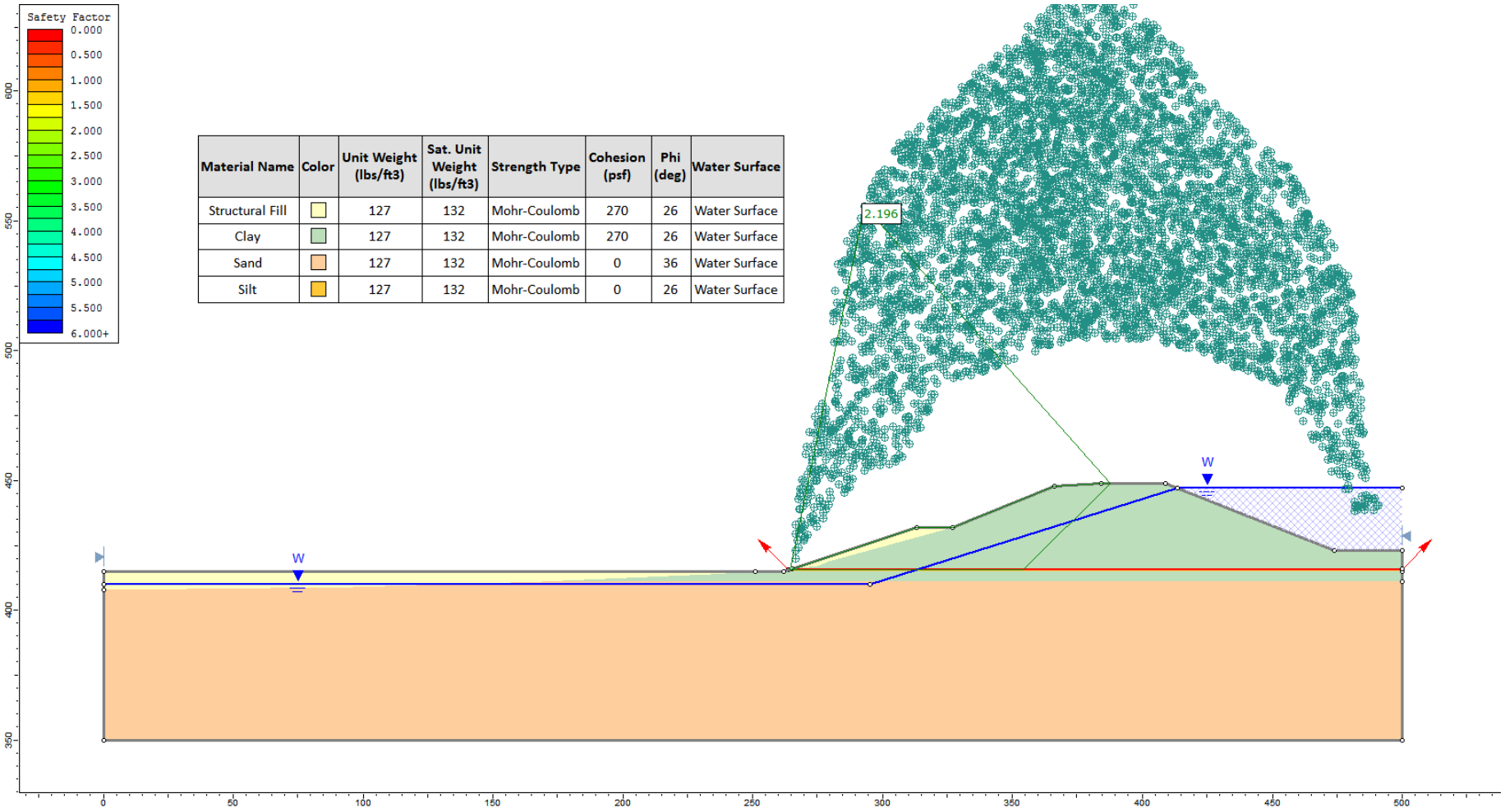



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Hu Type |
|---|---|---|---|---|---|---|---|---|
| Structural Fill | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface | Custom |
| Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface | Custom |
| Sand | | 127 | 132 | Mohr-Coulomb | 0 | 36 | Water Surface | Custom |
| Silt | | 127 | 132 | Mohr-Coulomb | 0 | 26 | Water Surface | Custom |

FIGURE **C.18**

**Results of Stability Analysis − FGD−B: B1−B1' − Case 4b**

Stability and Safety Factor Assessment, Oak Grove SES

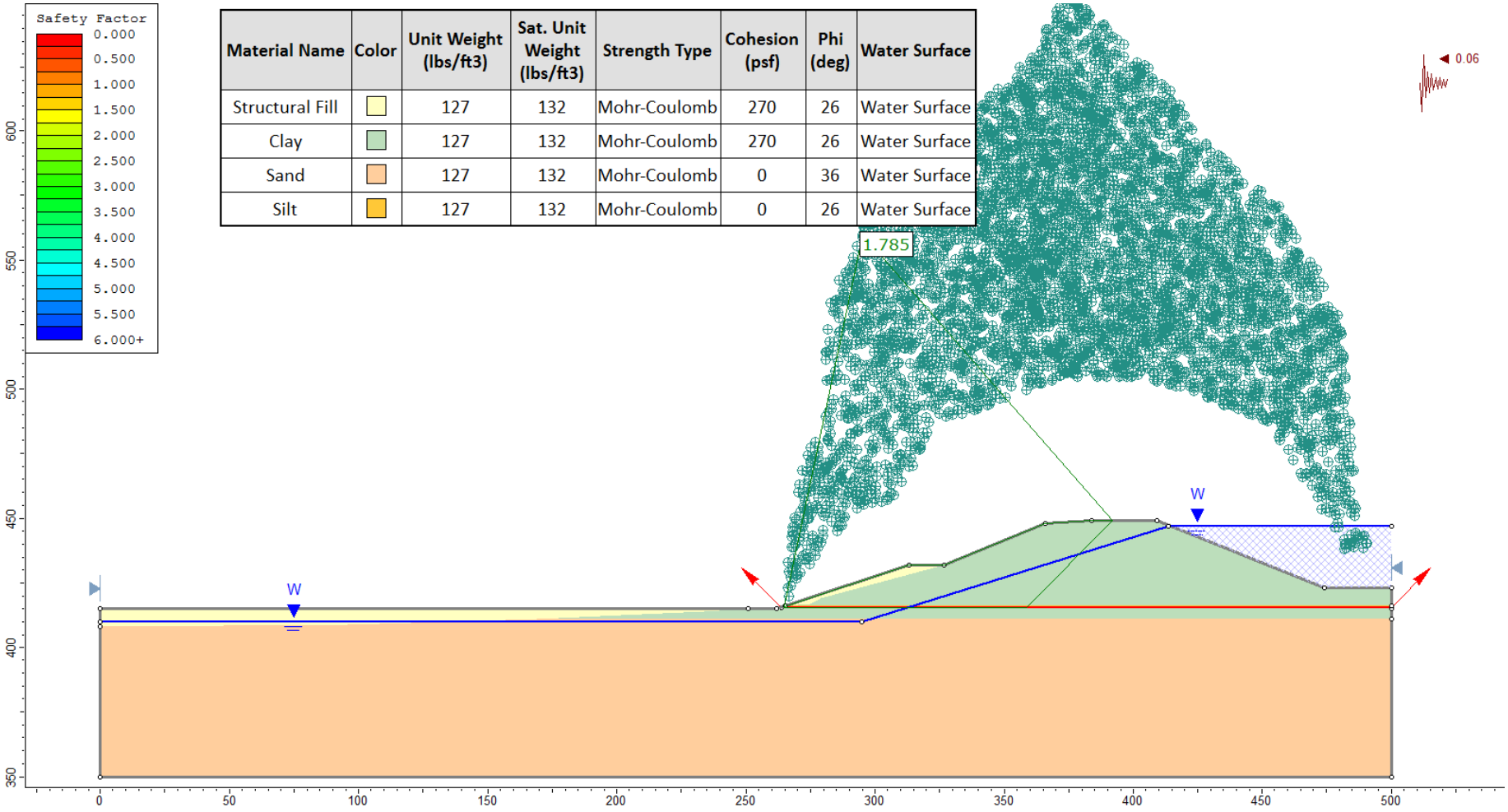



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| Structural Fill | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| Sand | | 127 | 132 | Mohr-Coulomb | 0 | 36 | Water Surface |
| Silt | | 127 | 132 | Mohr-Coulomb | 0 | 26 | Water Surface |

FIGURE **C.19**

**Results of Stability Analysis − FGD−B: B1−B1' − Case 5a**

Stability and Safety Factor Assessment, Oak Grove SES

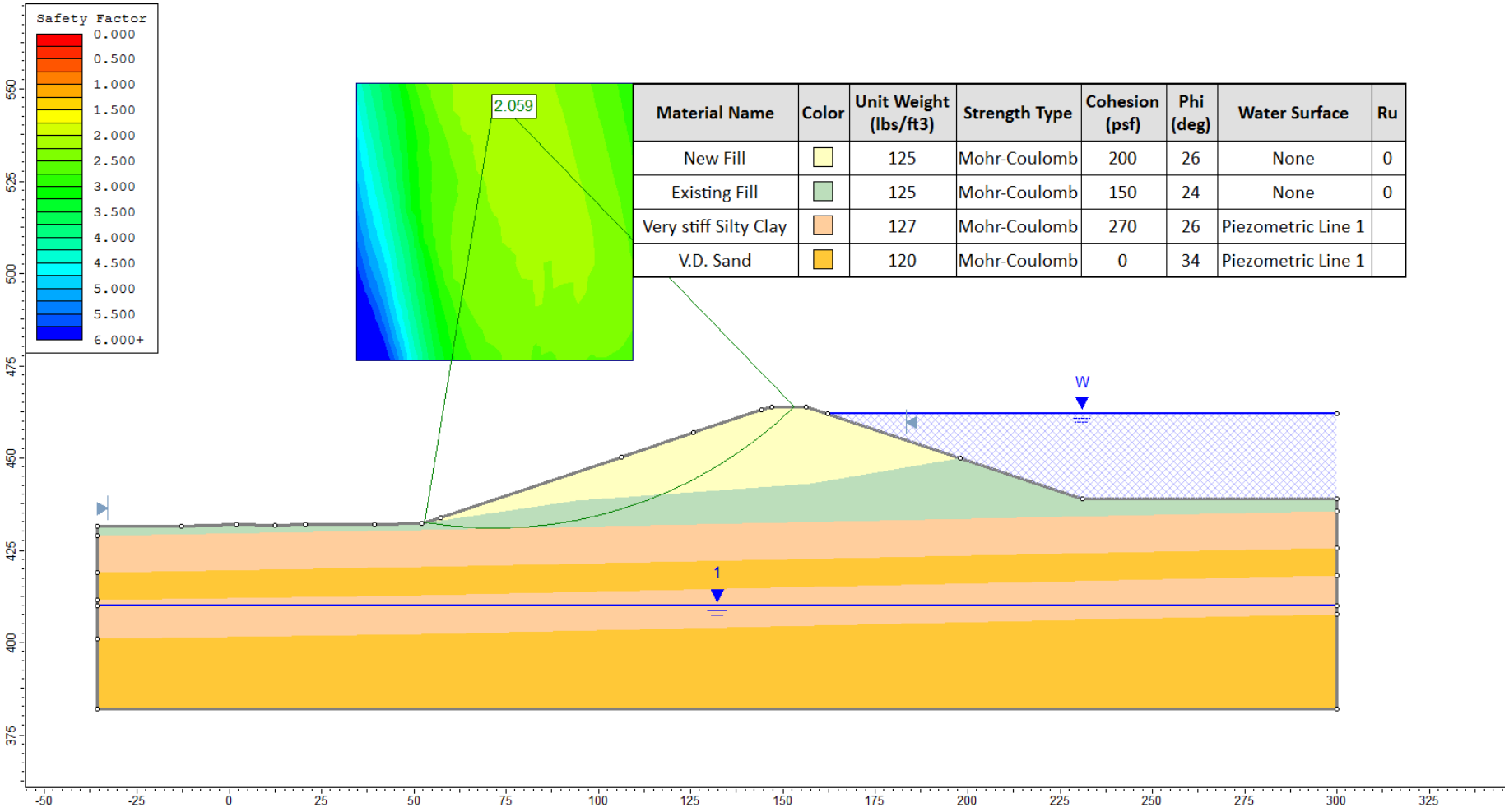



| Material Name | Color | Unit Weight (lbs/ft3) | Sat. Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface |
|---|---|---|---|---|---|---|---|
| Structural Fill | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| Clay | | 127 | 132 | Mohr-Coulomb | 270 | 26 | Water Surface |
| Sand | | 127 | 132 | Mohr-Coulomb | 0 | 36 | Water Surface |
| Silt | | 127 | 132 | Mohr-Coulomb | 0 | 26 | Water Surface |

FIGURE **C.20**

**Results of Stability Analysis − FGD−B: B1−B1' − Case 5b**

Stability and Safety Factor Assessment, Oak Grove SES

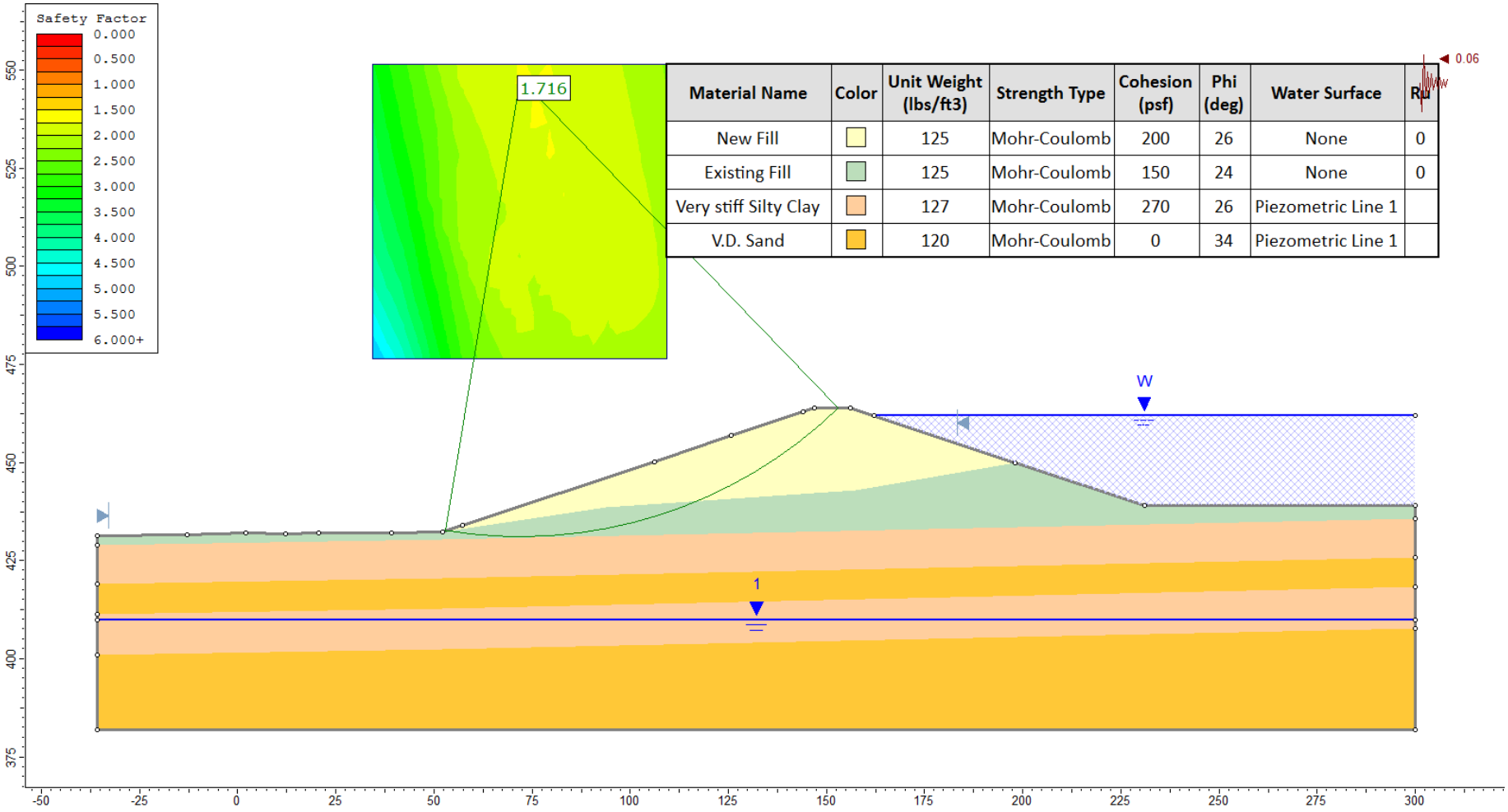



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Ru |
|---|---|---|---|---|---|---|---|
| New Fill | | 125 | Mohr-Coulomb | 200 | 26 | None | 0 |
| Existing Fill | | 125 | Mohr-Coulomb | 150 | 24 | None | 0 |
| Very stiff Silty Clay | | 127 | Mohr-Coulomb | 270 | 26 | Piezometric Line 1 | |
| V.D. Sand | | 120 | Mohr-Coulomb | 0 | 34 | Piezometric Line 1 | |

FIGURE **C.21**

**Results of Stability Analysis − FGD−C: C−C' − Case 1a**

Stability and Safety Factor Assessment, Oak Grove SES

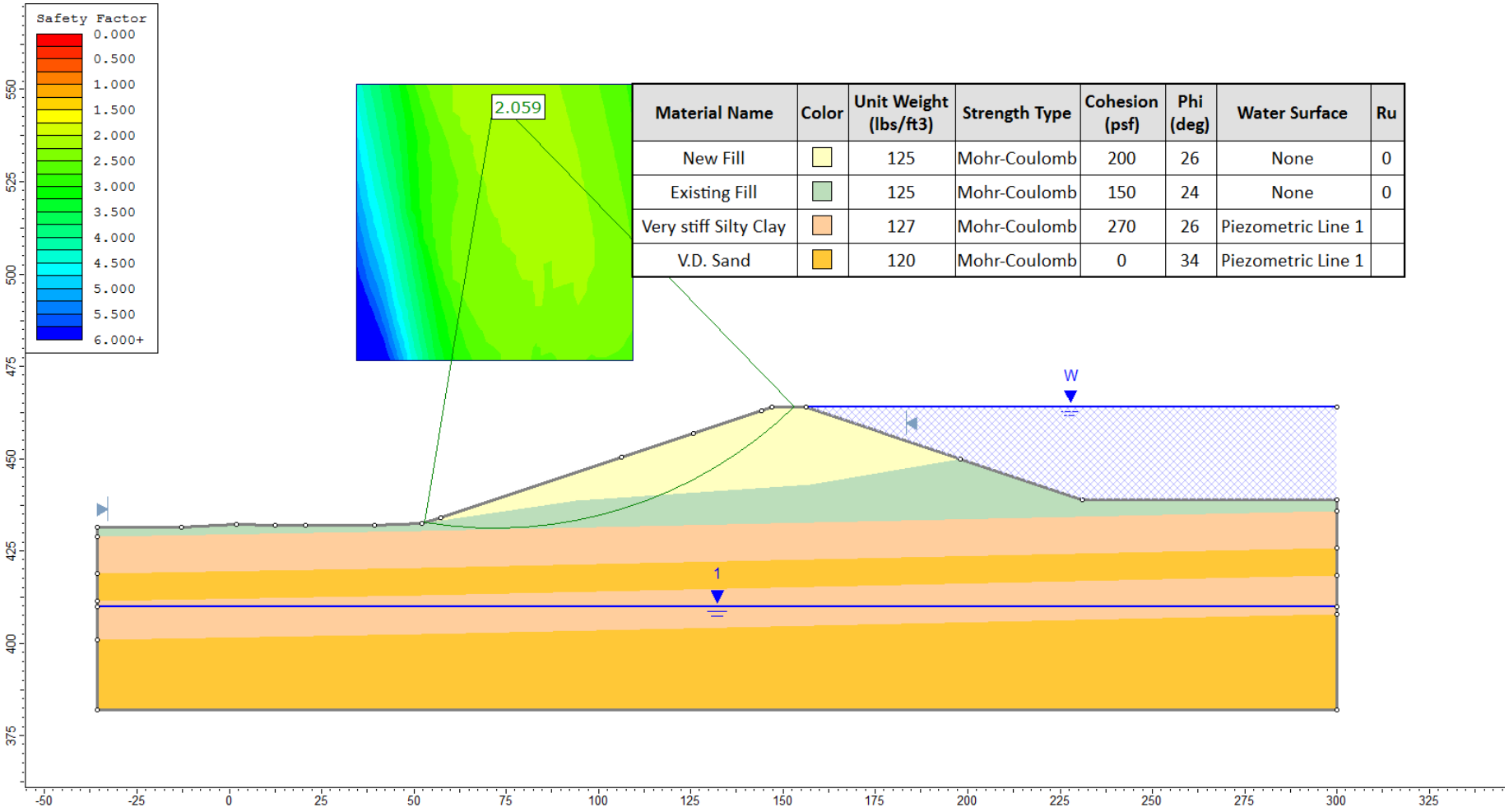



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Ru |
|---|---|---|---|---|---|---|---|
| New Fill | | 125 | Mohr-Coulomb | 200 | 26 | None | 0 |
| Existing Fill | | 125 | Mohr-Coulomb | 150 | 24 | None | 0 |
| Very stiff Silty Clay | | 127 | Mohr-Coulomb | 270 | 26 | Piezometric Line 1 | |
| V.D. Sand | | 120 | Mohr-Coulomb | 0 | 34 | Piezometric Line 1 | |

FIGURE **C.22**

**Results of Stability Analysis − FGD−C: C−C' − Case 1b**

Stability and Safety Factor Assessment, Oak Grove SES

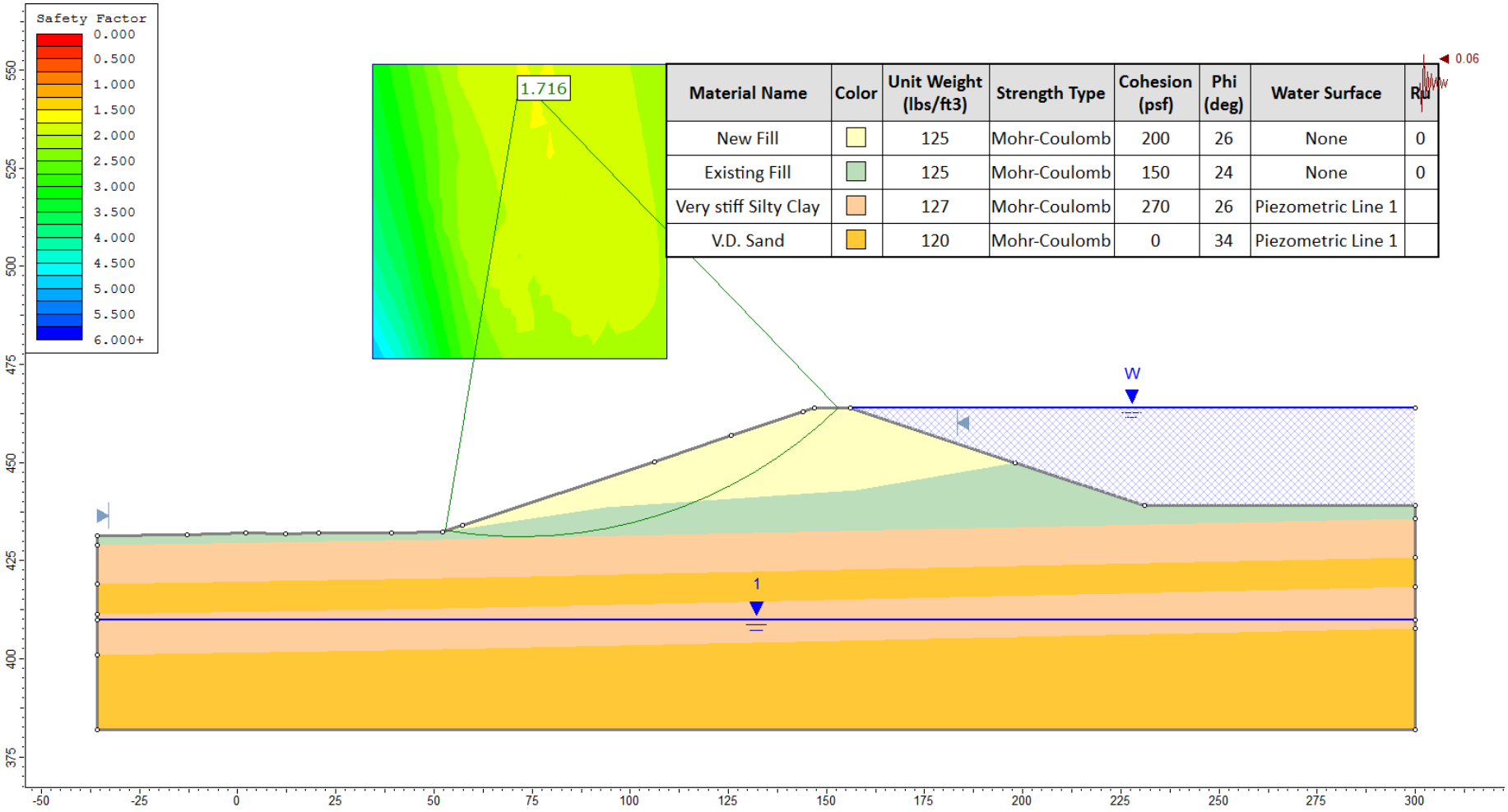



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Ru |
|---|---|---|---|---|---|---|---|
| New Fill | | 125 | Mohr-Coulomb | 200 | 26 | None | 0 |
| Existing Fill | | 125 | Mohr-Coulomb | 150 | 24 | None | 0 |
| Very stiff Silty Clay | | 127 | Mohr-Coulomb | 270 | 26 | Piezometric Line 1 | |
| V.D. Sand | | 120 | Mohr-Coulomb | 0 | 34 | Piezometric Line 1 | |

FIGURE **C.23**

**Results of Stability Analysis – FGD–C: C–C' – Case 2a**

Stability and Safety Factor Assessment, Oak Grove SES

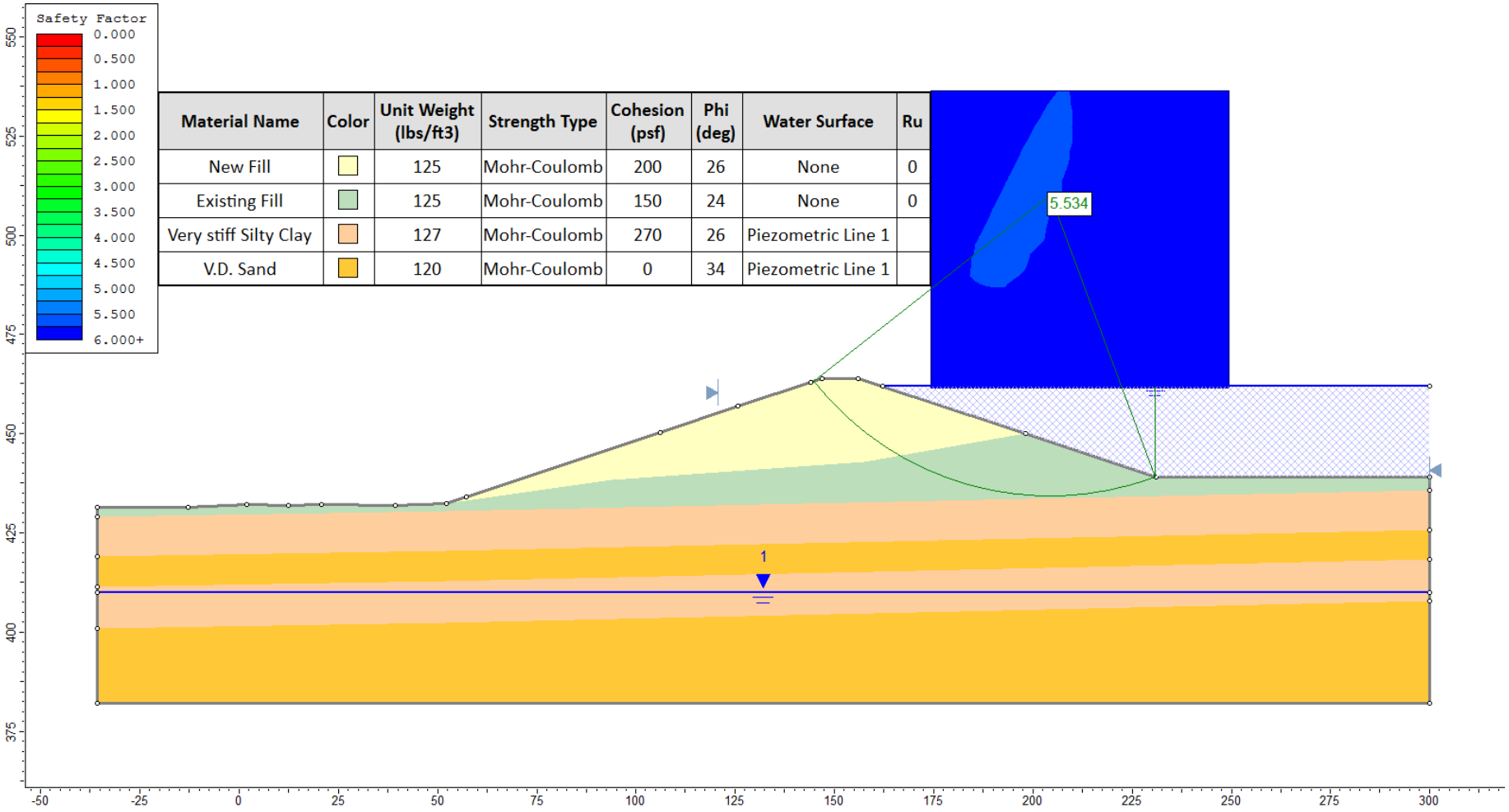



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Ru |
|---|---|---|---|---|---|---|---|
| New Fill | | 125 | Mohr-Coulomb | 200 | 26 | None | 0 |
| Existing Fill | | 125 | Mohr-Coulomb | 150 | 24 | None | 0 |
| Very stiff Silty Clay | | 127 | Mohr-Coulomb | 270 | 26 | Piezometric Line 1 | |
| V.D. Sand | | 120 | Mohr-Coulomb | 0 | 34 | Piezometric Line 1 | |

FIGURE **C.24**

**Results of Stability Analysis – FGD–C: C–C' – Case 2b**

Stability and Safety Factor Assessment, Oak Grove SES




| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Ru |
|---|---|---|---|---|---|---|---|
| New Fill | | 125 | Mohr-Coulomb | 200 | 26 | None | 0 |
| Existing Fill | | 125 | Mohr-Coulomb | 150 | 24 | None | 0 |
| Very stiff Silty Clay | | 127 | Mohr-Coulomb | 270 | 26 | Piezometric Line 1 | |
| V.D. Sand | | 120 | Mohr-Coulomb | 0 | 34 | Piezometric Line 1 | |

FIGURE **C.25**

## Results of Stability Analysis − FGD−C: C−C' − Case 3a

Stability and Safety Factor Assessment, Oak Grove SES

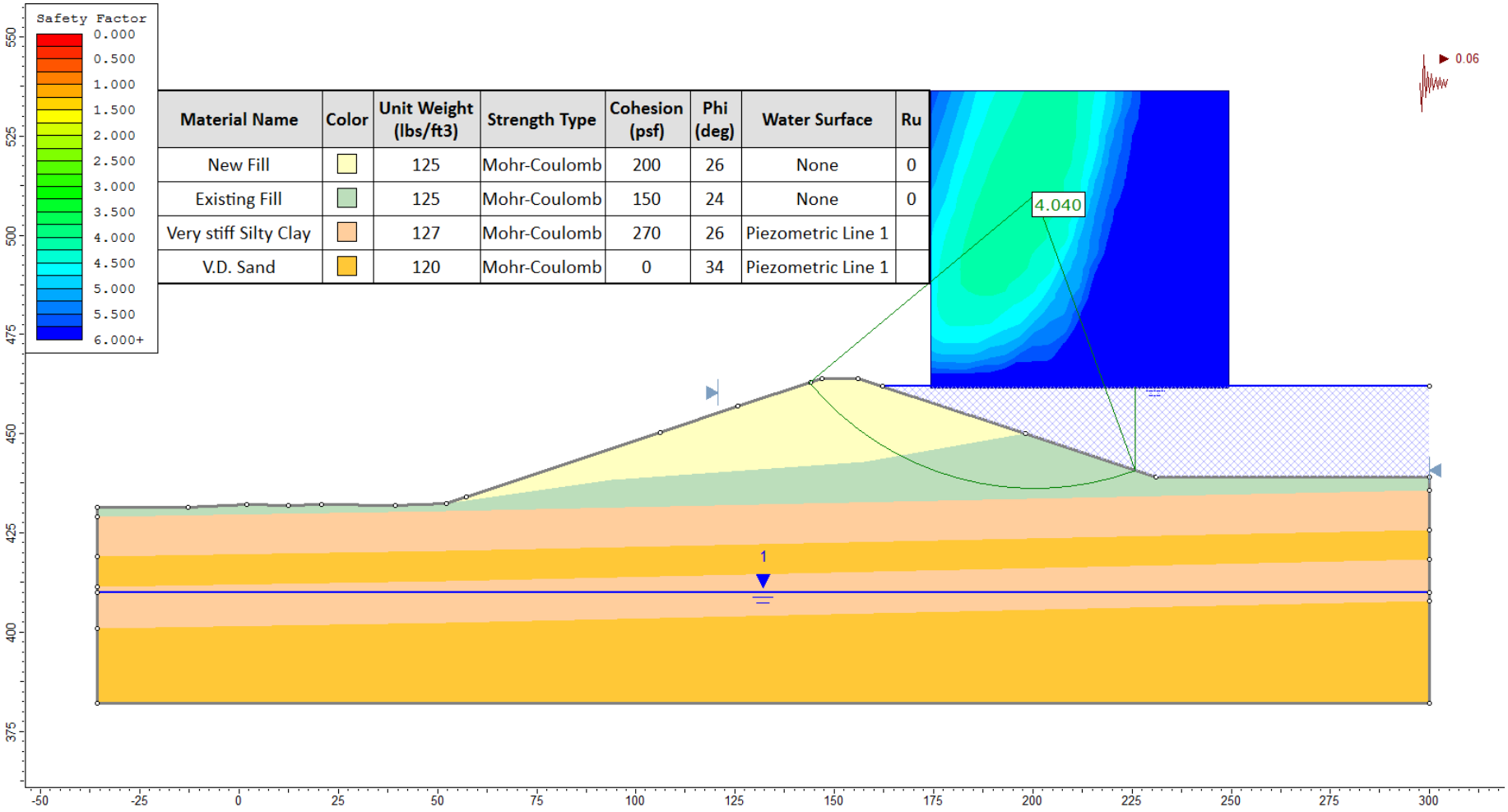
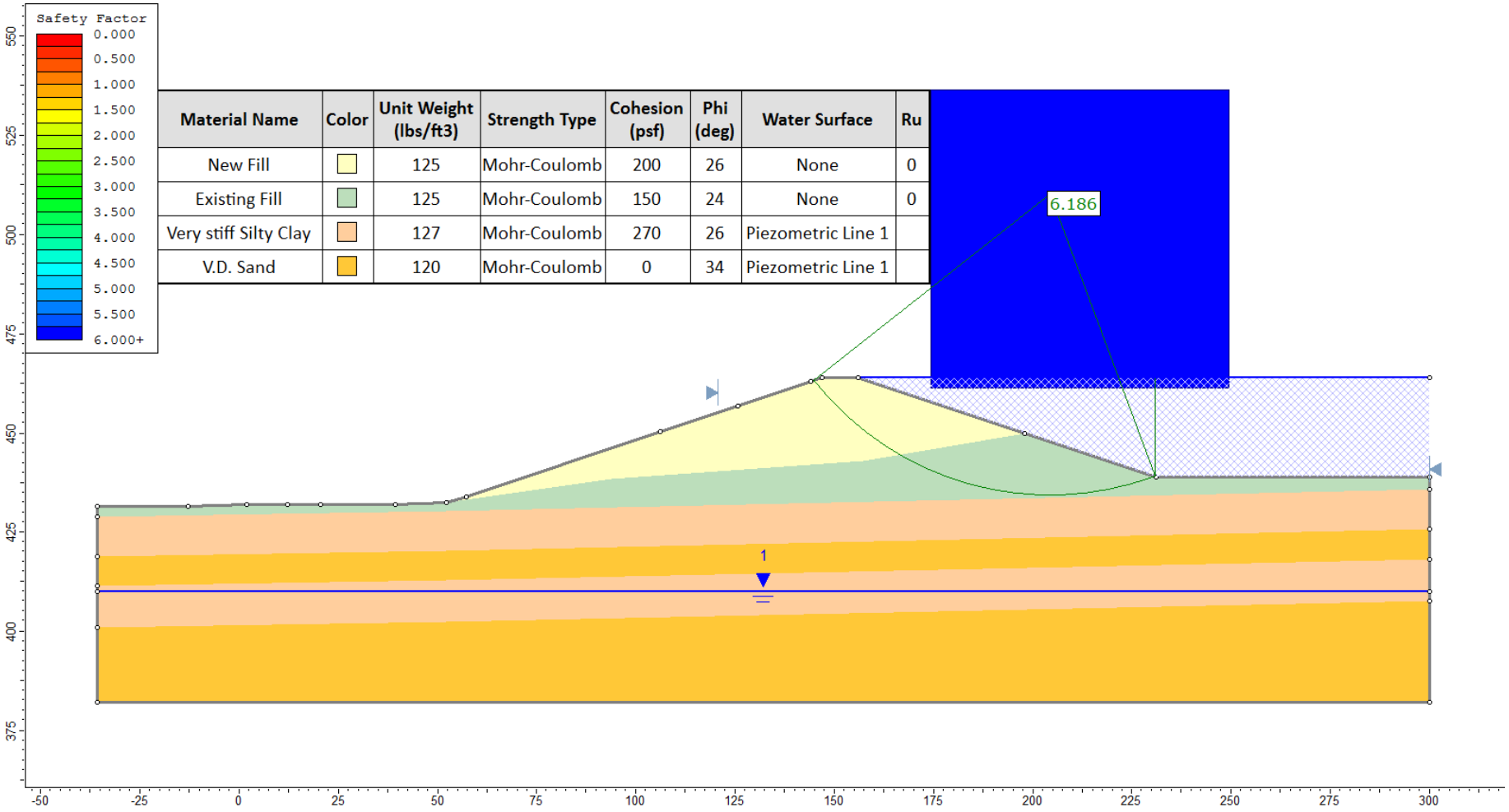



FIGURE **C.26**

## Results of Stability Analysis − FGD−C: C−C' − Case 3b

Stability and Safety Factor Assessment, Oak Grove SES




| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Ru |
|---|---|---|---|---|---|---|---|
| New Fill | | 125 | Mohr-Coulomb | 200 | 26 | None | 0 |
| Existing Fill | | 125 | Mohr-Coulomb | 150 | 24 | None | 0 |
| Very stiff Silty Clay | | 127 | Mohr-Coulomb | 270 | 26 | Piezometric Line 1 | |
| V.D. Sand | | 120 | Mohr-Coulomb | 0 | 34 | Piezometric Line 1 | |

FIGURE **C.27**

## Results of Stability Analysis − FGD−C: C−C' − Case 4a

Stability and Safety Factor Assessment, Oak Grove SES

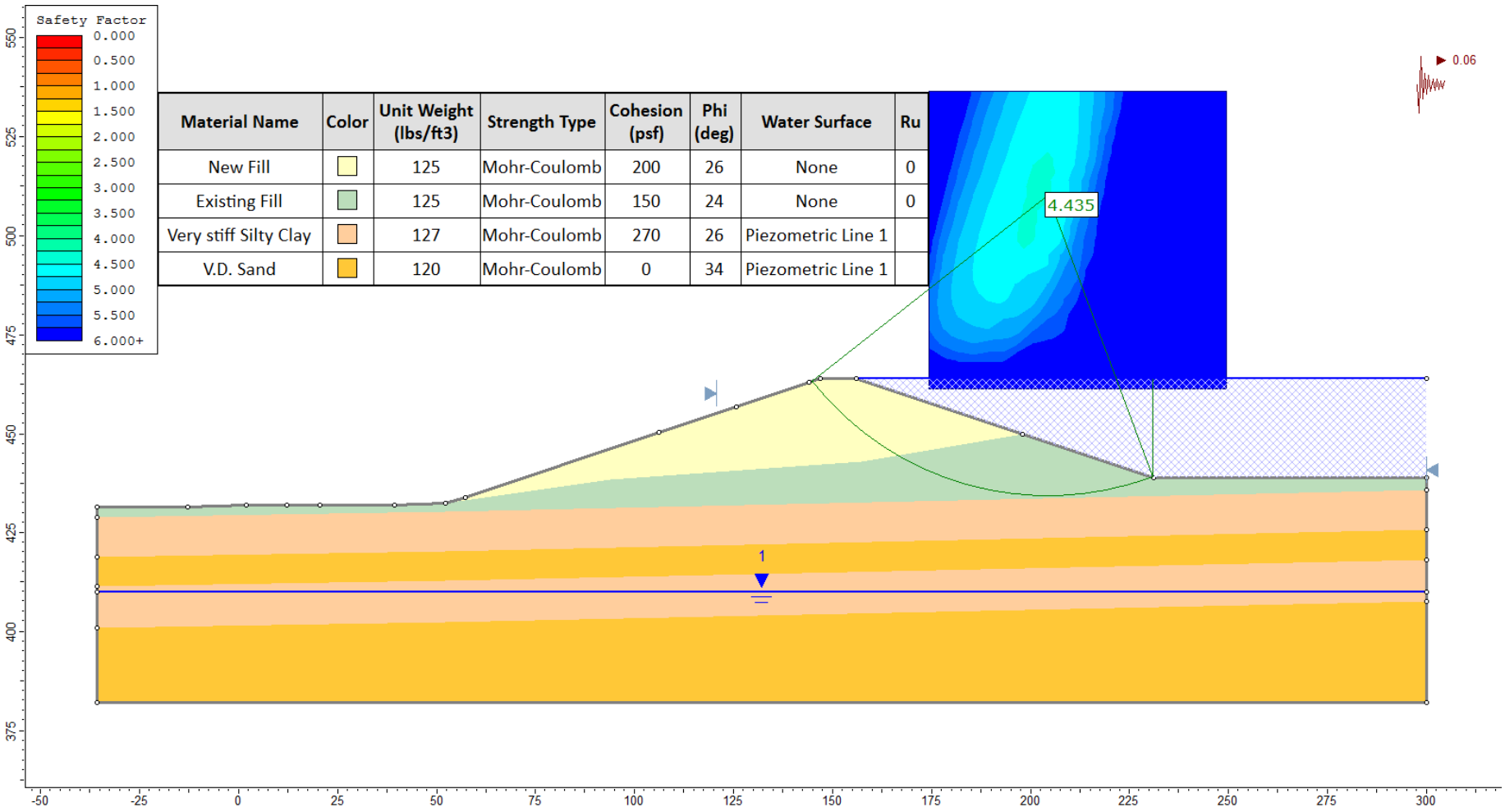
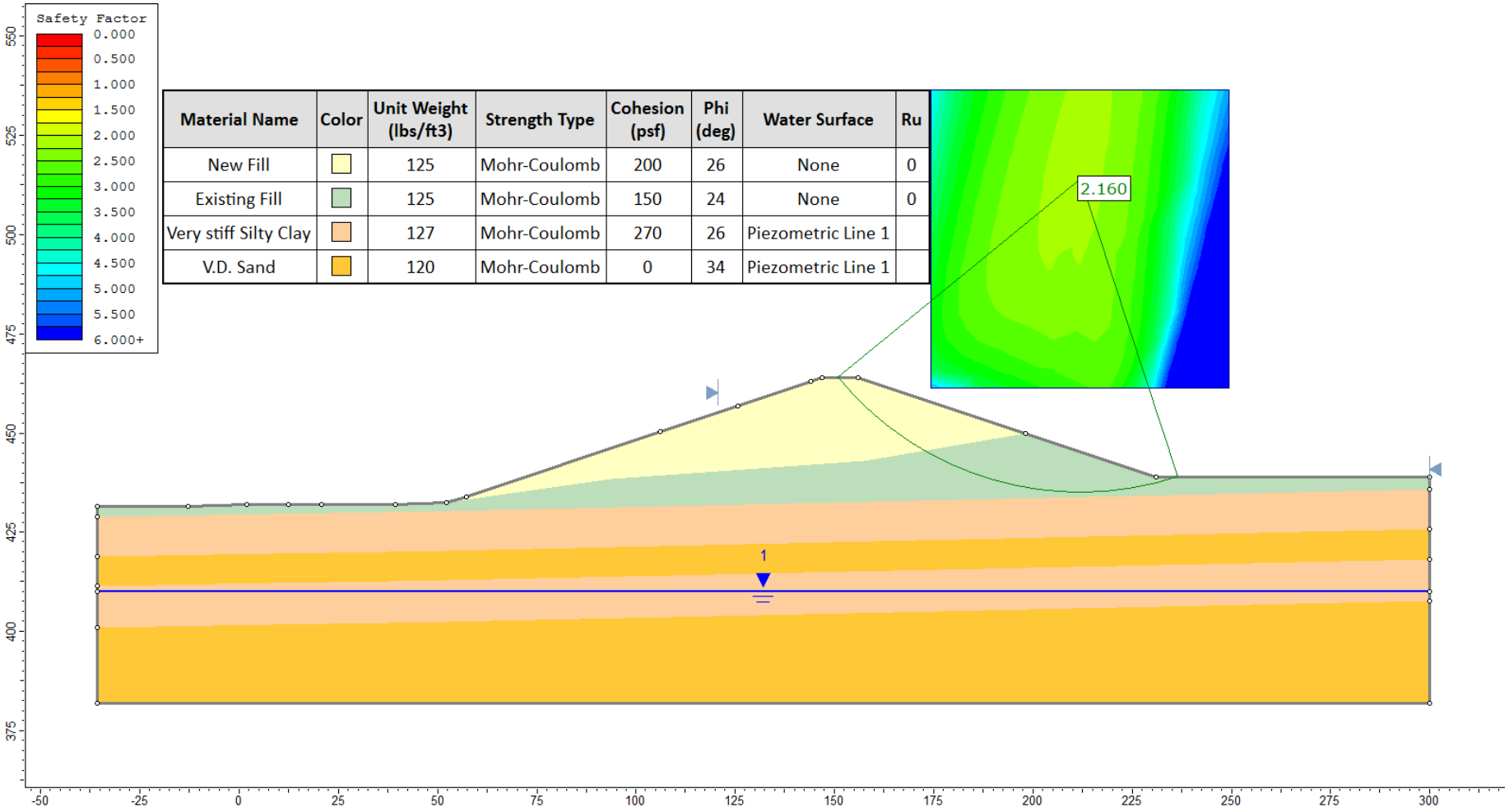



FIGURE **C.28**

## Results of Stability Analysis − FGD−C: C−C' − Case 4b

Stability and Safety Factor Assessment, Oak Grove SES

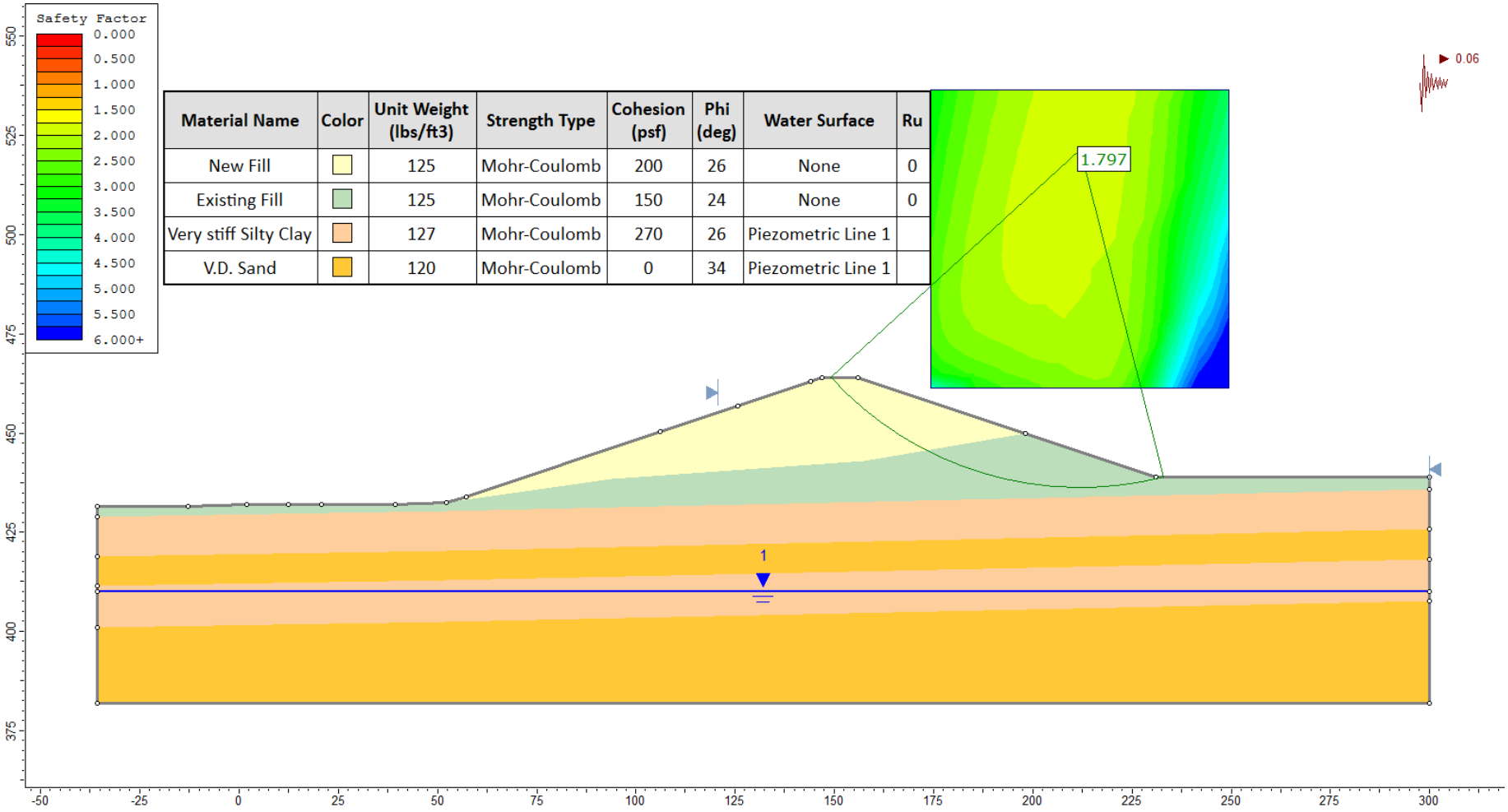



| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Ru |
|---|---|---|---|---|---|---|---|
| New Fill | | 125 | Mohr-Coulomb | 200 | 26 | None | 0 |
| Existing Fill | | 125 | Mohr-Coulomb | 150 | 24 | None | 0 |
| Very stiff Silty Clay | | 127 | Mohr-Coulomb | 270 | 26 | Piezometric Line 1 | |
| V.D. Sand | | 120 | Mohr-Coulomb | 0 | 34 | Piezometric Line 1 | |

FIGURE **C.29**

**Results of Stability Analysis − FGD−C: C−C' − Case 5a**

Stability and Safety Factor Assessment, Oak Grove SES




| Material Name | Color | Unit Weight (lbs/ft3) | Strength Type | Cohesion (psf) | Phi (deg) | Water Surface | Ru |
|---|---|---|---|---|---|---|---|
| New Fill | | 125 | Mohr-Coulomb | 200 | 26 | None | 0 |
| Existing Fill | | 125 | Mohr-Coulomb | 150 | 24 | None | 0 |
| Very stiff Silty Clay | | 127 | Mohr-Coulomb | 270 | 26 | Piezometric Line 1 | |
| V.D. Sand | | 120 | Mohr-Coulomb | 0 | 34 | Piezometric Line 1 | |

FIGURE **C.30**

**Results of Stability Analysis − FGD−C: C−C' − Case 5b**

Stability and Safety Factor Assessment, Oak Grove SES

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## APPENDIX F – GROUNDWATER MONITORING AND CORRECTIVE ACTION

**Groundwater Monitoring System Certification – Ash Landfill 1**
**Groundwater Monitoring System Certification – FGD Ponds**
**Groundwater Monitoring Plan-Revision 2 - Ash Landfill 1**
**Groundwater Monitoring Plan-Revision 2 - FGD Ponds**
**Statistical Analysis Plan-Revision 1 – Ash Landfill 1**
**Statistical Analysis Plan-Revision 1 – FGD Ponds**
**2017 Annual Groundwater Monitoring Report – Ash Landfill 1**
**2020 Groundwater Monitoring and Corrective Action Report – Ash Landfill 1**
**2021 Groundwater Monitoring and Corrective Action Report-Revision 1 – Ash Landfill 1**
**2020 Groundwater Monitoring and Corrective Action Report – FGD Ponds CCR**
**2021 Groundwater Monitoring and Corrective Action Report-Revision 1 – FGD Ponds**
**CCR Assessment of Corrective Measures Revision 1 - FGD Ponds**
**Assessment of Corrective Measures Public Meeting Documents - FGD Ponds**
**Remedy Selection Report - FGD Ponds**

**COAL COMBUSTION RESIDUAL RULE**
**GROUNDWATER MONITORING SYSTEM CERTIFICATION**

# OAK GROVE STEAM ELECTRIC STATION
# ASH LANDFILL 1
# ROBERTSON COUNTY, TEXAS

**OCTOBER 16, 2017**

LUMINANT

***Prepared For:***

Luminant Generation Company, LLC
6555 Sierra Drive
Irving, TX 75039

***Prepared By:***

Pastor, Behling & Wheeler, LLC
2201 Double Creek Drive, Suite 4004
Round Rock, Texas 78664
Texas Engineering Firm No. 4760

October 16, 2017

## PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Pastor, Behling & Wheeler, LLC under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the groundwater monitoring system installed at the referenced facility has been designed and constructed to meet the requirements of Section 257.91 of the CCR Rule.

Patrick J. Behling, P.E.
Principal Engineer
PASTOR, BEHLING & WHEELER, LLC

LUMINANT

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# 1.0 INTRODUCTION

Luminant Power (Luminant) operates the Oak Grove Steam Electric Station (OGSES) located approximately 10 miles north of Franklin, Robertson County, Texas (Figure 1). The OGSES consists of two 800-megawatt power generation units which burn lignite and coal. Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operations. Currently, CCRs generated at the OGSES are managed by Luminant in surface impoundments located on the OGSES property or the Ash Landfill 1. Two CCR units have been identified within the OGSES operations, the FGD Pond Area and the Ash Landfill 1. This report discusses the Ash Landfill 1 (the Site), which is located approximately 3,500 feet southwest of the OGSES power plant. The Ash Landfill 1 meets the definition of a CCR landfill and is subject to groundwater monitoring system requirements of the CCR Rule.

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the EPA to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. The final CCR Rule was published in the Federal Register on April 17, 2015. The effective date of the CCR Rule was October 19, 2015.

The CCR Rule establishes national minimum criteria for existing and new CCR landfills, existing and new CCR surface impoundments, and lateral expansions to landfills/impoundments. Pastor, Behling & Wheeler, LLC (PBW) was retained by Luminant to evaluate and certify that the groundwater monitoring system at the Site in accordance with Section 257.91 of the CCR Rule.

## 1.1 Description of Ash Landfill 1

Ash Landfill 1 is located approximately 3,500 feet southwest of the OGSES power plant (Figure 2). CCRs generated at the OGSES, including fly ash and bottom ash, are transported and managed/disposed of by Luminant in the Ash Landfill 1. Cell 1 of the Ash Landfill 1 was constructed in 2009 and the landfill was expanded in 2011. The existing liner system for the Ash Landfill 1 includes a 60-mil high density polyethylene (HDPE) geomembrane and a 3-foot thick compacted clay liner (Golder, 2015).

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## 1.2 CCR Unit Groundwater Monitoring System Requirements

Section 257.91 of the CCR Rule indicates that existing CCR landfills and surface impoundments be provided with a groundwater monitoring system that consists of sufficient wells, installed at appropriate location and depths, to yield groundwater samples from the uppermost aquifer that meet the following criteria:

- Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit; and
- Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary to ensure detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.

The specific configuration of the groundwater monitoring system must be determined based on site-specific technical information that must include aquifer thickness, groundwater flow rate, groundwater flow direction (including seasonal and temporal fluctuation in groundwater flow), saturated and unsaturated geologic units and fill materials that overly the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the upmost aquifer, including, but not limited to, thickness, stratigraphy, lithology, hydraulic conductivities, porosities, and effective porosities.

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At a minimum, the monitoring system must consist of at least one upgradient and three downgradient monitoring wells, and any additional monitoring wells necessary to accurately represent the quality of the background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit.

Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space above the sampling depth must be sealed to prevent contamination of samples and the groundwater. There must be documentation in the operating record of the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. The qualified engineer must have access to and must review this documentation as part of the groundwater monitoring system certification.

# 2.0 GROUNDWATER MONITORING SYSTEM EVALUATION

## 2.1 Ash Landfill 1 Groundwater Monitoring System

The CCR groundwater monitoring well system at the Ash Landfill 1 consists of six monitoring wells (MW-02, MW-05, MW-07, MW-08R, MW-09, and AL-10) that are each screened in the uppermost aquifer at the Site. The locations of the CCR monitoring wells are shown on Figure 2. Well construction information and survey data for the CCR wells are summarized in Table 1, CCR monitoring well logs are presented in Appendix A, and photographs of the CCR wells are presented in Appendix B.

## 2.2 Local Geology and Hydrogeology

The Site is located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1970). PBW reviewed historical soil boring logs, monitoring well completion documentation, and historical reports to describe the geologic and hydrogeologic conditions in the Ash Landfill 1. Geologic cross sections were constructed through the area using these data. The locations of the cross sections are presented on Figure 3 and the cross sections are presented on Figures 4 and 5.

Historical soil borings indicate the geology near the Ash Landfill 1 generally consists of relatively thick, interbedded sand and clay strata. The sand units in the Ash Landfill 1 Area are typically described as poorly sorted, silty to clayey sand with occasional zones of well sorted sand. The uppermost aquifer occurs under unconfined conditions within the shallow sand units at the Site.

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## 2.3 Groundwater Potentiometric Surface Elevations

Eight background groundwater monitoring events were performed using the Ash Landfill 1 CCR monitoring well system from October 2015 to April 2017. Static water levels measured during the background monitoring period indicated water elevations ranging from 406.96 feet above mean sea level (amsl) to 419.20 feet amsl, and depths to water ranging from 26.79 feet bgs to 50.38 feet bgs (Table 2). Groundwater potentiometric surface maps based on data collected during the background monitoring period are presented in Appendix C.

Groundwater elevations were generally highest to the southwest of the Ash Landfill 1 and lowest to the east of the Ash Landfill 1, with an inferred groundwater flow direction to the east. Based on the inferred groundwater flow direction, the location of each CCR monitoring well relative to Ash Landfill 1 is as

follows:

| Potential Upgradient Wells | Potential Downgradient Wells |
|---|---|
| MW-02 | MW-05 |
| AL-10 | MW-07 |
| | MW-08R |
| | MW-09 |

## 2.4 Uppermost Aquifer Hydraulic Conductivity Testing

PBW performed slug tests at monitoring wells MW-02, MW-05, and MW-09 on September 23, 2015 to evaluate groundwater linear flow velocities of the uppermost aquifer at the Site. Slug test data and time-head change plots used to calculate hydraulic conductivities and transmissivities of the uppermost aquifer are provided in Appendix D. A summary of these hydraulic properties is presented in Table 3. The average hydraulic conductivities for the wells ranged from $7.66 \times 10^{-3}$ cm/sec (well MW-09) to $2.74 \times 10^{-4}$ cm/sec (well MW-05), with a geometric mean for the test wells of $2.48 \times 10^{-3}$ cm/sec.

## 2.5 Conclusions

The CCR groundwater monitoring well system at the Ash Landfill 1 complies with Section 257.91 of the CCR Rule. This conclusion is supported by the following as described in detail in previous sections of this report:

- Six monitoring wells are included in the CCR groundwater monitoring system – two upgradient monitoring wells and four downgradient monitoring wells.
- Each monitoring well is screened in the uppermost aquifer at the Site. Samples collected from upgradient monitoring wells will be representative of the quality of background groundwater that has not been affected by leakage from the landfill and samples collected from downgradient wells will ensure detection of groundwater contamination in the uppermost aquifer from the landfill.
- The monitoring wells are constructed with appropriate well casing to maintain the integrity of the monitoring well borehole and with slotted well screens to enable collection of groundwater samples. In addition, the annular space above the well screen is appropriately sealed to prevent contamination of groundwater samples from surface sources.
- Appropriate documentation exists concerning the design, installation, and development of the monitoring wells.

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## 3.0 REFERENCES

Barnes, Virgil E., 1970. Geologic Atlas of Texas, Waco Sheet. Texas Bureau of Economic Geology.

Golder Associates (Golder), 2015. Coal Combustion Residuals Regulations and Their Effect on Existing Landfills and Surface Impoundments, Oak Grove Steam Electric Station. May 26.

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# Tables

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**TABLE 1**
**CCR WELL CONSTRUCTION SUMMARY**
**ASH LANDFILL 1**
**OAG GROVE STEAM ELECTRIC STATION**

| Well ID | Date Installed | Northing | Easting | Ground Elevation (ft amsl) | TOC Elevation (ft amsl) | Top of Screen (ft bgs) | Bottom of Screen (ft bgs) | Screen Length (ft) | Total Design Depth (ft bgs) | Casing Diameter (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-04 | 11/17/86 | 568593 | 3200315 | 432.94 | 436.63 | 35 | 50 | 15 | 50 | 2 |
| MW-05 | 09/05/08 | 569467 | 3201188 | 434.73 | 436.98 | 29 | 49 | 20 | 50 | 2 |
| MW-07 | 09/06/08 | 570377 | 3200695 | 436.93 | 438.84 | 29 | 49 | 20 | 50 | 2 |
| MW-08* | 08/27/08 | 570980 | 3199824 | 440.64 | 443.38 | 31 | 51 | 20 | 52 | 2 |
| MW-08R | 11/09/16 | 570970 | 3199809 | 441.22 | 443.84 | 32.5 | 52.5 | 20 | 52.5 | 2 |
| MW-09 | 12/29/11 | 570146 | 3198709 | 459.24 | 461.46 | 46 | 66 | 20 | 67 | 2 |
| AL-10 | 9/22/15 | 568673 | 3197291 | 457.54 | 460.81 | 50.3 | 60.3 | 10 | 60.3 | 2 |

Notes:

1. Abbreviations: ft - feet; amsl - above mean sea level; bgs - below ground surface.
2. Coordinates in NAD 27 Texas State Plane Central 4208.
3. * - Well MW-08 was damaged by a haul truck in 2016 and was subsequently plugged and replaced by well MW-08R.

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# TABLE 2
# GROUNDWATER ELEVATION SUMMARY
# ASH LANDFILL 1
# OAK GROVE STEAM ELECTRIC STATION

| Well ID | TOC Elevation (ft amsl) | Date | Depth to Water (ft btoc) | Water Elevation (ft amsl) |
|---|---|---|---|---|
| MW-02 | 463.65 | 11/03/15 | 47.61 | 416.04 |
| | | 12/17/15 | 47.49 | 416.16 |
| | | 02/10/16 | 45.93 | 417.72 |
| | | 04/15/16 | 46.69 | 416.96 |
| | | 06/14/16 | 44.84 | 418.81 |
| | | 08/24/16 | 44.61 | 419.04 |
| | | 10/04/16 | 45.24 | 418.41 |
| | | 12/19/16 | 46.96 | 416.69 |
| MW-05 | 436.98 | 11/03/15 | 29.94 | 407.04 |
| | | 12/17/15 | 29.71 | 407.27 |
| | | 02/10/16 | 28.93 | 408.05 |
| | | 04/15/16 | 28.02 | 408.96 |
| | | 06/14/16 | 27.57 | 409.41 |
| | | 08/24/16 | 28.38 | 408.60 |
| | | 10/04/16 | 27.94 | 409.04 |
| | | 12/19/16 | 30.02 | 406.96 |
| MW-07 | 438.84 | 11/03/15 | 28.54 | 410.30 |
| | | 12/17/15 | 28.07 | 410.77 |
| | | 02/09/16 | 27.71 | 411.13 |
| | | 04/15/16 | 27.43 | 411.41 |
| | | 06/14/16 | 27.11 | 411.73 |
| | | 08/24/16 | 27.11 | 411.73 |
| | | 10/04/16 | 27.62 | 411.22 |
| | | 12/19/16 | 26.79 | 412.05 |
| MW-08 | 443.38 | 11/03/15 | 32.77 | 410.61 |
| | | 12/17/15 | 32.63 | 410.75 |
| | | 02/09/16 | 32.47 | 410.91 |
| | | 04/15/16 | 32.12 | 411.26 |
| | | 06/14/16 | 29.96 | 413.42 |
| | | Destroyed | | |
| MW-08R | 443.84 | 12/19/16 | 33.97 | 409.87 |
| | | 03/21/17 | 31.89 | 411.95 |
| | | 04/20/17 | 31.80 | 412.04 |
| MW-09 | 461.46 | 11/03/15 | 48.43 | 413.03 |
| | | 12/17/15 | 48.71 | 412.75 |
| | | 02/09/16 | 48.20 | 413.26 |
| | | 04/15/16 | 47.69 | 413.77 |
| | | 06/14/16 | 47.31 | 414.15 |
| | | 08/24/16 | 47.56 | 413.90 |
| | | 10/04/16 | 47.22 | 414.24 |
| | | 12/19/16 | 50.38 | 411.08 |

ELEMENT

**TABLE 2**
**GROUNDWATER ELEVATION SUMMARY**
**ASH LANDFILL 1**
**OAK GROVE STEAM ELECTRIC STATION**

| Well ID | TOC Elevation (ft amsl) | Date | Depth to Water (ft btoc) | Water Elevation (ft amsl) |
|---|---|---|---|---|
| AL-10 | 460.81 | 11/03/15 | 43.19 | 417.62 |
| | | 12/17/15 | 43.09 | 417.72 |
| | | 02/10/16 | 42.51 | 418.30 |
| | | 04/15/16 | 42.14 | 418.67 |
| | | 06/14/16 | 41.61 | 419.20 |
| | | 08/24/16 | 41.89 | 418.92 |
| | | 10/04/16 | 41.92 | 418.89 |
| | | 12/19/16 | 43.68 | 417.13 |

Notes:
1. Abbreviations: TOC - top of casing; ft - feet, amsl - above mean sea level.

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**TABLE 3**
**SUMMARY OF AQUIFER TEST RESULTS**
**ASH LANDFILL 1**
**OAK GROVE STEAM ELECTRIC STATION**

| Well ID | Test Type | Aquifer Type | Analysis Method | Saturated Thickness (feet) | Results | |
|---|---|---|---|---|---|---|
| | | | | | T ($cm^2$/sec) | K (cm/sec) |
| **Ash Landfill 1** | | | | | | |
| MW-02 | Slug-Out[1] | Unconfined | Bouwer-Rice | 19.74 | **4.36E+00** | **7.25E-03** |
| | | | | | | |
| MW-05 | Slug-In | Unconfined | Bouwer-Rice | 22.18 | 1.52E-01 | 2.25E-04 |
| MW-05 | Slug-Out | Unconfined | Bouwer-Rice | 22.18 | 2.18E-01 | 3.22E-04 |
| | | | | **Mean** | **1.85E-01** | **2.74E-04** |
| MW-09 | Slug-Out[1] | Unconfined | Bouwer-Rice | 19.79 | **4.62E+00** | **7.66E-03** |
| | | | | **Geometric mean for all tests** | **1.55E+00** | **2.48E-03** |

Notes:

[1] - A slug-in test was not performed because the static water level was below top of screen.

[2] - Although the static water level was above the top of the screen, data collected during the slug-in test was not adequate for analysis.

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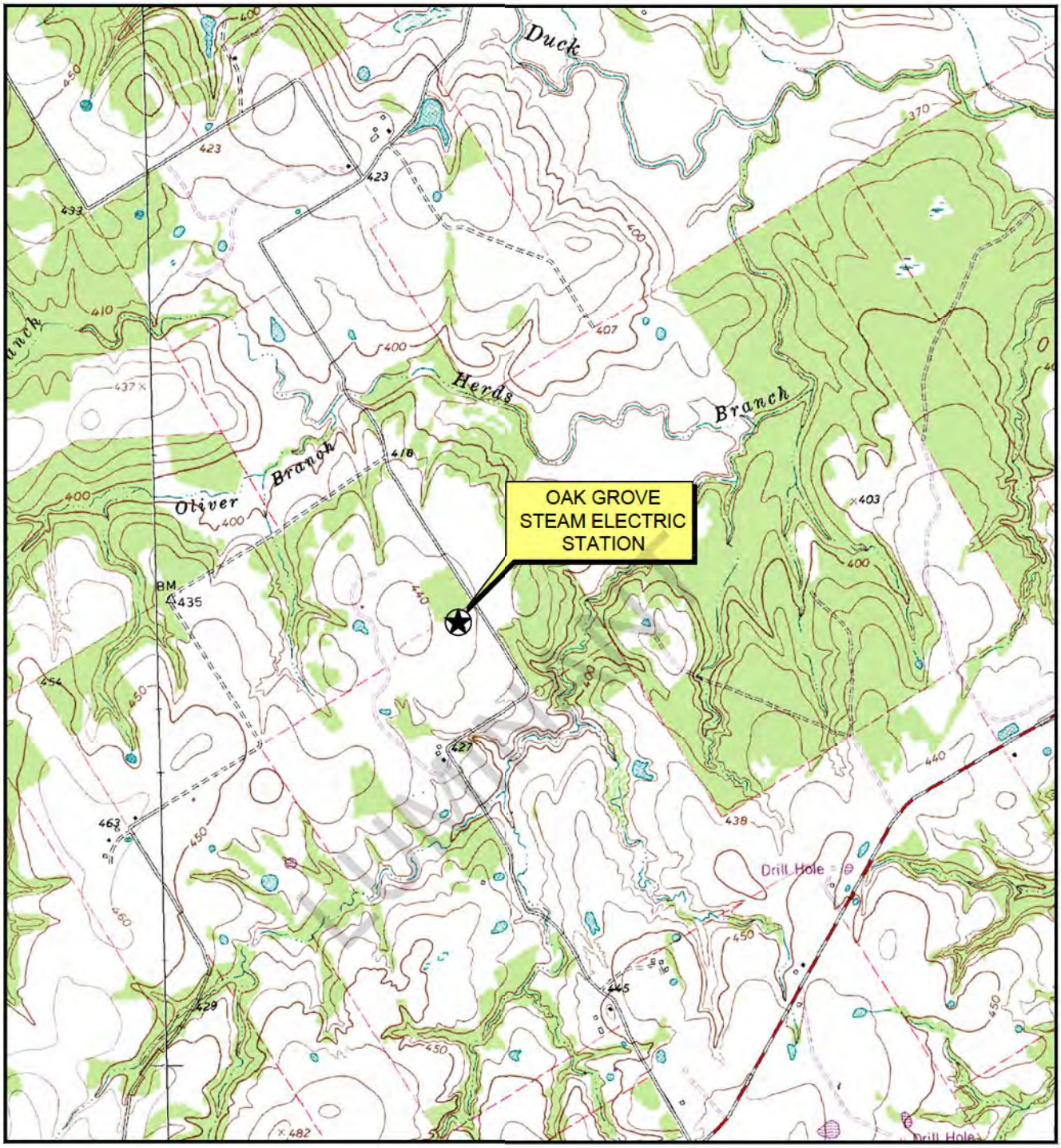
**Figures**



QUADRANGLE LOCATION

N

Scale in Feet

0 1000 2000

SOURCE:
Base map from www.tnris.gov, Bald Prairie, TX 7.5 min. USGS quadrangle dated 1965, revised 1982.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 1

**ASH LANDFILL 1**
**SITE LOCATION MAP**

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: NOV, 2015 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

**EXPLANATION**

CCR Monitoring Well

N

Scale in Feet

0 400 800

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 2

**ASH LANDFILL 1**
**DETAILED SITE PLAN**

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

## EXPLANATION

- CCR Monitoring Well
- Soil Boring Location
- A___A' Geologic Cross Section Location Lines

N

Scale in Feet

0 400 800

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

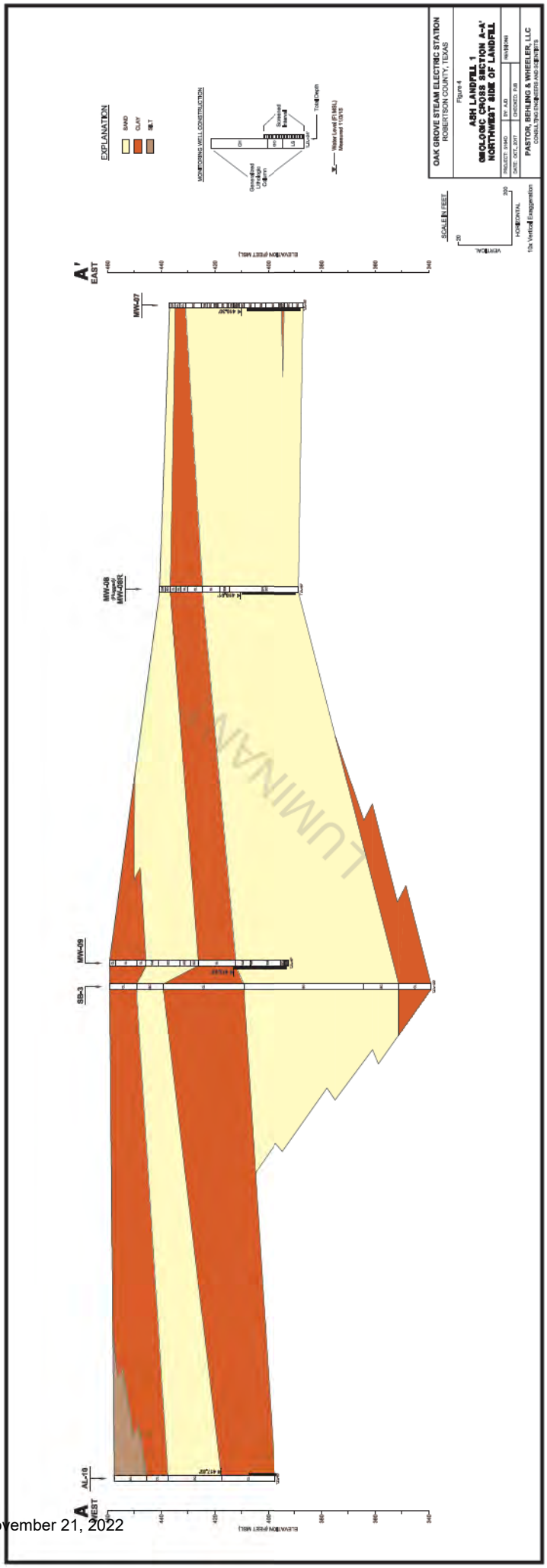
**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 3

# ASH LANDFILL 1
# CROSS SECTION LOCATION MAP

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS


OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS
Figure 4
ASH LANDFILL 1
GEOLOGIC CROSS SECTION A-A'
NORTHWEST SIDE OF LANDFILL
PROJECT: 10400
DRAWN BY: AJD
CHECKED: RJB
DATE: OCT, 2017
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS
SCALE IN FEET
VERTICAL 20
HORIZONTAL 200
10x Vertical Exaggeration
EXPLANATION
SAND
CLAY
SILT
MONITORING WELL CONSTRUCTION
Grout
Bentonite Seal
Sand
Screened Interval
Gravel-packed Interval
Cuttings
Top of Casing
Water Level (ft MSL) Measured 11/2015
A
WEST
A'
EAST
ELEVATION (FEET MSL)
AL-10
SB-3
MW-08
MW-08R
MW-07
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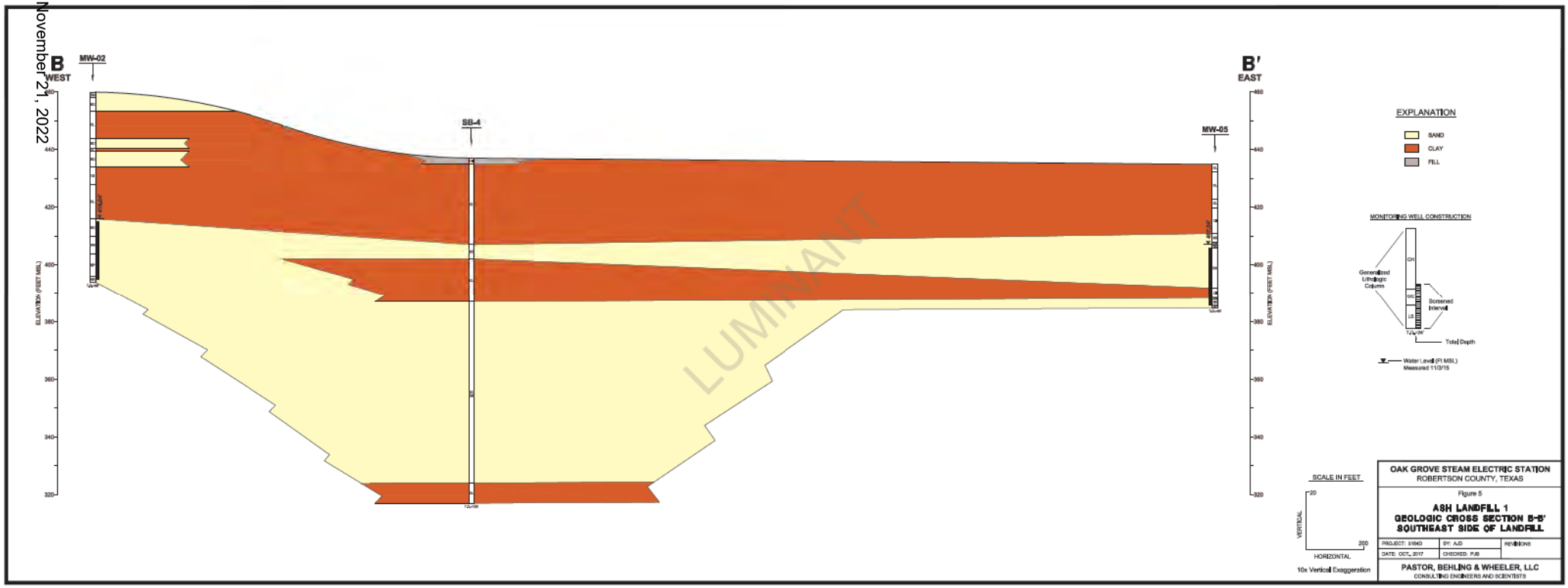
B
WEST
B′
EAST
MW-02
SB-4
MW-05
ELEVATION (FEET MSL)
460
440
420
400
380
360
340
320
EXPLANATION
SAND
CLAY
FILL
MONITORING WELL CONSTRUCTION
Generalized Lithologic Column
CH
SH
LS
Screened Interval
Total Depth
Water Level (Ft MSL) Measured 11/3/15
LUMINANT
SCALE IN FEET
VERTICAL
20
HORIZONTAL
200
10x Vertical Exaggeration
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS
Figure 5
ASH LANDFILL 1
GEOLOGIC CROSS SECTION B-B'
SOUTHEAST SIDE OF LANDFILL
PROJECT: 31940
BY: AJD
REVISIONS
DATE: OCT., 2017
CHECKED: PJB
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

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# Appendix A

# CCR Monitoring Well Logs

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# Log of Boring: AL-10

Oak Grove Steam Electric Station
Petteway, TX

PBW Project No. 5164D

| | | | |
|---|---|---|---|
| Completion Date: | 9/22/2015 | Drilling Method: | Sonic |
| Drilling Company: | Walker-Hill Environmental | Borehole Diameter (in.): | 6.5 |
| Driller: | Dwayne Whitehead | Total Depth (ft): | 60 |
| Driller's License: | 5814M | TOC Elevation (ft. AMSL): | 460.81 |
| Logged By: | Sara Taube | Northing: | 568673 |
| Sampling Method: | 4"x10' Core barrel | Easting: | 3197291 |

| Depth (ft) | Well Materials | Recovery (ft/ft) | USCS | Lithologic Description |
|---|---|---|---|---|
| 0 – 10 | | 1.3/10.0 | ML | (0 - 12) Clayey SILT, tan/brown/ very dry, unconsolidated, fine to coarse subangular gravel, thin clay chips interspersed |
| 10 – 20 | | 2.1/5.0<br>5.0/5.0 | CL | (12 - 20) Sandy CLAY, tan/light gray, very dry, strong cementation, very hard, no plasticity, some silt present, very fine sand grains, heavily indurated, visible bands, sandier and less consolidated with depth, hardened clay nodules |
| 20 – 40 | | 2.4/5.0<br>5.0/5.0<br>9.6/10.0 | SC | (20 - 40) Clayey SAND, tan/light gray, slightly moist, moderately unconsolidated, very fine grain, some silt, trace red staining, medium to coarse nodules of very dry indurated sandy clay interbedded, trace black staining |
| 40 – 60 | | 9.0/10.0<br>9.8/10.0 | CL | (40 - 60) Silty CLAY, light gray, moist, slightly unconsolidated, some purple clay bands, silt decreasing with depth, wet below 50', trace orange staining |

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**PBW**
**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(+3.35 - 50.3) Casing, 2" Sch 40 FJT PVC
(50.3 - 60.3) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-46') Grout
(46'-48') Bentonite chips
(48'-60') 20/40 sand

# RECORD OF BOREHOLE MW-ALF-02

SHEET 1 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 10-Sep-2008
BORING FINISHED: 10-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2103.59
EASTING (ft): 1625.59
ELEVATION (ft): 459.89

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Damp with shallow vegetation | | | | | | | | | | |
| | | GROUND SURFACE | | 459.9 | | | | | | | | |
| 0 | | Loose, brown, silty SAND, some organics, damp | | 0.0 | SB-1 | | 2<br>4<br>5<br>N9 | 53 | | | | |
| 2 | | Loose to compact, brown, clayey SAND, some organics, some roots, dry | | 2.0 | SB-2 | | 5<br>12<br>24<br>N10 | 47 | | | | |
| 4 | | dense at 4' | | | SB-3 | | 12<br>20<br>24<br>N44 | 53 | | | | |
| 6 | | Hard, gray and yellow, mottled, silty CLAY, dry | | 6.5 | SB-4 | | 5<br>13<br>20<br>N33 | 73 | | | | |
| 8 | | very stiff at 8' | | | SB-5 | | 5<br>11<br>15<br>N26 | 73 | | | | |
| 10 | | some iron oxide at 11' | | | SB-6 | | 5<br>12<br>17<br>N29 | 87 | | | | |
| 12 | | dark brown at 12.3' | | | SB-7 | | 4<br>7<br>12<br>N19 | 87 | | | | |
| 14 | | Hard, light grayish brown at 14' | | | SB-8 | | 8<br>15<br>24<br>N39 | 87 | | | | |
| 16 | | Hard, dark brown, CLAY, trace iron oxide, damp | | 16.0 | SB-9 | | 6<br>13<br>19<br>N32 | 100 | | | | |
| 18 | | | | | SB-10 | | 6<br>14<br>40<br>N54 | 87 | | | | |
| | | Very dense, gray, clayey SAND, dry | | 19.5 | | | | | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

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DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

# RECORD OF BOREHOLE MW-ALF-02

SHEET 2 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 10-Sep-2008
BORING FINISHED: 10-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2103.59
EASTING (ft): 1625.59
ELEVATION (ft): 459.89

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| | | Hard, dark brown, CLAY, damp | | 20.0 | | | | | | | | |
| | | Dense, gray and yellow, mottled, clayey SAND, dry | | 20.5 | SB-11 | | 13<br>22<br>27<br>N49 | 80 | | | | |
| 22 | | | | | SB-12 | | 9<br>17<br>32<br>N49 | 73 | | | | |
| | | some iron oxide at 23.5' | | | | | | | | | | |
| 24 | | very dense at 24' | | | | | | | | | | |
| | | grayish brown at 24.5' | | | SB-13 | | 10<br>22<br>37<br>N59 | 93 | | | | |
| 26 | | Hard, gray, clayey SILT, with iron oxide, dry | | 26.0 | SB-14 | | 11<br>32<br>40<br>N72 | 100 | | | | |
| 28 | | | | | SB-15 | | 16<br>25<br>40<br>N65 | 100 | | | | |
| 30 | | | | | SB-16 | | 22<br>35<br>50/5" | 87 | | | | |
| 32 | | Hard, gray, silty CLAY, dry | | 32.0 | SB-17 | | 22<br>35<br>50/5" | 93 | | | | |
| 34 | | gray and yellow, mottled at 34' | | | | | | | | | | |
| | | dark gray at 35' | | | SB-18 | | 16<br>24<br>50/5" | 87 | | | | |
| 36 | | black at 36.5' | | | SB-19 | | 22<br>50/2" | 67 | | | | |
| 38 | | light gray at 38' | | | SB-20 | | 17<br>27<br>50/2" | 87 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-02

SHEET 3 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 10-Sep-2008
BORING FINISHED: 10-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2103.59
EASTING (ft): 1625.59
ELEVATION (ft): 459.89

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | | | 40.0 | SB-21 | | 15<br>25<br>38<br>N63 | 100 | | | | |
| 42 | | | | | SB-22 | | 15<br>27<br>42<br>N69 | 93 | | | | |
| 44 | | Very dense, gray, clayey SAND, damp | | 44.0 | SB-23 | | 16<br>27<br>50/1" | 93 | | | | |
| 46 | | moist at 46' | | | SB-24 | | 22<br>46<br>50/3" | 87 | | | | 46' 09/10/2008 |
| 48 | | wet at 48' | | | SB-25 | | 22<br>45<br>50/3" | 93 | | | | |
| 50 | | Very dense, gray, silty SAND, wet | | 50.0 | SB-26 | | 22<br>50/5" | 67 | | | | |
| 52 | | some cemented clayey sand at 53' | | | SB-27 | | 23<br>46<br>50/2" | 87 | | | | |
| 54 | | | | | SB-28 | | 25<br>50/5" | 67 | | | | |
| 56 | | Very dense, gray, SAND, wet | | 56.0 | SB-29 | | 45<br>50/5" | 80 | | | | |
| 58 | | | | | SB-30 | | 45<br>50/5" | 67 | | | | |
| 60 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-02

SHEET 4 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 10-Sep-2008
BORING FINISHED: 10-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2103.59
EASTING (ft): 1625.59
ELEVATION (ft): 459.89

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ❖ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | |
| | | | | 60.0 | SB-31 | | 37<br>50/5" | 87 | | | | |
| 62 | | | | | | | | | | | | |
| | | | | | SB-32 | | 35<br>50/5" | | | | | |
| 64 | | No recovery | | 64.0 | | | | | | | | |
| 66 | | BORING TERMINATED AT 66' | | 66.0 | | | | | | | | |
| 68 | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | |
| 72 | | | | | | | | | | | | |
| 74 | | | | | | | | | | | | |
| 76 | | | | | | | | | | | | |
| 78 | | | | | | | | | | | | |
| 80 | | | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-05

SHEET 1 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 05-Sep-2008
BORING FINISHED: 08-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 1758.08
EASTING (ft): 1973.71
ELEVATION (ft): 434.77

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dry with vegetation | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 434.8 | | | | | | | | |
| | | Soft to firm, dark brown, silty CLAY, with organics, dry | | 0.0 | SB-1 | | 2<br>1<br>3<br>N4 | 87 | | | | |
| 2 | | Very stiff, light brown and yellow, mottled, CLAY, some organics, dry | | 2.5 | SB-2 | | 3<br>7<br>13<br>N20 | 67 | | | | |
| 4 | | hard at 4' | | | SB-3 | | 7<br>17<br>23<br>N40 | 67 | | | | |
| 6 | | very stiff, light gray, with silt at 6' | | | SB-4 | | 5<br>12<br>14<br>N26 | 53 | | | | |
| 8 | | light grayish brown at 8' | | | SB-5 | | 4<br>8<br>14<br>N22 | 87 | | | | |
| 10 | | gray and dark brown, mottled, some iron oxide at 11' | | | SB-6 | | 5<br>12<br>16<br>N28 | 80 | | | | |
| 12 | | Hard, grayish brown and red, mottled, silty CLAY, dry | | 12.0 | SB-7 | | 6<br>13<br>22<br>N35 | 80 | | | | |
| 14 | | Hard, light gray, clayey SILT, dry | | 15.0 | SB-8 | | 8<br>29<br>32<br>N66 | 93 | | | | |
| 16 | | | | | SB-9 | | 14<br>38<br>50/5" | 87 | | | | |
| 18 | | reddish gray at 19' | | | SB-10 | | 20<br>35<br>46<br>N81 | 93 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-05

SHEET 2 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 05-Sep-2008
BORING FINISHED: 08-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 1758.08
EASTING (ft): 1973.71
ELEVATION (ft): 434.77

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | light grayish brown, damp at 20' | | 20.0 | SB-11 | | 16<br>37<br>38<br>N75 | 100 | | | | |
| 22 | | | | | SB-12 | | 6<br>17<br>25<br>N42 | 87 | | | | |
| 24 | | Very dense, yellowish gray, clayey SAND, damp | | 24.0 | SB-13 | | 11<br>24<br>32<br>N56 | 100 | | | | |
| 26 | | grayish brown at 26' | | | SB-14 | | 11<br>26<br>40<br>N66 | 87 | | | | |
| | | Very dense, yellowish gray, silty SAND, damp | | 27.0 | | | | | | | | |
| 28 | | dense, seam of clayey SAND at 28' | | 28.0 | | | | | | | | |
| | | dense, light gray and brown, mottled, moist at 28.5' | | 29.0 | SB-15 | | 11<br>21<br>27<br>N48 | 87 | | | | |
| 30 | | very dense, wet at 30' | | | SB-16 | | 13<br>24<br>35<br>N59 | 100 | | | | ▼ 30' 09/05/2008 |
| 32 | | grayish brown, moist at 32' | | | SB-17 | | 13<br>23<br>32<br>N55 | 93 | | | | |
| 34 | | some iron oxide at 34' | | | | | | | | | | |
| | | seam of brown at 34.5' | | | SB-18 | | 9<br>28<br>45<br>N73 | 100 | | | | |
| 36 | | dense at 36' | | | SB-19 | | 9<br>19<br>20<br>N39 | 100 | | | | |
| 38 | | | | | SB-20 | | 9<br>17<br>22<br>N39 | 100 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-05

SHEET 3 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 05-Sep-2008
BORING FINISHED: 08-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 1758.08
EASTING (ft): 1973.71
ELEVATION (ft): 434.77

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear -■ UU - ✥ TORV. -▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80 / WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| | | very dense, yellowish brown, some clay at 40' | | 40.0 | SB-21 | | 11<br>21<br>32<br>N53 | 100 | | | | |
| 42 | | dense at 42' | | | | | | | | | | |
| | | Hard, dark grayish brown, clayey SILT, some iron oxide, damp | | 43.0 | SB-22 | | 12<br>22<br>40<br>N62 | 100 | | | | |
| 44 | | | | | SB-23 | | 12<br>27<br>45<br>N72 | 100 | | | | |
| 46 | | seam of yellowish SAND | | 46.5 | | | | | | | | |
| | | Very dense, gray and black, mottled, clayey SAND, some iron oxide, moist | | 47.0 | SB-24 | | 15<br>31<br>38<br>N69 | 100 | | | | |
| 48 | | | | | SB-25 | | 15<br>31<br>45<br>N76 | 100 | | | | |
| | | Very dense, gray, SAND, wet | | 49.0 | | | | | | | | |
| 50 | | BORING TERMINATED AT 50' | | 50.0 | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-06

SHEET 1 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 09-Sep-2008
BORING FINISHED: 09-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2788.65
EASTING (ft): 2054.72
ELEVATION (ft): 436.52

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Damp | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 436.5 | | | | | | | | |
| | | Compact, light gray, SAND, with gravel | | 0.0 | SB-1 | | 8<br>5<br>6<br>N11 | 13 | | | | |
| 2 | | Very stiff, reddish brown, CLAY, some sand, dry | | 2.2 | SB-2 | | 4<br>10<br>19<br>N29 | 67 | | | | |
| 4 | | Hard, reddish brown, silty CLAY, some angular gravel, dry | | 4.0 | SB-3 | | 9<br>25<br>32<br>N57 | 67 | | | | |
| 6 | | Very dense, yellowish light gray, clayey SAND, dry, some gravel, some organics, dry | | 6.0 | SB-4 | | 10<br>25<br>39<br>N64 | 87 | | | | |
| 8 | | | | | SB-5 | | 20<br>50/5" | 53 | | | | |
| 10 | | dark red, some iron oxide at 9.5' | | | SB-6 | | 15<br>35<br>50/5" | 93 | | | | |
| 12 | | light brown and gray, mottled, possible clayey silt at 11' | | | | | | | | | | |
| | | Very dense, light yellowish brown, silty SAND, dry | | 12.0 | SB-7 | | 12<br>27<br>35<br>N62 | 80 | | | | |
| 14 | | Very dense, light brown, clayey SAND, some iron oxide, dry | | 14.0 | SB-8 | | 18<br>29<br>47<br>N76 | 93 | | | | |
| 16 | | Very dense, light grayish brown, silty SAND, dry | | 16.5 | SB-9 | | 10<br>19<br>37<br>N56 | 93 | | | | |
| | | Very dense, gray, clayey SAND, some iron oxide, dry | | 17.5 | | | | | | | | |
| 18 | | Very dense, yellowish gray, silty SAND, dry | | 18.0 | SB-10 | | 12<br>33<br>50/5" | 87 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-06

SHEET 2 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 09-Sep-2008
BORING FINISHED: 09-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2788.65
EASTING (ft): 2054.72
ELEVATION (ft): 436.52

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | | | 20.0 | SB-11 | | 22<br>47<br>50/5" | 80 | | | | |
| | | Very dense, clayey SAND, some iron oxide seam | | 21.5 | | | | | | | | |
| 22 | | Very dense, yellowish gray, silty SAND, dry | | 22.0 | SB-12 | | 16<br>28<br>39<br>N67 | 87 | | | | |
| 24 | | Very dense, yellowish brown, SAND, with clay seam | | 24.0 | SB-13 | | 13<br>31<br>40<br>N71 | 80 | | | | |
| | | Very dense, yellowish gray, silty SAND, damp | | 25.0 | | | | | | | | |
| 26 | | Compact, yellowish gray, clayey SAND, damp<br><br>some iron oxide at 27.5' | | 26.0 | SB-14 | | 3<br>13<br>13<br>N26 | 87 | | | | |
| 28 | | Very dense, grayish brown, SAND, with clay, damp | | 28.0 | SB-15 | | 12<br>22<br>50/5" | 93 | | | | |
| 30 | | wet at 30' | | | SB-16 | | 8<br>28<br>46<br>N74 | 93 | | | | ▼ 30' 09/09/2008 |
| 32 | | Very dense, yellowish gray, silty SAND, wet | | 32.0 | SB-17 | | 25<br>43<br>48<br>N91 | 80 | | | | |
| 34 | | | | | SB-18 | | 8<br>31<br>27<br>N58 | 100 | | | | |
| 36 | | some iron oxide at 35.5'<br>Very dense, dark gray, clayey SAND, moist | | 36.0 | SB-19 | | 12<br>28<br>50/5" | 100 | | | | |
| 38 | | yellowish brown at 38.5'<br><br>light gray at 39'<br><br>dark gray, trace iron oxide at 39.5' | | | SB-20 | | 12<br>25<br>40<br>N65 | 93 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-06

SHEET 3 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 09-Sep-2008
BORING FINISHED: 09-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2788.65
EASTING (ft): 2054.72
ELEVATION (ft): 436.52

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | | | 40.0 | SB-21 | | 11<br>26<br>42<br>N68 | 100 | | | | |
| | | Very dense, yellowish brown, silty SAND, damp | | 41.0 | | | | | | | | |
| 42 | | Hard, brown, yellow, and gray, mottled, sandy CLAY, moist | | 42.0 | SB-22 | | 15<br>34<br>42<br>N76 | 100 | | | | |
| | | Very dense, yellowish brown and gray, mottled, clayey SAND, moist<br>dark brown at 43.5' | | 43.0 | | | | | | | | |
| 44 | | | | | SB-23 | | 22<br>40<br>50/5" | 100 | | | | |
| 46 | | Very dense, gray and yellowish brown, mottled, SAND, moist | | 46.0 | SB-24 | | 22<br>40<br>50/5" | 60 | | | | |
| 48 | | gray and dark gray, mottled, some clay at 48' | | | SB-25 | | 30<br>50/5" | 67 | | | | |
| 50 | | BORING TERMINATED AT 50' | | 50.0 | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-07

SHEET 1 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 28-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 3770.18
EASTING (ft): 1654.96
ELEVATION (ft): 440.00

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dry with vegetation | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 440.0 | | | | | | | | |
| | | Loose, grayish brown, silty SAND, damp | | 0.0 | SB-1 | | 2<br>4<br>3<br>N7 | 87 | | | | |
| | | clay seam, some roots at 1.5' | | | | | | | | | | |
| 2 | | Compact, grayish brown, clayey SAND, some coarse material, some organics, trace iron oxide, dry | | 2.0 | SB-2 | | 3<br>5<br>8<br>N13 | 73 | | | | |
| 4 | | Very stiff, gray, mottles of yellow and light gray, sandy CLAY, some iron oxide, damp | | 4.0 | SB-3 | | 5<br>10<br>20<br>N30 | 67 | | | | |
| 6 | | Hard, reddish gray, mottled, CLAY, with sand, some organics, dry | | 6.0 | SB-4 | | 16<br>21<br>20<br>N41 | 74 | | | | |
| 8 | | Hard, reddish brown and gray, mottled, sandy CLAY, some organics, dry | | 8.0 | SB-5 | | 6<br>13<br>20<br>N38 | 60 | | | | |
| 10 | | Hard, gray, yellow, and some red, mottled, silty CLAY, dry | | 10.5 | SB-6 | | 6<br>16<br>25<br>N41 | 67 | | | | |
| 12 | | gray and yellowish brown seams at 12' | | | SB-7 | | 9<br>21<br>27<br>N48 | 100 | | | | |
| 14 | | light gray at 15' | | | SB-8 | | 6<br>13<br>21<br>N34 | 100 | | | | |
| | | light brown at 15.5' | | | | | | | | | | |
| 16 | | Dense, gray and yellow, mottled, clayey SAND, some silt, damp | | 16.0 | SB-9 | | 9<br>18<br>25<br>N43 | 100 | | | | |
| 18 | | | | | SB-10 | | 14<br>18<br>22<br>N40 | 100 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-07

SHEET 2 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 28-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 3770.18
EASTING (ft): 1654.96
ELEVATION (ft): 440.00

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | Compact, occasional organic layers at 20' | | 20.0 | SB-11 | | 8<br>12<br>17<br>N29 | 100 | | | | |
| 22 | | yellowish gray at 22' | | | | | | | | | | |
| | | Dense, gray, silty SAND, damp | | 22.5 | SB-12 | | 8<br>15<br>20<br>N35 | 87 | | | | |
| 24 | | very dense at 24' | | | | | | | | | | |
| | | reddish brown seam at 24.75' | | | SB-13 | | 8<br>21<br>30<br>N51 | 100 | | | | |
| 26 | | Very dense, gray, SAND, damp | | 26.0 | SB-14 | | 19<br>36<br>44<br>N80 | 100 | | | | |
| | | reddish brown seam at 27.5' | | | | | | | | | | |
| 28 | | reddish yellow seam at 29' | | | SB-15 | | 13<br>26<br>29<br>N55 | 100 | | | | |
| | | brownish gray seam at 29.5' | | | | | | | | | | |
| 30 | | moist at 30' | | | SB-16 | | 18<br>30<br>41<br>N71 | 87 | | | | |
| 32 | | | | | | | | | | | | ▼ 32' 08/27/2008 |
| | | | | | SB-17 | | 20<br>37<br>38<br>N75 | 100 | | | | |
| 34 | | | | | | | | | | | | |
| | | | | | SB-18 | | 19<br>32<br>50/5" | 100 | | | | |
| 36 | | dense, dark brown, with clay, some iron oxide, damp at 36.3' | | | SB-19 | | 8<br>18<br>28<br>N46 | 100 | | | | |
| 38 | | wet at 38' | | | | | | | | | | |
| | | yellowish brown, damp at 39' | | | SB-20 | | 3<br>10<br>30<br>N40 | 100 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-07

SHEET 3 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 28-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 3770.18
EASTING (ft): 1654.96
ELEVATION (ft): 440.00

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ❖ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | very dense, reddish brown, moist at 40' | | 40.0 | SB-21 | | 12<br>26<br>31<br>N57 | 87 | | | | |
| | | gray, damp at 41' | | | | | | | | | | |
| 42 | | very dense, yellowish brown, moist at 42' | | | SB-22 | | 14<br>32<br>37<br>N69 | 100 | | | | |
| | | wet at 42.5' | | | | | | | | | | |
| 44 | | | | | SB-23 | | 15<br>31<br>45<br>N76 | 67 | | | | |
| | | damp at 45' | | | | | | | | | | |
| 46 | | grayish brown, moist at 46' | | | SB-24 | | 18<br>28<br>36<br>N64 | 100 | | | | |
| 48 | | wet at 48' | | | SB-25 | | 20<br>38<br>50/5" | 93 | | | | |
| 50 | | | | | SB-26 | | 24<br>50/5" | 100 | | | | |
| 52 | | BORING TERMINATED AT 52' | | 52.0 | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

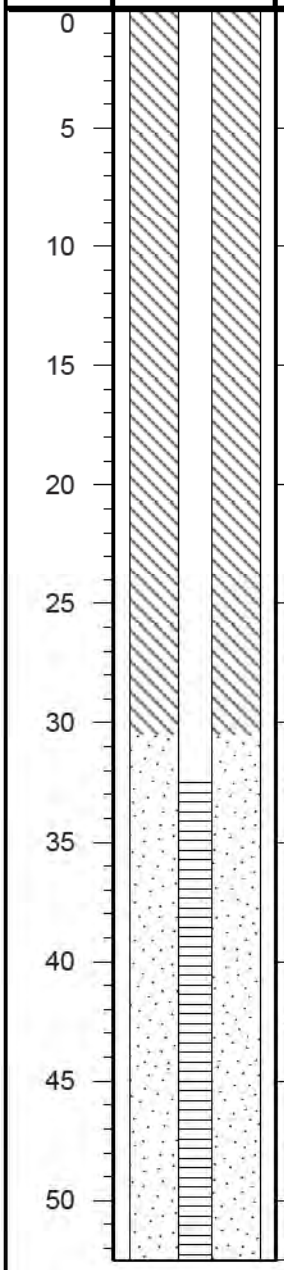
# Luminant

# Log of Boring: MW-8R

Oak Grove Steam Electric Station
Robertson County, TX

PBW Project No. 5164D

| | | | |
|---|---|---|---|
| Completion Date: | 11/9/2016 | Drilling Method: | HSA |
| Drilling Company: | Sunbelt Industrial Services | Borehole Diameter (in.): | 8.25 |
| Driller: | Juan R. Alcala | Total Depth (ft): | 52.5 |
| Driller's License: | 59430 | TOC Elevation (ft. AMSL): | 443.84 |
| Logged By: | Michelle Hermiston | Northing: | 570970 |
| Sampling Method: | 2.25" X 5' Split Spoon | Easting: | 3199809 |




| Lithologic Description |
|---|
| (0 - 3) Silty SAND, dark brown, abundant roots, very fine grained sand, unconsolidated, damp, gradational basal contact |
| (3 - 10.5) Silty CLAY, mottled gray, orange, and red, firm, very firm from 4.0' to 5.0', pieces of lignite present throughout, moderate plasticity, damp, sharp basal contact |
| (10.5 - 27.5) Sandy CLAY, laminated light gray and orange/brown, trace black laminations present, no to low plasticity, moderate plasticity at 17.5' to 27.5', higher sand content at 15.0' to 17.5', purplish gray clay lenses from 23.0' to 27.5', soft, firm to very firm from 17.5' to 27.5', damp, gradational basal contact |
| (27.5 - 52.5) Silty SAND, light gray, laminated dark gray and orange (28.5'-31.0', 38.0'-42.0'), unconsolidated, trace clay present, 0.25" thick clay lenses at 31.5', 37.5', and 41.0',dark brown/red around clay lense at 37.5', trace black laminae at 38.0' to 40.0', moist, wet at 35.0', interbedded dark brownish red and light gray sand and clay at 42.0' to 45.5', orange/brown from 45.5' to 50.0', gray with some orange staining from 50.0' to 52.5' |

LUMINANT

**PBW**

**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(+2.5 - 32.5) Casing, 2" Sch 40 FJT PVC
(32.5 - 52.5) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-30.5') Bentonite Grout
(30.5'-52.5') 20/40 sand

# RECORD OF BOREHOLE MW-ALF-08

SHEET 1 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 29-Aug-2008
BORING FINISHED: 01-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 3681.62
EASTING (ft): 266.62
ELEVATION (ft): 458.55

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Damp with shallow vegetation | | | | | | | | | | |
| | | GROUND SURFACE | | 458.6 | | | | | | | | |
| 0 | | Stiff, dark brown, gray, and red, mottled, CLAY, with silt, some organics, damp | | 0.0 | SB-1 | | 3<br>3<br>3<br>N9 | 33 | | | | |
| 2 | | Very stiff, reddish brown, silty CLAY, dry | | 2.0 | SB-2 | | 6<br>11<br>16<br>N27 | 67 | | | | |
| | | red and light gray, mottled, some organics at 3' | | | | | | | | | | |
| 4 | | light gray at 4' | | | SB-3 | | 6<br>12<br>15<br>N27 | 67 | | | | |
| | | yellow to orange, mottled, dry at 5' | | | | | | | | | | |
| 6 | | hard at 6' | | | SB-4 | | 8<br>17<br>19<br>N36 | 100 | | | | |
| | | some organics at 7' | | | | | | | | | | |
| | | reddish gray at 7.5' | | | | | | | | | | |
| 8 | | very stiff at 8' | | | SB-5 | | 7<br>12<br>16<br>N23 | 93 | | | | |
| | | light gray, damp at 9' | | | | | | | | | | |
| 10 | | Very stiff, gray, CLAY, damp | | 10.0 | SB-6 | | 3<br>8<br>11<br>N19 | 87 | | | | |
| 12 | | hard, yellowish gray at 12' | | | SB-7 | | 5<br>9<br>22<br>N31 | 100 | | | | |
| | | Dense, light gray, SAND, with silt, dry | | 13.5 | | | | | | | | |
| 14 | | | | | SB-8 | | 8<br>13<br>22<br>N35 | 100 | | | | |
| 16 | | seam of yellow clayey sand at 16' | | | SB-9 | | 11<br>18<br>27<br>N45 | 100 | | | | |
| 18 | | Dense, light brown and yellow, mottled, clayey SAND, damp | | 18.0 | SB-10 | | 8<br>17<br>28<br>N45 | 100 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-08

SHEET 2 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | very dense, grayish brown, some silt at 20' | | 20.0 | SB-11 | | 13<br>26<br>39<br>N65 | 100 | | | | |
| 22 | | dense at 22' | | | SB-12 | | 14<br>20<br>28<br>N48 | 100 | | | | |
| 24 | | | | | SB-13 | | 11<br>19<br>28<br>N47 | 100 | | | | |
| 26 | | Very dense, grayish brown, SAND, with clay, damp | | 26.0 | SB-14 | | 14<br>28<br>42<br>N70 | 100 | | | | |
| 28 | | | | | SB-15 | | 10<br>22<br>36<br>N58 | 87 | | | | |
| 30 | | Very dense, yellowish brown, clayey SAND, damp | | 30.0 | SB-16 | | 12<br>26<br>41<br>N67 | 100 | | | | |
| 32 | | compact, light gray, some silt at 32' | | | SB-17 | | 8<br>12<br>15<br>N27 | 100 | | | | |
| | | Very stiff, light gray, silty CLAY, damp | | 33.0 | | | | | | | | |
| 34 | | | | | SB-18 | | 6<br>11<br>13<br>N24 | 100 | | | | |
| 36 | | dark gray at 35.5'<br>hard, grayish black, dry at 36' | | | SB-19 | | 20<br>45<br>50/5" | 100 | | | | |
| 38 | | black at 37' | | | SB-20 | | 15<br>45<br>50/5" | 100 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-08

SHEET 3 OF 4
DATUM: LOCAL

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LOCATION: FRANKLIN, TEXAS

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | | | 40.0 | SB-21 | | 10<br>41<br>50/5" | 100 | | | | |
| 42 | | | | | SB-22 | | 18<br>50/5" | 87 | | | | |
| 44 | | | | | SB-23 | | 20<br>46<br>50/5" | 100 | | | | |
| 46 | | | | | SB-24 | | 22<br>50/5" | 87 | | | | ▼<br>47' 08/29/2008 |
| 48 | | Very dense, gray, silty SAND, moist | | 47.0 | SB-25 | | 25<br>50/5" | 53 | | | | |
| 50 | | | | | SB-26 | | 30<br>50/5" | 73 | | | | |
| 52 | | Hard, black, CLAY | | 52.5 | | | | | | | | |
| | | Very dense, gray, silty SAND, moist | | 52.8 | SB-27 | | 23<br>50/5" | 67 | | | | |
| 54 | | | | | SB-28 | | 18<br>50/5" | 67 | | | | |
| 56 | | | | | SB-29 | | 27<br>50/5" | 67 | | | | |
| 58 | | | | | SB-30 | | 27<br>50/5" | 87 | | | | |
| 60 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-08

SHEET 4 OF 4
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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| | | Very dense, gray, silty SAND, moist | | | SB-31 | | 24<br>41<br>50/5" | 100 | | | | |
| 62 | | | | | SB-32 | | 23<br>50/5" | 80 | | | | |
| 64 | | Very dense, gray, SAND, layered with clay, moist | | 64.0 | SB-33 | | 17<br>41<br>50/5" | 87 | | | | |
| | | | | 64.9 | | | | | | | | |
| | | | | 65.2 | | | | | | | | |
| | | | | 65.4 | | | | | | | | |
| | | | | 65.7 | | | | | | | | |
| 66 | | | | 66.0 | | | | | | | | |
| | | | | 66.4 | | | | | | | | |
| | | | | 67.0 | SB-34 | | 17<br>42<br>50/5" | 100 | | | | |
| | | BORING TERMINATED AT 67' | | | | | | | | | | |
| 68 | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | |
| 72 | | | | | | | | | | | | |
| 74 | | | | | | | | | | | | |
| 76 | | | | | | | | | | | | |
| 78 | | | | | | | | | | | | |
| 80 | | | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

LUMINANT

# Appendix B

# Photographs of CCR Monitoring Wells

**Appendix B – Photographs of CCR Monitoring Wells**
**Oak Grove Ash Landfill 1**

**Photograph 1: AL-10**

**Photograph 2: MW-02**

**Appendix B – Photographs of CCR Monitoring Wells**
**Oak Grove Ash Landfill 1**

**Photograph 5: MW-05**

**Photograph 7: MW-07**

**Appendix B – Photographs of CCR Monitoring Wells**
**Oak Grove Ash Landfill 1**

**Photograph 8: MW-08**

**Photograph 9: MW-09**

LUMINANT

# Appendix C

## Potentiometric Surface Maps

## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

Note:
423.76*-measurement appears erroneous based on subsequent measurements. Result was not used to construct potentiometric surface contours.

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 1

# GROUNDWATER POTENTIOMETRIC SURFACE MAP NOVEMBER 3, 2015

| | | |
|---|---|---|
| PROJECT: 5164D | BY: AJD | REVISIONS |
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

Note:
423.89*-measurement appears erroneous based on subsequent measurements. Result was not used to construct potentiometric surface contours.

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 2

# GROUNDWATER POTENTIOMETRIC SURFACE MAP DECEMBER 12, 2015

| | | |
|---|---|---|
| PROJECT: 5164D | BY: AJD | REVISIONS |
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

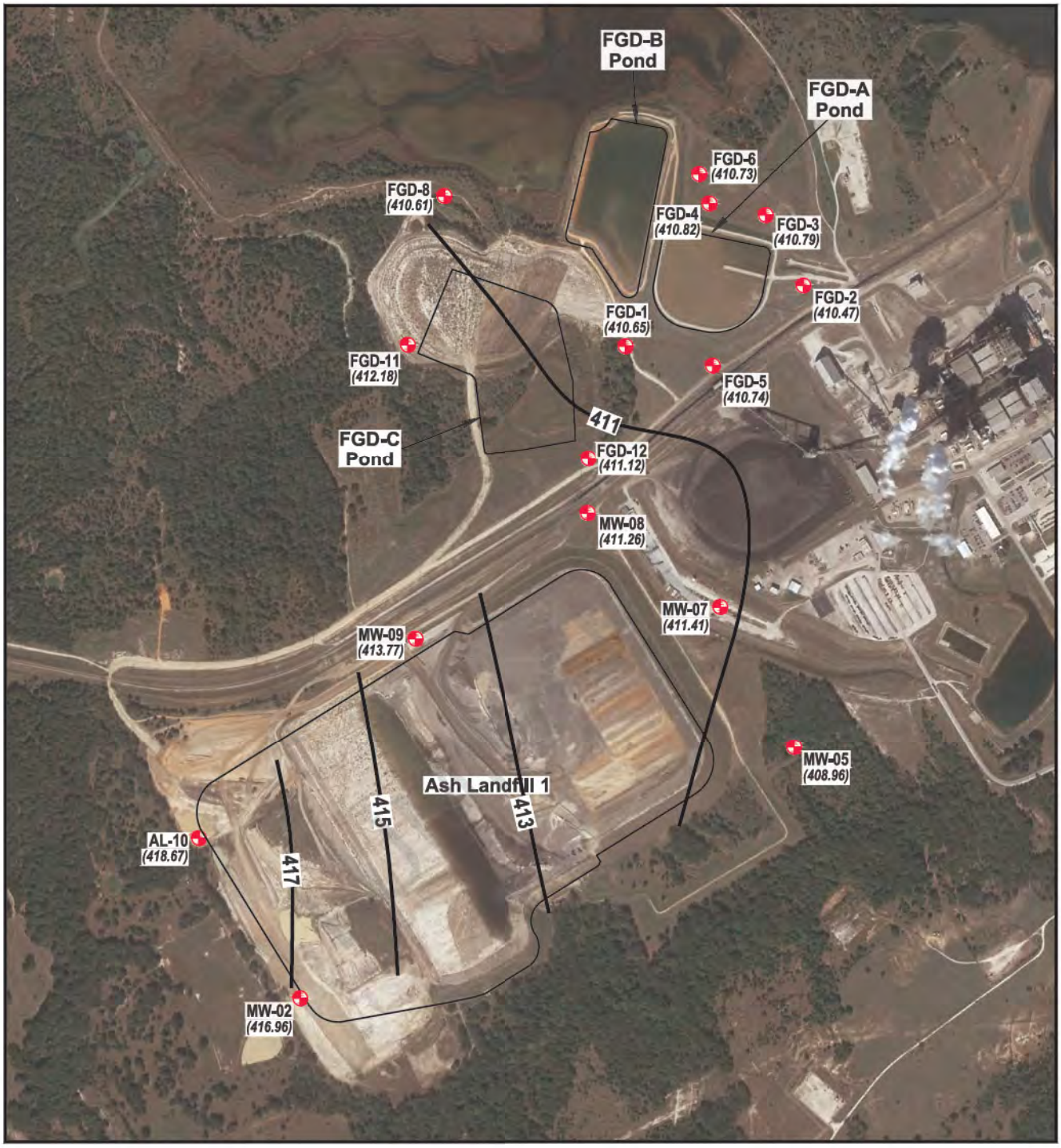
**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 3

# GROUNDWATER POTENTIOMETRIC SURFACE MAP FEBRUARY 9-10, 2016

| | | |
|---|---|---|
| PROJECT: 5164D | BY: AJD | REVISIONS |
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS




## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

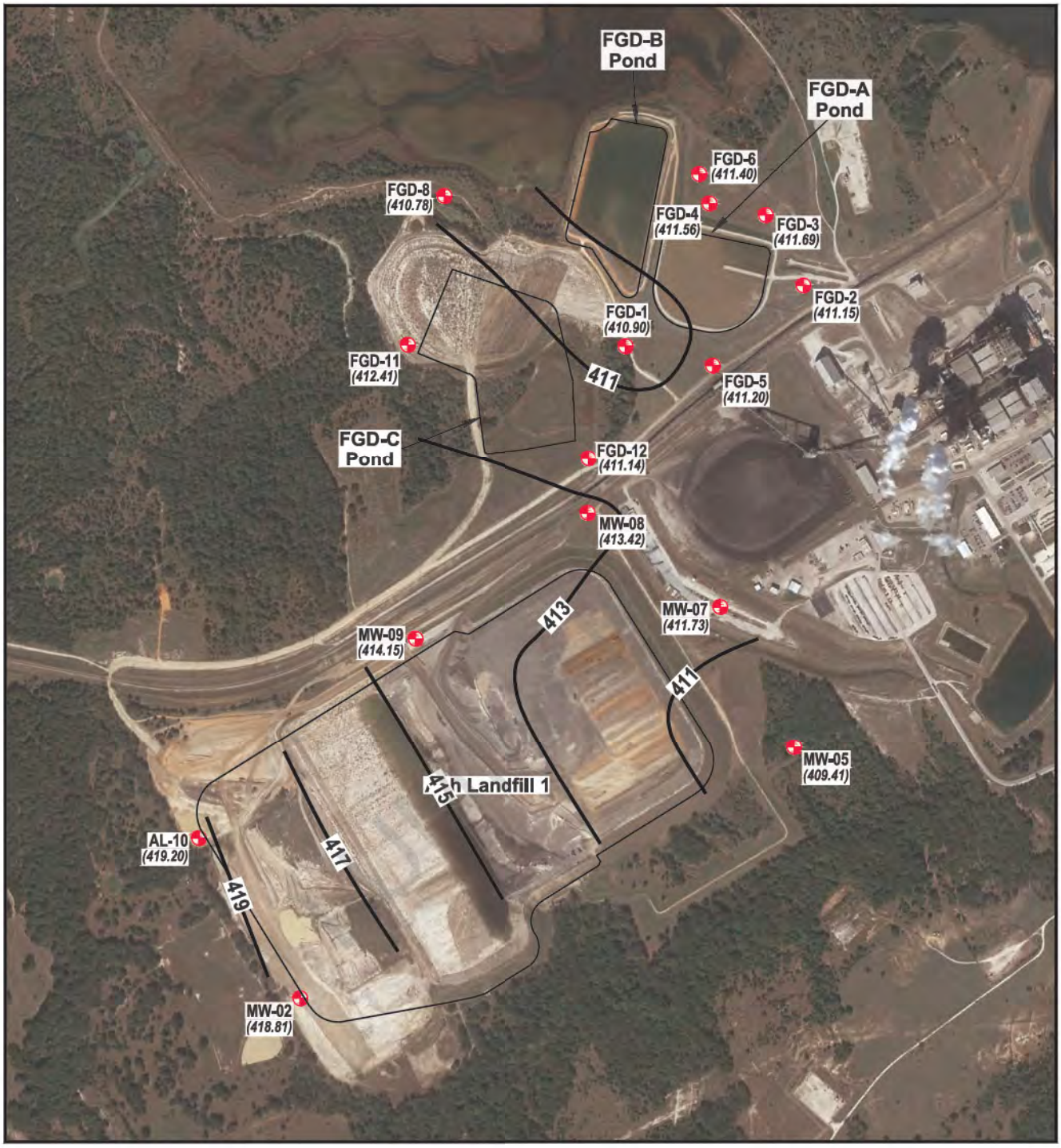
**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 4

# GROUNDWATER POTENTIOMETRIC SURFACE MAP APRIL 14-15, 2016

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS




## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

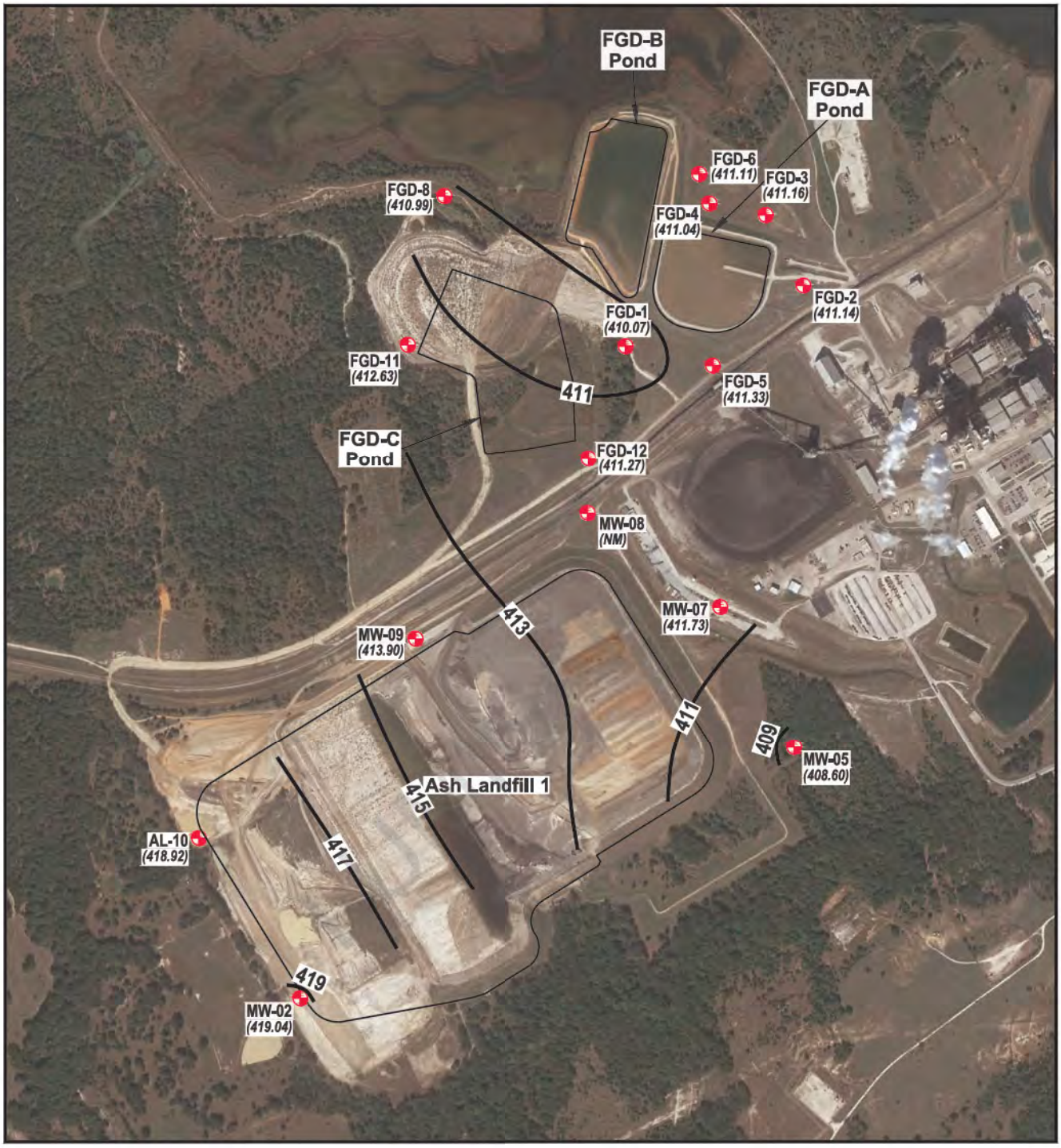
**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 5

# GROUNDWATER POTENTIOMETRIC SURFACE MAP JUNE 16, 2016

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS




## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

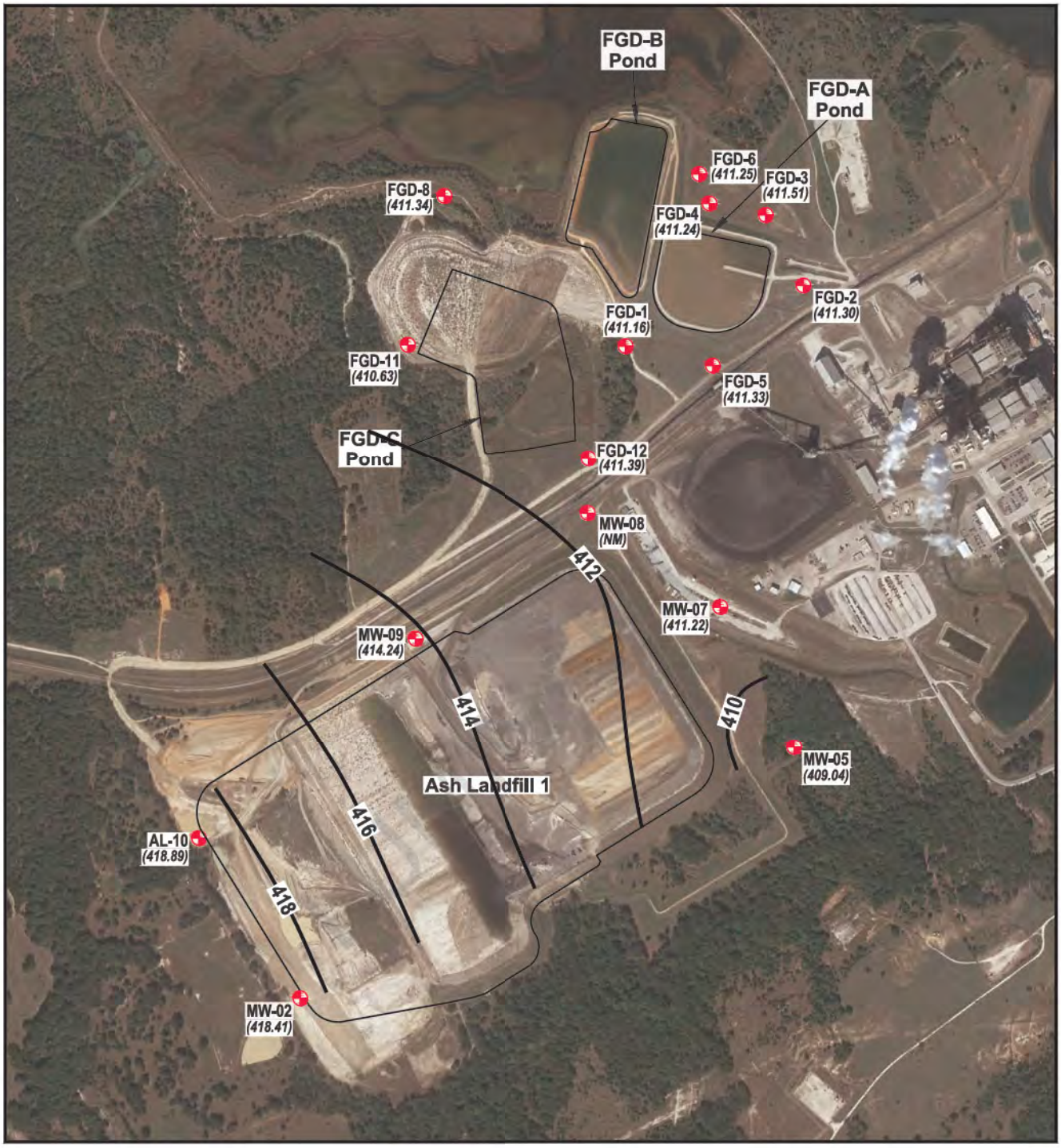
**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 6

# GROUNDWATER POTENTIOMETRIC SURFACE MAP AUGUST 24, 2016

| | | |
|---|---|---|
| PROJECT: 5164D | BY: AJD | REVISIONS |
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS




## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 7

# GROUNDWATER POTENTIOMETRIC SURFACE MAP OCTOBER 4, 2016

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 8

# GROUNDWATER POTENTIOMETRIC SURFACE MAP DECEMBER 19, 2016

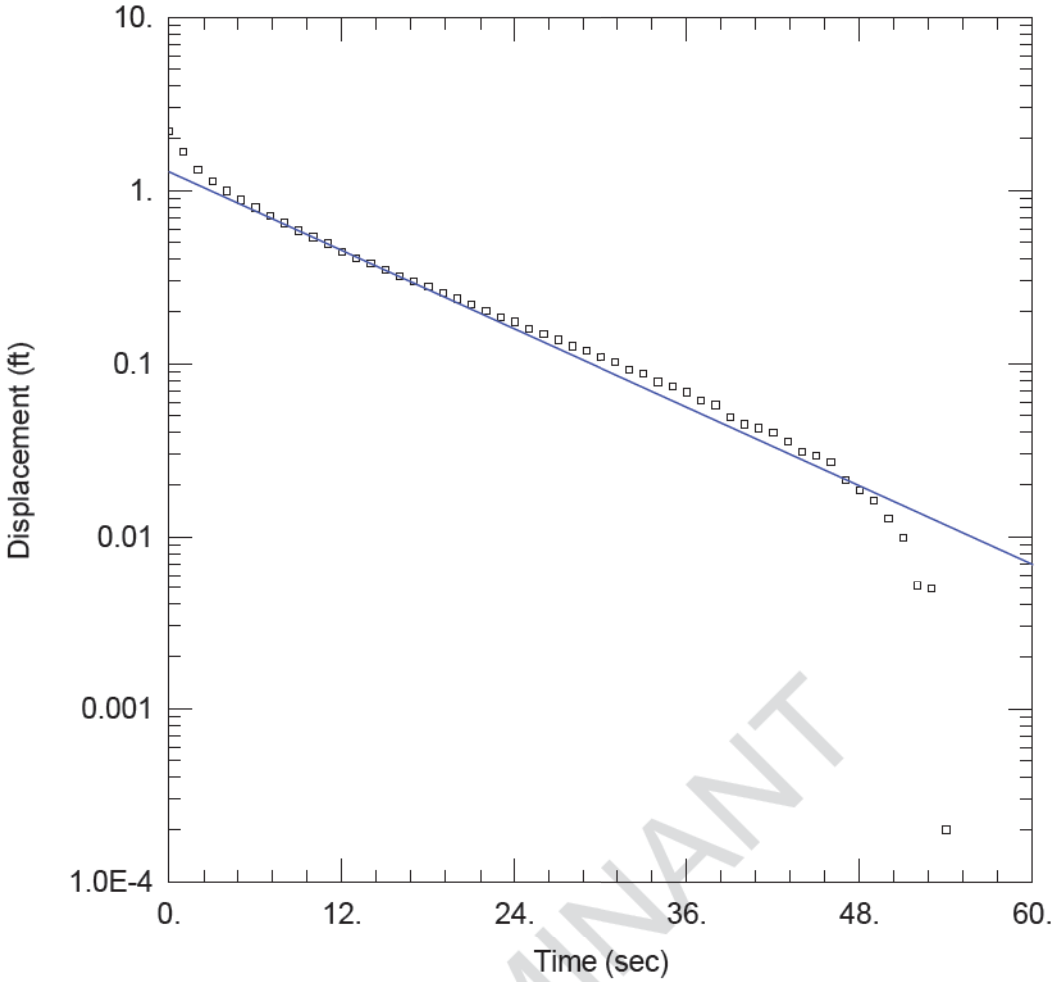
| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

LUMINANT

# Appendix D

# Aquifer Test Data




LUMINANT

## WELL TEST ANALYSIS

Data Set: J:\...\MW-02 Slug OUT.aqt
Date: 01/18/16 Time: 17:05:57

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: MW-02
Test Date: 9-23-15

## AQUIFER DATA

Saturated Thickness: 19.74 ft Anisotropy Ratio (Kz/Kr): 1.

## WELL DATA (MW-02)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 19.74 ft
Casing Radius: 0.083 ft
Static Water Column Height: 19.74 ft
Screen Length: 19.74 ft
Well Radius: 0.39 ft
Gravel Pack Porosity: 0.2

## SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.007252 cm/sec y0 = 1.281 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-D_Oak Grove\OGSES Slug Tests Sept 201
Date: 01/18/16
Time: 17:06:12

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: MW-02

## AQUIFER DATA

Saturated Thickness: 19.74 ft
Anisotropy Ratio (Kz/Kr): 1.

## SLUG TEST WELL DATA

Test Well: MW-02

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 19.74 ft
Casing Radius: 0.083 ft
Well Radius: 0.39 ft
Well Skin Radius: 0.39 ft
Screen Length: 19.74 ft
Total Well Penetration Depth: 19.74 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1896 ft
Gravel Pack Porosity: 0.2

No. of Observations: 55

Observation Data

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 0. | 0. | 28. | 0.1264 |
| 1. | 1.668 | 29. | 0.1188 |
| 2. | 1.325 | 30. | 0.1088 |
| 3. | 1.134 | 31. | 0.1017 |
| 4. | 0.9925 | 32. | 0.0922 |
| 5. | 0.8819 | 33. | 0.0869 |
| 6. | 0.7979 | 34. | 0.0783 |
| 7. | 0.7112 | 35. | 0.0738 |
| 8. | 0.648 | 36. | 0.0685 |
| 9. | 0.5866 | 37. | 0.0608 |
| 10. | 0.5383 | 38. | 0.0575 |
| 11. | 0.493 | 39. | 0.0492 |
| 12. | 0.4444 | 40. | 0.0445 |
| 13. | 0.4083 | 41. | 0.0423 |
| 14. | 0.3786 | 42. | 0.0397 |
| 15. | 0.3494 | 43. | 0.0352 |
| 16. | 0.3209 | 44. | 0.0308 |
| 17. | 0.2974 | 45. | 0.0294 |
| 18. | 0.2775 | 46. | 0.0268 |
| 19. | 0.2564 | 47. | 0.0211 |
| 20. | 0.2369 | 48. | 0.0184 |
| 21. | 0.2193 | 49. | 0.0162 |
| 22. | 0.2013 | 50. | 0.0127 |
| 23. | 0.1863 | 51. | 0.0099 |
| 24. | 0.1747 | 52. | 0.0052 |
| 25. | 0.1589 | 53. | 0.005 |
| 26. | 0.1485 | 54. | 0.0002 |
| 27. | 0.1375 | | |

LUMINANT

## SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.004

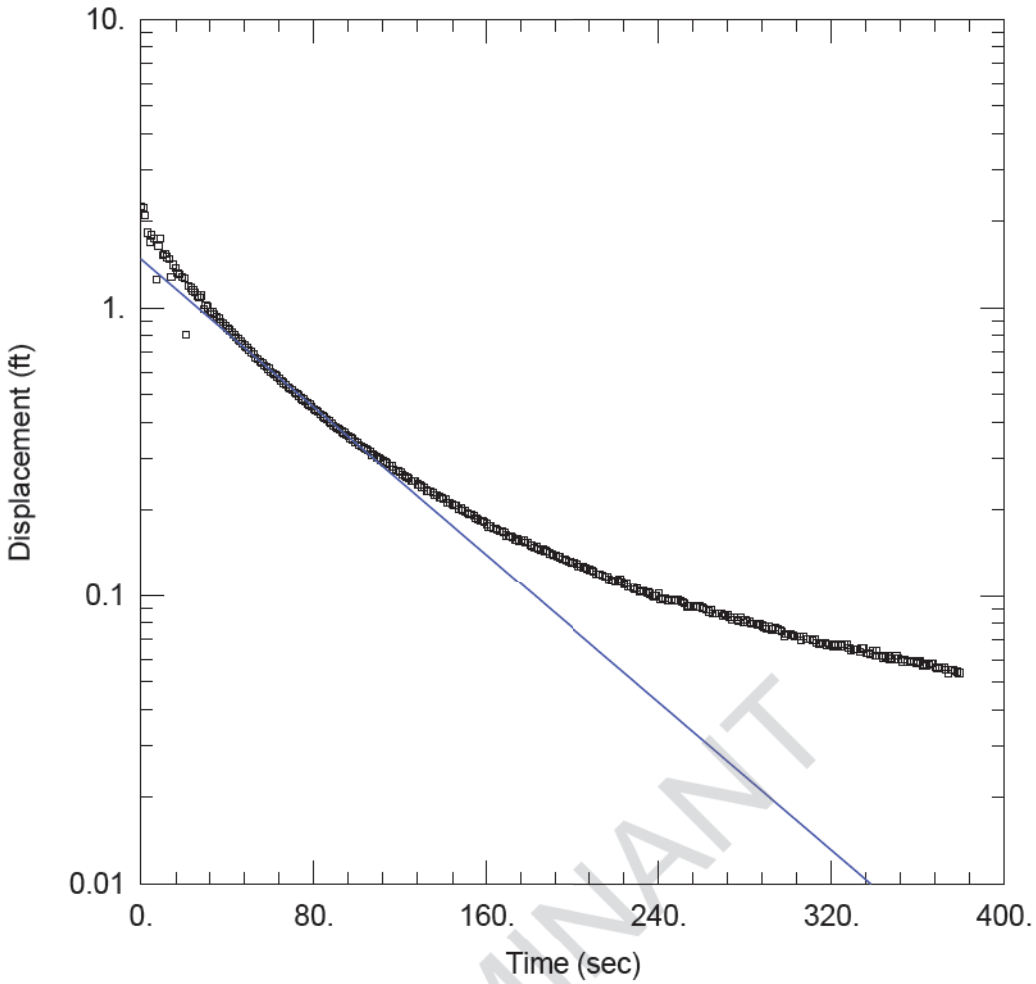
## VISUAL ESTIMATION RESULTS

### Estimated Parameters

| Parameter | Estimate | |
|---|---|---|
| K | 0.007252 | cm/sec |
| y0 | 1.281 | ft |

T = K*b = 4.364 cm²/sec

LUMINANT




LUMINANT

## WELL TEST ANALYSIS

Data Set: J:\...\MW-05 slug IN.aqt
Date: 01/18/16 Time: 17:06:52

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: Oak Grove
Test Well: MW-05
Test Date: 9/23/15

## AQUIFER DATA

Saturated Thickness: 22.18 ft Anisotropy Ratio (Kz/Kr): 1.

## WELL DATA (MW-05)

Initial Displacement: 2.25 ft Static Water Column Height: 22.18 ft
Total Well Penetration Depth: 22.18 ft Screen Length: 21.3 ft
Casing Radius: 0.083 ft Well Radius: 0.39 ft

## SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 0.0002251 cm/sec y0 = 1.475 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-D_Oak Grove\OGSES Slug Tests Sept 201
Date: 01/19/16
Time: 09:29:23

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: Oak Grove
Test Date: 9/23/15
Test Well: MW-05

## AQUIFER DATA

Saturated Thickness: 22.18 ft
Anisotropy Ratio (Kz/Kr): 1.

## SLUG TEST WELL DATA

Test Well: MW-05

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.25 ft
Static Water Column Height: 22.18 ft
Casing Radius: 0.083 ft
Well Radius: 0.39 ft
Well Skin Radius: 0.39 ft
Screen Length: 21.3 ft
Total Well Penetration Depth: 22.18 ft

No. of Observations: 380

Observation Data

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 0. | 0. | 190. | 0.1407 |
| 1. | 2.224 | 191. | 0.1394 |
| 2. | 2.095 | 192. | 0.1392 |
| 3. | 1.821 | 193. | 0.1378 |
| 4. | 1.699 | 194. | 0.1367 |
| 5. | 1.787 | 195. | 0.1345 |
| 6. | 1.737 | 196. | 0.1348 |
| 7. | 1.257 | 197. | 0.1336 |
| 8. | 1.637 | 198. | 0.1321 |
| 9. | 1.734 | 199. | 0.1313 |
| 10. | 1.524 | 200. | 0.131 |
| 11. | 1.535 | 201. | 0.1306 |
| 12. | 1.5 | 202. | 0.129 |
| 13. | 1.473 | 203. | 0.1264 |
| 14. | 1.28 | 204. | 0.1271 |
| 15. | 1.41 | 205. | 0.1262 |
| 16. | 1.375 | 206. | 0.1251 |
| 17. | 1.323 | 207. | 0.1244 |
| 18. | 1.303 | 208. | 0.1234 |
| 19. | 1.278 | 209. | 0.1227 |
| 20. | 1.264 | 210. | 0.1214 |
| 21. | 0.8071 | 211. | 0.1192 |
| 22. | 1.195 | 212. | 0.1195 |
| 23. | 1.174 | 213. | 0.1193 |
| 24. | 1.152 | 214. | 0.1178 |
| 25. | 1.128 | 215. | 0.1171 |
| 26. | 1.104 | 216. | 0.1166 |
| 27. | 1.085 | 217. | 0.1143 |
| 28. | 1.103 | 218. | 0.1134 |
| 29. | 0.9916 | 219. | 0.1132 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 30. | 1.023 | 220. | 0.1123 |
| 31. | 1.005 | 221. | 0.1127 |
| 32. | 0.9699 | 222. | 0.1141 |
| 33. | 0.9668 | 223. | 0.112 |
| 34. | 0.9486 | 224. | 0.11 |
| 35. | 0.9319 | 225. | 0.1113 |
| 36. | 0.9174 | 226. | 0.1073 |
| 37. | 0.8969 | 227. | 0.1079 |
| 38. | 0.8815 | 228. | 0.1069 |
| 39. | 0.8682 | 229. | 0.1056 |
| 40. | 0.8524 | 230. | 0.1064 |
| 41. | 0.8374 | 231. | 0.1032 |
| 42. | 0.8212 | 232. | 0.104 |
| 43. | 0.807 | 233. | 0.1039 |
| 44. | 0.7929 | 234. | 0.1029 |
| 45. | 0.7799 | 235. | 0.1026 |
| 46. | 0.7662 | 236. | 0.1019 |
| 47. | 0.7536 | 237. | 0.1004 |
| 48. | 0.7413 | 238. | 0.0995 |
| 49. | 0.7265 | 239. | 0.0998 |
| 50. | 0.7142 | 240. | 0.1022 |
| 51. | 0.7035 | 241. | 0.0971 |
| 52. | 0.6911 | 242. | 0.098 |
| 53. | 0.6721 | 243. | 0.0983 |
| 54. | 0.6655 | 244. | 0.0965 |
| 55. | 0.6534 | 245. | 0.096 |
| 56. | 0.6451 | 246. | 0.0973 |
| 57. | 0.6336 | 247. | 0.0962 |
| 58. | 0.624 | 248. | 0.0958 |
| 59. | 0.6159 | 249. | 0.0965 |
| 60. | 0.602 | 250. | 0.0958 |
| 61. | 0.5944 | 251. | 0.0949 |
| 62. | 0.5859 | 252. | 0.0945 |
| 63. | 0.5789 | 253. | 0.0917 |
| 64. | 0.5691 | 254. | 0.0926 |
| 65. | 0.559 | 255. | 0.0923 |
| 66. | 0.5506 | 256. | 0.0921 |
| 67. | 0.543 | 257. | 0.0915 |
| 68. | 0.5328 | 258. | 0.0916 |
| 69. | 0.5241 | 259. | 0.0917 |
| 70. | 0.5193 | 260. | 0.0909 |
| 71. | 0.51 | 261. | 0.0906 |
| 72. | 0.504 | 262. | 0.0893 |
| 73. | 0.4966 | 263. | 0.0882 |
| 74. | 0.4879 | 264. | 0.0898 |
| 75. | 0.4818 | 265. | 0.0866 |
| 76. | 0.4747 | 266. | 0.0869 |
| 77. | 0.4668 | 267. | 0.0869 |
| 78. | 0.4621 | 268. | 0.0866 |
| 79. | 0.4539 | 269. | 0.0869 |
| 80. | 0.4459 | 270. | 0.0852 |
| 81. | 0.4409 | 271. | 0.0859 |
| 82. | 0.4357 | 272. | 0.0859 |
| 83. | 0.429 | 273. | 0.0843 |
| 84. | 0.4213 | 274. | 0.0824 |
| 85. | 0.4175 | 275. | 0.0841 |
| 86. | 0.4117 | 276. | 0.0824 |
| 87. | 0.4049 | 277. | 0.0818 |
| 88. | 0.3975 | 278. | 0.0841 |
| 89. | 0.3912 | 279. | 0.0809 |
| 90. | 0.388 | 280. | 0.0823 |
| 91. | 0.3819 | 281. | 0.0813 |
| 92. | 0.3782 | 282. | 0.0811 |
| 93. | 0.3729 | 283. | 0.0802 |
| 94. | 0.3688 | 284. | 0.0799 |
| 95. | 0.3631 | 285. | 0.0799 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 96. | 0.3591 | 286. | 0.0792 |
| 97. | 0.3543 | 287. | 0.08 |
| 98. | 0.3512 | 288. | 0.0788 |
| 99. | 0.3438 | 289. | 0.0779 |
| 100. | 0.3406 | 290. | 0.077 |
| 101. | 0.3337 | 291. | 0.078 |
| 102. | 0.3328 | 292. | 0.0764 |
| 103. | 0.3287 | 293. | 0.077 |
| 104. | 0.3242 | 294. | 0.0776 |
| 105. | 0.3214 | 295. | 0.0763 |
| 106. | 0.3173 | 296. | 0.0758 |
| 107. | 0.3106 | 297. | 0.0749 |
| 108. | 0.3098 | 298. | 0.0725 |
| 109. | 0.3042 | 299. | 0.0739 |
| 110. | 0.3021 | 300. | 0.0735 |
| 111. | 0.2978 | 301. | 0.0732 |
| 112. | 0.2948 | 302. | 0.0729 |
| 113. | 0.2915 | 303. | 0.0722 |
| 114. | 0.289 | 304. | 0.0723 |
| 115. | 0.283 | 305. | 0.0722 |
| 116. | 0.2831 | 306. | 0.0698 |
| 117. | 0.2767 | 307. | 0.0719 |
| 118. | 0.2735 | 308. | 0.0709 |
| 119. | 0.272 | 309. | 0.0708 |
| 120. | 0.2712 | 310. | 0.0706 |
| 121. | 0.2655 | 311. | 0.07 |
| 122. | 0.2627 | 312. | 0.0703 |
| 123. | 0.2594 | 313. | 0.0687 |
| 124. | 0.2565 | 314. | 0.0679 |
| 125. | 0.2515 | 315. | 0.0684 |
| 126. | 0.2506 | 316. | 0.0686 |
| 127. | 0.2506 | 317. | 0.0687 |
| 128. | 0.2454 | 318. | 0.0676 |
| 129. | 0.2434 | 319. | 0.0678 |
| 130. | 0.2401 | 320. | 0.067 |
| 131. | 0.2391 | 321. | 0.0669 |
| 132. | 0.2331 | 322. | 0.0677 |
| 133. | 0.2324 | 323. | 0.0671 |
| 134. | 0.2318 | 324. | 0.0668 |
| 135. | 0.2292 | 325. | 0.068 |
| 136. | 0.2245 | 326. | 0.0678 |
| 137. | 0.2245 | 327. | 0.0676 |
| 138. | 0.2211 | 328. | 0.0656 |
| 139. | 0.2201 | 329. | 0.0648 |
| 140. | 0.2183 | 330. | 0.0653 |
| 141. | 0.2173 | 331. | 0.0651 |
| 142. | 0.211 | 332. | 0.0653 |
| 143. | 0.2119 | 333. | 0.064 |
| 144. | 0.209 | 334. | 0.0656 |
| 145. | 0.2073 | 335. | 0.0654 |
| 146. | 0.2063 | 336. | 0.0631 |
| 147. | 0.2015 | 337. | 0.063 |
| 148. | 0.2019 | 338. | 0.0625 |
| 149. | 0.1982 | 339. | 0.0645 |
| 150. | 0.1978 | 340. | 0.062 |
| 151. | 0.1951 | 341. | 0.0643 |
| 152. | 0.1925 | 342. | 0.0621 |
| 153. | 0.1926 | 343. | 0.062 |
| 154. | 0.1906 | 344. | 0.061 |
| 155. | 0.1874 | 345. | 0.0613 |
| 156. | 0.1855 | 346. | 0.0618 |
| 157. | 0.1829 | 347. | 0.0603 |
| 158. | 0.1833 | 348. | 0.0607 |
| 159. | 0.1811 | 349. | 0.0603 |
| 160. | 0.1784 | 350. | 0.0619 |
| 161. | 0.1748 | 351. | 0.0604 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 162. | 0.1747 | 352. | 0.0602 |
| 163. | 0.1717 | 353. | 0.0591 |
| 164. | 0.1721 | 354. | 0.06 |
| 165. | 0.1709 | 355. | 0.0587 |
| 166. | 0.1683 | 356. | 0.0594 |
| 167. | 0.1684 | 357. | 0.0587 |
| 168. | 0.1665 | 358. | 0.0594 |
| 169. | 0.1629 | 359. | 0.0582 |
| 170. | 0.1618 | 360. | 0.0586 |
| 171. | 0.1614 | 361. | 0.0591 |
| 172. | 0.1603 | 362. | 0.0569 |
| 173. | 0.1575 | 363. | 0.0579 |
| 174. | 0.1578 | 364. | 0.0573 |
| 175. | 0.1557 | 365. | 0.0576 |
| 176. | 0.1575 | 366. | 0.0581 |
| 177. | 0.1562 | 367. | 0.0583 |
| 178. | 0.1535 | 368. | 0.0565 |
| 179. | 0.1536 | 369. | 0.056 |
| 180. | 0.1512 | 370. | 0.0559 |
| 181. | 0.1499 | 371. | 0.0565 |
| 182. | 0.1481 | 372. | 0.0563 |
| 183. | 0.1484 | 373. | 0.0553 |
| 184. | 0.1461 | 374. | 0.0535 |
| 185. | 0.1451 | 375. | 0.0554 |
| 186. | 0.1453 | 376. | 0.0553 |
| 187. | 0.144 | 377. | 0.0548 |
| 188. | 0.1433 | 378. | 0.0544 |
| 189. | 0.1411 | 379. | 0.0539 |

## SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.

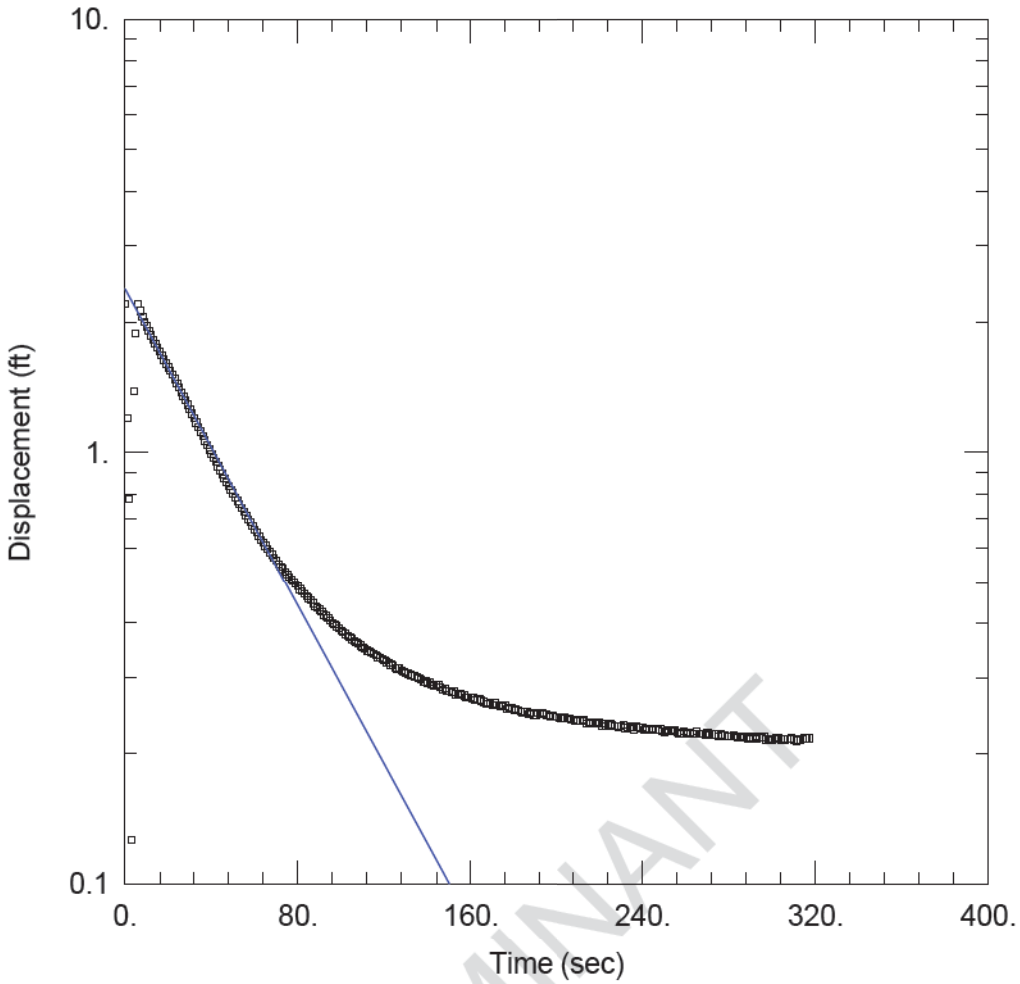
## VISUAL ESTIMATION RESULTS

### Estimated Parameters

| Parameter | Estimate | |
|---|---|---|
| K | 0.0002251 | cm/sec |
| y0 | 1.475 | ft |

$T = K*b = 0.1522$ cm²/sec

LUMINANT




LUMINANT

## WELL TEST ANALYSIS

Data Set: J:\...\MW-05 SluG OUT.aqt
Date: 01/19/16 Time: 09:30:32

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: MW-05
Test Date: 9-23-15

## AQUIFER DATA

Saturated Thickness: 22.18 ft Anisotropy Ratio (Kz/Kr): 1.

## WELL DATA (MW-5)

Initial Displacement: 2.2 ft Static Water Column Height: 22.18 ft
Total Well Penetration Depth: 22.18 ft Screen Length: 21.3 ft
Casing Radius: 0.083 ft Well Radius: 0.39 ft

## SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 0.0003221 cm/sec y0 = 2.384 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-D_Oak Grove\OGSES Slug Tests Sept 201
Date: 01/19/16
Time: 09:30:55

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: MW-05

## AQUIFER DATA

Saturated Thickness: 22.18 ft
Anisotropy Ratio (Kz/Kr): 1.

## SLUG TEST WELL DATA

Test Well: MW-5

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 22.18 ft
Casing Radius: 0.083 ft
Well Radius: 0.39 ft
Well Skin Radius: 0.39 ft
Screen Length: 21.3 ft
Total Well Penetration Depth: 22.18 ft

No. of Observations: 317

Observation Data

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 1. | 1.2 | 160. | 0.2689 |
| 2. | 0.7792 | 161. | 0.2684 |
| 3. | 0.1262 | 162. | 0.2658 |
| 4. | 1.381 | 163. | 0.2665 |
| 5. | 1.878 | 164. | 0.2662 |
| 6. | 2.197 | 165. | 0.2646 |
| 7. | 2.121 | 166. | 0.2626 |
| 8. | 2.057 | 167. | 0.2607 |
| 9. | 2.002 | 168. | 0.2602 |
| 10. | 1.956 | 169. | 0.2625 |
| 11. | 1.907 | 170. | 0.2581 |
| 12. | 1.863 | 171. | 0.2611 |
| 13. | 1.822 | 172. | 0.2583 |
| 14. | 1.784 | 173. | 0.2582 |
| 15. | 1.744 | 174. | 0.2568 |
| 16. | 1.707 | 175. | 0.2585 |
| 17. | 1.672 | 176. | 0.2573 |
| 18. | 1.637 | 177. | 0.2537 |
| 19. | 1.602 | 178. | 0.2548 |
| 20. | 1.571 | 179. | 0.254 |
| 21. | 1.541 | 180. | 0.2513 |
| 22. | 1.51 | 181. | 0.2536 |
| 23. | 1.478 | 182. | 0.2516 |
| 24. | 1.443 | 183. | 0.2498 |
| 25. | 1.41 | 184. | 0.2489 |
| 26. | 1.378 | 185. | 0.2492 |
| 27. | 1.35 | 186. | 0.2501 |
| 28. | 1.322 | 187. | 0.2464 |
| 29. | 1.289 | 188. | 0.2481 |
| 30. | 1.259 | 189. | 0.2454 |

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| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 31. | 1.228 | 190. | 0.2456 |
| 32. | 1.199 | 191. | 0.2479 |
| 33. | 1.171 | 192. | 0.2464 |
| 34. | 1.143 | 193. | 0.2482 |
| 35. | 1.116 | 194. | 0.2466 |
| 36. | 1.087 | 195. | 0.2453 |
| 37. | 1.065 | 196. | 0.2442 |
| 38. | 1.04 | 197. | 0.2431 |
| 39. | 1.015 | 198. | 0.2439 |
| 40. | 0.9928 | 199. | 0.2427 |
| 41. | 0.9712 | 200. | 0.2434 |
| 42. | 0.9512 | 201. | 0.2412 |
| 43. | 0.9277 | 202. | 0.2421 |
| 44. | 0.9107 | 203. | 0.2418 |
| 45. | 0.8916 | 204. | 0.2422 |
| 46. | 0.8702 | 205. | 0.2412 |
| 47. | 0.8531 | 206. | 0.2413 |
| 48. | 0.8354 | 207. | 0.2393 |
| 49. | 0.8202 | 208. | 0.2399 |
| 50. | 0.8047 | 209. | 0.2387 |
| 51. | 0.7875 | 210. | 0.2376 |
| 52. | 0.7723 | 211. | 0.2382 |
| 53. | 0.7583 | 212. | 0.2375 |
| 54. | 0.7432 | 213. | 0.2394 |
| 55. | 0.7274 | 214. | 0.2353 |
| 56. | 0.715 | 215. | 0.2361 |
| 57. | 0.6999 | 216. | 0.2351 |
| 58. | 0.6904 | 217. | 0.2343 |
| 59. | 0.676 | 218. | 0.2366 |
| 60. | 0.6618 | 219. | 0.2348 |
| 61. | 0.6534 | 220. | 0.2362 |
| 62. | 0.6401 | 221. | 0.232 |
| 63. | 0.6285 | 222. | 0.2354 |
| 64. | 0.6196 | 223. | 0.2312 |
| 65. | 0.6084 | 224. | 0.2332 |
| 66. | 0.5991 | 225. | 0.2339 |
| 67. | 0.5882 | 226. | 0.2323 |
| 68. | 0.5807 | 227. | 0.2321 |
| 69. | 0.5714 | 228. | 0.2318 |
| 70. | 0.561 | 229. | 0.2308 |
| 71. | 0.552 | 230. | 0.2316 |
| 72. | 0.5446 | 231. | 0.2329 |
| 73. | 0.5377 | 232. | 0.2293 |
| 74. | 0.5295 | 233. | 0.2306 |
| 75. | 0.5214 | 234. | 0.2309 |
| 76. | 0.5152 | 235. | 0.2299 |
| 77. | 0.506 | 236. | 0.2279 |
| 78. | 0.5005 | 237. | 0.2308 |
| 79. | 0.4932 | 238. | 0.2295 |
| 80. | 0.4866 | 239. | 0.2293 |
| 81. | 0.4793 | 240. | 0.2295 |
| 82. | 0.4739 | 241. | 0.2268 |
| 83. | 0.4673 | 242. | 0.2289 |
| 84. | 0.4623 | 243. | 0.228 |
| 85. | 0.4565 | 244. | 0.2274 |
| 86. | 0.451 | 245. | 0.2289 |
| 87. | 0.4443 | 246. | 0.2269 |
| 88. | 0.4375 | 247. | 0.2271 |
| 89. | 0.4343 | 248. | 0.2276 |
| 90. | 0.4292 | 249. | 0.2256 |
| 91. | 0.4244 | 250. | 0.2239 |
| 92. | 0.418 | 251. | 0.2257 |
| 93. | 0.415 | 252. | 0.2264 |
| 94. | 0.4099 | 253. | 0.2264 |
| 95. | 0.4059 | 254. | 0.2253 |
| 96. | 0.4006 | 255. | 0.2261 |

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| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 97. | 0.3967 | 256. | 0.2239 |
| 98. | 0.3933 | 257. | 0.2233 |
| 99. | 0.3888 | 258. | 0.2226 |
| 100. | 0.3839 | 259. | 0.2249 |
| 101. | 0.3807 | 260. | 0.2242 |
| 102. | 0.3772 | 261. | 0.2228 |
| 103. | 0.3741 | 262. | 0.2244 |
| 104. | 0.3705 | 263. | 0.2225 |
| 105. | 0.367 | 264. | 0.2229 |
| 106. | 0.3643 | 265. | 0.2249 |
| 107. | 0.3616 | 266. | 0.2228 |
| 108. | 0.3587 | 267. | 0.222 |
| 109. | 0.3547 | 268. | 0.2218 |
| 110. | 0.3515 | 269. | 0.2213 |
| 111. | 0.3483 | 270. | 0.2232 |
| 112. | 0.3453 | 271. | 0.2226 |
| 113. | 0.3439 | 272. | 0.2215 |
| 114. | 0.3411 | 273. | 0.2216 |
| 115. | 0.3393 | 274. | 0.2215 |
| 116. | 0.3368 | 275. | 0.219 |
| 117. | 0.3335 | 276. | 0.2216 |
| 118. | 0.3321 | 277. | 0.2204 |
| 119. | 0.3298 | 278. | 0.2202 |
| 120. | 0.3274 | 279. | 0.2197 |
| 121. | 0.3249 | 280. | 0.2198 |
| 122. | 0.3229 | 281. | 0.2196 |
| 123. | 0.3202 | 282. | 0.2202 |
| 124. | 0.3188 | 283. | 0.2193 |
| 125. | 0.3152 | 284. | 0.2182 |
| 126. | 0.314 | 285. | 0.2175 |
| 127. | 0.3143 | 286. | 0.2188 |
| 128. | 0.3111 | 287. | 0.2182 |
| 129. | 0.3079 | 288. | 0.2177 |
| 130. | 0.3063 | 289. | 0.2168 |
| 131. | 0.3052 | 290. | 0.2186 |
| 132. | 0.3035 | 291. | 0.2175 |
| 133. | 0.3015 | 292. | 0.2188 |
| 134. | 0.301 | 293. | 0.2168 |
| 135. | 0.2998 | 294. | 0.2178 |
| 136. | 0.2975 | 295. | 0.2174 |
| 137. | 0.296 | 296. | 0.2187 |
| 138. | 0.2928 | 297. | 0.2157 |
| 139. | 0.2932 | 298. | 0.2156 |
| 140. | 0.2908 | 299. | 0.2165 |
| 141. | 0.2915 | 300. | 0.2152 |
| 142. | 0.2884 | 301. | 0.2166 |
| 143. | 0.2864 | 302. | 0.2172 |
| 144. | 0.2873 | 303. | 0.2184 |
| 145. | 0.2877 | 304. | 0.2157 |
| 146. | 0.2837 | 305. | 0.216 |
| 147. | 0.2808 | 306. | 0.2157 |
| 148. | 0.2817 | 307. | 0.2165 |
| 149. | 0.279 | 308. | 0.2169 |
| 150. | 0.2784 | 309. | 0.217 |
| 151. | 0.2772 | 310. | 0.2155 |
| 152. | 0.2775 | 311. | 0.214 |
| 153. | 0.2736 | 312. | 0.2153 |
| 154. | 0.2736 | 313. | 0.2157 |
| 155. | 0.2747 | 314. | 0.2167 |
| 156. | 0.2732 | 315. | 0.2172 |
| 157. | 0.2721 | 316. | 0.2172 |
| 158. | 0.2696 | 317. | 0.2171 |
| 159. | 0.2697 | | |

SOLUTION

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Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.091

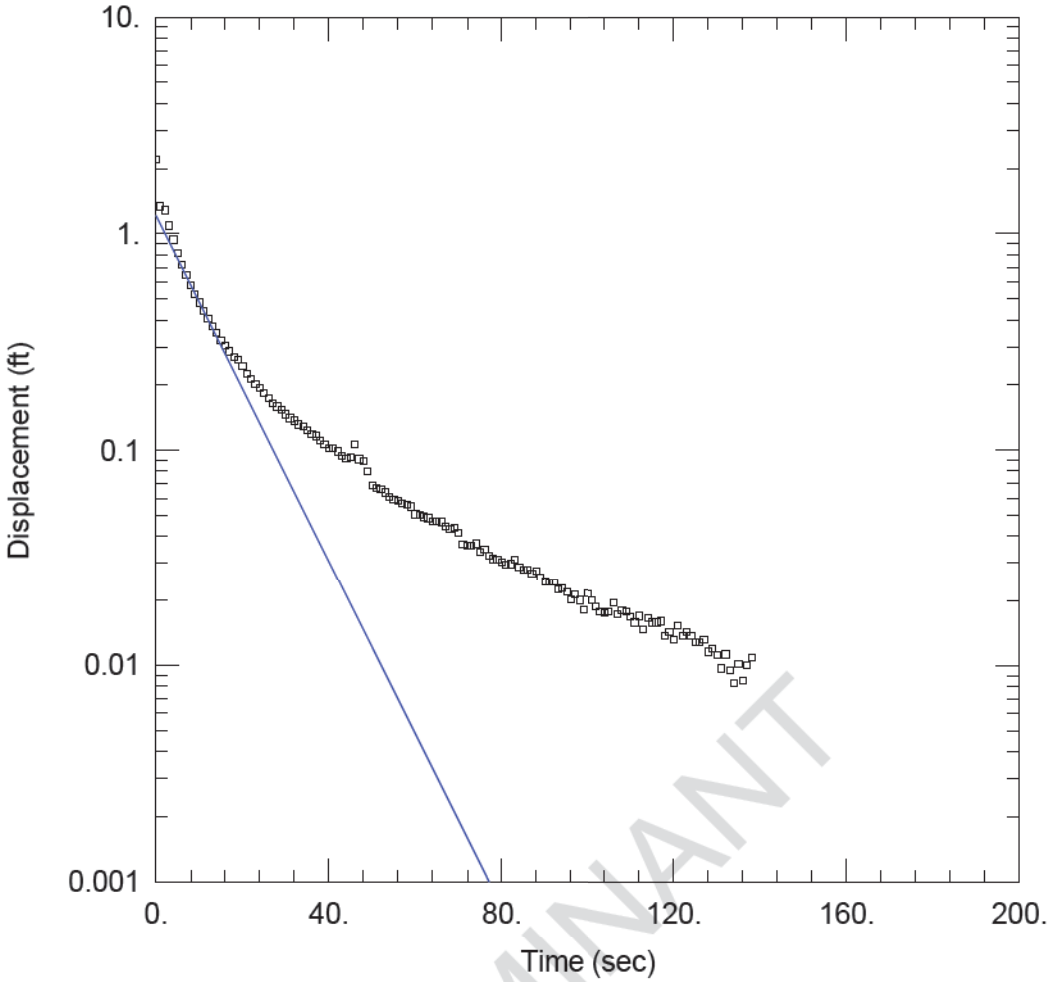
## VISUAL ESTIMATION RESULTS

### Estimated Parameters

| Parameter | Estimate | |
|---|---|---|
| K | 0.0003221 | cm/sec |
| y0 | 2.384 | ft |

T = K*b = 0.2177 cm²/sec

LUMINANT




LUMINANT

## WELL TEST ANALYSIS

Data Set: J:\...\MW-09 Slug OUT.aqt
Date: 01/18/16 Time: 17:08:39

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: MW-09
Test Date: 9-23-15

## AQUIFER DATA

Saturated Thickness: 19.79 ft Anisotropy Ratio (Kz/Kr): 1.

## WELL DATA (MW-9)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 19.79 ft
Casing Radius: 0.083 ft
Static Water Column Height: 19.79 ft
Screen Length: 19.79 ft
Well Radius: 0.39 ft
Gravel Pack Porosity: 0.2

## SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.007662 cm/sec y0 = 1.212 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-D_Oak Grove\OGSES Slug Tests Sept 201
Date: 01/18/16
Time: 17:08:53

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: MW-09

## AQUIFER DATA

Saturated Thickness: 19.79 ft
Anisotropy Ratio (Kz/Kr): 1.

## SLUG TEST WELL DATA

Test Well: MW-9

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 19.79 ft
Casing Radius: 0.083 ft
Well Radius: 0.39 ft
Well Skin Radius: 0.39 ft
Screen Length: 19.79 ft
Total Well Penetration Depth: 19.79 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1896 ft
Gravel Pack Porosity: 0.2

No. of Observations: 138

Observation Data

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 1. | 1.337 | 70. | 0.0414 |
| 2. | 1.285 | 71. | 0.0368 |
| 3. | 1.089 | 72. | 0.0364 |
| 4. | 0.941 | 73. | 0.0364 |
| 5. | 0.815 | 74. | 0.037 |
| 6. | 0.7223 | 75. | 0.0338 |
| 7. | 0.6433 | 76. | 0.0349 |
| 8. | 0.579 | 77. | 0.0326 |
| 9. | 0.5252 | 78. | 0.0314 |
| 10. | 0.481 | 79. | 0.0312 |
| 11. | 0.4407 | 80. | 0.0304 |
| 12. | 0.4044 | 81. | 0.0295 |
| 13. | 0.3751 | 82. | 0.0297 |
| 14. | 0.3497 | 83. | 0.0311 |
| 15. | 0.3219 | 84. | 0.0287 |
| 16. | 0.3047 | 85. | 0.0279 |
| 17. | 0.2865 | 86. | 0.0279 |
| 18. | 0.2688 | 87. | 0.0268 |
| 19. | 0.263 | 88. | 0.0276 |
| 20. | 0.2443 | 89. | 0.0259 |
| 21. | 0.2252 | 90. | 0.0246 |
| 22. | 0.2126 | 91. | 0.0244 |
| 23. | 0.2023 | 92. | 0.0245 |
| 24. | 0.1943 | 93. | 0.0224 |
| 25. | 0.1838 | 94. | 0.0227 |
| 26. | 0.1738 | 95. | 0.0219 |
| 27. | 0.1647 | 96. | 0.0201 |
| 28. | 0.1592 | 97. | 0.0213 |

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| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 29. | 0.1533 | 98. | 0.02 |
| 30. | 0.1468 | 99. | 0.0181 |
| 31. | 0.1407 | 100. | 0.0216 |
| 32. | 0.1375 | 101. | 0.0201 |
| 33. | 0.1315 | 102. | 0.0188 |
| 34. | 0.1292 | 103. | 0.0179 |
| 35. | 0.1232 | 104. | 0.0175 |
| 36. | 0.1183 | 105. | 0.0179 |
| 37. | 0.1166 | 106. | 0.0197 |
| 38. | 0.1106 | 107. | 0.0173 |
| 39. | 0.1068 | 108. | 0.018 |
| 40. | 0.1027 | 109. | 0.0178 |
| 41. | 0.1022 | 110. | 0.0169 |
| 42. | 0.0987 | 111. | 0.0159 |
| 43. | 0.0944 | 112. | 0.017 |
| 44. | 0.0921 | 113. | 0.0148 |
| 45. | 0.093 | 114. | 0.0167 |
| 46. | 0.106 | 115. | 0.0159 |
| 47. | 0.0911 | 116. | 0.0159 |
| 48. | 0.0894 | 117. | 0.0161 |
| 49. | 0.0796 | 118. | 0.0138 |
| 50. | 0.0687 | 119. | 0.0144 |
| 51. | 0.0673 | 120. | 0.0132 |
| 52. | 0.0659 | 121. | 0.0153 |
| 53. | 0.0639 | 122. | 0.0138 |
| 54. | 0.0611 | 123. | 0.0143 |
| 55. | 0.0593 | 124. | 0.0138 |
| 56. | 0.0587 | 125. | 0.0128 |
| 57. | 0.0571 | 126. | 0.0129 |
| 58. | 0.0559 | 127. | 0.0132 |
| 59. | 0.055 | 128. | 0.0116 |
| 60. | 0.0506 | 129. | 0.012 |
| 61. | 0.0503 | 130. | 0.0112 |
| 62. | 0.0494 | 131. | 0.0097 |
| 63. | 0.0486 | 132. | 0.0113 |
| 64. | 0.047 | 133. | 0.0095 |
| 65. | 0.047 | 134. | 0.0083 |
| 66. | 0.0467 | 135. | 0.0102 |
| 67. | 0.0446 | 136. | 0.0085 |
| 68. | 0.0431 | 137. | 0.0101 |
| 69. | 0.044 | 138. | 0.0109 |

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## SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.006

## VISUAL ESTIMATION RESULTS

### Estimated Parameters

| Parameter | Estimate | |
|---|---|---|
| K | 0.007662 | cm/sec |
| y0 | 1.212 | ft |

$T = K*b = 4.622$ cm²/sec

# COAL COMBUSTION RESIDUAL RULE
# GROUNDWATER MONITORING SYSTEM CERTIFICATION

## OAK GROVE STEAM ELECTRIC STATION
## FGD POND AREA
## ROBERTSON COUNTY, TEXAS

**OCTOBER 16, 2017**

LUMINANT

***Prepared For:***

Luminant Generation Company, LLC
6555 Sierra Drive
Irving, TX 75039

***Prepared By:***

Pastor, Behling & Wheeler, LLC
2201 Double Creek Drive, Suite 4004
Round Rock, Texas 78664
Texas Engineering Firm No. 4760

October 16, 2017

## PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Pastor, Behling & Wheeler, LLC under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the groundwater monitoring system installed at the referenced facility has been designed and constructed to meet the requirements of Section 257.91 of the CCR Rule.

Patrick J. Behling, P.E.
Principal Engineer
PASTOR, BEHLING & WHEELER, LLC

LUMINANT

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| 4 | FGD Pond Area A-A' Geologic Cross Section |
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| 6 | FGD Pond Area C-C' Geologic Cross Section |


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| B | Photographs of CCR Groundwater Monitoring Wells |
| C | Groundwater Potentiometric Surface Maps |
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# 1.0 INTRODUCTION

Luminant Power (Luminant) operates the Oak Grove Steam Electric Station (OGSES) located approximately 10 miles north of Franklin, Robertson County, Texas (Figure 1). The OGSES consists of two 800-megawatt power generation units which burn lignite and coal (PBW, 2008a). Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operations. Currently, CCRs generated at the OGSES are managed by Luminant in surface impoundments located on the OGSES property or the Ash Landfill 1. Two CCR units have been identified within the OGSES operations, the FGD Pond Area and the Ash Landfill 1. This report discusses the FGD Pond Area (the Site), which includes FGD-A Pond, FGD-B Pond, and FGD-C Pond. The FGD Ponds meet the definition of CCR surface impoundments and are subject to groundwater monitoring system requirements of the CCR Rule.

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the EPA to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. The final CCR Rule was published in the Federal Register on April 17, 2015. The effective date of the CCR Rule was October 19, 2015.

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The CCR Rule establishes national minimum criteria for existing and new CCR landfills, existing and new CCR surface impoundments, and lateral expansions to landfills/impoundments. Pastor, Behling & Wheeler, LLC (PBW) was retained by Luminant to evaluate and certify that the groundwater monitoring system at the Site has been designed and constructed to meet the requirements of Section 257.91 of the CCR Rule.

## 1.1 Description of the FGD Ponds

The FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the "FGD Ponds") are located approximately 2,500 feet northwest of the power generation units (Figure 2). FGD-A Pond was originally constructed in the mid-1980s during the initial facility construction phase. Plant and pond construction were halted in the 1980s prior to activation of the pond. OGSES construction began again in 2007 and an assessment of the pond's condition was conducted as part of the OGSES project. Two phases of pond assessment were conducted and it was determined that reconstruction was required to

bring the pond into compliance with Texas Commission on Environmental Quality (TCEQ) regulations. The FGD-A Pond was reconstructed by Fluor Enterprises, Inc., and is approximately 9.5 acres in size (PBW, 2008b). The FGD-A Pond contains combustion byproducts generated from the OGSES, which consists of fly ash, bottom ash, and gypsum/scrubber sludge. Other wastes, including but not limited to, low volume wastewaters and ash contact water which are periodically generated during OGSES operation and stored in the FGD-A Pond prior to treatment for recycling or disposal (PBW, 2008b). FGD-A is lined with a 3-foot thick compacted clay liner (Golder, 2015a).

The FGD-B Pond was originally constructed in the mid-1980s during the initial OGSES construction phase for use as a storm water retention pond. Plant and pond construction were halted in the 1980s prior to activation of the pond. The former retention pond was reconstructed in 2012 as FGD-B Pond to supplement the adjacent FGD-A Pond, and is approximately 12 acres in size. FGD-B Pond receives combustion byproducts generated from the OGSES similar to FGD-A Pond (PBW, 2011). FGD-B is lined with an approximately 3-foot thick compacted clay liner (Golder, 2015a).

FGD-C Pond construction commenced in June 2015 and was completed in 2016. FGD-C Pond is approximately 25 acres in size and used to manage flue gas desulfurization (FGD) system wastewater and scrubber sludge/gypsum from the OGSES. The pond is also used to manage lesser amounts of low volume wastewaters, ash contact water, metal cleaning wastewaters, and storm water runoff prior to treatment for recycling or disposal (Golder, 2015b).

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### 1.2 CCR Unit Groundwater Monitoring System Requirements

Section 257.91 of the CCR Rule indicates that existing CCR landfills and surface impoundments be provided with a groundwater monitoring system that consists of sufficient wells, installed at appropriate location and depths, to yield groundwater samples from the uppermost aquifer that meet the following criteria:

- Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit; and
- Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary to ensure detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.

The specific configuration of the groundwater monitoring system must be determined based on site-specific technical information that must include aquifer thickness, groundwater flow rate, groundwater flow direction (including seasonal and temporal fluctuation in groundwater flow), saturated and unsaturated geologic units and fill materials that overly the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the upmost aquifer, including, but not limited to, thickness, stratigraphy, lithology, hydraulic conductivities, porosities, and effective porosities.

At a minimum, the monitoring system must consist of at least one upgradient and three downgradient monitoring wells, and any additional monitoring wells necessary to accurately represent the quality of the background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit. Multi-unit groundwater monitoring systems are allowed but must be equally as capable of detecting monitored constituents at the waste boundary of a CCR unit as individual groundwater monitoring wells.

Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space above the sampling depth must be sealed to prevent contamination of samples and the groundwater. There must be documentation in the operating record of the design, installation, development, and decommissionings of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. The qualified engineer must have access to and must review this documentation as part of the groundwater monitoring system certification.

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# 2.0 GROUNDWATER MONITORING SYSTEM EVALUATION

## 2.1 FGD Ponds Groundwater Monitoring System

The CCR groundwater monitoring well system at the FGD Ponds consists of nine monitoring wells (FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, FGD-8, FGD-11, and FGD-12) that are each screened in the uppermost aquifer at the Site. The locations of the CCR monitoring wells are shown on Figure 2. Well construction information and survey data for the CCR wells are summarized in Table 1, CCR monitoring well logs are presented in Appendix A, and photographs of the CCR wells are presented in Appendix B.

## 2.2 Local Geology and Hydrogeology

The FGD Ponds are located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1970). PBW reviewed historical soil boring logs, monitoring well completion documentation, and historical reports to describe the geologic and hydrogeologic conditions in the FGD Pond Area. Geologic cross sections were constructed using these data. Cross section locations are presented on Figure 3 and the cross sections are presented on Figures 4, 5, and 6.

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Historical soil borings indicate the geology in the FGD Pond Area primarily consists of an upper zone of relatively thick, interbedded sand and clay strata and a lower zone of interbedded silty to clayey sand and well sorted sand. The uppermost aquifer at the Site occurs in the lower zone of interbedded silty to clayey sand.

## 2.3 Groundwater Potentiometric Surface Elevations

Eight background groundwater monitoring events were performed using the FGD Pond Area CCR monitoring well system from October 2015 to December 2016. Static water levels measured during the background monitoring period indicated water elevations ranging from 409.34 feet above mean sea level (amsl) to 431.61 feet amsl, and depths to water ranging from 13.25 feet bgs to 42.01 feet bgs (Table 2). Groundwater potentiometric surface maps based on data collected during the background monitoring period are presented in Appendix C.

Groundwater elevations were generally highest to the west of the FGD Pond Area and lowest to the east of the FGD Pond Area, with an inferred groundwater flow direction to the east. Based on the inferred

groundwater flow direction, the location of each CCR monitoring well relative to the FGD Ponds is as follows:

| Upgradient Wells | Downgradient Wells |
|---|---|
| FGD-8 | FGD-1 |
| FGD-11 | FGD-2 |
| | FGD-3 |
| | FGD-4 |
| | FGD-5 |
| | FGD-6 |
| | FGD-12 |

### 2.4 Uppermost Aquifer Hydraulic Conductivity Testing

PBW performed slug tests at monitoring wells FGD-5, FGD-11, and FGD-12 on September 23, 2015 to evaluate groundwater linear flow velocities of the uppermost aquifer at the Site. Slug test data and time-head change plots used to calculate hydraulic conductivities and transmissivities of the uppermost aquifer are provided in Appendix D. A summary of these hydraulic properties is presented in Table 3. The average hydraulic conductivities for the wells ranged from $2.48 \times 10^{-3}$ cm/sec (well FGD-12) to $9.07 \times 10^{-5}$ cm/sec (well FGD-11), with a geometric mean for the test wells of $4.19 \times 10^{-4}$ cm/sec.

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### 2.5 Conclusions

The CCR groundwater monitoring well system at the FGD Pond Area complies with Section 257.91 of the CCR Rule. This conclusion is supported by the following as described in detail in previous sections of this report:

- Nine monitoring wells are included in the CCR groundwater monitoring system – two upgradient monitoring wells and seven downgradient monitoring wells.
- Each monitoring well is screened in the uppermost aquifer at the Site. Samples collected from upgradient monitoring wells will be representative of the quality of background groundwater that has not been affected by leakage from the CCR units and samples collected from downgradient wells will ensure detection of groundwater contamination in the uppermost aquifer from the CCR units.
- The monitoring wells are constructed with appropriate well casing to maintain the integrity of the monitoring well borehole and with slotted well screens to enable collection of groundwater samples. In addition, the annular space above the well screen is appropriately sealed to prevent contamination of groundwater samples from surface sources.

- Appropriate documentation exists concerning the design, installation, and development of the monitoring wells.

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## 3.0 REFERENCES

Barnes, Virgil E., 1970. Geologic Atlas of Texas, Waco Sheet. Texas Bureau of Economic Geology.

Golder Associates (Golder), 2015a. Coal Combustion Residuals Regulations and Their Effect on Existing Landfills and Surface Impoundments, Oak Grove Steam Electric Station. May 26.

Golder, 2015b. TCEQ Registration Package, Oak Grove Steam Electric Station FGD-C Pond. June.

Pastor, Behling & Wheeler, LLC (PBW), 2008a. Draft TCEQ Registration Package, Oak Grove Ash Landfill. June 16.

PBW, 2008b. TCEQ Registration Package, Oak Grove Steam Electric Station, FGD-A Pond. August 21.

PBW, 2011. TCEQ Registration Package, Oak Grove Steam Electric Station, FGD-B Pond. April 5.

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# Tables

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# TABLE 1
# CCR WELL CONSTRUCTION SUMMARY
# FGD POND AREA
# OAK GROVE STEAM ELECTRIC STATION

| Well ID | Date Installed | Northing | Easting | Ground Elevation (ft amsl) | TOC Elevation (ft amsl) | Top of Screen (ft bgs) | Bottom of Screen (ft bgs) | Screen Length (ft) | Total Design Depth (ft bgs) | Casing Diameter (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-1 | 08/27/08 | 572070 | 3200059 | 421.71 | 424.44 | 13 | 33 | 20 | 34 | 2 |
| FGD-2 | 08/22/08 | 572478 | 3201212 | 436.58 | 439.36 | 31 | 51 | 20 | 52 | 2 |
| FGD-3 | 08/21/08 | 572934 | 3200961 | 432.20 | 434.90 | 27 | 47 | 20 | 48 | 2 |
| FGD-4 | 08/20/08 | 573005 | 3200595 | 429.34 | 432.03 | 22.5 | 42.5 | 20 | 44 | 2 |
| FGD-5 | 03/03/10 | 571950 | 3200628 | 430.20 | 433.01 | 40 | 50 | 10 | 50 | 2 |
| FGD-6 | 03/04/10 | 573195 | 3200526 | 425.42 | 428.62 | 18 | 28 | 10 | 28 | 2 |
| FGD-8 | 03/04/10 | 573033 | 3198862 | 436.80 | 440.15 | 30 | 40 | 10 | 40 | 2 |
| FGD-11 | 11/26/14 | 572064 | 3198637 | 448.80 | 452.22 | 40.8 | 49.8 | 9 | 50.8 | 2 |
| FGD-12 | 11/26/14 | 571336 | 3199826 | 439.46 | 443.16 | 30.7 | 39.7 | 9 | 40.7 | 2 |

Notes:
1. Abbreviations: ft - feet; amsl - above mean sea level; bgs - below ground surface.
2. Coordinates in NAD 27 Texas State Plane Central 4208.

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**TABLE 2**
**GROUNDWATER ELEVATION SUMMARY**
**FGD POND AREA**
**OAK GROVE STEAM ELECTRIC STATION**

| Well ID | TOC Elevation (ft amsl) | Date | Depth to Water (ft btoc) | Water Elevation (ft amsl) |
|---|---|---|---|---|
| FGD-1 | 424.44 | 11/03/15 | 14.27 | 410.17 |
| | | 12/17/15 | 14.22 | 410.22 |
| | | 02/09/16 | 13.89 | 410.55 |
| | | 04/14/16 | 13.79 | 410.65 |
| | | 06/14/16 | 13.54 | 410.90 |
| | | 08/24/16 | 13.37 | 411.07 |
| | | 10/04/16 | 13.28 | 411.16 |
| | | 12/19/16 | 13.25 | 411.19 |
| FGD-2 | 439.36 | 11/03/15 | 29.31 | 410.05 |
| | | 12/17/15 | 29.39 | 409.97 |
| | | 02/09/16 | 29.03 | 410.33 |
| | | 04/14/16 | 28.89 | 410.47 |
| | | 06/14/16 | 28.21 | 411.15 |
| | | 08/24/16 | 28.22 | 411.14 |
| | | 10/04/16 | 28.06 | 411.30 |
| | | 12/19/16 | 28.50 | 410.86 |
| FGD-3 | 434.90 | 11/03/15 | 24.76 | 410.14 |
| | | 12/17/15 | 24.33 | 410.57 |
| | | 02/09/16 | 24.08 | 410.82 |
| | | 04/14/16 | 24.11 | 410.79 |
| | | 06/14/16 | 23.21 | 411.69 |
| | | 08/24/16 | 23.74 | 411.16 |
| | | 10/04/16 | 23.39 | 411.51 |
| | | 12/19/16 | 23.69 | 411.21 |
| FGD-4 | 432.03 | 11/03/15 | 21.84 | 410.19 |
| | | 12/17/15 | 21.89 | 410.14 |
| | | 02/09/16 | 21.31 | 410.72 |
| | | 04/14/16 | 21.21 | 410.82 |
| | | 06/14/16 | 20.47 | 411.56 |
| | | 08/24/16 | 20.99 | 411.04 |
| | | 10/04/16 | 20.79 | 411.24 |
| | | 12/19/16 | 21.02 | 411.01 |
| FGD-5 | 433.01 | 11/03/15 | 22.81 | 410.20 |
| | | 12/17/15 | 22.58 | 410.43 |
| | | 02/09/16 | 22.73 | 410.28 |
| | | 04/14/16 | 22.27 | 410.74 |
| | | 06/14/16 | 21.81 | 411.20 |
| | | 08/24/16 | 21.68 | 411.33 |
| | | 10/04/16 | 21.68 | 411.33 |
| | | 12/19/16 | 21.69 | 411.32 |
| FGD-6 | 428.62 | 11/03/15 | 18.44 | 410.18 |
| | | 12/17/15 | 18.04 | 410.58 |
| | | 02/09/16 | 17.96 | 410.66 |
| | | 04/14/16 | 17.89 | 410.73 |
| | | 06/14/16 | 17.22 | 411.40 |
| | | 08/24/16 | 17.51 | 411.11 |
| | | 10/04/16 | 17.37 | 411.25 |
| | | 12/19/16 | 17.72 | 410.90 |

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**TABLE 2**
**GROUNDWATER ELEVATION SUMMARY**
**FGD POND AREA**
**OAK GROVE STEAM ELECTRIC STATION**

| Well ID | TOC Elevation (ft amsl) | Date | Depth to Water (ft btoc) | Water Elevation (ft amsl) |
|---|---|---|---|---|
| FGD-8 | 440.15 | 11/03/15 | 16.39 | 423.76* |
| | | 12/17/15 | 16.26 | 423.89* |
| | | 02/09/16 | 29.64 | 410.51 |
| | | 04/14/16 | 29.54 | 410.61 |
| | | 06/14/16 | 29.37 | 410.78 |
| | | 08/24/16 | 29.16 | 410.99 |
| | | 10/04/16 | 28.81 | 411.34 |
| | | 12/19/16 | 29.21 | 410.94 |
| FGD-11 | 452.22 | 11/03/15 | 20.67 | 431.55* |
| | | 12/17/15 | 20.61 | 431.61* |
| | | 02/09/16 | 41.62 | 410.60 |
| | | 04/14/16 | 40.04 | 412.18 |
| | | 06/14/16 | 39.81 | 412.41 |
| | | 08/24/16 | 39.59 | 412.63 |
| | | 10/04/16 | 41.59 | 410.63 |
| | | 12/19/16 | 42.01 | 410.21 |
| FGD-12 | 443.16 | 11/03/15 | 33.82 | 409.34 |
| | | 12/17/15 | 33.69 | 409.47 |
| | | 02/09/16 | 32.42 | 410.74 |
| | | 04/14/16 | 32.04 | 411.12 |
| | | 06/14/16 | 32.02 | 411.14 |
| | | 08/24/16 | 31.89 | 411.27 |
| | | 10/04/16 | 31.77 | 411.39 |
| | | 12/19/16 | 31.96 | 411.20 |

Notes:
1. Abbreviations: TOC - top of casing; ft - feet, amsl - above mean sea level.
2. * - Measurement appears to be erroneous based on subsequent measurements. Result was not used to construct groundwater potentiometric surface map.

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**TABLE 3**
**SUMMARY OF AQUIFER TEST RESULTS**
**FGD POND AREA**
**OAK GROVE STEAM ELECTRIC STATION**

| Well ID | Test Type | Aquifer Type | Analysis Method | Saturated Thickness (feet) | Results | |
|---|---|---|---|---|---|---|
| | | | | | T ($cm^2$/sec) | K (cm/sec) |
| **FGD Pond Area** | | | | | | |
| FGD-5 | Slug-Out | Unconfined | Bouwer-Rice | 12.65 | **1.23E-01** | **3.19E-04** |
| | | | | | | |
| FGD-11 | Slug-Out | Unconfined | Bouwer-Rice | 12.86 | **3.55E-02** | **9.07E-05** |
| | | | | | | |
| FGD-12 | Slug-In | Unconfined | Bouwer-Rice | 11.45 | 6.00E-01 | 1.72E-03 |
| FGD-12 | Slug-Out | Unconfined | Bouwer-Rice | 11.45 | 1.13E+00 | 3.25E-03 |
| | | | | **Mean** | **8.67E-01** | **2.48E-03** |
| | | | | **Geometric mean for all tests** | **1.56E-01** | **4.16E-04** |

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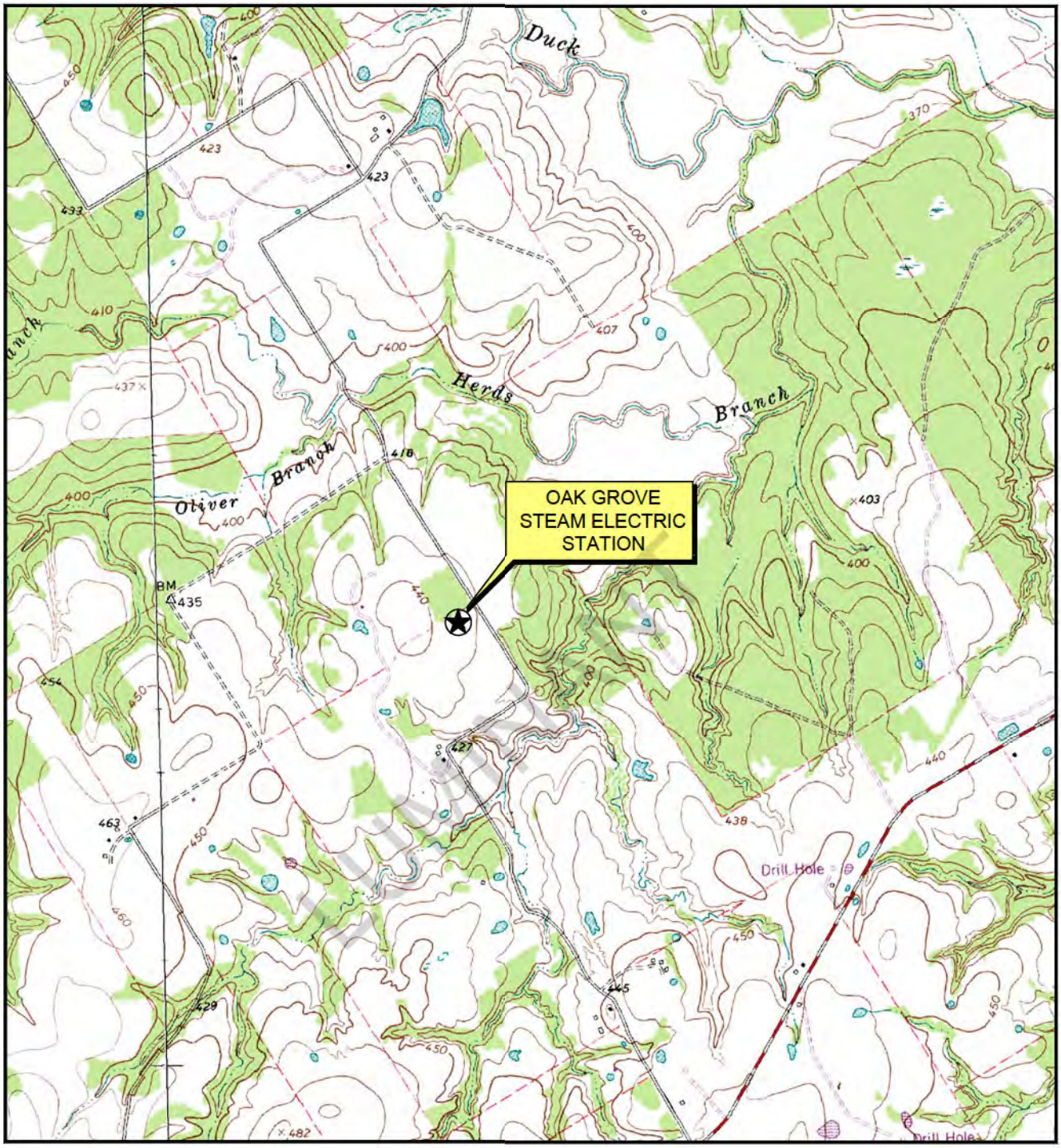
**Figures**



QUADRANGLE LOCATION

N

Scale in Feet

0 1000 2000

SOURCE:
Base map from www.tnris.gov, Bald Prairie, TX 7.5 min. USGS quadrangle dated 1965, revised 1982.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 1

**FGD POND AREA**
**SITE LOCATION MAP**

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: NOV, 2015 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

**EXPLANATION**

CCR Monitoring Well

N

Scale in Feet

0 350 700

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 2

**FGD POND AREA DETAILED SITE PLAN**

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

## EXPLANATION

- CCR Monitoring Well
- A A' Geologic Cross Section Location Lines

N

Scale in Feet

0 350 700

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 3

# FGD POND AREA CROSS SECTION LOCATION MAP

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

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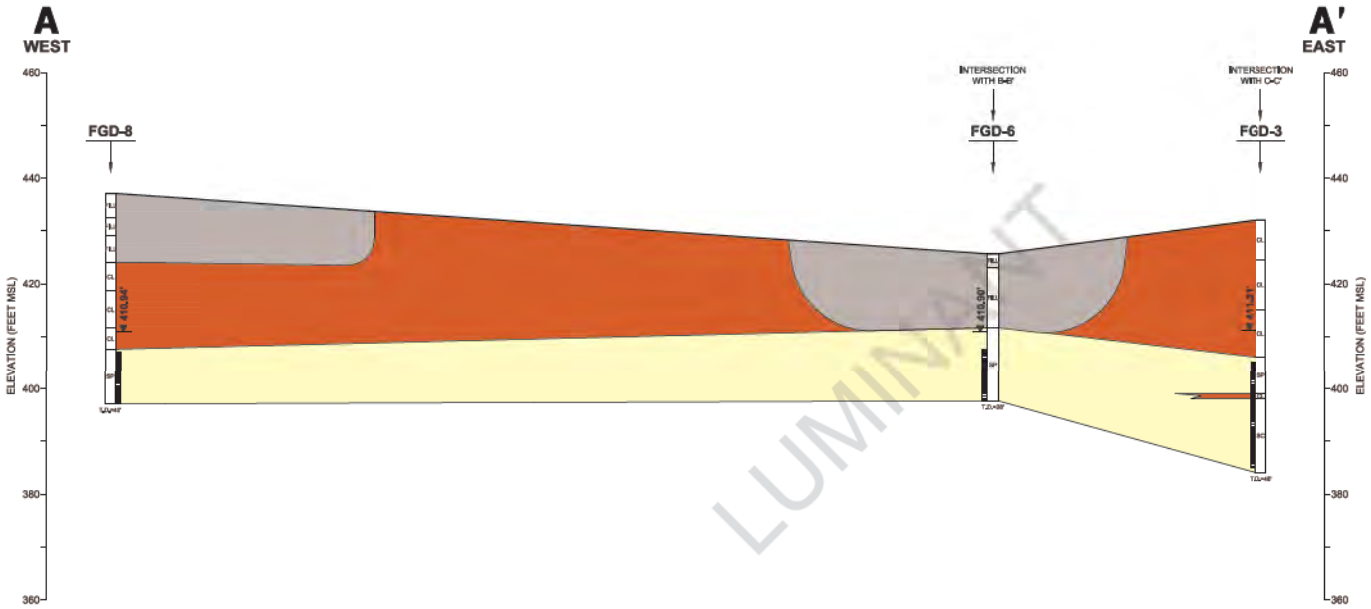
CONSULTING ENGINEERS AND SCIENTISTS

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SCALE IN FEET

VERTICAL 20

HORIZONTAL 200

10x Vertical Exaggeration

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 4

**FGD POND AREA**
**A-A' CROSS SECTION**

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: OCT., 2017 | CHECKED: PJB | |

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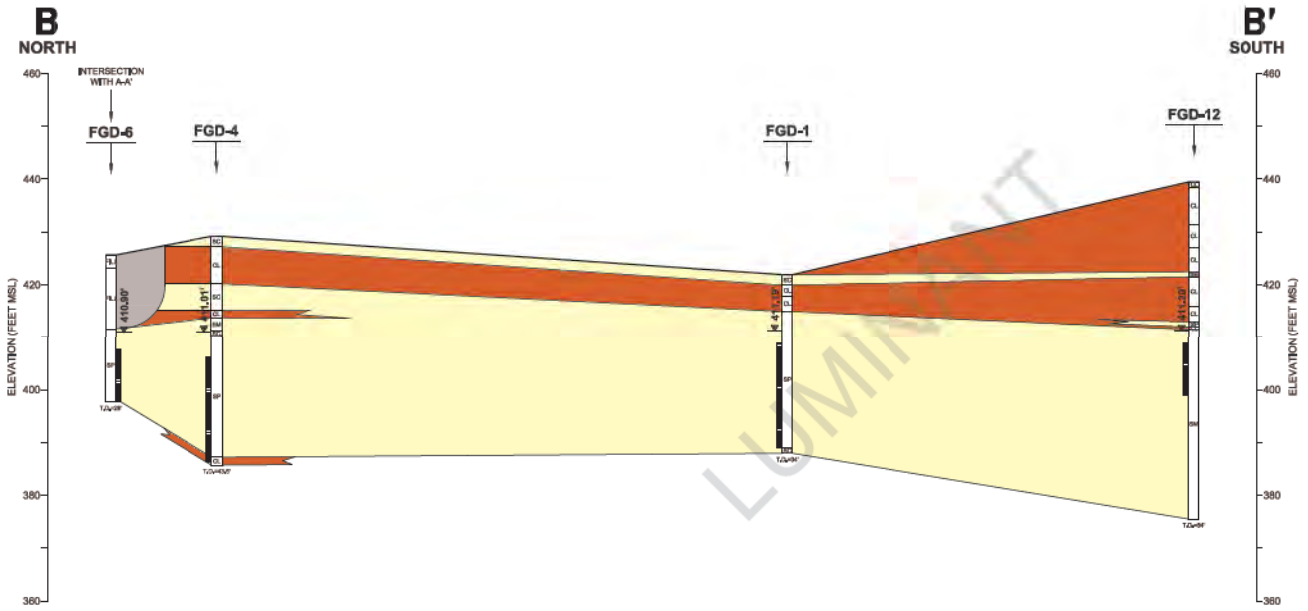


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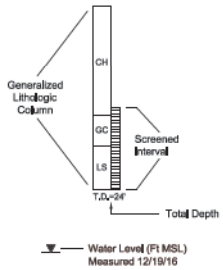
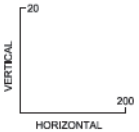
EXPLANATION

SAND
CLAY
FILL

MONITORING WELL CONSTRUCTION




SCALE IN FEET




10x Vertical Exaggeration

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 5

**FGD POND AREA**
**B-B' CROSS SECTION**

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: OCT., 2017 | CHECKED: PJB | |

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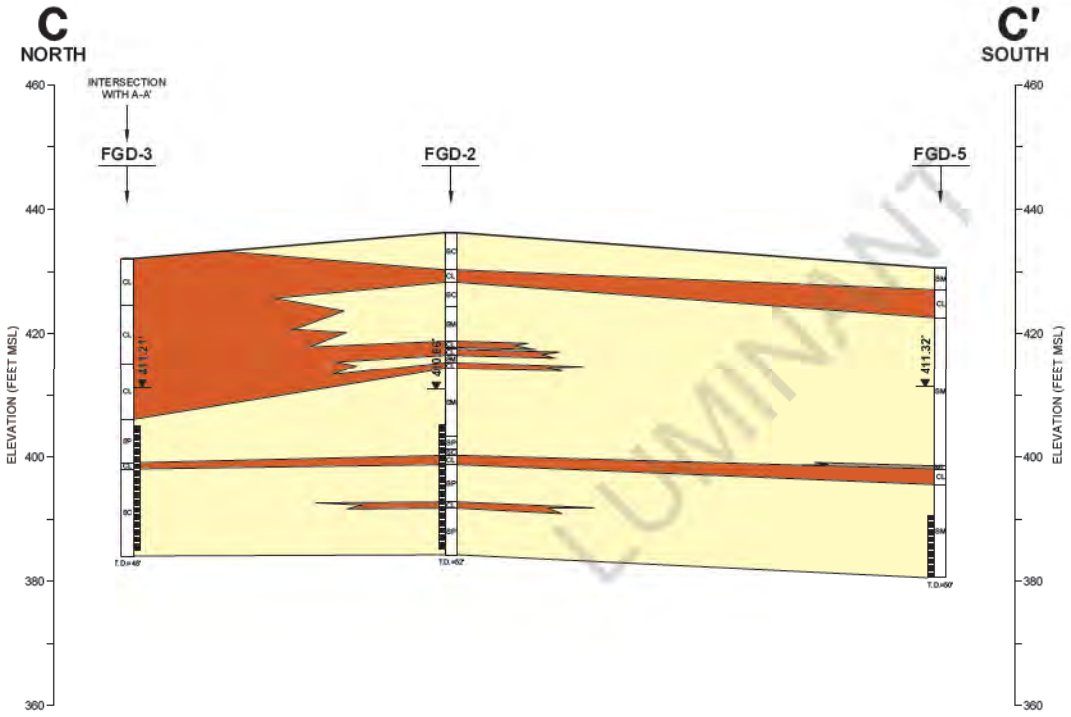
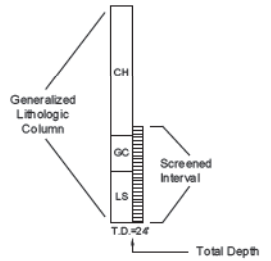



EXPLANATION

- SAND
- CLAY
- SILT

MONITORING WELL CONSTRUCTION




SCALE IN FEET

VERTICAL 20

HORIZONTAL 200

10x Vertical Exaggeration

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 6

**FGD POND AREA**
**C-C' CROSS SECTION**

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: OCT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

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# Appendix A

# CCR Monitoring Well Logs

# RECORD OF BOREHOLE MW-FGD-01

SHEET 1 OF 2
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 27-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4549.42
EASTING (ft): 2454.41
ELEVATION (ft): 421.91

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL ⊖W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy with vegetation | | | | | | | | | | |
| | | GROUND SURFACE | | 421.9 | | | | | | | | |
| 0 | | Firm, brown to light brown, sandy CLAY, some vegetative presence, dry | | 0.0 | SB-1 | | 2<br>3<br>3<br>N6 | 40 | | | | |
| | | trace red at 1.5' | | | | | | | | | | |
| 2 | | Hard, grayish brown with red, CLAY, with sand, dry | | 2.0 | SB-2 | | 8<br>20<br>32<br>N52 | 67 | | | | |
| 4 | | Hard, gray, trace red, silty CLAY, dry | | 4.0 | SB-3 | | 10<br>14<br>18<br>N32 | 73 | | | | |
| 6 | | red, some iron oxide at 6' | | | | | | | | | | |
| | | Compact, grayish brown, SAND, with silt, damp | | 7.0 | SB-4 | | 7<br>13<br>14<br>N27 | 87 | | | | |
| 8 | | reddish brown, some clay at 8' | | | SB-5 | | 6<br>7<br>8<br>N15 | 87 | | | | |
| 10 | | trace red at 10' | | | SB-6 | | 7<br>8<br>8<br>N16 | 87 | | | | |
| 12 | | | | | SB-7 | | 3<br>10<br>13<br>N23 | 67 | | | | |
| 14 | | wet at 14' | | | SB-8 | | 7<br>9<br>9<br>N18 | 100 | | | | ▼ 14' 08/27/2008 |
| 16 | | | | | SB-9 | | 1<br>10<br>12<br>N22 | 87 | | | | |
| 18 | | | | | SB-10 | | 1<br>10<br>19<br>N29 | 93 | | | | |
| 20 | | some yellowish brown at 19.5' | | | | | | | | | | |
| | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

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DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-01



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 27-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4549.42
EASTING (ft): 2454.41
ELEVATION (ft): 421.91

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ❖ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | very dense at 20' | | 20.0 | SB-11 | | 15<br>26<br>35<br>N61 | 87 | | | | |
| 22 | | dense, grayish brown and mottled yellow at 22' | | | SB-12 | | 17<br>21<br>27<br>N48 | 100 | | | | |
| 24 | | very dense, moist at 24' | | | SB-13 | | 18<br>25<br>35<br>N60 | 87 | | | | |
| 26 | | | | | SB-14 | | 16<br>17<br>35<br>N52 | 93 | | | | |
| 28 | | | | | SB-15 | | 20<br>35<br>36<br>N71 | 100 | | | | |
| 30 | | | | | SB-16 | | 18<br>28<br>32<br>N60 | 87 | | | | |
| 32 | | | | | | | | | | | | |
| | | Very dense, dark brownish gray, clayey SAND, trace iron oxide, damp | | 33.0 | SB-17 | | 21<br>36<br>50/5" | 93 | | | | |
| 34 | | BORING TERMINATED AT 34' | | 34.0 | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-02

SHEET 1 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 436.2 | | | | | | | | |
| | | Stiff, brown with some dark brown, sandy CLAY, some gravel, damp | | 0.0 | SB-1 | | 4<br>4<br>5<br>N9 | 27 | | | | |
| 2 | | very stiff, dark brown at 2' | | | SB-2 | | 4<br>7<br>16<br>N23 | 47 | | | | |
| 4 | | very stiff, brown to yellowish brown, some iron oxide traces, possible lignite traces, dry at 4' | | | SB-3 | | 7<br>10<br>13<br>N23 | 53 | | | | |
| 6 | | Very stiff, mottled gray and brown, CLAY, some gravel, dry | | 6.0 | SB-4 | | 5<br>13<br>15<br>N28 | 67 | | | | |
| 8 | | Very stiff, brown, yellow, and gray, mottled, sandy CLAY | | 8.0 | SB-5 | | 5<br>13<br>16<br>N29 | 53 | | | | |
| 10 | | hard at 10' | | | SB-6 | | 7<br>13<br>20<br>N33 | 80 | | | | |
| | | gray at 11' | | | | | | | | | | |
| 12 | | Dense, light gray, fine, silty SAND, with a seam of clay, damp | | 12.0 | SB-7 | | 14<br>17<br>21<br>N38 | 87 | | | | |
| 14 | | | | | SB-8 | | 10<br>19<br>27<br>N46 | 93 | | | | |
| 16 | | | | | SB-9 | | 16<br>23<br>24<br>N47 | 87 | | | | |
| | | seam of hard CLAY | | 17.5 | | | | | | | | |
| 18 | | very dense at 18' | | | | | | | | | | |
| | | | | 18.5 | | | | | | | | |
| | | seam of very hard CLAY | | 18.8 | SB-10 | | 10<br>25<br>36<br>N61 | 87 | | | | |
| | | | | 19.8 | | | | | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-02



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | dense at 20' | | 20.0 | SB-11 | | 14<br>19<br>27<br>N46 | 92 | | | | |
| | | seam of hard CLAY | | 21.0 | | | | | | | | |
| 22 | | very dense at 22' | | 22.0 | SB-12 | | 13<br>27<br>37<br>N64 | 100 | | | | |
| 24 | | | | | SB-13 | | 17<br>29<br>28<br>N57 | 87 | | | | |
| 26 | | | | | SB-14 | | 17<br>25<br>42<br>N67 | 67 | | | | |
| | | yellow at 27.5' | | | | | | | | | | |
| 28 | | | | | SB-15 | | 20<br>39<br>50/5" | 87 | | | | |
| 30 | | gray at 30.5' | | | SB-16 | | 25<br>45<br>24<br>N69 | 87 | | | | |
| 32 | | | | | | | | | | | | ▼ 32' 08/22/2008 |
| | | Very loose, brown, SAND, moist | | 33.0 | SB-17 | | 4<br>1<br>2<br>N3 | 80 | | | | |
| 34 | | | | | | | | | | | | |
| | | Very stiff, brown, sandy CLAY, moist | | 35.0 | SB-18 | | 7<br>14<br>14<br>N28 | 73 | | | | |
| 36 | | Hard, brown, CLAY, with silt, moist | | 36.0 | SB-19 | | 8<br>25<br>50/4" | 93 | | | | |
| | | Very dense, brown, SAND | | 37.5 | | | | | | | | |
| 38 | | gray and yellow, mottled at 39' | | | SB-20 | | 20<br>45<br>50/3" | 80 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-02

SHEET 3 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ❖ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | brownish gray at 40' | | 40.0 | SB-21 | | 24<br>42<br>50/4" | 87 | | | | |
| 42 | | gray at 41'<br>dense at 42' | | | SB-22 | | 32<br>25<br>22<br>N47 | 100 | | | | |
| 44 | | seam of hard, yellowish gray and brown, CLAY at 43.5' | | 43.5 | | | | | | | | |
| | | very dense at 44' | | 44.5 | SB-23 | | 18<br>36<br>50/4" | 100 | | | | |
| 46 | | | | | SB-24 | | 32<br>45<br>50/3" | 73 | | | | |
| 48 | | | | | SB-25 | | 24<br>24<br>50/5" | 80 | | | | |
| 50 | | | | | SB-26 | | 32<br>45<br>50/3" | 87 | | | | |
| 52 | | BORING TERMINATED AT 52' | | 52.0 | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03

SHEET 1 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy | | | | | | | | | | |
| | | GROUND SURFACE | | 432.0 | | | | | | | | |
| 0 | | Soft to firm, reddish brown, CLAY, with sand, some gravel | | 0.0 | SB-1 | | 2<br>2<br>2<br>N4 | 33 | | | | |
| 2 | | | | | ST-2 | | | 70 | ⊕ | | | |
| 4 | | very stiff, brown, mottled at 4' | | | SB-3 | | 5<br>7<br>12<br>N19 | 83 | | | | |
| 6 | | | | | SB-4 | | 5<br>12<br>15<br>N27 | 93 | | | | |
| | | Very stiff, gray, silty CLAY | | 7.5 | | | | | | | | |
| 8 | | | | | SB-5 | | 5<br>8<br>12<br>N20 | 87 | | | | |
| 10 | | trace brown at 10' | | | SB-6 | | 4<br>7<br>9<br>N16 | 93 | | | | |
| 12 | | stiff, light brown at 12' | | | SB-7 | | 3<br>5<br>7<br>N12 | 73 | | | | |
| 14 | | | | | SB-8 | | 3<br>5<br>6<br>N11 | 87 | | | | |
| 16 | | | | | ST-9 | | | 55 | ⊕ | | | |
| | | Stiff, brown, CLAY, damp | | 17.0 | | | | | | | | |
| 18 | | firm to stiff at 18' | | | SB-10 | | 2<br>3<br>5<br>N8 | 100 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03


DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | firm at 20' | | 20.0 | SB-11 | | 2<br>2<br>3<br>N5 | 100 | | | | |
| 22 | | firm to stiff at 22' | | | SB-12 | | 2<br>3<br>5<br>N8 | 100 | | | | |
| 24 | | dark brown, some silt at 24' | | | SB-13 | | 2<br>3<br>5<br>N8 | 87 | | | | |
| 26 | | Dense, light brown, SAND, moist | | 26.0 | SB-14 | | 12<br>15<br>30<br>N45 | 73 | | | | ▼ *26' 08/21/2008* |
| 28 | | very dense, gray at 28' | | | SB-15 | | 12<br>31<br>30<br>N61 | 73 | | | | |
| 30 | | dense, trace yellowish brown at 30' | | | SB-16 | | 5<br>14<br>17<br>N31 | 67 | | | | |
| 32 | | | | | SB-17 | | 3<br>13<br>21<br>N34 | 67 | | | | |
| | | Hard, brown, some mottled dark brown, CLAY, damp | | 33.0 | | | | | | | | |
| 34 | | Hard, gray and yellowish brown mottled, sandy CLAY, some iron staining | | 34.0 | SB-18 | | 6<br>21<br>23<br>N44 | 67 | | | | |
| 36 | | | | | SB-19 | | 5<br>13<br>20<br>N33 | 87 | | | | |
| 38 | | | | | SB-20 | | 7<br>16<br>25<br>N41 | 80 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03

SHEET 3 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ❖ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | trace iron oxide at 40' | | 40.0 | | | | | | | | |
| 42 | | | | | SB-21 | | 7<br>16<br>25<br>N41 | 80 | | | | |
| 44 | | | | | SB-22 | | 10<br>19<br>29<br>N48 | 74 | | | | |
| 46 | | | | | ST-23 | | | 100 | | | | |
| 48 | | | | | SB-24 | | 13<br>23<br>36<br>N59 | 73 | | | | |
| | | BORING TERMINATED AT 48' | | 48.0 | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-04

SHEET 1 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 429.2 | | | | | | | | |
| | | Brown, sandy CLAY, damp | | 0.0 | ST-1 | | | 75 | | | | |
| 2 | | Brown, CLAY, with silt, damp | | 2.0 | ST-2 | | | 65 | | | | |
| 4 | | very stiff, reddish and yellowish brown, mottled, with occasional calcareous nodules at 4' | | | SB-3 | | 4<br>6<br>10<br>N16 | 67 | | | | |
| 6 | | | | | ST-4 | | | 87 | | | | |
| 8 | | | | | SB-5 | | 9<br>11<br>14<br>N25 | 27 | | | | |
| | | Very stiff, brown, sandy CLAY, damp | | 9.0 | | | | | | | | |
| | | with occasional coarse, angular gravel at 9.5' | | | | | | | | | | |
| 10 | | reddish brown at 10' | | | SB-6 | | 7<br>9<br>9<br>N18 | 53 | | | | |
| 12 | | stiff at 12' | | | SB-7 | | 10<br>5<br>4<br>N9 | 40 | | | | |
| 14 | | Stiff, reddish brown, CLAY, with sand, damp | | 14.0 | SB-8 | | 4<br>6<br>5<br>N11 | 27 | | | | |
| | | Compact, brown, fine, silty SAND, damp | | 15.5 | | | | | | | | |
| 16 | | light brown at 16.25' | | | SB-9 | | 7<br>12<br>14<br>N26 | 93 | | | | |
| | | reddish brown at 17.25' | | | | | | | | | | |
| 18 | | Compact, reddish brown, clayey SAND, moist | | 18.0 | SB-10 | | 5<br>8<br>15<br>N23 | 87 | | | | |
| | | Compact, light brown, fine, SAND, moist | | 19.0 | | | | | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-04

SHEET 2 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✥ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | dense, occasional seams of gray at 20' | | 20.0 | SB-11 | | 6<br>20<br>20<br>N40 | 100 | | | | |
| 22 | | occasional streaks of yellowish brown at 22' | | | SB-12 | | 12<br>15<br>19<br>N34 | 93 | | | | ▼ 22' 08/20/2008 |
| 24 | | very dense, gray with mottled reddish brown at 24' | | | SB-13 | | 14<br>28<br>30<br>N58 | 100 | | | | |
| 26 | | dense, mottled, reddish brown, yellowish brown, and gray at 26' | | | SB-14 | | 13<br>21<br>22<br>N43 | 100 | | | | |
| 28 | | very dense at 28' | | | SB-15 | | 11<br>15<br>50<br>N65 | 87 | | | | |
| 30 | | dense at 30' | | | SB-16 | | 8<br>15<br>21<br>N36 | 87 | | | | |
| 32 | | | | | SB-17 | | 14<br>18<br>27<br>N45 | 80 | | | | |
| 34 | | very dense at 34' | | | SB-18 | | 20<br>31<br>35<br>N66 | 100 | | | | |
| 36 | | | | | SB-19 | | 20<br>31<br>31<br>N62 | 100 | | | | |
| 38 | | | | | SB-20 | | 21<br>42<br>50/5" | 100 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-04

SHEET 3 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ❖ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | | | 40.0 | SB-21 | | 18<br>35<br>33<br>N68 | 100 | | | | |
| 42 | | Hard, gray, CLAY, with sand | | 42.0 | SB-22 | | 11<br>21<br>34<br>N55 | 100 | | | | |
| 44 | | BORING TERMINATED AT 43.5' | | 43.5 | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

LUMINANT

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

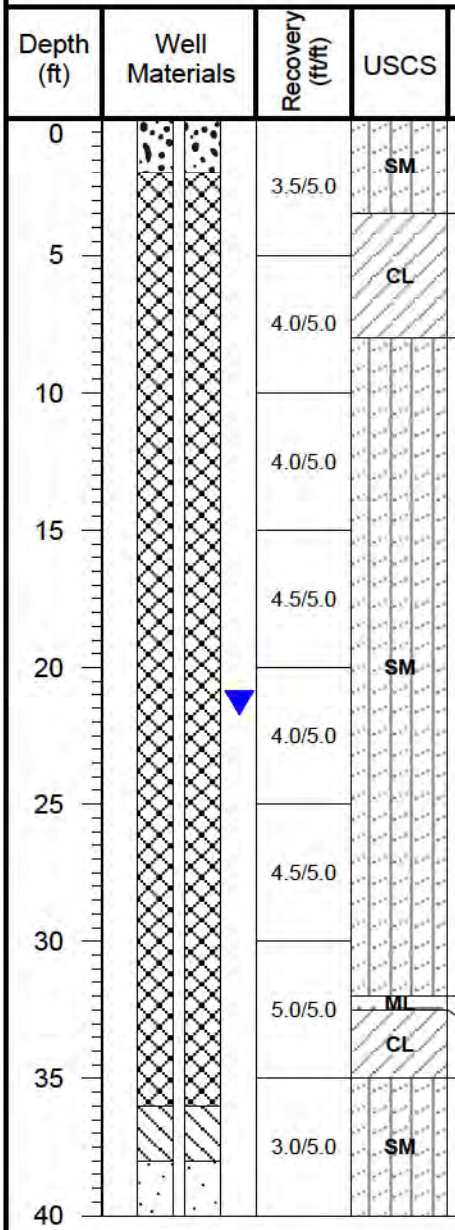
# Luminant Power

# Log of Boring: FGD-5

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/3/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 50 |
| Driller's License: | 3121 | Northing: | 571950.33 |
| Field Supervisor: | Chris Moore | Easting: | 3200628.33 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 430.54 |




| Lithologic Description |
|---|
| SILTY SAND, SM, brown, moist, soft. |
| SILTY CLAY, CL, mottled yellowish brown and yellowish red, moist, firm, with sand from 6'-8'. |
| SILTY SAND, SM, banded very pale brown and brownish yellow, moist, soft to firm, laminated, very fine grained, trace thinly laminated silt lenses. |
| SILT, ML, brown, moist to wet, very soft to soft. |
| CLAY, CL, dark gray, moist, firm to hard, with thinly laminated silt and sand lenses. |
| SILTY SAND, SM, dark gray to gray, moist, soft to firm, very fine grained, some thinly laminated silt lenses, trace thin carbonaceous lenses, wet at 40', clayey lenses at: 40.5' -41', 44'-44.5, and, 47'-48'. |

LUMINANT

**PBW**
**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 23.67 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 36.0) Cement/Bentonite Grout
(36.0 - 38.0) Bentonite Chips
(38.0 - 50.0) 12/20 Silica Sand

Well Materials
(+2.4 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

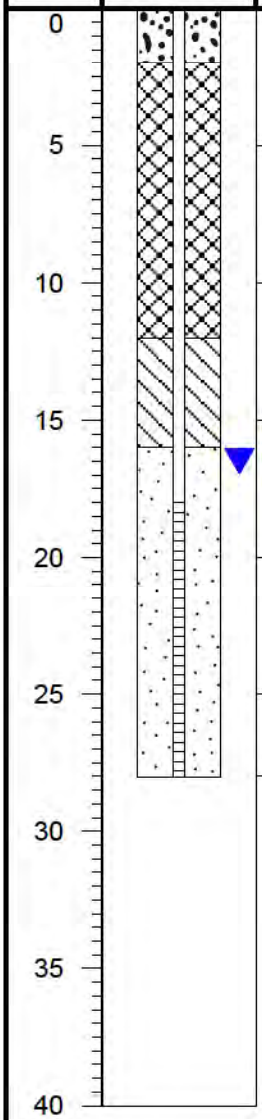
# Luminant Power

# Log of Boring: FGD-6

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/4/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 28 |
| Driller's License: | 3121 | Northing: | 573195.06 |
| Field Supervisor: | Chris Moore | Easting: | 3200525.61 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 425.63 |




| Lithologic Description |
|---|
| FILL, sandy clay, yellowish brown, moist, soft to firm, very fine grained sand. |
| FILL, clay, olive gray, moist, firm, with concrete fragments. |
| SAND, SP, yellowish brown, wet, soft, laminated, very fine grained, becomes gray at 26'. |

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**PBW**
**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 19.48 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 14.0) Cement/Bentonite Grout
(14.0 - 16.0) Bentonite Chips
(16.0 - 28.0) 12/20 Silica Sand

Well Materials
(+3.0 - 18.0) Casing, 2" Sch 40 FJT PVC
(18.0 - 28.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

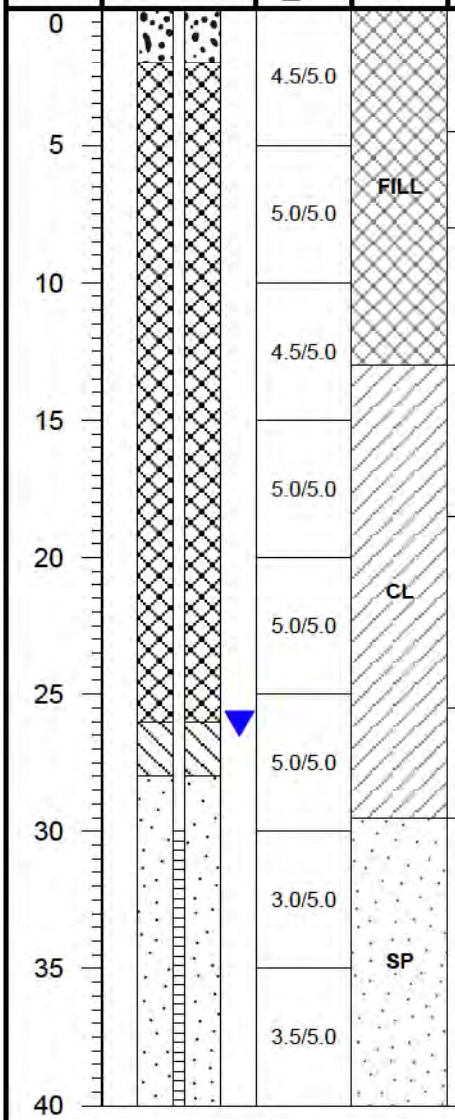
# Luminant Power

# Log of Boring: FGD-8

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/4/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 40 |
| Driller's License: | 3121 | Northing: | 573033.29 |
| Field Supervisor: | Chris Moore | Easting: | 3198862.3 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 437.06 |




Lithologic Description

FILL, silty clay, CL, brown, moist, soft to firm.

FILL, silty sand, SM, very pale brown, dry to moist, soft, very fine grained.

FILL, silty clay, CL, dark gray, moist, firm, crumbles easily, some sand layers.

SANDY, CLAY, CL, strong brown, moist, firm, laminated, very fine grained sand

SILTY CLAY, CL, dark gray, moist, firm, with sand laminae.

SILTY CLAY, CL, mottled gray and brown, moist, firm to hard, some sand laminae, some oxidized staining.

SAND, SP, dark gray, wet, very soft to soft, very fine grained, some silty laminae.

LUMINANT

**PBW**
**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 29.11 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 26.0) Cement/Bentonite Grout
(26.0 - 28.0) Bentonite Chips
(28.0 - 40.0) 12/20 Silica Sand

Well Materials
(+3.0 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-11



**CLIENT** Luminant Power
**PROJECT NAME** Luminant
**PROJECT NUMBER** 1406296
**PROJECT LOCATION** Oak Grove SES
**DATE STARTED** 11/25/14 **COMPLETED** 11/26/14
**GROUND ELEVATION** 448.67 ft **HOLE SIZE** 6 inches
**DRILLING CONTRACTOR** Envirotech
**GROUND WATER LEVELS:**
**DRILLING METHOD** Auger
**AT TIME OF DRILLING 40** 40' bgs
**LOGGED BY** DMW **CHECKED BY** CFR
**AT END OF DRILLING**
**NOTES**
**AFTER DRILLING**

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 0 | | Firm, brown and green, CLAY, and topsoil, moist | | | | | |
| | | Hard, brown and tan, SANDY CLAY, moist | ST | 75 | | 1.0 | |
| | | | ST | 50 | | 4.5 | |
| 5 | | | ST | 54 | | 4.5 | |
| | | | SS | 58 | 3-5-7-10 (12) | | |
| | | | SS | 79 | 6-8-8-9 (16) | | |
| 10 | | | SS | 67 | 5-9-10-12 (19) | | |
| | | | SS | 71 | 6-8-9-12 (17) | | |
| | | Very stiff, red and black, CLAY, with brown sand, moist | | | | | |
| 15 | | Stiff, brown and tan, SANDY CLAY, moist | SS | 67 | 6-8-6-7 (14) | | |
| | | maroon, gravel sized rocks at 15.0' | SS | 92 | 5-6-8-9 (14) | | |
| | | | SS | 79 | 4-6-8-9 (14) | | |
| 20 | | Compact, brown and tan, CLAYEY SAND, moist | | | | | |
| | | with gray and brown clay lenses at 21.0' | SS | 71 | 6-8-7-8 (15) | | |
| | | loosely consolidated sand at 23.0' | SS | 79 | 7-8-11-15 (19) | | |
| 25 | | orange mottlings at 25.0' | SS | 83 | 9-13-17-19 (30) | | |
| | | | SS | 83 | 9-10-14-16 (24) | | |
| | | Very stiff, gray, SAND and CLAY, moist | SS | 92 | 8-9-18-21 (27) | | |
| 30 | | dense at 29.5' | | | | | |

SPT N VALUE
20 40 60 80
PL MC LL
20 40 60 80
FINES CONTENT (%)
20 40 60 80

LUMINANT

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Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-11



**CLIENT** Luminant Power **PROJECT NAME** Luminant

**PROJECT NUMBER** 1406296 **PROJECT LOCATION** Oak Grove SES

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 30 | | Very stiff, gray, SAND and CLAY, moist *(continued)* | SS | 83 | 9-13-17-19 (30) | | |
| | | without clay at 31.0' | SS | 88 | 10-16-22-22 (38) | | |
| | | Dense, gray and tan, SILTY SAND, moist | SS | 83 | 7-11-17-17 (28) | | |
| | | poorly consoldiated at 33.0' | | | | | |
| 35 | | | SS | 71 | 6-13-14-15 (27) | | |
| | | Very stiff, gray, SILTY CLAY, moist | SS | 75 | 4-6-13-17 (19) | | |
| | | Dense, gray and tan, SILTY SAND, moist | | | | | |
| | | moist to wet at 38.0' | SS | 71 | 6-5-8-10 (13) | | |
| 40 | | Compact, gray and tan, SAND, moist to wet | SS | 67 | 3-4-4-7 (8) | | |
| | | Compact, gray and tan, SILTY SAND, wet | | | | | |
| | | Very stiff, gray, SILTY CLAY, moist | SS | 88 | 7-9-10-13 (19) | | |
| 45 | | Dense, gray and tan, SILTY SAND, moist to wet | SS | 92 | 3-8-24-28 (32) | | |
| | | moist at 46.0' | SS | 83 | 4-8-26-40 (34) | | |
| | | slightly wet at 48.0' | SS | 75 | 14-28-29-34 (57) | | |
| 50 | | very dense at 50.0' | SS | 92 | 9-38-50 (88) | | |
| | | moist at 52.0' | SS | 83 | 15-28-46-50 (74) | | |
| | | moist to wet at 54.0' | SS | 71 | 14-36-50 (86) | | |
| 55 | | | SS | | 21-39-48-113 (87) | | |

Bottom of borehole at 58.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
□ FINES CONTENT (%) □
20 40 60 80

LUMINANT

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Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-12



**CLIENT** Luminant Power
**PROJECT NAME** Luminant
**PROJECT NUMBER** 1406296
**PROJECT LOCATION** Oak Grove SES
**DATE STARTED** 11/26/14 **COMPLETED** 11/26/14
**GROUND ELEVATION** 439.48 ft **HOLE SIZE** 6 inches
**DRILLING CONTRACTOR** Envirotech
**GROUND WATER LEVELS:**
**DRILLING METHOD** Auger
**AT TIME OF DRILLING 32** 32' bgs
**LOGGED BY** DMW **CHECKED BY** CFR
**AT END OF DRILLING**
**NOTES**
**AFTER DRILLING**

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) | ▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|
| 0 | | Firm, brown, CLAY, topsoil, moist | ST | 46 | | 1.0 | | |
| | | Hard, brown, SANDY CLAY, moist | ST | 63 | | 4.5 | | |
| 5 | | | ST | 42 | | 4.5 | | |
| | | | SS | 75 | 6-8-10-7 (18) | | | ▲ |
| | | Firm, red, orange and gray, CLAY, moist, with red and orange mottling | SS | 75 | 5-8-10-11 (18) | | | ▲ |
| 10 | | | SS | 75 | 6-8-12-14 (20) | | | ▲ |
| | | Very stiff, gray and red, SILTY CLAY, moist, silt partings | SS | 71 | 4-8-14-15 (22) | | | ▲ |
| 15 | | increasing silt at 15.0' | SS | 63 | 8-10-19-16 (29) | | | ▲ |
| | | decreasing silt at 16.0' | SS | 75 | 5-9-12-16 (21) | | | ▲ |
| | | Dense, red and gray, SANDY SILT, moist<br>increasing silt at 17.5' | SS | 79 | 8-14-12-8 (26) | | | ▲ |
| | | Compact, orange and tan, SILTY SAND, moist | SS | 63 | 7-5-5-6 (10) | | | ▲ |
| 20 | | loosely consoldiated at 19.0' | SS | 83 | 9-12-13-15 (25) | | | ▲ |
| | | increased clay at 20.0' | SS | | 17-11-16-20 (27) | | | ▲ |
| | | more consolidated at 21.0' | SS | | 12-18-14-15 (32) | | | ▲ |
| | | Stiff, gray, SILTY CLAY, moist, silt partings | SS | 83 | 9-19-19-17 (38) | | | ▲ |
| 25 | | intervals of gray sand mixed with silty clay at 25.0' | | | | | | |
| | | Dense, gray, SAND, moist | | | | | | |
| | | Stiff, gray, SILTY CLAY, moist | | | | | | |
| | | Dense, gray, SILTY SAND, with interbedded clay, moist, with red staining | | | | | | |
| 30 | | | | | | | | |

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Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-12



**CLIENT** Luminant Power **PROJECT NAME** Luminant

**PROJECT NUMBER** 1406296 **PROJECT LOCATION** Oak Grove SES

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 30 | | Dense, gray, SILTY SAND, with interbedded clay, moist, with red staining *(continued)* | SS | 88 | 4-5-15-24 (20) | | |
| | | ▽ red to moist, turning red at 32.0' | SS | 67 | 10-16-30-28 (46) | | |
| 35 | | brown to gray at 34.0' | SS | 63 | 14-24-48-42 (72) | | |
| | | | SS | 92 | 8-18-32-42 (50) | | |
| | | increasing sand at 38.0' | SS | 92 | 8-26-48-50 (74) | | |
| 40 | | | SS | 92 | 3-4-10-26 (14) | | |
| | | gray and tan at 42.0' | SS | 92 | 13-24-42-43 (66) | | |
| 45 | | | SS | 92 | 16-30-45-50 (75) | | |
| | | | SS | 58 | 20-36-50 (86) | | |
| | | | SS | 88 | 16-40-50 (90) | | |
| 50 | | | SS | 71 | 18-26-50 (76) | | |
| | | | SS | 63 | 4-30-50 (80) | | |
| 55 | | | SS | 50 | 7-24-50 (74) | | |
| | | | SS | 58 | 22-48-50 (98) | | |
| | | | SS | 54 | 24-48-50 (98) | | |
| 60 | | dark gray at 60.0' | SS | 46 | 25-48-50 (98) | | |
| | | | SS | 50 | 30-50 | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

LUMINANT

Bottom of borehole at 64.0 feet.

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# Appendix B

# Photographs of CCR Groundwater Monitoring Wells

**Appendix B – Photographs of CCR Groundwater Monitoring Wells**
**Oak Grove Steam Electric Station Monitoring Well Network**

***FGD AREA***

**Photograph 1: FGD-1**

**Photograph 2: FGD-2**

**Appendix B – Photographs of CCR Groundwater Monitoring Wells**
**Oak Grove Steam Electric Station Monitoring Well Network**

**Photograph 3: FGD-3**

**Photograph 4: FGD-4**

**Appendix B – Photographs of CCR Groundwater Monitoring Wells**
**Oak Grove Steam Electric Station Monitoring Well Network**

**Photograph 5: FGD-5**

**Photograph 6: FGD-6**

**Appendix B – Photographs of CCR Groundwater Monitoring Wells**
**Oak Grove Steam Electric Station Monitoring Well Network**

**Photograph 7: FGD-8**

**Photograph 8: FGD-11**

**Appendix B – Photographs of CCR Groundwater Monitoring Wells**
**Oak Grove Steam Electric Station Monitoring Well Network**

**Photograph 9: FGD-12**

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# Appendix C

# Groundwater Potentiometric Surface Maps

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## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

Note:
423.76*-measurement appears erroneous based on subsequent measurements. Result was not used to construct potentiometric surface contours.

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 1

# GROUNDWATER POTENTIOMETRIC SURFACE MAP NOVEMBER 3, 2015

| | | |
|---|---|---|
| PROJECT: 5164D | BY: AJD | REVISIONS |
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

Note:
423.89*-measurement appears erroneous based on subsequent measurements. Result was not used to construct potentiometric surface contours.

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 2

# GROUNDWATER POTENTIOMETRIC SURFACE MAP DECEMBER 12, 2015

| | | |
|---|---|---|
| PROJECT: 5164D | BY: AJD | REVISIONS |
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

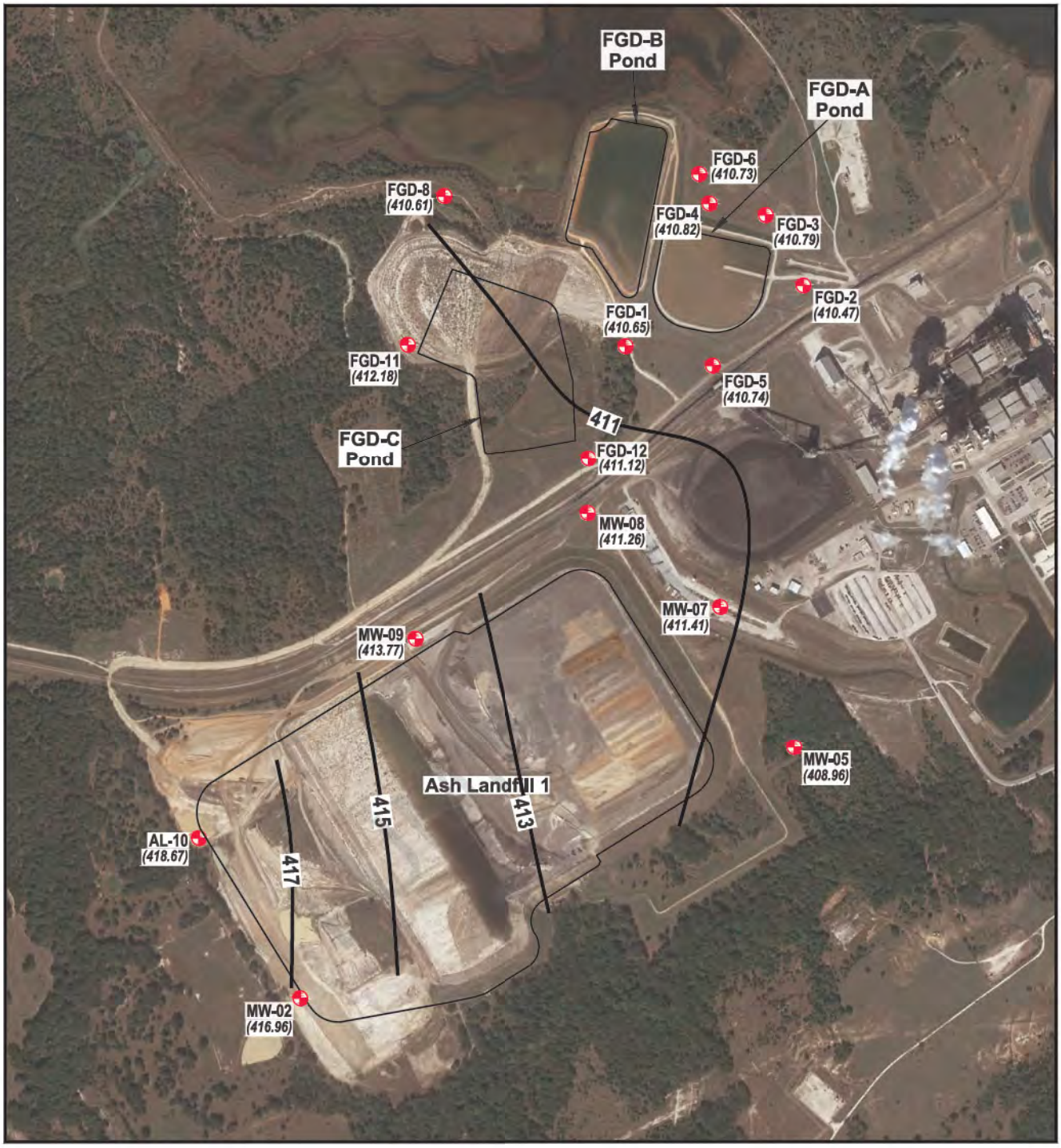
**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 3

# GROUNDWATER POTENTIOMETRIC SURFACE MAP FEBRUARY 9-10, 2016

| | | |
|---|---|---|
| PROJECT: 5164D | BY: AJD | REVISIONS |
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS




## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

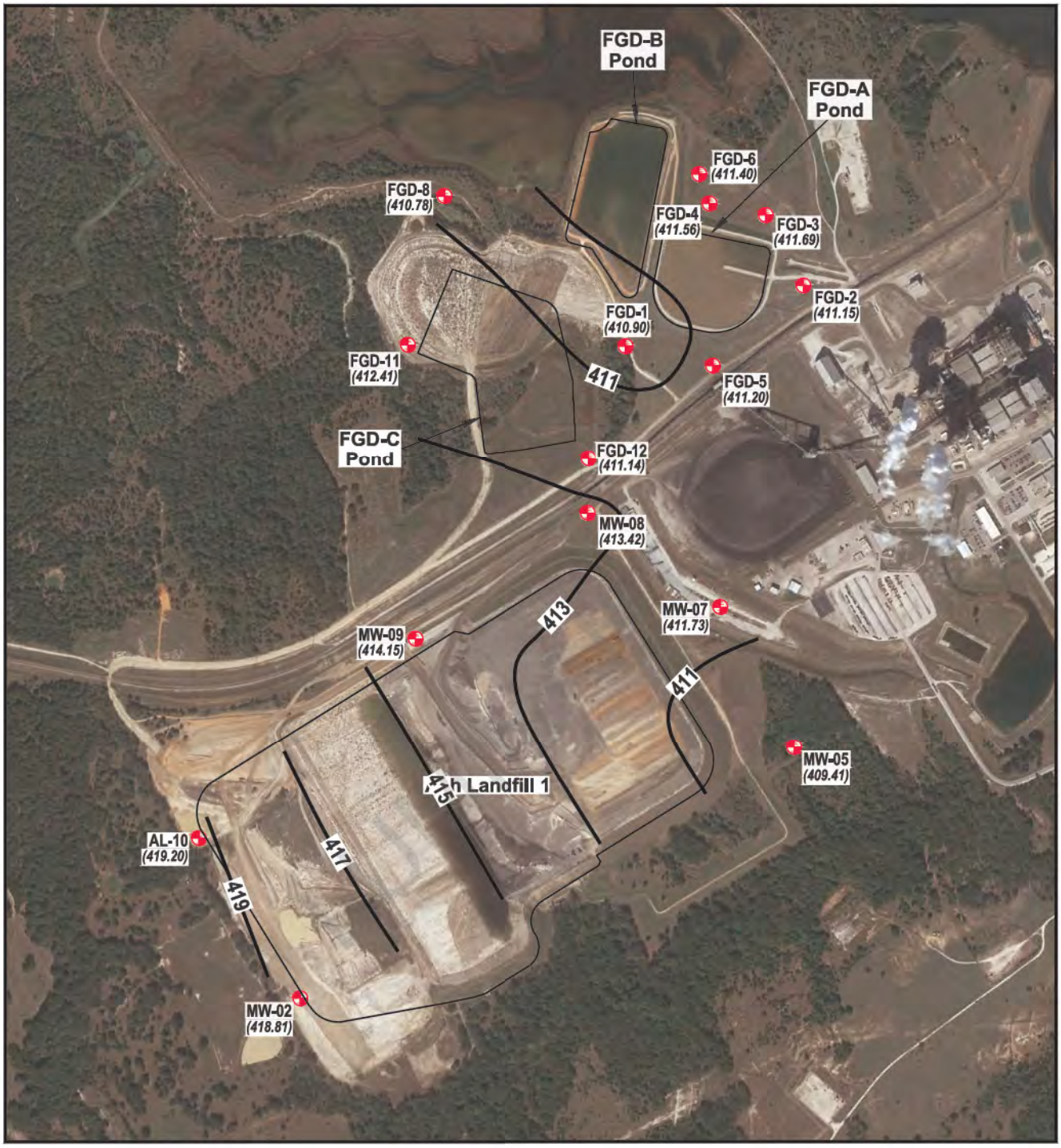
**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 4

# GROUNDWATER POTENTIOMETRIC SURFACE MAP APRIL 14-15, 2016

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS




## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

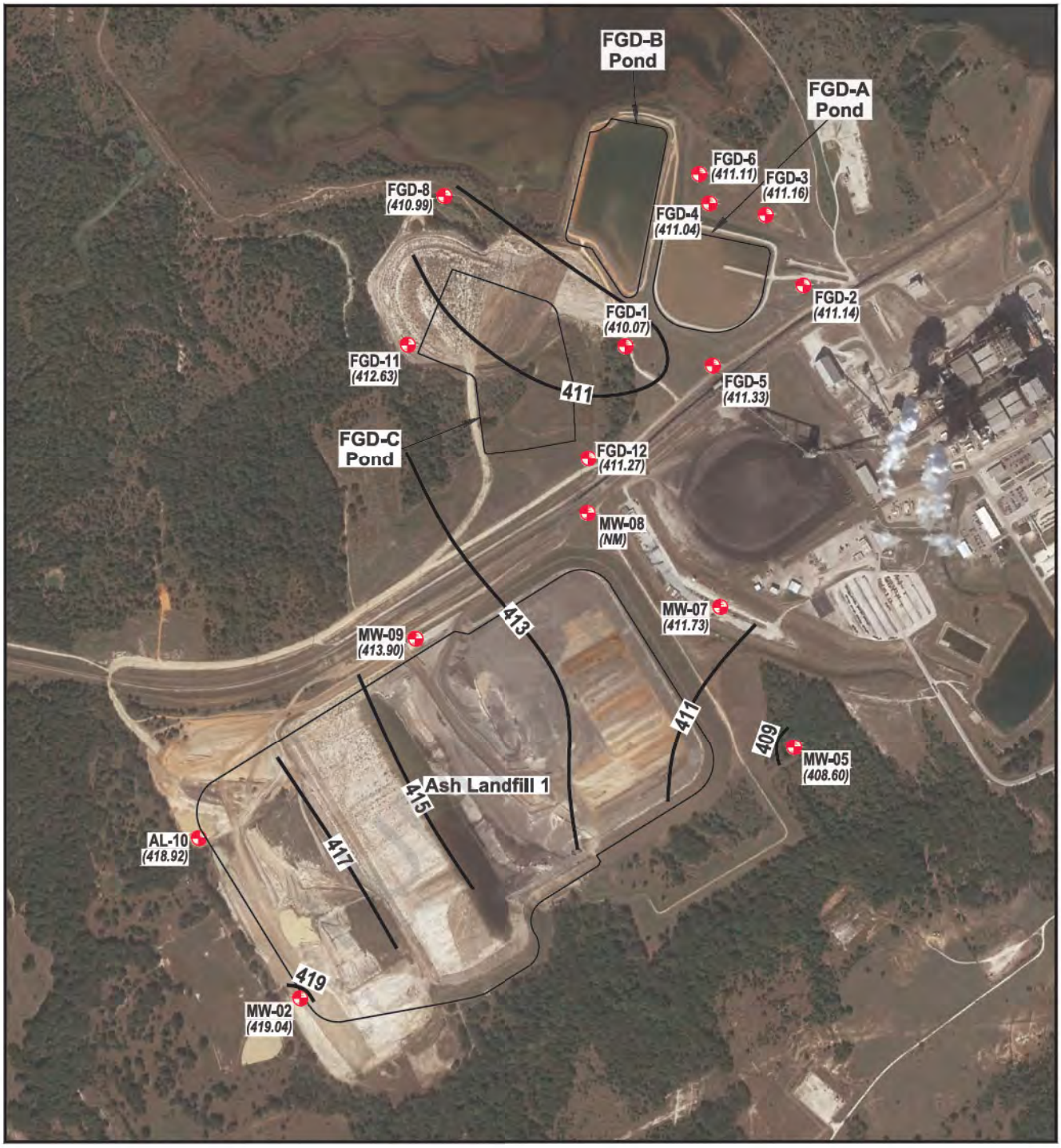
**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 5

# GROUNDWATER POTENTIOMETRIC SURFACE MAP JUNE 16, 2016

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS




## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 6

# GROUNDWATER POTENTIOMETRIC SURFACE MAP AUGUST 24, 2016

| | | |
|---|---|---|
| PROJECT: 5164D | BY: AJD | REVISIONS |
| DATE: SEPT., 2017 | CHECKED: PJB | |

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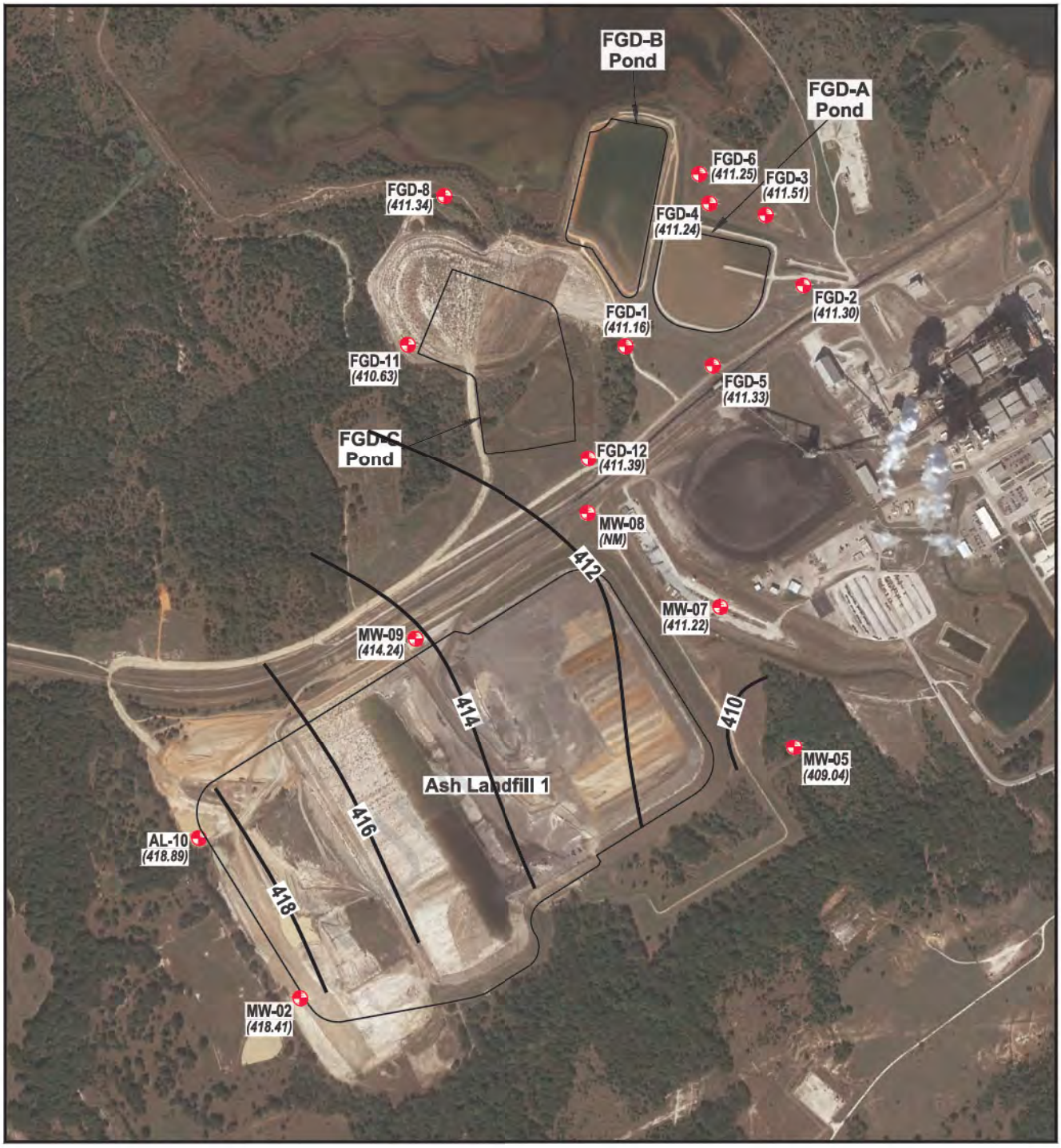
CONSULTING ENGINEERS AND SCIENTISTS




## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 7

# GROUNDWATER POTENTIOMETRIC SURFACE MAP OCTOBER 4, 2016

| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- —400— Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 8

# GROUNDWATER POTENTIOMETRIC SURFACE MAP DECEMBER 19, 2016

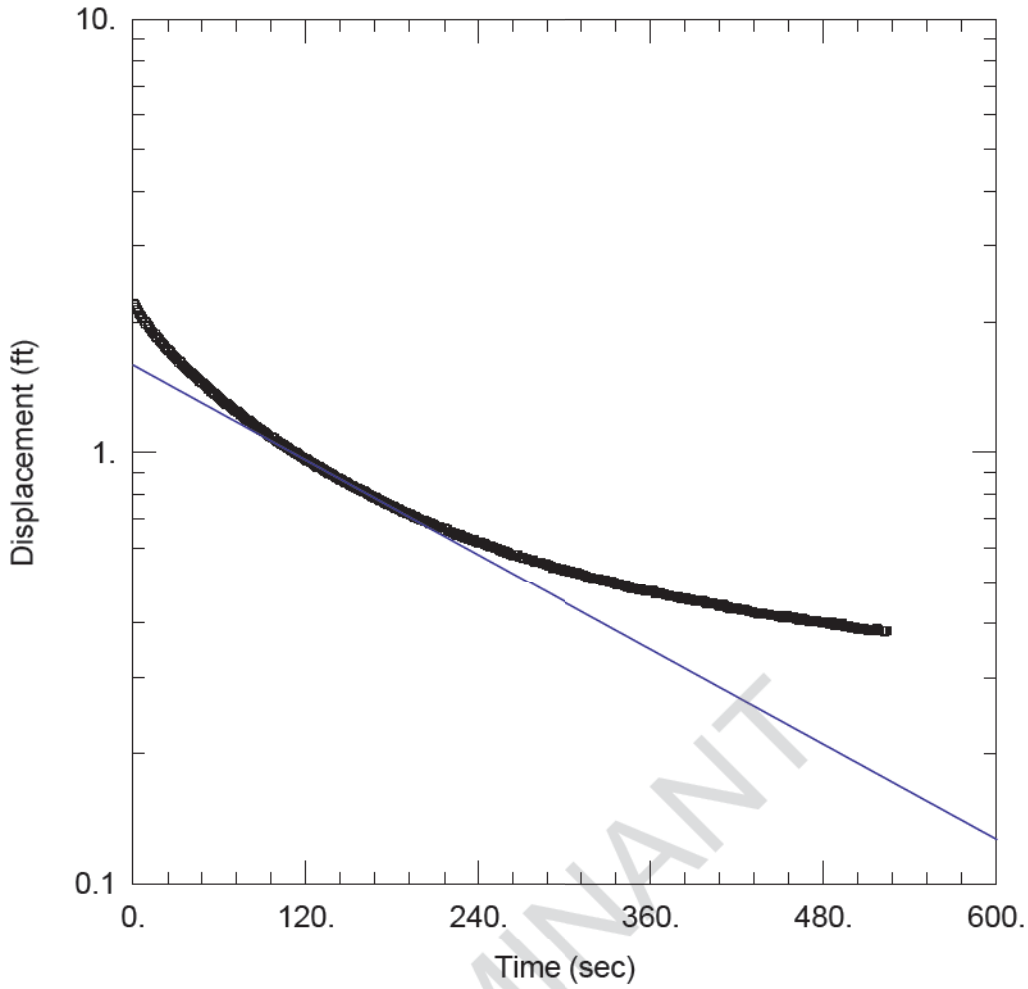
| PROJECT: 5164D | BY: AJD | REVISIONS |
|---|---|---|
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

LUMINANT

# Appendix D

# Aquifer Test Data




LUMINANT

## WELL TEST ANALYSIS

Data Set: J:\...\FGD-5 Slug OUT.aqt
Date: 10/02/17 Time: 14:47:55

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: FGD-5
Test Date: 9-23-15

## AQUIFER DATA

Saturated Thickness: 12.65 ft Anisotropy Ratio (Kz/Kr): 1.

## WELL DATA (FGD-5)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 8.65 ft
Casing Radius: 0.083 ft
Static Water Column Height: 8.65 ft
Screen Length: 8.65 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.2

## SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0003194 cm/sec
y0 = 1.591 ft

Data Set: J:\5164 - Luminant CCR GW Monitoring\5164-D_Oak Grove\OGSES Slug Tests Sept 2015\Aqtesolv files
Date: 10/02/17
Time: 14:48:13

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: FGD-5

## AQUIFER DATA

Saturated Thickness: 12.65 ft
Anisotropy Ratio (Kz/Kr): 1.

## SLUG TEST WELL DATA

### Test Well: FGD-5

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 8.65 ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft
Well Skin Radius: 0.25 ft
Screen Length: 8.65 ft
Total Well Penetration Depth: 8.65 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1342 ft
Gravel Pack Porosity: 0.2

No. of Observations: 525

Observation Data

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 0. | 0. | 263. | 0.5796 |
| 1. | 2.19 | 264. | 0.5779 |
| 2. | 2.156 | 265. | 0.5787 |
| 3. | 2.131 | 266. | 0.5775 |
| 4. | 2.099 | 267. | 0.5786 |
| 5. | 2.076 | 268. | 0.5732 |
| 6. | 2.055 | 269. | 0.5725 |
| 7. | 2.033 | 270. | 0.5718 |
| 8. | 2.009 | 271. | 0.57 |
| 9. | 1.987 | 272. | 0.5691 |
| 10. | 1.968 | 273. | 0.5682 |
| 11. | 1.947 | 274. | 0.5655 |
| 12. | 1.926 | 275. | 0.5642 |
| 13. | 1.905 | 276. | 0.565 |
| 14. | 1.888 | 277. | 0.5646 |
| 15. | 1.871 | 278. | 0.5621 |
| 16. | 1.852 | 279. | 0.5574 |
| 17. | 1.837 | 280. | 0.5578 |
| 18. | 1.819 | 281. | 0.5573 |
| 19. | 1.803 | 282. | 0.5567 |
| 20. | 1.786 | 283. | 0.5562 |
| 21. | 1.772 | 284. | 0.5533 |
| 22. | 1.758 | 285. | 0.5535 |
| 23. | 1.738 | 286. | 0.5518 |
| 24. | 1.728 | 287. | 0.5509 |
| 25. | 1.713 | 288. | 0.5488 |
| 26. | 1.699 | 289. | 0.5456 |
| 27. | 1.685 | 290. | 0.5467 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 28. | 1.672 | 291. | 0.5389 |
| 29. | 1.658 | 292. | 0.542 |
| 30. | 1.645 | 293. | 0.5402 |
| 31. | 1.632 | 294. | 0.5405 |
| 32. | 1.62 | 295. | 0.5366 |
| 33. | 1.607 | 296. | 0.5377 |
| 34. | 1.594 | 297. | 0.536 |
| 35. | 1.584 | 298. | 0.536 |
| 36. | 1.571 | 299. | 0.5324 |
| 37. | 1.559 | 300. | 0.533 |
| 38. | 1.549 | 301. | 0.5335 |
| 39. | 1.536 | 302. | 0.53 |
| 40. | 1.526 | 303. | 0.5293 |
| 41. | 1.516 | 304. | 0.5296 |
| 42. | 1.506 | 305. | 0.5281 |
| 43. | 1.493 | 306. | 0.526 |
| 44. | 1.484 | 307. | 0.5257 |
| 45. | 1.476 | 308. | 0.5228 |
| 46. | 1.462 | 309. | 0.5249 |
| 47. | 1.453 | 310. | 0.523 |
| 48. | 1.443 | 311. | 0.5219 |
| 49. | 1.434 | 312. | 0.5189 |
| 50. | 1.426 | 313. | 0.519 |
| 51. | 1.415 | 314. | 0.5175 |
| 52. | 1.403 | 315. | 0.5164 |
| 53. | 1.395 | 316. | 0.5139 |
| 54. | 1.384 | 317. | 0.5129 |
| 55. | 1.378 | 318. | 0.5135 |
| 56. | 1.368 | 319. | 0.5119 |
| 57. | 1.359 | 320. | 0.5095 |
| 58. | 1.348 | 321. | 0.5092 |
| 59. | 1.342 | 322. | 0.5103 |
| 60. | 1.335 | 323. | 0.5106 |
| 61. | 1.325 | 324. | 0.5084 |
| 62. | 1.317 | 325. | 0.5067 |
| 63. | 1.306 | 326. | 0.5065 |
| 64. | 1.299 | 327. | 0.5033 |
| 65. | 1.292 | 328. | 0.5058 |
| 66. | 1.288 | 329. | 0.5025 |
| 67. | 1.278 | 330. | 0.5017 |
| 68. | 1.268 | 331. | 0.4985 |
| 69. | 1.261 | 332. | 0.4982 |
| 70. | 1.255 | 333. | 0.5006 |
| 71. | 1.247 | 334. | 0.4994 |
| 72. | 1.242 | 335. | 0.4973 |
| 73. | 1.236 | 336. | 0.4969 |
| 74. | 1.224 | 337. | 0.4941 |
| 75. | 1.218 | 338. | 0.4944 |
| 76. | 1.211 | 339. | 0.4926 |
| 77. | 1.204 | 340. | 0.4927 |
| 78. | 1.198 | 341. | 0.4912 |
| 79. | 1.186 | 342. | 0.4901 |
| 80. | 1.184 | 343. | 0.4902 |
| 81. | 1.177 | 344. | 0.4866 |
| 82. | 1.172 | 345. | 0.4876 |
| 83. | 1.162 | 346. | 0.4819 |
| 84. | 1.157 | 347. | 0.4844 |
| 85. | 1.149 | 348. | 0.4842 |
| 86. | 1.145 | 349. | 0.4835 |
| 87. | 1.139 | 350. | 0.4812 |
| 88. | 1.133 | 351. | 0.4812 |
| 89. | 1.125 | 352. | 0.4787 |
| 90. | 1.119 | 353. | 0.4808 |
| 91. | 1.116 | 354. | 0.4798 |
| 92. | 1.107 | 355. | 0.4782 |
| 93. | 1.1 | 356. | 0.4771 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 94. | 1.096 | 357. | 0.4757 |
| 95. | 1.088 | 358. | 0.4774 |
| 96. | 1.085 | 359. | 0.4776 |
| 97. | 1.079 | 360. | 0.476 |
| 98. | 1.075 | 361. | 0.4775 |
| 99. | 1.064 | 362. | 0.4749 |
| 100. | 1.06 | 363. | 0.4709 |
| 101. | 1.057 | 364. | 0.4718 |
| 102. | 1.051 | 365. | 0.4718 |
| 103. | 1.045 | 366. | 0.4727 |
| 104. | 1.04 | 367. | 0.4711 |
| 105. | 1.037 | 368. | 0.4701 |
| 106. | 1.029 | 369. | 0.4697 |
| 107. | 1.025 | 370. | 0.4665 |
| 108. | 1.021 | 371. | 0.4652 |
| 109. | 1.013 | 372. | 0.4669 |
| 110. | 1.01 | 373. | 0.4643 |
| 111. | 1.005 | 374. | 0.4622 |
| 112. | 0.9984 | 375. | 0.4621 |
| 113. | 0.9968 | 376. | 0.4638 |
| 114. | 0.99 | 377. | 0.4637 |
| 115. | 0.9883 | 378. | 0.4605 |
| 116. | 0.98 | 379. | 0.4611 |
| 117. | 0.9757 | 380. | 0.4603 |
| 118. | 0.9732 | 381. | 0.458 |
| 119. | 0.9658 | 382. | 0.4569 |
| 120. | 0.9637 | 383. | 0.4575 |
| 121. | 0.9578 | 384. | 0.4588 |
| 122. | 0.9538 | 385. | 0.4567 |
| 123. | 0.9499 | 386. | 0.4552 |
| 124. | 0.946 | 387. | 0.4548 |
| 125. | 0.9417 | 388. | 0.4558 |
| 126. | 0.9378 | 389. | 0.4542 |
| 127. | 0.9311 | 390. | 0.4542 |
| 128. | 0.9259 | 391. | 0.452 |
| 129. | 0.9249 | 392. | 0.4516 |
| 130. | 0.9206 | 393. | 0.4511 |
| 131. | 0.9136 | 394. | 0.4511 |
| 132. | 0.9126 | 395. | 0.4501 |
| 133. | 0.9061 | 396. | 0.4522 |
| 134. | 0.9016 | 397. | 0.4494 |
| 135. | 0.8999 | 398. | 0.4492 |
| 136. | 0.8946 | 399. | 0.4461 |
| 137. | 0.8924 | 400. | 0.4453 |
| 138. | 0.8887 | 401. | 0.446 |
| 139. | 0.885 | 402. | 0.4462 |
| 140. | 0.8805 | 403. | 0.4465 |
| 141. | 0.8754 | 404. | 0.4435 |
| 142. | 0.8715 | 405. | 0.4442 |
| 143. | 0.8696 | 406. | 0.4433 |
| 144. | 0.8645 | 407. | 0.4427 |
| 145. | 0.8599 | 408. | 0.4401 |
| 146. | 0.857 | 409. | 0.4395 |
| 147. | 0.8533 | 410. | 0.4427 |
| 148. | 0.8521 | 411. | 0.4406 |
| 149. | 0.8485 | 412. | 0.4382 |
| 150. | 0.846 | 413. | 0.4366 |
| 151. | 0.8392 | 414. | 0.4377 |
| 152. | 0.8383 | 415. | 0.4334 |
| 153. | 0.8334 | 416. | 0.4352 |
| 154. | 0.8265 | 417. | 0.4361 |
| 155. | 0.8255 | 418. | 0.4347 |
| 156. | 0.8239 | 419. | 0.4327 |
| 157. | 0.8219 | 420. | 0.4349 |
| 158. | 0.8183 | 421. | 0.4314 |
| 159. | 0.8141 | 422. | 0.4319 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 160. | 0.8135 | 423. | 0.4302 |
| 161. | 0.8084 | 424. | 0.4287 |
| 162. | 0.8031 | 425. | 0.432 |
| 163. | 0.801 | 426. | 0.4285 |
| 164. | 0.7985 | 427. | 0.429 |
| 165. | 0.7953 | 428. | 0.4266 |
| 166. | 0.7912 | 429. | 0.4265 |
| 167. | 0.7878 | 430. | 0.4263 |
| 168. | 0.7851 | 431. | 0.4262 |
| 169. | 0.7847 | 432. | 0.4244 |
| 170. | 0.7793 | 433. | 0.4247 |
| 171. | 0.7747 | 434. | 0.4224 |
| 172. | 0.7739 | 435. | 0.4247 |
| 173. | 0.7732 | 436. | 0.4218 |
| 174. | 0.7651 | 437. | 0.4235 |
| 175. | 0.7641 | 438. | 0.4226 |
| 176. | 0.761 | 439. | 0.4213 |
| 177. | 0.7566 | 440. | 0.4201 |
| 178. | 0.7556 | 441. | 0.4218 |
| 179. | 0.751 | 442. | 0.4204 |
| 180. | 0.7497 | 443. | 0.4187 |
| 181. | 0.7492 | 444. | 0.4183 |
| 182. | 0.7433 | 445. | 0.4178 |
| 183. | 0.7425 | 446. | 0.4176 |
| 184. | 0.7411 | 447. | 0.4176 |
| 185. | 0.738 | 448. | 0.4178 |
| 186. | 0.7314 | 449. | 0.4153 |
| 187. | 0.7288 | 450. | 0.416 |
| 188. | 0.7277 | 451. | 0.4132 |
| 189. | 0.7248 | 452. | 0.4138 |
| 190. | 0.724 | 453. | 0.4131 |
| 191. | 0.7212 | 454. | 0.4151 |
| 192. | 0.7199 | 455. | 0.4165 |
| 193. | 0.7166 | 456. | 0.4125 |
| 194. | 0.7117 | 457. | 0.4144 |
| 195. | 0.7095 | 458. | 0.4116 |
| 196. | 0.7099 | 459. | 0.4137 |
| 197. | 0.7054 | 460. | 0.4119 |
| 198. | 0.7034 | 461. | 0.41 |
| 199. | 0.7014 | 462. | 0.4113 |
| 200. | 0.6986 | 463. | 0.4076 |
| 201. | 0.6961 | 464. | 0.4091 |
| 202. | 0.6943 | 465. | 0.4114 |
| 203. | 0.6926 | 466. | 0.4088 |
| 204. | 0.6907 | 467. | 0.4081 |
| 205. | 0.6885 | 468. | 0.4077 |
| 206. | 0.6851 | 469. | 0.406 |
| 207. | 0.6848 | 470. | 0.4051 |
| 208. | 0.6841 | 471. | 0.4043 |
| 209. | 0.6794 | 472. | 0.4056 |
| 210. | 0.6754 | 473. | 0.4065 |
| 211. | 0.6749 | 474. | 0.4076 |
| 212. | 0.6736 | 475. | 0.4064 |
| 213. | 0.6716 | 476. | 0.4038 |
| 214. | 0.6695 | 477. | 0.4032 |
| 215. | 0.6685 | 478. | 0.403 |
| 216. | 0.6677 | 479. | 0.4025 |
| 217. | 0.6624 | 480. | 0.4045 |
| 218. | 0.6621 | 481. | 0.404 |
| 219. | 0.6544 | 482. | 0.404 |
| 220. | 0.655 | 483. | 0.4017 |
| 221. | 0.6544 | 484. | 0.3994 |
| 222. | 0.6521 | 485. | 0.4009 |
| 223. | 0.65 | 486. | 0.4024 |
| 224. | 0.6477 | 487. | 0.4001 |
| 225. | 0.6449 | 488. | 0.3949 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 226. | 0.6443 | 489. | 0.3969 |
| 227. | 0.6445 | 490. | 0.3973 |
| 228. | 0.6407 | 491. | 0.3971 |
| 229. | 0.6384 | 492. | 0.3968 |
| 230. | 0.6356 | 493. | 0.3995 |
| 231. | 0.6353 | 494. | 0.395 |
| 232. | 0.6327 | 495. | 0.3944 |
| 233. | 0.6304 | 496. | 0.3941 |
| 234. | 0.6289 | 497. | 0.395 |
| 235. | 0.6271 | 498. | 0.3921 |
| 236. | 0.6267 | 499. | 0.3916 |
| 237. | 0.6284 | 500. | 0.3914 |
| 238. | 0.6219 | 501. | 0.3911 |
| 239. | 0.6211 | 502. | 0.3924 |
| 240. | 0.6178 | 503. | 0.3902 |
| 241. | 0.6187 | 504. | 0.3886 |
| 242. | 0.6171 | 505. | 0.3891 |
| 243. | 0.6168 | 506. | 0.3885 |
| 244. | 0.6147 | 507. | 0.388 |
| 245. | 0.6111 | 508. | 0.3898 |
| 246. | 0.6084 | 509. | 0.3876 |
| 247. | 0.609 | 510. | 0.3868 |
| 248. | 0.606 | 511. | 0.3853 |
| 249. | 0.603 | 512. | 0.3854 |
| 250. | 0.6045 | 513. | 0.3851 |
| 251. | 0.6003 | 514. | 0.3881 |
| 252. | 0.5988 | 515. | 0.385 |
| 253. | 0.5986 | 516. | 0.3857 |
| 254. | 0.5961 | 517. | 0.3902 |
| 255. | 0.5936 | 518. | 0.3863 |
| 256. | 0.5928 | 519. | 0.385 |
| 257. | 0.59 | 520. | 0.3849 |
| 258. | 0.5898 | 521. | 0.3849 |
| 259. | 0.5858 | 522. | 0.3841 |
| 260. | 0.586 | 523. | 0.3859 |
| 261. | 0.5839 | 524. | 0.3859 |
| 262. | 0.5804 | | |

## SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.387

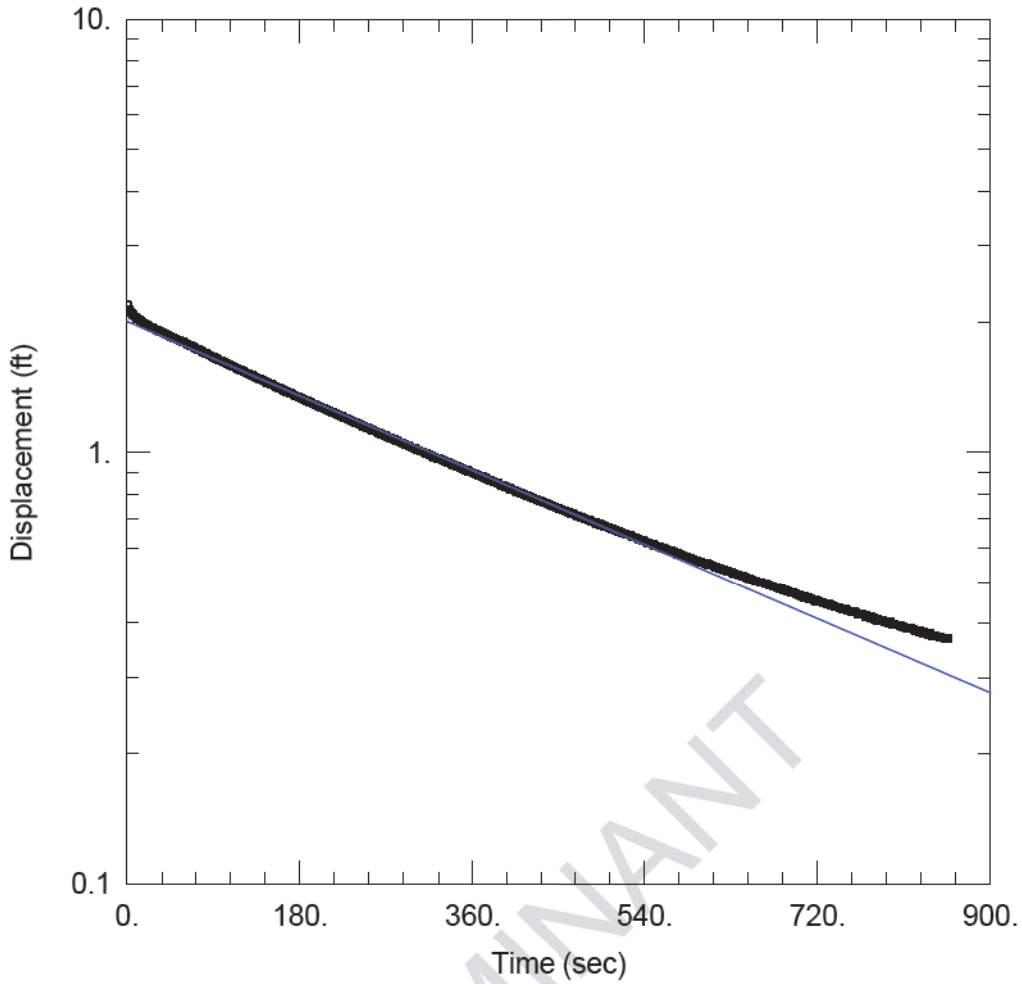
## VISUAL ESTIMATION RESULTS

### Estimated Parameters

| Parameter | Estimate | |
|---|---|---|
| K | 0.0003194 | cm/sec |
| y0 | 1.591 | ft |

T = K*b = 0.1231 cm²/sec

LUMINANT




LUMINANT

## WELL TEST ANALYSIS

Data Set: J:\...\FGD-11 Slug OUT.aqt
Date: 01/18/16 Time: 16:57:34

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: FGD-11
Test Date: 9-23-15

## AQUIFER DATA

Saturated Thickness: 6.1 ft Anisotropy Ratio (Kz/Kr): 1.

## WELL DATA (FGD-11)

Initial Displacement: 2.2 ft Static Water Column Height: 6.1 ft
Total Well Penetration Depth: 6.1 ft Screen Length: 6.1 ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

## SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 9.068E-5 cm/sec y0 = 2.006 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-D_Oak Grove\OGSES Slug Tests Sept 201
Date: 01/18/16
Time: 16:57:52

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: FGD-11

## AQUIFER DATA

Saturated Thickness: 6.1 ft
Anisotropy Ratio (Kz/Kr): 1.

## SLUG TEST WELL DATA

Test Well: FGD-11

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 6.1 ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft
Well Skin Radius: 0.25 ft
Screen Length: 6.1 ft
Total Well Penetration Depth: 6.1 ft

No. of Observations: 857

Observation Data

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 0. | 0. | 429. | 0.774 |
| 1. | 2.178 | 430. | 0.7729 |
| 2. | 2.144 | 431. | 0.7716 |
| 3. | 2.123 | 432. | 0.7693 |
| 4. | 2.105 | 433. | 0.7685 |
| 5. | 2.092 | 434. | 0.7661 |
| 6. | 2.076 | 435. | 0.7644 |
| 7. | 2.07 | 436. | 0.7642 |
| 8. | 2.059 | 437. | 0.7617 |
| 9. | 2.052 | 438. | 0.759 |
| 10. | 2.045 | 439. | 0.7576 |
| 11. | 2.029 | 440. | 0.757 |
| 12. | 2.024 | 441. | 0.7552 |
| 13. | 2.02 | 442. | 0.7543 |
| 14. | 2.008 | 443. | 0.752 |
| 15. | 2. | 444. | 0.75 |
| 16. | 1.994 | 445. | 0.7484 |
| 17. | 1.99 | 446. | 0.7476 |
| 18. | 1.982 | 447. | 0.744 |
| 19. | 1.977 | 448. | 0.7423 |
| 20. | 1.975 | 449. | 0.744 |
| 21. | 1.968 | 450. | 0.7415 |
| 22. | 1.962 | 451. | 0.7406 |
| 23. | 1.956 | 452. | 0.7384 |
| 24. | 1.95 | 453. | 0.7383 |
| 25. | 1.943 | 454. | 0.7351 |
| 26. | 1.94 | 455. | 0.734 |
| 27. | 1.935 | 456. | 0.7332 |
| 28. | 1.93 | 457. | 0.7313 |
| 29. | 1.925 | 458. | 0.7305 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 30. | 1.922 | 459. | 0.7284 |
| 31. | 1.917 | 460. | 0.7255 |
| 32. | 1.913 | 461. | 0.7257 |
| 33. | 1.906 | 462. | 0.7237 |
| 34. | 1.902 | 463. | 0.7211 |
| 35. | 1.9 | 464. | 0.7218 |
| 36. | 1.892 | 465. | 0.7219 |
| 37. | 1.889 | 466. | 0.7191 |
| 38. | 1.883 | 467. | 0.7175 |
| 39. | 1.878 | 468. | 0.7147 |
| 40. | 1.875 | 469. | 0.7156 |
| 41. | 1.868 | 470. | 0.7116 |
| 42. | 1.865 | 471. | 0.7116 |
| 43. | 1.861 | 472. | 0.7106 |
| 44. | 1.856 | 473. | 0.7061 |
| 45. | 1.851 | 474. | 0.7084 |
| 46. | 1.847 | 475. | 0.7053 |
| 47. | 1.842 | 476. | 0.7037 |
| 48. | 1.838 | 477. | 0.7024 |
| 49. | 1.833 | 478. | 0.7002 |
| 50. | 1.83 | 479. | 0.698 |
| 51. | 1.828 | 480. | 0.699 |
| 52. | 1.821 | 481. | 0.6962 |
| 53. | 1.818 | 482. | 0.697 |
| 54. | 1.815 | 483. | 0.6942 |
| 55. | 1.808 | 484. | 0.6919 |
| 56. | 1.805 | 485. | 0.691 |
| 57. | 1.801 | 486. | 0.6915 |
| 58. | 1.799 | 487. | 0.6896 |
| 59. | 1.794 | 488. | 0.6882 |
| 60. | 1.792 | 489. | 0.688 |
| 61. | 1.786 | 490. | 0.6832 |
| 62. | 1.783 | 491. | 0.6808 |
| 63. | 1.776 | 492. | 0.6833 |
| 64. | 1.773 | 493. | 0.6829 |
| 65. | 1.769 | 494. | 0.6786 |
| 66. | 1.762 | 495. | 0.6787 |
| 67. | 1.761 | 496. | 0.6782 |
| 68. | 1.754 | 497. | 0.6769 |
| 69. | 1.75 | 498. | 0.6749 |
| 70. | 1.743 | 499. | 0.6717 |
| 71. | 1.739 | 500. | 0.6732 |
| 72. | 1.736 | 501. | 0.6716 |
| 73. | 1.73 | 502. | 0.6722 |
| 74. | 1.726 | 503. | 0.6682 |
| 75. | 1.722 | 504. | 0.6675 |
| 76. | 1.72 | 505. | 0.6645 |
| 77. | 1.716 | 506. | 0.6644 |
| 78. | 1.71 | 507. | 0.6625 |
| 79. | 1.705 | 508. | 0.6618 |
| 80. | 1.7 | 509. | 0.6605 |
| 81. | 1.696 | 510. | 0.6578 |
| 82. | 1.692 | 511. | 0.6595 |
| 83. | 1.689 | 512. | 0.6549 |
| 84. | 1.684 | 513. | 0.6559 |
| 85. | 1.679 | 514. | 0.6548 |
| 86. | 1.674 | 515. | 0.6535 |
| 87. | 1.672 | 516. | 0.6516 |
| 88. | 1.665 | 517. | 0.649 |
| 89. | 1.663 | 518. | 0.6492 |
| 90. | 1.659 | 519. | 0.6484 |
| 91. | 1.654 | 520. | 0.6463 |
| 92. | 1.65 | 521. | 0.6455 |
| 93. | 1.647 | 522. | 0.6449 |
| 94. | 1.643 | 523. | 0.6443 |
| 95. | 1.636 | 524. | 0.6436 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 96. | 1.634 | 525. | 0.6419 |
| 97. | 1.63 | 526. | 0.6396 |
| 98. | 1.627 | 527. | 0.6369 |
| 99. | 1.623 | 528. | 0.6368 |
| 100. | 1.617 | 529. | 0.6366 |
| 101. | 1.614 | 530. | 0.6352 |
| 102. | 1.611 | 531. | 0.6342 |
| 103. | 1.605 | 532. | 0.6306 |
| 104. | 1.604 | 533. | 0.6315 |
| 105. | 1.599 | 534. | 0.6288 |
| 106. | 1.595 | 535. | 0.6277 |
| 107. | 1.591 | 536. | 0.6262 |
| 108. | 1.589 | 537. | 0.6252 |
| 109. | 1.584 | 538. | 0.6238 |
| 110. | 1.579 | 539. | 0.6246 |
| 111. | 1.577 | 540. | 0.6235 |
| 112. | 1.573 | 541. | 0.6202 |
| 113. | 1.569 | 542. | 0.6202 |
| 114. | 1.563 | 543. | 0.6163 |
| 115. | 1.561 | 544. | 0.6179 |
| 116. | 1.555 | 545. | 0.6143 |
| 117. | 1.554 | 546. | 0.614 |
| 118. | 1.55 | 547. | 0.6141 |
| 119. | 1.545 | 548. | 0.6123 |
| 120. | 1.542 | 549. | 0.6127 |
| 121. | 1.539 | 550. | 0.6087 |
| 122. | 1.532 | 551. | 0.6103 |
| 123. | 1.533 | 552. | 0.6062 |
| 124. | 1.526 | 553. | 0.6056 |
| 125. | 1.522 | 554. | 0.6056 |
| 126. | 1.521 | 555. | 0.6029 |
| 127. | 1.515 | 556. | 0.6048 |
| 128. | 1.512 | 557. | 0.6016 |
| 129. | 1.508 | 558. | 0.5997 |
| 130. | 1.506 | 559. | 0.5998 |
| 131. | 1.501 | 560. | 0.6011 |
| 132. | 1.498 | 561. | 0.596 |
| 133. | 1.492 | 562. | 0.5973 |
| 134. | 1.492 | 563. | 0.5956 |
| 135. | 1.487 | 564. | 0.5952 |
| 136. | 1.484 | 565. | 0.5922 |
| 137. | 1.48 | 566. | 0.5929 |
| 138. | 1.476 | 567. | 0.5913 |
| 139. | 1.472 | 568. | 0.592 |
| 140. | 1.47 | 569. | 0.5898 |
| 141. | 1.465 | 570. | 0.5893 |
| 142. | 1.461 | 571. | 0.586 |
| 143. | 1.46 | 572. | 0.5846 |
| 144. | 1.456 | 573. | 0.5872 |
| 145. | 1.452 | 574. | 0.5801 |
| 146. | 1.448 | 575. | 0.584 |
| 147. | 1.447 | 576. | 0.5808 |
| 148. | 1.442 | 577. | 0.5804 |
| 149. | 1.438 | 578. | 0.5776 |
| 150. | 1.436 | 579. | 0.5793 |
| 151. | 1.432 | 580. | 0.5765 |
| 152. | 1.43 | 581. | 0.5748 |
| 153. | 1.424 | 582. | 0.574 |
| 154. | 1.422 | 583. | 0.5739 |
| 155. | 1.418 | 584. | 0.5732 |
| 156. | 1.413 | 585. | 0.5694 |
| 157. | 1.412 | 586. | 0.5707 |
| 158. | 1.409 | 587. | 0.5687 |
| 159. | 1.404 | 588. | 0.5691 |
| 160. | 1.401 | 589. | 0.5676 |
| 161. | 1.399 | 590. | 0.5658 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 162. | 1.396 | 591. | 0.565 |
| 163. | 1.391 | 592. | 0.563 |
| 164. | 1.389 | 593. | 0.5633 |
| 165. | 1.385 | 594. | 0.5613 |
| 166. | 1.38 | 595. | 0.5604 |
| 167. | 1.378 | 596. | 0.5587 |
| 168. | 1.376 | 597. | 0.5585 |
| 169. | 1.372 | 598. | 0.5574 |
| 170. | 1.37 | 599. | 0.5578 |
| 171. | 1.364 | 600. | 0.5554 |
| 172. | 1.364 | 601. | 0.5541 |
| 173. | 1.357 | 602. | 0.5538 |
| 174. | 1.357 | 603. | 0.5525 |
| 175. | 1.352 | 604. | 0.5509 |
| 176. | 1.35 | 605. | 0.5529 |
| 177. | 1.347 | 606. | 0.5492 |
| 178. | 1.344 | 607. | 0.5478 |
| 179. | 1.341 | 608. | 0.5488 |
| 180. | 1.336 | 609. | 0.548 |
| 181. | 1.333 | 610. | 0.5484 |
| 182. | 1.33 | 611. | 0.5467 |
| 183. | 1.328 | 612. | 0.5444 |
| 184. | 1.323 | 613. | 0.5428 |
| 185. | 1.32 | 614. | 0.5406 |
| 186. | 1.318 | 615. | 0.5423 |
| 187. | 1.315 | 616. | 0.54 |
| 188. | 1.314 | 617. | 0.5404 |
| 189. | 1.308 | 618. | 0.537 |
| 190. | 1.307 | 619. | 0.5383 |
| 191. | 1.302 | 620. | 0.535 |
| 192. | 1.299 | 621. | 0.5351 |
| 193. | 1.295 | 622. | 0.5345 |
| 194. | 1.295 | 623. | 0.5332 |
| 195. | 1.292 | 624. | 0.5316 |
| 196. | 1.288 | 625. | 0.5297 |
| 197. | 1.284 | 626. | 0.5314 |
| 198. | 1.284 | 627. | 0.5291 |
| 199. | 1.281 | 628. | 0.5285 |
| 200. | 1.276 | 629. | 0.5282 |
| 201. | 1.275 | 630. | 0.5278 |
| 202. | 1.269 | 631. | 0.5264 |
| 203. | 1.27 | 632. | 0.5238 |
| 204. | 1.265 | 633. | 0.5242 |
| 205. | 1.264 | 634. | 0.5229 |
| 206. | 1.258 | 635. | 0.5219 |
| 207. | 1.257 | 636. | 0.5206 |
| 208. | 1.253 | 637. | 0.5196 |
| 209. | 1.251 | 638. | 0.5178 |
| 210. | 1.247 | 639. | 0.5183 |
| 211. | 1.244 | 640. | 0.5173 |
| 212. | 1.242 | 641. | 0.5153 |
| 213. | 1.24 | 642. | 0.5151 |
| 214. | 1.236 | 643. | 0.5164 |
| 215. | 1.232 | 644. | 0.5148 |
| 216. | 1.23 | 645. | 0.5148 |
| 217. | 1.228 | 646. | 0.5116 |
| 218. | 1.224 | 647. | 0.5117 |
| 219. | 1.223 | 648. | 0.5098 |
| 220. | 1.219 | 649. | 0.5092 |
| 221. | 1.216 | 650. | 0.508 |
| 222. | 1.213 | 651. | 0.5077 |
| 223. | 1.209 | 652. | 0.5063 |
| 224. | 1.21 | 653. | 0.5053 |
| 225. | 1.206 | 654. | 0.5045 |
| 226. | 1.202 | 655. | 0.5028 |
| 227. | 1.2 | 656. | 0.503 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 228. | 1.198 | 657. | 0.5012 |
| 229. | 1.195 | 658. | 0.5009 |
| 230. | 1.192 | 659. | 0.5014 |
| 231. | 1.188 | 660. | 0.4993 |
| 232. | 1.186 | 661. | 0.5 |
| 233. | 1.183 | 662. | 0.4974 |
| 234. | 1.181 | 663. | 0.4963 |
| 235. | 1.177 | 664. | 0.4966 |
| 236. | 1.176 | 665. | 0.4949 |
| 237. | 1.174 | 666. | 0.4958 |
| 238. | 1.172 | 667. | 0.4939 |
| 239. | 1.168 | 668. | 0.4938 |
| 240. | 1.166 | 669. | 0.4927 |
| 241. | 1.163 | 670. | 0.4915 |
| 242. | 1.161 | 671. | 0.4907 |
| 243. | 1.158 | 672. | 0.4908 |
| 244. | 1.155 | 673. | 0.4898 |
| 245. | 1.152 | 674. | 0.4876 |
| 246. | 1.149 | 675. | 0.4884 |
| 247. | 1.147 | 676. | 0.4874 |
| 248. | 1.144 | 677. | 0.4885 |
| 249. | 1.142 | 678. | 0.4853 |
| 250. | 1.139 | 679. | 0.4848 |
| 251. | 1.137 | 680. | 0.4823 |
| 252. | 1.133 | 681. | 0.4852 |
| 253. | 1.131 | 682. | 0.4825 |
| 254. | 1.129 | 683. | 0.4805 |
| 255. | 1.125 | 684. | 0.4796 |
| 256. | 1.123 | 685. | 0.4787 |
| 257. | 1.119 | 686. | 0.4796 |
| 258. | 1.12 | 687. | 0.477 |
| 259. | 1.118 | 688. | 0.4759 |
| 260. | 1.114 | 689. | 0.4758 |
| 261. | 1.114 | 690. | 0.4735 |
| 262. | 1.107 | 691. | 0.4741 |
| 263. | 1.109 | 692. | 0.4727 |
| 264. | 1.103 | 693. | 0.4724 |
| 265. | 1.102 | 694. | 0.4729 |
| 266. | 1.097 | 695. | 0.4711 |
| 267. | 1.099 | 696. | 0.4707 |
| 268. | 1.093 | 697. | 0.4696 |
| 269. | 1.093 | 698. | 0.4678 |
| 270. | 1.088 | 699. | 0.4673 |
| 271. | 1.086 | 700. | 0.4658 |
| 272. | 1.084 | 701. | 0.4666 |
| 273. | 1.077 | 702. | 0.465 |
| 274. | 1.081 | 703. | 0.463 |
| 275. | 1.077 | 704. | 0.4644 |
| 276. | 1.076 | 705. | 0.4606 |
| 277. | 1.074 | 706. | 0.4638 |
| 278. | 1.072 | 707. | 0.4597 |
| 279. | 1.068 | 708. | 0.4592 |
| 280. | 1.064 | 709. | 0.4607 |
| 281. | 1.064 | 710. | 0.4604 |
| 282. | 1.06 | 711. | 0.4567 |
| 283. | 1.058 | 712. | 0.4566 |
| 284. | 1.056 | 713. | 0.4569 |
| 285. | 1.056 | 714. | 0.4547 |
| 286. | 1.051 | 715. | 0.4552 |
| 287. | 1.047 | 716. | 0.4534 |
| 288. | 1.046 | 717. | 0.4561 |
| 289. | 1.045 | 718. | 0.4504 |
| 290. | 1.04 | 719. | 0.4533 |
| 291. | 1.038 | 720. | 0.4515 |
| 292. | 1.037 | 721. | 0.4519 |
| 293. | 1.036 | 722. | 0.4485 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 294. | 1.032 | 723. | 0.4491 |
| 295. | 1.03 | 724. | 0.449 |
| 296. | 1.027 | 725. | 0.4473 |
| 297. | 1.026 | 726. | 0.446 |
| 298. | 1.023 | 727. | 0.4449 |
| 299. | 1.02 | 728. | 0.4458 |
| 300. | 1.021 | 729. | 0.4447 |
| 301. | 1.018 | 730. | 0.4457 |
| 302. | 1.013 | 731. | 0.4431 |
| 303. | 1.013 | 732. | 0.4451 |
| 304. | 1.01 | 733. | 0.4409 |
| 305. | 1.007 | 734. | 0.4417 |
| 306. | 1.006 | 735. | 0.4415 |
| 307. | 1.005 | 736. | 0.4401 |
| 308. | 1.002 | 737. | 0.4405 |
| 309. | 0.9991 | 738. | 0.4371 |
| 310. | 0.9966 | 739. | 0.4375 |
| 311. | 0.9937 | 740. | 0.4374 |
| 312. | 0.9954 | 741. | 0.4359 |
| 313. | 0.9915 | 742. | 0.4369 |
| 314. | 0.9895 | 743. | 0.4346 |
| 315. | 0.987 | 744. | 0.4342 |
| 316. | 0.9841 | 745. | 0.4324 |
| 317. | 0.9832 | 746. | 0.4341 |
| 318. | 0.9797 | 747. | 0.4301 |
| 319. | 0.9745 | 748. | 0.4301 |
| 320. | 0.9769 | 749. | 0.4322 |
| 321. | 0.9728 | 750. | 0.4308 |
| 322. | 0.9728 | 751. | 0.4291 |
| 323. | 0.9682 | 752. | 0.4279 |
| 324. | 0.9688 | 753. | 0.4285 |
| 325. | 0.9676 | 754. | 0.4281 |
| 326. | 0.9661 | 755. | 0.4263 |
| 327. | 0.9623 | 756. | 0.4257 |
| 328. | 0.96 | 757. | 0.4245 |
| 329. | 0.9568 | 758. | 0.4265 |
| 330. | 0.9574 | 759. | 0.4242 |
| 331. | 0.9535 | 760. | 0.4246 |
| 332. | 0.9519 | 761. | 0.4232 |
| 333. | 0.948 | 762. | 0.4197 |
| 334. | 0.9481 | 763. | 0.4191 |
| 335. | 0.9439 | 764. | 0.4199 |
| 336. | 0.9426 | 765. | 0.4205 |
| 337. | 0.943 | 766. | 0.421 |
| 338. | 0.9396 | 767. | 0.42 |
| 339. | 0.9354 | 768. | 0.4199 |
| 340. | 0.9344 | 769. | 0.4157 |
| 341. | 0.9323 | 770. | 0.4151 |
| 342. | 0.9327 | 771. | 0.4184 |
| 343. | 0.9269 | 772. | 0.4157 |
| 344. | 0.9279 | 773. | 0.4139 |
| 345. | 0.9272 | 774. | 0.4136 |
| 346. | 0.9268 | 775. | 0.412 |
| 347. | 0.9194 | 776. | 0.416 |
| 348. | 0.9211 | 777. | 0.4127 |
| 349. | 0.9189 | 778. | 0.4129 |
| 350. | 0.9142 | 779. | 0.4096 |
| 351. | 0.9147 | 780. | 0.4119 |
| 352. | 0.9106 | 781. | 0.4096 |
| 353. | 0.9063 | 782. | 0.4067 |
| 354. | 0.9093 | 783. | 0.4118 |
| 355. | 0.9034 | 784. | 0.4047 |
| 356. | 0.9047 | 785. | 0.4056 |
| 357. | 0.9025 | 786. | 0.4069 |
| 358. | 0.8994 | 787. | 0.4065 |
| 359. | 0.899 | 788. | 0.4065 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 360. | 0.8959 | 789. | 0.4057 |
| 361. | 0.8945 | 790. | 0.4038 |
| 362. | 0.8934 | 791. | 0.4041 |
| 363. | 0.8912 | 792. | 0.4046 |
| 364. | 0.8864 | 793. | 0.4004 |
| 365. | 0.8855 | 794. | 0.3995 |
| 366. | 0.8843 | 795. | 0.4012 |
| 367. | 0.8825 | 796. | 0.4039 |
| 368. | 0.8822 | 797. | 0.3996 |
| 369. | 0.8805 | 798. | 0.3986 |
| 370. | 0.8785 | 799. | 0.3983 |
| 371. | 0.8741 | 800. | 0.4007 |
| 372. | 0.8719 | 801. | 0.3975 |
| 373. | 0.873 | 802. | 0.3973 |
| 374. | 0.8722 | 803. | 0.397 |
| 375. | 0.8648 | 804. | 0.3965 |
| 376. | 0.864 | 805. | 0.3944 |
| 377. | 0.8629 | 806. | 0.3959 |
| 378. | 0.8617 | 807. | 0.394 |
| 379. | 0.8613 | 808. | 0.3911 |
| 380. | 0.8578 | 809. | 0.393 |
| 381. | 0.8569 | 810. | 0.3918 |
| 382. | 0.8541 | 811. | 0.392 |
| 383. | 0.8525 | 812. | 0.3886 |
| 384. | 0.8546 | 813. | 0.3902 |
| 385. | 0.8492 | 814. | 0.3916 |
| 386. | 0.8494 | 815. | 0.3893 |
| 387. | 0.8464 | 816. | 0.3905 |
| 388. | 0.8426 | 817. | 0.3906 |
| 389. | 0.8406 | 818. | 0.389 |
| 390. | 0.8384 | 819. | 0.3887 |
| 391. | 0.8384 | 820. | 0.388 |
| 392. | 0.8382 | 821. | 0.3859 |
| 393. | 0.8367 | 822. | 0.3843 |
| 394. | 0.8318 | 823. | 0.3836 |
| 395. | 0.8298 | 824. | 0.3861 |
| 396. | 0.8287 | 825. | 0.3823 |
| 397. | 0.8288 | 826. | 0.382 |
| 398. | 0.8264 | 827. | 0.3854 |
| 399. | 0.8215 | 828. | 0.3828 |
| 400. | 0.8224 | 829. | 0.38 |
| 401. | 0.8203 | 830. | 0.3825 |
| 402. | 0.8195 | 831. | 0.3814 |
| 403. | 0.8176 | 832. | 0.3789 |
| 404. | 0.8157 | 833. | 0.3816 |
| 405. | 0.8141 | 834. | 0.3784 |
| 406. | 0.8101 | 835. | 0.3767 |
| 407. | 0.809 | 836. | 0.3781 |
| 408. | 0.8093 | 837. | 0.3796 |
| 409. | 0.8068 | 838. | 0.3766 |
| 410. | 0.8047 | 839. | 0.3747 |
| 411. | 0.8038 | 840. | 0.376 |
| 412. | 0.8024 | 841. | 0.3745 |
| 413. | 0.8 | 842. | 0.3753 |
| 414. | 0.7971 | 843. | 0.3748 |
| 415. | 0.7969 | 844. | 0.3737 |
| 416. | 0.7938 | 845. | 0.3732 |
| 417. | 0.7934 | 846. | 0.3741 |
| 418. | 0.7916 | 847. | 0.3719 |
| 419. | 0.7896 | 848. | 0.3738 |
| 420. | 0.7878 | 849. | 0.3707 |
| 421. | 0.787 | 850. | 0.371 |
| 422. | 0.7859 | 851. | 0.3703 |
| 423. | 0.7834 | 852. | 0.3687 |
| 424. | 0.7804 | 853. | 0.3705 |
| 425. | 0.7818 | 854. | 0.3678 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 426. | 0.7795 | 855. | 0.3697 |
| 427. | 0.7773 | 856. | 0.3698 |
| 428. | 0.7759 | | |

## SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.393

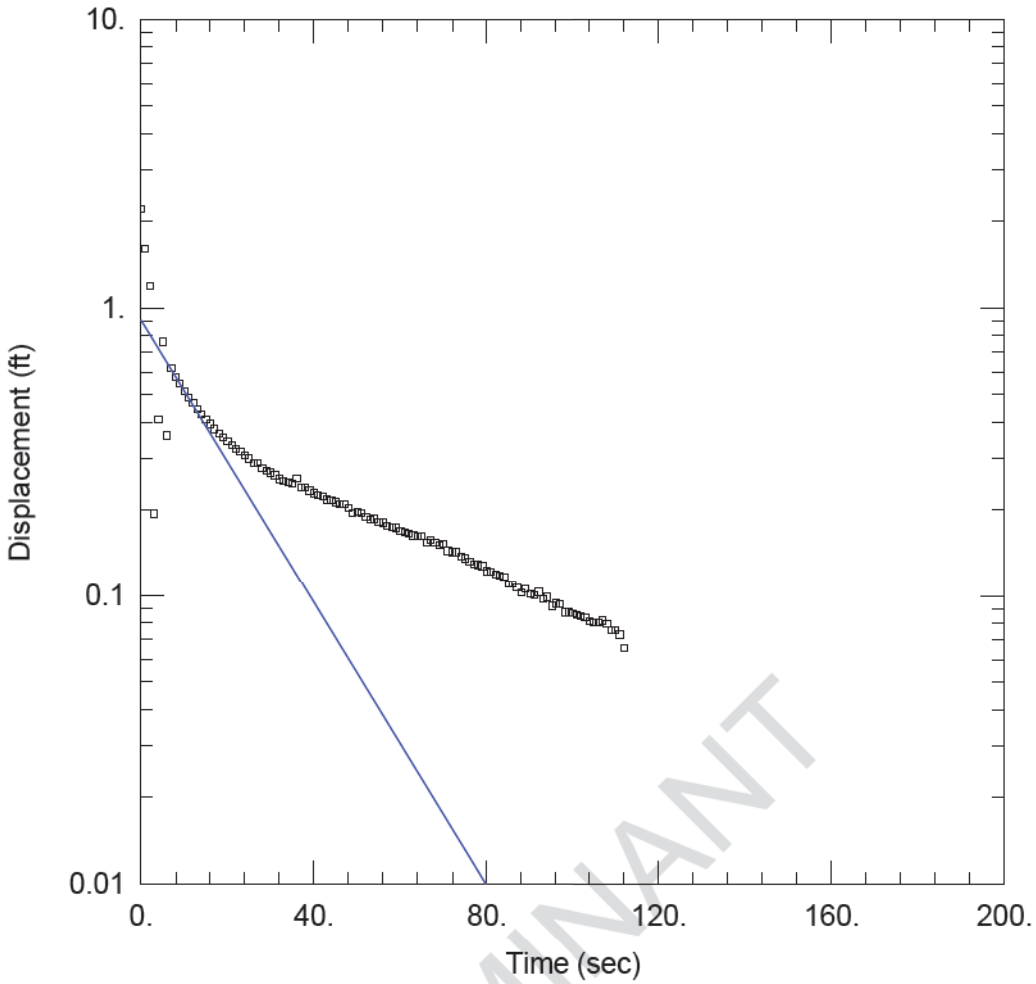
## VISUAL ESTIMATION RESULTS

### Estimated Parameters

| Parameter | Estimate | |
|---|---|---|
| K | 9.068E-5 | cm/sec |
| y0 | 2.006 | ft |

T = K*b = 0.01686 cm²/sec

LUMINANT




LUMINANT

## WELL TEST ANALYSIS

Data Set: J:\...\FGD-12 Slug IN.aqt
Date: 01/18/16 Time: 17:04:18

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: FGD-12
Test Date: 9-23-15

## AQUIFER DATA

Saturated Thickness: 11.45 ft Anisotropy Ratio (Kz/Kr): 1.

## WELL DATA (FGD-12)

Initial Displacement: 2.2 ft
Static Water Column Height: 11.45 ft
Total Well Penetration Depth: 11.45 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft

## SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.00172 cm/sec
y0 = 0.9069 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-D_Oak Grove\OGSES Slug Tests Sept 201
Date: 01/18/16
Time: 17:04:38

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: FGD-12

## AQUIFER DATA

Saturated Thickness: 11.45 ft
Anisotropy Ratio (Kz/Kr): 1.

## SLUG TEST WELL DATA

Test Well: FGD-12

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 11.45 ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft
Well Skin Radius: 0.25 ft
Screen Length: 10. ft
Total Well Penetration Depth: 11.45 ft

No. of Observations: 113

Observation Data

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 0. | 0. | 57. | 0.1762 |
| 1. | 1.603 | 58. | 0.1739 |
| 2. | 1.192 | 59. | 0.173 |
| 3. | 0.1935 | 60. | 0.1692 |
| 4. | 0.4115 | 61. | 0.167 |
| 5. | 0.7639 | 62. | 0.1658 |
| 6. | 0.3615 | 63. | 0.1628 |
| 7. | 0.6189 | 64. | 0.1617 |
| 8. | 0.5782 | 65. | 0.1614 |
| 9. | 0.5462 | 66. | 0.1541 |
| 10. | 0.5141 | 67. | 0.1574 |
| 11. | 0.4892 | 68. | 0.154 |
| 12. | 0.4681 | 69. | 0.1513 |
| 13. | 0.4456 | 70. | 0.1518 |
| 14. | 0.4276 | 71. | 0.1439 |
| 15. | 0.4124 | 72. | 0.1427 |
| 16. | 0.3961 | 73. | 0.1426 |
| 17. | 0.3803 | 74. | 0.1373 |
| 18. | 0.3678 | 75. | 0.1356 |
| 19. | 0.3574 | 76. | 0.1323 |
| 20. | 0.3453 | 77. | 0.1291 |
| 21. | 0.3357 | 78. | 0.1286 |
| 22. | 0.3254 | 79. | 0.1274 |
| 23. | 0.3179 | 80. | 0.1222 |
| 24. | 0.3086 | 81. | 0.1214 |
| 25. | 0.3013 | 82. | 0.1191 |
| 26. | 0.2913 | 83. | 0.1176 |
| 27. | 0.2897 | 84. | 0.1166 |
| 28. | 0.2792 | 85. | 0.1099 |
| 29. | 0.273 | 86. | 0.1102 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 30. | 0.269 | 87. | 0.1065 |
| 31. | 0.2633 | 88. | 0.1022 |
| 32. | 0.2553 | 89. | 0.1056 |
| 33. | 0.2518 | 90. | 0.1011 |
| 34. | 0.2499 | 91. | 0.1004 |
| 35. | 0.2468 | 92. | 0.1026 |
| 36. | 0.2563 | 93. | 0.0968 |
| 37. | 0.2393 | 94. | 0.0986 |
| 38. | 0.2396 | 95. | 0.0919 |
| 39. | 0.2328 | 96. | 0.0938 |
| 40. | 0.228 | 97. | 0.0931 |
| 41. | 0.2239 | 98. | 0.0871 |
| 42. | 0.2219 | 99. | 0.0872 |
| 43. | 0.217 | 100. | 0.0868 |
| 44. | 0.2153 | 101. | 0.0858 |
| 45. | 0.2124 | 102. | 0.085 |
| 46. | 0.209 | 103. | 0.0842 |
| 47. | 0.2094 | 104. | 0.0818 |
| 48. | 0.203 | 105. | 0.0806 |
| 49. | 0.1953 | 106. | 0.0808 |
| 50. | 0.1973 | 107. | 0.082 |
| 51. | 0.1944 | 108. | 0.0797 |
| 52. | 0.1888 | 109. | 0.0757 |
| 53. | 0.1845 | 110. | 0.0758 |
| 54. | 0.186 | 111. | 0.0732 |
| 55. | 0.1814 | 112. | 0.0659 |
| 56. | 0.1803 | | |

## SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.898

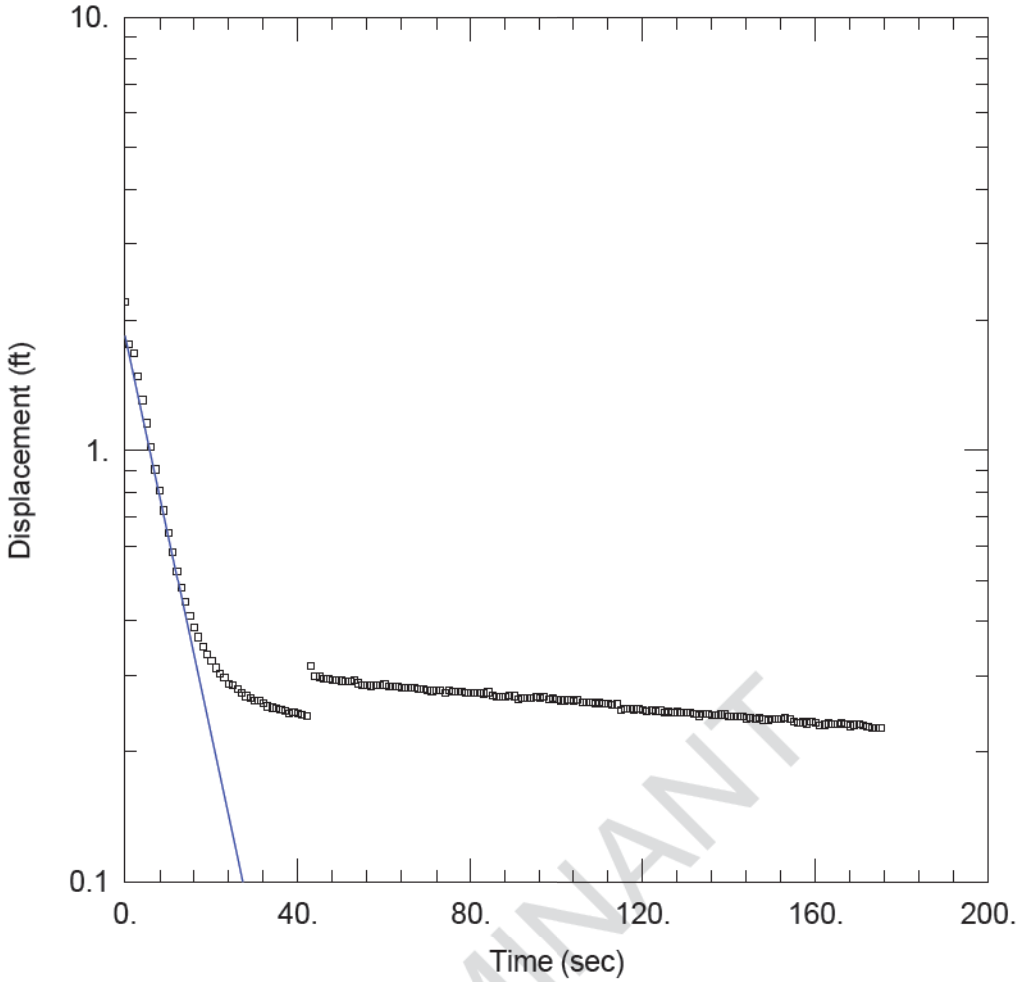
## VISUAL ESTIMATION RESULTS

### Estimated Parameters

| Parameter | Estimate | |
|---|---|---|
| K | 0.00172 | cm/sec |
| y0 | 0.9069 | ft |

$T = K*b = 0.6003\ cm^2/sec$

LUMINANT




LUMINANT

## WELL TEST ANALYSIS

Data Set: J:\...\FGD-12 Slug OUT.aqt
Date: 01/18/16 Time: 17:09:49

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: FGD-12
Test Date: 9-23-15

## AQUIFER DATA

Saturated Thickness: 11.45 ft Anisotropy Ratio (Kz/Kr): 1.

## WELL DATA (FGD-12)

Initial Displacement: 2.2 ft
Static Water Column Height: 11.45 ft
Total Well Penetration Depth: 11.45 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft

## SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003249 cm/sec
y0 = 1.835 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-D_Oak Grove\OGSES Slug Tests Sept 201
Date: 01/19/16
Time: 09:27:57

## PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: FGD-12

## AQUIFER DATA

Saturated Thickness: 11.45 ft
Anisotropy Ratio (Kz/Kr): 1.

## SLUG TEST WELL DATA

Test Well: FGD-12

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 11.45 ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft
Well Skin Radius: 0.25 ft
Screen Length: 10. ft
Total Well Penetration Depth: 11.45 ft

No. of Observations: 176

Observation Data

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 0. | 0. | 88. | 0.2678 |
| 1. | 1.76 | 89. | 0.2697 |
| 2. | 1.675 | 90. | 0.2682 |
| 3. | 1.483 | 91. | 0.2643 |
| 4. | 1.308 | 92. | 0.2652 |
| 5. | 1.155 | 93. | 0.266 |
| 6. | 1.018 | 94. | 0.2659 |
| 7. | 0.9038 | 95. | 0.2673 |
| 8. | 0.8075 | 96. | 0.2655 |
| 9. | 0.7261 | 97. | 0.2667 |
| 10. | 0.6453 | 98. | 0.2632 |
| 11. | 0.5815 | 99. | 0.2651 |
| 12. | 0.5251 | 100. | 0.2638 |
| 13. | 0.4779 | 101. | 0.2627 |
| 14. | 0.4432 | 102. | 0.2628 |
| 15. | 0.4112 | 103. | 0.2637 |
| 16. | 0.3861 | 104. | 0.2619 |
| 17. | 0.3672 | 105. | 0.2637 |
| 18. | 0.3495 | 106. | 0.2605 |
| 19. | 0.3349 | 107. | 0.2598 |
| 20. | 0.3228 | 108. | 0.2595 |
| 21. | 0.3115 | 109. | 0.2579 |
| 22. | 0.3028 | 110. | 0.2604 |
| 23. | 0.2959 | 111. | 0.2587 |
| 24. | 0.2869 | 112. | 0.2579 |
| 25. | 0.2841 | 113. | 0.2572 |
| 26. | 0.2786 | 114. | 0.2574 |
| 27. | 0.2733 | 115. | 0.2492 |
| 28. | 0.2684 | 116. | 0.2516 |
| 29. | 0.265 | 117. | 0.2517 |

LUMINANT

| Time (sec) | Displacement (ft) | Time (sec) | Displacement (ft) |
|---|---|---|---|
| 30. | 0.2621 | 118. | 0.2507 |
| 31. | 0.2618 | 119. | 0.2513 |
| 32. | 0.2582 | 120. | 0.2502 |
| 33. | 0.2541 | 121. | 0.2478 |
| 34. | 0.2523 | 122. | 0.2491 |
| 35. | 0.2519 | 123. | 0.2475 |
| 36. | 0.25 | 124. | 0.2487 |
| 37. | 0.2481 | 125. | 0.2469 |
| 38. | 0.2448 | 126. | 0.2478 |
| 39. | 0.2463 | 127. | 0.2462 |
| 40. | 0.2445 | 128. | 0.2472 |
| 41. | 0.2429 | 129. | 0.2464 |
| 42. | 0.2417 | 130. | 0.2464 |
| 43. | 0.3141 | 131. | 0.2465 |
| 44. | 0.2977 | 132. | 0.245 |
| 45. | 0.2969 | 133. | 0.2423 |
| 46. | 0.2941 | 134. | 0.2446 |
| 47. | 0.2937 | 135. | 0.2445 |
| 48. | 0.2917 | 136. | 0.2429 |
| 49. | 0.2927 | 137. | 0.2435 |
| 50. | 0.2911 | 138. | 0.2437 |
| 51. | 0.2899 | 139. | 0.2436 |
| 52. | 0.2901 | 140. | 0.2418 |
| 53. | 0.2915 | 141. | 0.2414 |
| 54. | 0.2872 | 142. | 0.241 |
| 55. | 0.2843 | 143. | 0.2414 |
| 56. | 0.2845 | 144. | 0.2388 |
| 57. | 0.2831 | 145. | 0.2395 |
| 58. | 0.284 | 146. | 0.2382 |
| 59. | 0.2837 | 147. | 0.2391 |
| 60. | 0.2854 | 148. | 0.2372 |
| 61. | 0.2824 | 149. | 0.2366 |
| 62. | 0.2825 | 150. | 0.2385 |
| 63. | 0.2819 | 151. | 0.2376 |
| 64. | 0.2807 | 152. | 0.2381 |
| 65. | 0.281 | 153. | 0.2394 |
| 66. | 0.2811 | 154. | 0.2376 |
| 67. | 0.2807 | 155. | 0.2352 |
| 68. | 0.279 | 156. | 0.2332 |
| 69. | 0.2784 | 157. | 0.234 |
| 70. | 0.2768 | 158. | 0.2324 |
| 71. | 0.2758 | 159. | 0.2344 |
| 72. | 0.2764 | 160. | 0.233 |
| 73. | 0.2759 | 161. | 0.2303 |
| 74. | 0.2726 | 162. | 0.2308 |
| 75. | 0.2767 | 163. | 0.2325 |
| 76. | 0.2751 | 164. | 0.2318 |
| 77. | 0.2746 | 165. | 0.2317 |
| 78. | 0.2749 | 166. | 0.2335 |
| 79. | 0.2732 | 167. | 0.2314 |
| 80. | 0.2725 | 168. | 0.2294 |
| 81. | 0.2728 | 169. | 0.2308 |
| 82. | 0.2727 | 170. | 0.2312 |
| 83. | 0.2717 | 171. | 0.2299 |
| 84. | 0.2737 | 172. | 0.228 |
| 85. | 0.2694 | 173. | 0.2265 |
| 86. | 0.2673 | 174. | 0.2271 |
| 87. | 0.2677 | 175. | 0.2271 |

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.

LUMINANT

## VISUAL ESTIMATION RESULTS

### Estimated Parameters

| Parameter | Estimate | |
|---|---|---|
| K | 0.003249 | cm/sec |
| y0 | 1.835 | ft |

T = K*b = 1.134 cm²/sec

LUMINANT

**REPORT**

# Groundwater Monitoring Plan - Revision 2

*Oak Grove Steam Electric Station - Ash Landfill 1*
*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

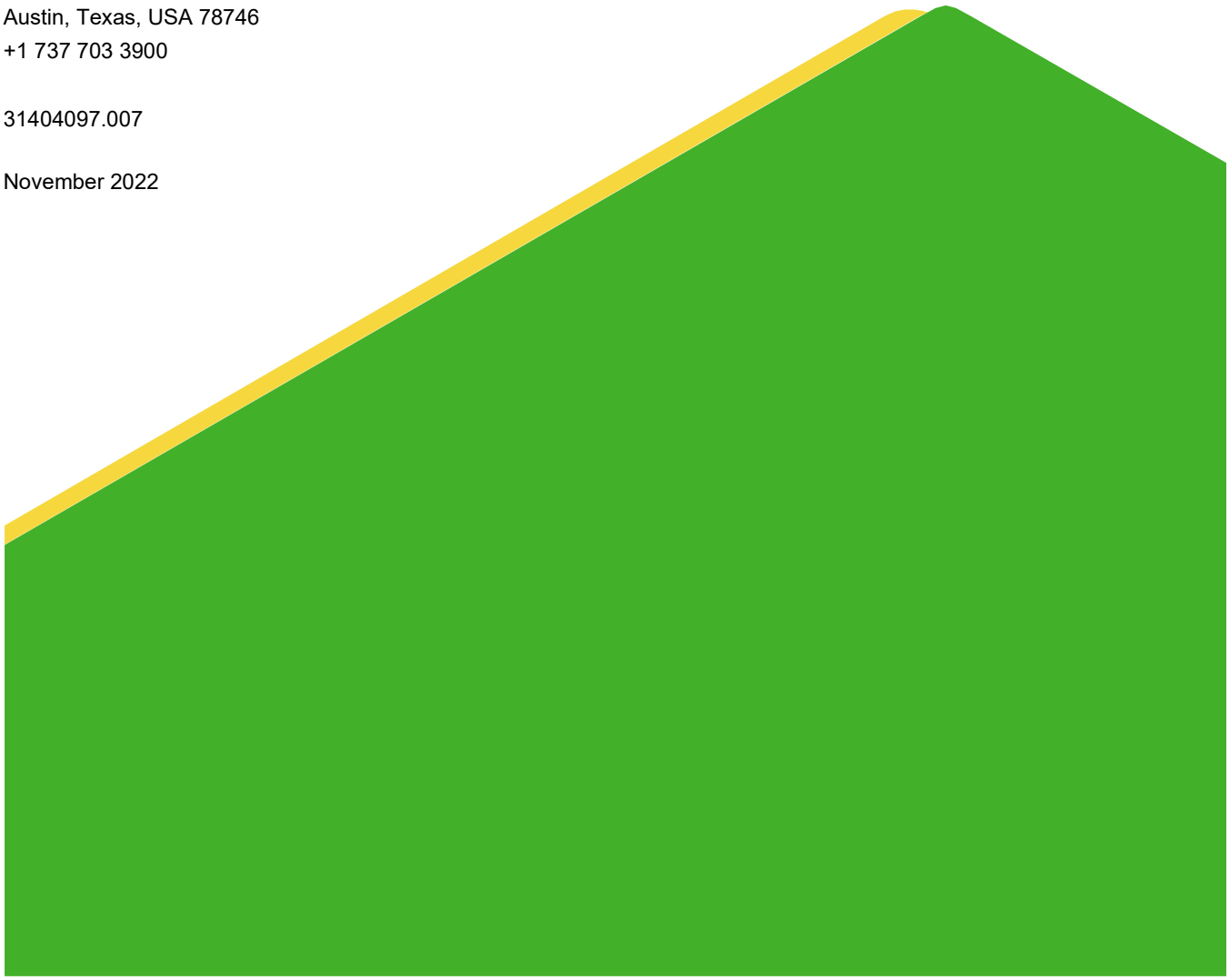
Submitted by:

**WSP GOLDER**

1601 S MoPac Expressway
Suite 325D
Austin, Texas, USA 78746
+1 737 703 3900

31404097.007

November 2022



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Appendix A CCR Monitoring Well Logs

## DOCUMENT REVISION RECORD

| Issue No. | Date | Details of Revisions |
|---|---|---|
| **Revision 0** | October 2017 | Original Document |
| **Revision 1** | January 2022 | Updated information on data evaluation procedures, updated well information |
| **Revision 2** | November 2022 | Signed/sealed report and added professional geoscientist seal to figures that contain geological interpretations (e.g., boring logs), addressed sample shipment and quality assurance/quality control procedures, specified that the rate and direction of groundwater flow will be determined each sampling event, provided additional information on the statistical methods used to develop background values and evaluate sample data, specified that Alternate Source Demonstrations must be certified by a professional engineer, and updated groundwater protection standard information for cobalt, lithium, molybdenum |

# 1.0 INTRODUCTION

Oak Grove Management Company LLC operates the Oak Grove Steam Electric Station (OGSES) located approximately 10 miles north of Franklin, Robertson County, Texas (Figure 1). The OGSES consists of two 800-megawatt power generation units which burn lignite and coal. Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operations. CCRs generated at the OGSES are managed in the FGD Pond Area (FGD-A, FGD-B and FGD-C) and Ash Landfill 1. This report discusses the Ash Landfill 1 (the Site).

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the EPA to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. The CCR Rule establishes national minimum criteria for existing and new CCR landfills, existing and new CCR surface impoundments, and lateral expansions to landfills/impoundments. The Ash Landfill 1 is considered an "existing landfill" under 40 CFR 257.53.

A groundwater monitoring plan was developed for the Site in accordance with Sections 257.90 through 257.95 of the CCR Rule (PBW, 2017a). The CCR groundwater monitoring system at the Site was certified by a professional engineer in accordance with Section 257.91 of the CCR Rule as part of a separate report (PBW, 2017b). This revised groundwater monitoring plan updates and replaces the previous groundwater monitoring plan for the Ash Landfill 1.

## 1.1 CCR Unit Groundwater Monitoring Applicability

Section 257.90 of the CCR Rule requires that existing CCR landfills and surface impoundments be in compliance with the following groundwater monitoring requirements:

- Install a groundwater monitoring system as required under Section 257.91;
- Develop a groundwater sampling and analysis program to include selection of the statistical procedures to be used for evaluating groundwater monitoring data as required under Section 257.93;
- Initiate a detection monitoring program to include obtaining a minimum of eight independent samples for each background and downgradient monitoring well as required under Section 257.94; and
- Begin evaluating the groundwater monitoring data for statistically significant increases over background levels for the constituents listed in Appendix III of this part as required under

Section 257.94.

Once a groundwater monitoring system and groundwater monitoring program has been established at the CCR unit, the owner or operator must conduct groundwater monitoring and, if necessary, corrective action throughout the active life and post-closure care period of the CCR unit. In the event of a release from a CCR unit, the owner or operator must take all necessary measures to control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of contaminants into the environment.

For existing CCR landfills and surface impoundments, the owner or operator must prepare an annual groundwater monitoring and corrective action report to document the status of the groundwater monitoring and corrective action program for the CCR unit for the previous calendar year.

## 1.2 Groundwater Sampling and Analysis Requirements

The CCR Rule establishes groundwater sampling and analysis criteria that are designed to create consistency and ensure that monitoring results provide accurate representations of groundwater quality at the CCR groundwater monitoring wells. A sampling and analysis program must be developed for each unit that includes procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, chain of custody control, and quality assurance and quality control. Depending on the constituents and concentrations detected, groundwater monitoring at each CCR unit may consist of detection monitoring (Section 257.94) only or a combination of detection monitoring and assessment monitoring (Section 257.95). Selected technical groundwater sampling and analysis criteria are described in detail below; however, the complete CCR Rule should be referenced for notification requirements and other criteria.

### 1.2.1 Groundwater Elevations

Groundwater elevations must be measured in each well immediately prior to purging, each time groundwater is sampled.

### 1.2.2 General Groundwater Analytical Requirements

The CCR groundwater monitoring program must include sampling and analytical methods that are appropriate for groundwater sampling and that accurately measure hazardous constituents and other monitoring parameters in groundwater samples. The EPA publication *Test Methods for Evaluating*

*Solid Waste, Physical/Chemical Methods (SW-846)*, is EPA'S official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with the RCRA regulations (EPA, 2015).

Groundwater monitoring under the CCR Rule includes analyses for inorganic parameters and metals. All metals analyses must be reported as "total recoverable metals" to capture both the particulate fraction and dissolved fraction of metals in the groundwater. The CCR Rule stipulates that groundwater samples cannot be field filtered prior to analysis.

### 1.2.3 Background Groundwater Quality Determination

Background groundwater quality must be established in a hydraulically upgradient or background well(s) for each of the groundwater constituents required in the detection monitoring or assessment monitoring program that applies to the CCR unit. Background groundwater quality may be established at wells that are not located hydraulically upgradient from the CCR unit if the samples accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit.

### 1.2.4 Detection Monitoring Requirements

Groundwater detection monitoring must be performed at each CCR unit (CCR Rule Section 257.94). The following constituents must be included in the detection monitoring program (from Appendix III to the CCR Rule):

- Boron
- Calcium
- Chloride
- Fluoride
- pH
- Sulfate
- Total Dissolved Solids (TDS)

The monitoring frequency for these constituents must be at least semi-annual during the active life of the CCR unit and post-closure period. The reported concentrations of the detection monitoring constituents must be compared to the respective CCR unit background concentration developed for each constituent. If a statistically significant increase over background levels is determined for one or more of the constituents listed above at any monitoring well at the CCR unit waste boundary, within 90

days the owner or operator must:

- Establish an assessment monitoring program as described in Section 257.95 of the Rule, or
- Demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with the detection monitoring program.

### 1.2.5 Assessment Monitoring Requirements

Assessment monitoring is required under the CCR Rule whenever a statistically significant increase over background levels has been detected for one or more of the detection monitoring constituents listed above (CCR Rule Section 257.95). The following constituents must be included in the assessment monitoring program (from Appendix IV to the CCR Rule):

- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Fluoride
- Lead
- Lithium
- Mercury
- Molybdenum
- Selenium
- Thallium
- Radium 226 and 228 combined

Within 90 days of triggering an assessment monitoring program, and annually thereafter, the owner or operator of the CCR unit must sample and analyze the groundwater for all assessment monitoring constituents (Appendix IV) listed above. At least one sample must be collected from each well associated with the CCR unit.

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, the owner or operator of the CCR unit must resample all wells associated with the CCR unit, conduct analyses for all detection monitoring parameters (Appendix III) and for those assessment monitoring

constituents (Appendix IV) that have been detected as part of assessment monitoring. At least one sample must be collected from each well associated with the CCR unit. This monitoring must be performed on at least a semi-annual basis thereafter. The owner or operator of a CCR unit may demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for these constituents during the active life and the post-closure care period based on the availability of groundwater. If there is not adequate groundwater flow to sample wells semi-annually, the alternative frequency shall be no less than annual.

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, groundwater protection standards (GWPSs) must be established for all assessment monitoring constituents (Appendix IV) detected in the CCR unit monitoring wells. The GWPS shall be:

- For constituents for which a federal maximum contaminant level (MCL) has been established under 40 CFR 141.62 and 141.66, the MCL for that constituent; or
- For constituents for which an MCL has not been established, the background concentration or approved regional screening level for the constituent established in accordance with CCR Rule Section 257.91; or
- For constituents for which the background level is higher than the MCL, the background concentration.

Following are the federal MCLs or alternate accepted screening criteria that have been established for the assessment monitoring constituents (Appendix IV) identified in the Rule:

| Constituent | MCL (mg/L) |
|---|---|
| Antimony | 0.006 |
| Arsenic | 0.01 |
| Barium | 2.0 |
| Beryllium | 0.004 |
| Cadmium | 0.005 |
| Chromium | 0.10 |
| Cobalt | 0.006* |
| Fluoride | 4.0 |
| Lead | 0.015* |
| Lithium | 0.04* |

| Constituent | MCL (mg/L) |
|---|---|
| Mercury | 0.002 |
| Molybdenum | 0.10* |
| Selenium | 0.05 |
| Thallium | 0.002 |
| Radium 226/228 Combined | 5 pCi/L** |

* Health-protective benchmarks adopted by the USEPA for Appendix IV constituents without established MCLs.
** pCi/L = picocuries per liter
Note: This table does not include background prediction limits.

If the concentrations of all detection monitoring constituents (Appendix III) and assessment monitoring constituents (Appendix IV) are shown to be statistically at or below background values for two consecutive sampling events, the owner or operator may return to performing only detection monitoring of the CCR unit. If the concentrations of any detection monitoring constituents (Appendix III) and assessment monitoring constituents (Appendix IV) are shown to be statistically above background values, but all concentrations are below their respective GWPS, the owner or operator must continue assessment monitoring of the CCR Unit.

Within 90 days of finding that any of the assessment monitoring constituents (Appendix IV) have been detected at a statistically significant level exceeding their respective GWPS, the owner or operator of the CCR unit must either:

- Initiate an assessment of corrective measures for the CCR unit (CCR Rule Section 257.96); or
- Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. If a successful demonstration is made, the owner or operator must continue assessment monitoring. If a successful demonstration has not been made at the end of the 90 day period, the owner or operator of the CCR unit must initiate an assessment of corrective measures for the CCR unit.

If one or more assessment monitoring constituents (Appendix IV) are detected at statistically significant levels above their respective GWPS, the owner or operator of the CCR unit must characterize the nature and extent of the release. Characterization of the release includes the following minimum measures:

- Install additional monitoring wells necessary to define the contaminant plume(s);

- Collect data on the nature and estimated quantity of material released including specific information on the assessment monitoring constituents (Appendix IV) and the levels at which they are present in the material released;

- Install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well for all detection monitoring parameters (Appendix III) and for those assessment monitoring constituents (Appendix IV) that have been detected as part of assessment monitoring. This monitoring must be performed on at least a semi-annual basis thereafter.

- Sample all CCR unit wells for all detection monitoring parameters (Appendix III) and for those assessment monitoring constituents (Appendix IV) that have been detected as part of assessment monitoring. This monitoring must be performed on at least a semi-annual basis thereafter.

If an assessment of corrective measures is required as a result of assessment monitoring, and if the CCR unit being monitored is considered an existing unlined CCR surface impoundment under the CCR Rule, then the CCR unit is required to retrofit or close in accordance with the applicable parts of the CCR Rule.

## 1.3 Groundwater Statistical Evaluation Requirements

Statistical analysis of the groundwater monitoring data is required as part of detection monitoring and assessment monitoring under the CCR Rule. One of the following statistical methods must be used to evaluate groundwater monitoring data for each monitored constituent:

- A parametric analysis of variance followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent; or

- An analysis of variance based on ranks followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent; or

- A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data. The level of each constituent in each compliance well is compared to the upper tolerance or prediction limit established from the background data; or

- A control chart approach that gives control limits for each constituent; or

- Another statistical test method that meets the performance standards.

Any statistical method chosen must comply with the following performance standards:

- The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of constituents. Probability distributions of data values shall use parametric methods, and non-probability distributions of data values shall use non-parametric methods. If the distribution of the constituents is shown to be inappropriate for a probability theory test, the data must be transformed or a distribution-free (non-parametric) theory test must be used. If the distributions for the constituents differ, more than one statistical method may be needed;

- If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a GWPS, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparison procedure is used, the Type I experiment wise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparison must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals, or control charts;
- If a control chart approach is used to evaluate groundwater monitoring data, the specific type of chart and its associated parameter values shall be such that this approach is at least as effective as any other approach in this section for evaluating groundwater data. The parameter values shall be determined after considering the number of samples in the background database, the data distribution, and the range of the concentration values for each constituent of concern;

- If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be such that this approach is at least as effective as any other approach in this section for evaluating groundwater data. These parameters shall be determined after considering the number of samples in the background database, the data distribution, and the range of the concentration values for each constituent of concern;

- The statistical method must account for data below the limit of detection with one or more statistical procedures that shall be at least as effective as any other approach in this section for evaluating groundwater data. Any practical quantitation limit that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility; and

- If necessary, the statistical method must include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

The owner/operator of the CCR unit must determine if there has been a statistically significant increase over background (detection monitoring) or MCLs/background (assessment monitoring) for each constituent required in the particular groundwater monitoring program that applies to the CCR unit. The determination of statistical increase over background/MCLs for each constituent at each monitoring well

must be made within 90 days after completing sampling and analysis.

# 2.0 GROUNDWATER MONITORING PROCEDURES

This section describes groundwater sampling and analysis procedures for monitoring the CCR unit wells to comply with the requirements of 40 CFR 257.90 - 257.95 of the CCR Rule.

## 2.1 Ash Landfill 1 Groundwater Monitoring System

The CCR groundwater monitoring system at the Ash Landfill 1 consists of the following six monitoring wells:

| Upgradient Wells | Downgradient Wells |
|---|---|
| MW-02<br>AL-10 | MW-05<br>MW-07<br>MW-08R<br>MW-09 |

A detailed Site Plan showing the locations of the CCR monitoring wells is shown on Figure 2. Well logs for the wells are reproduced in Appendix A. The CCR groundwater monitoring system was certified by a professional engineer in accordance with Section 257.91 of the CCR Rule as part of a separate report (PBW, 2017).

## 2.2 Groundwater Sampling Procedures

### 2.2.1 Equipment Assembly and Preparation

Activities that occur during groundwater sampling are summarized as follows:

- pre-arrangement of sample analytical requests with analytical testing laboratory;
- assembly and preparation of sampling equipment and supplies;
- groundwater sampling;
- water-level measurements;
- well purging;
- field parameter measurements;
- sample collection;
- sample preservation;
- sample labeling;
- completion of sample records;
- completion of chain-of-custody records; and
- sample shipment.

Prior to each sampling event, equipment to be used is assembled, properly cleaned and its operating condition verified. In addition, all record-keeping materials are prepared. Sampling procedures are conducted in general accordance with EPA SW-846 methods.

Decontamination of all non-disposable or non-dedicated field measurement, purging, and sampling equipment are performed for each sampling event before any purging/sampling activities begin, after each well is sampled, and at the end of the sampling event. Decontamination procedures are summarized below:

(1) Wash equipment with low-residue soap and/or detergent solution.
(2) Rinse with distilled water; and
(3) Repeat steps (1) and (2) above, as necessary.

### 2.2.2 General Groundwater Sampling Procedures

Prior to collecting samples, each well is inspected for signs of damage to the well protective casing and well pad. Each field instrument is calibrated according to the manufacturer's instructions prior to use.

Special care should be exercised to prevent contamination of the groundwater and extracted samples during the sampling activities. The primary way in which such contamination can occur is contact with improperly cleaned equipment. To prevent such contamination, all non-dedicated sampling equipment is thoroughly cleaned before and between uses at different sampling locations. In addition to the use of properly cleaned equipment, a new pair of disposable latex (or similar) gloves is worn for each well.

### 2.2.3 Groundwater Level Measurements

Groundwater levels are measured prior to purging the wells. Using a pre-cleaned water level meter, the groundwater surface is measured from the casing datum to the nearest 0.01-foot. Total depth measurements are also collected on, at least, an annual basis. The rate and direction of groundwater flow should be determined for each groundwater monitoring event.

### 2.2.4 Well Purging and Sampling

Well purging and sampling is conducted using either a submersible pump or peristaltic pump in accordance with standard low flow sampling procedures. The sampler withdraws water in a manner that minimized stress (drawdown) to the system to the extent practicable. When the pump intake is located within the screened interval, the water pumped is drawn in directly from the formation with little mixing of casing water or disturbance to the sampling zone. Thus, sample results are more representative of the constituents present in the groundwater.

Purging rates during sample collection are generally performed at 0.5 liters per minute (L/min) or less. Field parameters (pH, temperature, conductivity and turbidity) are measured to evaluate when the well is adequately purged. Turbidity in the samples should be minimized as much as possible. By using minimal pumping rates, dedicated equipment whenever possible, and positioning the intake for the sample tubing or submersible pump off of the bottom of the well.

For groundwater samples, at least three field measurements should be taken during the course of purging the well. If the parameters have not stabilized at that time, field measurements and purging will continue until two consecutive readings have stabilized to within the following limits:

- Temperature: +/-1° C
- pH: +/-0.1 pH units
- Specific conductance: +/-10%
- Turbidity: +/- 10%

Sample extraction is accomplished by using the pump that was previously used to purge the well. The sample bottle is filled directly from the pump line. The pumping rate and parameter measurements are recorded on groundwater sampling forms in the field. If a well goes dry during purging, sampling is performed after the well has sufficiently recharged to allow sample collection.

Groundwater samples will not be filtered in the field prior to collection in accordance with Section 257.93(i) of the CCR Rule.

### 2.2.5 Container, Labels, and Shipment

Samples are collected in laboratory-supplied containers. The following information is legibly and indelibly written on the label:

- project identification;
- sample identification;
- name or initials of collector;
- date and time of collection;
- analysis requested; and
- sample preservative, if applicable.

After the samples are collected, the sample containers are placed in a cooler or similar container, preserved with ice, and shipped to the laboratory for analysis.

### 2.2.6 Chain-of-Custody Control

After samples are collected, chain-of-custody procedures are followed to establish a written record concerning sample movement between the sampling site and the testing laboratory. Each shipping container has a chain-of-custody form completed by the sampling personnel packing the samples. The chain-of-custody form for each container is completed and sealed in the shipping container.

## 2.3 Analytical Procedures

The laboratory analytical methods utilized for the analysis of detection monitoring and assessment monitoring programs are appropriate and commonly utilized EPA methodologies, or other similar standard methodologies. Typical methodologies used to analyze the detection and assessment program constituents are presented below:

Detection Monitoring Program (Appendix III Constituents)

- Boron and calcium by EPA Method SW6020;
- Chloride, fluoride, and sulfate by EPA Method E300;
- pH by Standard Method M4500-H + B (field measurement); and
- TDS by Standard Method M2540.

Assessment Monitoring Program (Appendix IV Constituents)

- Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, lithium, molybdenum, selenium, and thallium by EPA Method SW6020;
- Fluoride EPA Method E300;
- Mercury by EPA Method SW7470; and
- Radium 226 and 228 by EPA Methods 904.0/SW9320 Modified and 903.1 Modified.

All metals analyses shall be reported as “total recoverable metals” in accordance with Section 257.93(1) of the CCR Rule. Filtering of samples prior to analysis is not permitted.

### 2.3.1 Data Quality Assurance/Quality Control

A quality assurance/quality control (QA/QC) program will be implemented to confirm the validity of the analytical results. Laboratory QC samples will include method blanks, laboratory control samples, and matrix spike/matrix spike duplicates. Field QC samples will include one field duplicate per sampling event. The selected laboratory must have in place documented quality assurance protocols and quality control checks to demonstrate the laboratory’s procedures and practices are consistent with the National Environmental Laboratory Accreditation Conference (NELAC) standards. Potential issues regarding the quality of the data should be evaluated through the examination of:

- The project objectives;
- Laboratory review checklist and associated exceptions report;
- The reportable data including data from one field duplicate per sampling event; and
- The field notes and data associated with the sampling event(s).

In the case where quality control criteria are outside applicable limits, a summary must be presented that indicates the affected samples, the quality control parameter reviewed, the qualifiers and bias code(s) applied to the data point, and the determination made concerning the usability of data.

## 3.0 STATISTICAL EVALUATION PROCEDURESSTATISTACAL EVALUATION PROCEDURES

The following statistical evaluation approaches were selected to demonstrate groundwater compliance for the Ash Landfill 1 under the CCR Rule:

- Use of interwell data evaluations, which compare new sample data to data from upgradient or background monitoring wells.

- Use of upper prediction limits (UPLs) to develop site-specific background concentrations for all Appendix III and Appendix IV constituents. This approach is a common statistical method used to evaluate groundwater compliance for Subtitle D landfill facilities and is one of the approved options for groundwater quality data statistical evaluation under the CCR Rule.

- After every detection monitoring event, Appendix III constituent concentrations from each well are compared to background UPLs to ascertain if a statistically significant increase above background exists. Background UPLs are based on a 1-of-2 resampling approach, meaning that if zero or one concentration measurement from a series of two independent samples collected from a well do not exceed the appropriate UPL, then a statistically significant increase over background has not occurred at a CCR unit.

- If in assessment monitoring, the 95% lower confidence limit of the mean (LCL) is calculated after each assessment monitoring event for each Appendix IV constituent. The set of data used to calculate LCLs is based on current and historical constituent concentrations. A statistically significant increase over the GWPS has occurred at a CCR unit when the LCL for at least one assessment monitoring constituent at a well is greater than the appropriate GWPS.

The statistical evaluation procedures proposed for the Ash Landfill 1 groundwater data conforms with the Rule requirements shown in Section 1.3, as well as the Statistical Analysis Plan for the CCR unit (Golder, 2022), EPA's *Unified Guidance: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities* (EPA, 2009), and the American Society for Testing and Materials (ASTM) standard D6312-17, *Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at waste Disposal Facilities* (ASTM, 2017).

Eight independent groundwater samples were evaluated for each Appendix III parameter at each well to statistically establish detection monitoring prediction limits. Eight independent groundwater samples were also evaluated for each Appendix IV parameter at each well to establish assessment monitoring GWPS. The GWPSs were developed using the following methodology:

- For constituents for which a federal maximum contaminant level (MCL) has been established, the MCL for that constituent; or

- For constituents for which an MCL has not been established, the background concentration

(prediction limit) or approved regional screening level for the constituent; or

- For constituents for which the background level (prediction limit) is higher than the MCL, the background concentration (prediction limit) for the constituent.

## 4.0 DETECTION MONITORING DATA EVALUATION

CCR groundwater detection monitoring will be performed on a semi-annual basis during the active life of the landfill and during the post-closure period. Each CCR monitoring well will be sampled for the following Appendix III constituents as part of the detection monitoring program:

- Boron
- Calcium
- Chloride
- Fluoride
- pH
- Sulfate
- Total Dissolved Solids (TDS)

Sampling and analytical procedures will be as described in previous sections of this plan.

After each detection monitoring event, the reported concentrations of the detection monitoring constituents at each well will be compared to the background concentration prediction limits developed for each constituent as described in Section 3 of this plan to ascertain if a statistically significant increase above background concentrations does or no does not exist. Possible outcomes from comparing the detection monitoring constituent concentrations in each well to their respective background concentration prediction limits are as follows:

- All detection monitoring constituent concentrations in each well are less than or equal to their respective background concentration prediction limits in the well; or
- One or more detection monitoring constituent concentrations in each well are above their respective background concentration prediction limits in the well.

### 4.1 No Statistically Significant Increase Over Background Concentrations

The background concentration prediction limits were developed based on a one-of-two resampling approach, meaning that if concentrations in at least one sample in a series of two independent samples collected from a well do not exceed their prediction limits, then a statistically significant increase over background concentrations has not occurred. This conclusion will be reached if the data indicate either of the following:

- All detection monitoring constituent concentrations in each well are less than or equal to their respective background concentration prediction limits; or

- One or more detection monitoring constituent concentration in any well is above the respective background concentration prediction limits. If this occurs, the well or wells with concentrations above the prediction limits will be resampled and analyzed for the detection monitoring constituent or constituents that exceed the prediction limits. If the resample indicates that the target detection monitoring constituent concentrations in the well or wells are less than or equal to their respective background concentration prediction limits, then it can be concluded that a statistically significant increase over background concentrations for all detection monitoring constituents does not exist, since concentrations in one sample of the two independent samples do not exceed their prediction limits.

If the groundwater monitoring data indicate that a statistically significant increase over background does not exist at the CCR wells, detection monitoring at all CCR wells will continue on a semi-annual basis.

## 4.2 Statistically Significant Increase Over Background Concentrations

If one or more detection monitoring constituent concentrations in any well is above the respective background concentration prediction limit in both the original detection monitoring sample and the resample, then a statistically significant increase over background concentrations for the target detection monitoring constituents can be concluded. If a statistically significant increase is indicated, within 90 days the owner/operator must:

- Establish an assessment monitoring program as described in this plan, or
- Demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The demonstration must be summarized in a report that is certified by a professional engineer. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with the detection monitoring program.

## 5.0 ASSESSMENT MONITORING DATA EVALUATION

CCR groundwater assessment monitoring will be performed at the Ash Landfill 1 groundwater monitoring system whenever a statistically significant increase over GWPSs has been confirmed for one or more of the detection monitoring constituents listed in this plan. Within 90 days of triggering the assessment monitoring program, and annually thereafter, each CCR monitoring well in the groundwater monitoring system will be sampled for the following Appendix IV parameters as part of the assessment monitoring program:

- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Fluoride
- Lead
- Lithium
- Mercury
- Molybdenum
- Selenium
- Thallium
- Radium 226 and 228 combined

Sampling and analytical procedures will be as described in previous sections of this plan.

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, all wells in the groundwater monitoring system will be resampled and analyzed for:

- All Appendix III detection monitoring parameters; and
- The Appendix IV assessment monitoring parameters that were detected as part of the assessment monitoring event.

This monitoring will be performed on at least a semi-annual basis thereafter unless the owner/operator can demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for these constituents during the active life and the post-closure care period based on the availability of groundwater. If there is not adequate groundwater flow to sample wells semi-annually, the alternative frequency shall be no less than annual.

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, GWPSs will be established for all Appendix IV assessment monitoring constituents that were detected in the Ash Landfill 1 groundwater monitoring system wells as follows:

- For constituents for which a federal maximum contaminant level (MCL) has been established, the MCL for that constituent; or
- For constituents for which an MCL has not been established, the background concentration or approved regional screening level for the constituent; or
- For constituents for which the background level is higher than the MCL, the background concentration for the constituent.

The 95% LCL of each Appendix IV constituent concentration at each well will be compared to the GWPS established for each constituent to ascertain if a statistically significant increase above the GWPS does or does not exist.

## 5.1 No Statistically Significant Increase Over Groundwater Protection Standards

If the groundwater monitoring data indicate that a statistically significant increase over GWPS does not exist at the CCR wells, all wells in the Ash Landfill 1 groundwater monitoring system will be sampled on a semi-annual basis and analyzed for:

- All Appendix III detection monitoring parameters; and
- The Appendix IV assessment monitoring parameters that were detected as part of the initial assessment monitoring event.

This monitoring will be performed on at least a semi-annual basis unless the owner/operator can demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for these constituents during the active life and the post-closure care period based on the availability of groundwater.

If the concentrations of all Appendix III detection monitoring constituents and Appendix IV assessment monitoring constituents are shown to be statistically at or below background values for two consecutive assessment monitoring sampling events, assessment monitoring will be terminated and detection monitoring as described in this plan will resume. If the concentrations of any Appendix III detection

monitoring constituents and Appendix IV assessment monitoring constituents are shown to be statistically above background values, but all concentrations are below their respective GWPS, assessment monitoring will continue.

## 5.2 Statistically Significant Increase Over Groundwater Protection Standards

If a statistically significant increase over GWPSs for any Appendix IV assessment monitoring constituent is confirmed, within 90 days of the initial assessment monitoring event, the owner/operator must:

- Initiate an assessment of corrective measures for the CCR unit in accordance with CCR Rule Section 257.96; or
- Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The demonstration must be summarized in a report that is certified by a professional engineer. If a successful demonstration is made, the owner or operator must continue assessment monitoring. If a successful demonstration has not been made at the end of the 90 day period, the owner or operator of the CCR unit must initiate an assessment of corrective measures for the CCR unit.

If one or more Appendix IV assessment monitoring constituents are detected at statistically significant levels above their respective GWPS in any sampling event, and if a source other than the CCR unit cannot be demonstrated to have caused the contamination, a release from the CCR unit is likely and the nature and extent of the release will be further characterized as follows:

- Install additional monitoring wells necessary to define the contaminant plume(s);
- Collect data on the nature and estimated quantity of material released including specific information on the Appendix IV assessment monitoring constituents and the levels at which they are present in the material released;
- Install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well for all Appendix III detection monitoring parameters and for those Appendix IV assessment monitoring constituents that have been detected as part of assessment monitoring. This monitoring must be performed on at least a semi-annual basis thereafter.
- Sample all CCR unit wells for all Appendix III detection monitoring parameters and for those Appendix IV assessment monitoring constituents hat have been detected as part of assessment monitoring. This monitoring must be performed on at least a semi-annual basis thereafter.

## 6.0 REPORTING REQUIREMENTS

The results of the CCR groundwater monitoring program will be reported each year in an Annual Groundwater Monitoring and Corrective Action Report. The annual report will document the status of the groundwater monitoring and corrective action program, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. At a minimum, the Annual Groundwater Monitoring and Corrective Action Report will contain the following information:

- A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;
- In addition to all the monitoring data obtained under CCR Rule Sections 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;
- A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and
- Other information required to be included in the annual report as specified in CCR Rule Sections 257.90 through 257.98.

The Groundwater Monitoring and Corrective Action Reports must be placed in the facility operating record no later than January 31 of the year following completion of the groundwater monitoring program from the preceding calendar year.

## 7.0 REFERENCES

ASTM, 2017. Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at Waste Disposal Facilities - D6312-17.

EPA, 2015. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). On-Line.

EPA, 2009. Unified Guidance Document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, EPA 530/R-09-007. March.

Golder Associates USA, Inc. (Golder), 2022. Statistical Analysis Plan, Revision No. 1, Ash Landfill 1, Oak Grove Steam Electric Station. November 16.

PBW, 2017a. CCR Groundwater Monitoring Plan – Oak Grove Steam Electric Station, Ash Landfill 1, Robertson County, Texas. August.

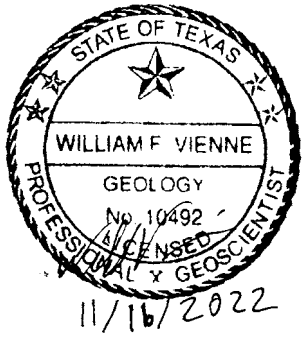
PBW, 2017b. CCR Groundwater Monitoring System Certification – Oak Grove Steam Electric Station, Ash Landfill 1, Robertson County, Texas. August.

# SIGNATURE PAGE

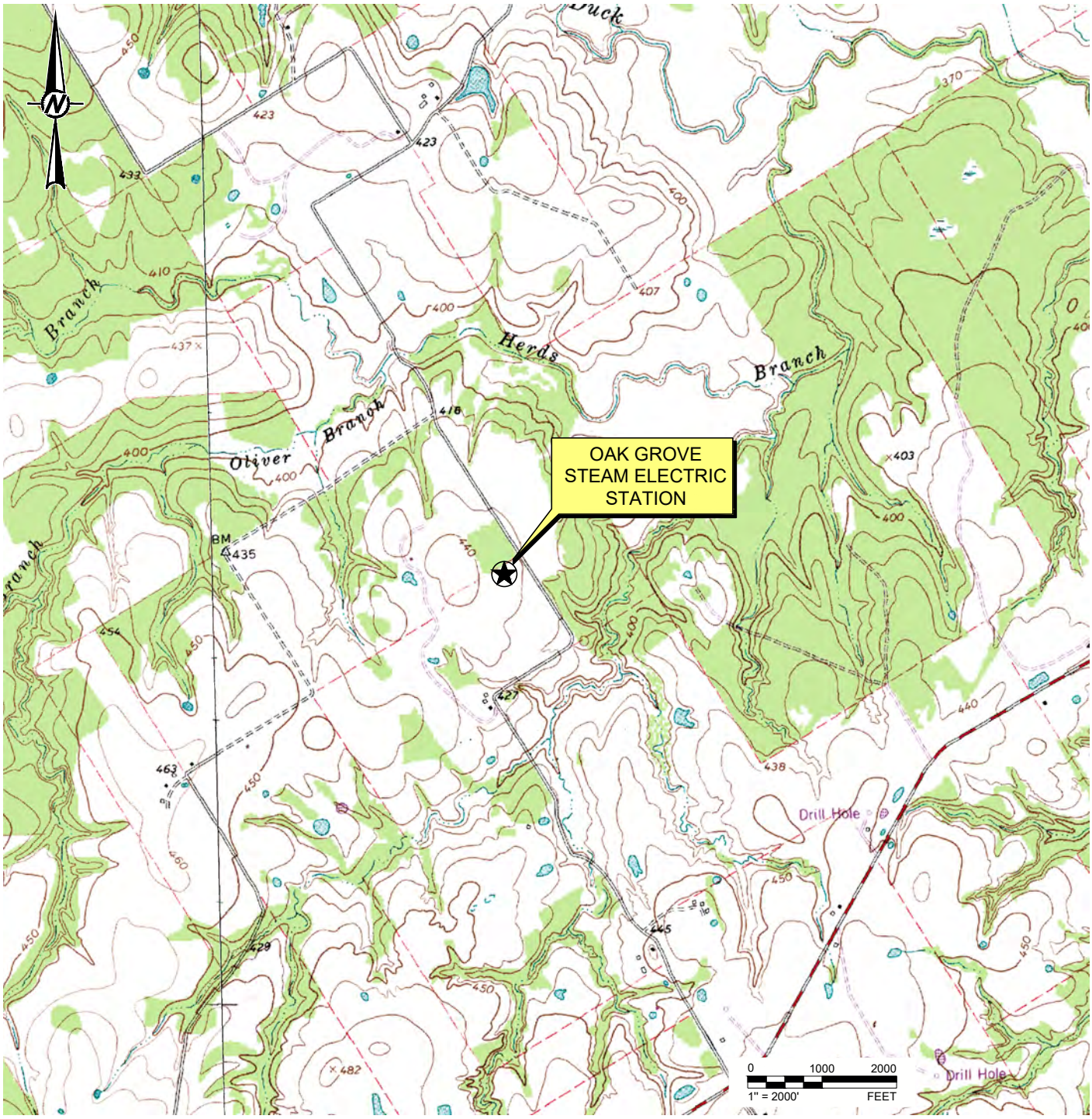
**Golder Associates Inc., Member of WSP**

Patrick J. Behling
*Principal Engineer*

William F. Vienne
*Senior Hydrogeologist*

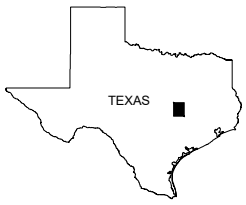


# FIGURES




**REFERENCE(S)**

BASE MAP TAKEN FROM TNRIS.GOV, BALD PRAIRIE, TX 7.5 MIN. USGS QUADRANGLE DATED 1965, REVISED 1982.




QUADRANGLE LOCATION

CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**SITE LOCATION MAP**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2021-12-07 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 20142034 | | 0 | 1 |



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Path: \\golder.gds\complexdata\office\texarkana\projects - round rock_2020\20142034 - luminant\production\D - OAK GROVE\ | File Name: 1-Topographic Map.dwg

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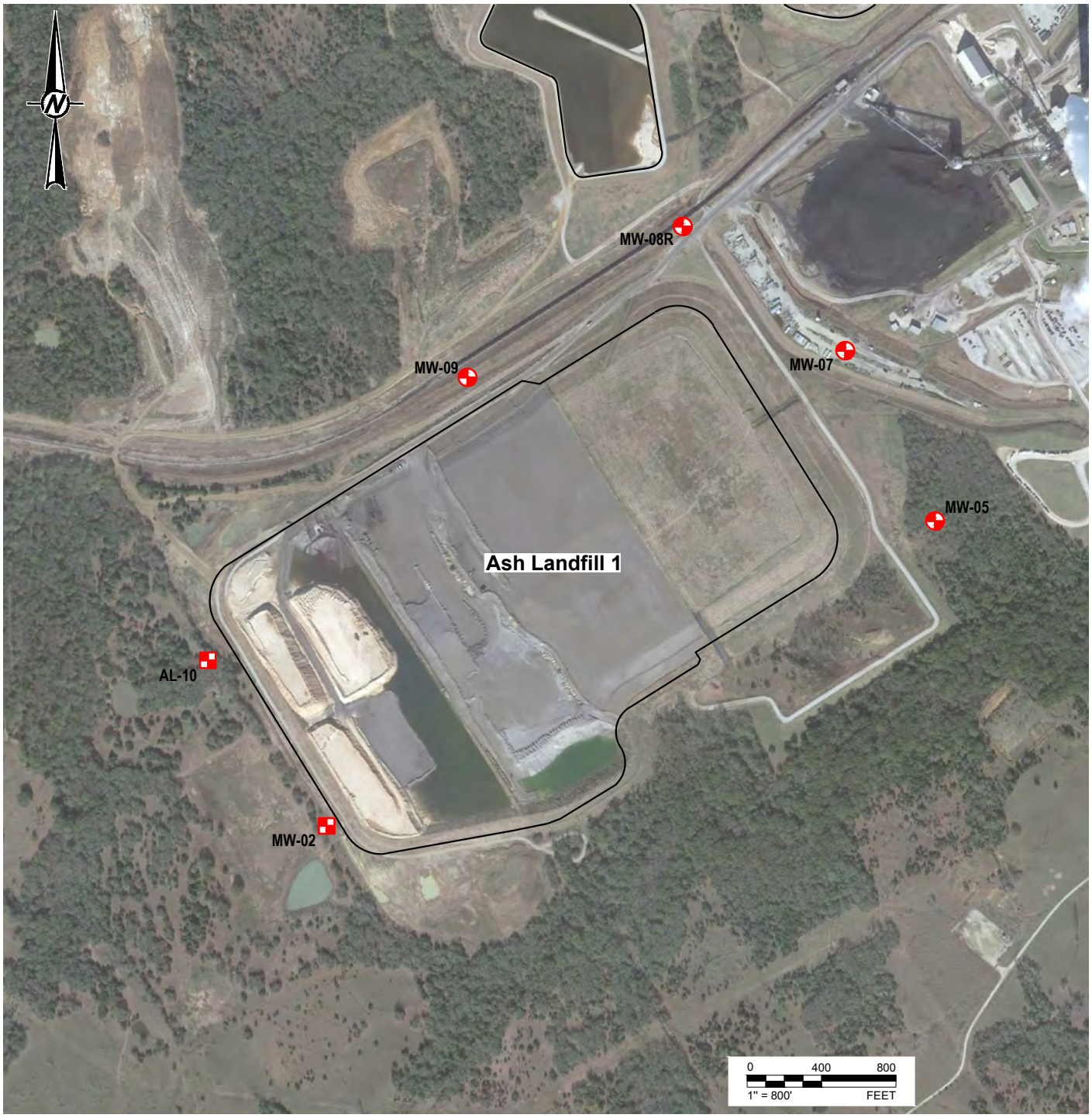
0 1 in




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**SITE PLAN**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 19122262 | 0 | 2 |

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**APPENDIX A**

# CCR Monitoring Well Logs

# Luminant

# Log of Boring: AL-10

Oak Grove Steam Electric Station
Petteway, TX

PBW Project No. 5164D

| | | | |
|---|---|---|---|
| Completion Date: | 9/22/2015 | Drilling Method: | Sonic |
| Drilling Company: | Walker-Hill Environmental | Borehole Diameter (in.): | 6.5 |
| Driller: | Dwayne Whitehead | Total Depth (ft): | 60 |
| Driller's License: | 5814M | TOC Elevation (ft. AMSL): | 460.81 |
| Logged By: | Sara Taube | Northing: | 568673 |
| Sampling Method: | 4"x10' Core barrel | Easting: | 3197291 |

| Depth (ft) | Well Materials | Recovery (ft/ft) | USCS | Lithologic Description |
|---|---|---|---|---|
| 0 | | | | |
| 5 | | 1.3/10.0 | ML | (0 - 12) Clayey SILT, tan/brown/ very dry, unconsolidated, fine to coarse subangular gravel, thin clay chips interspersed |
| 10 | | 2.1/5.0 | | |
| 15 | | 5.0/5.0 | CL | (12 - 20) Sandy CLAY, tan/light gray, very dry, strong cementation, very hard, no plasticity, some silt present, very fine sand grains, heavily indurated, visible bands, sandier and less consolidated with depth, hardened clay nodules |
| 20 | | 2.4/5.0 | | |
| 25 | | 5.0/5.0 | | |
| 30 | | | SC | (20 - 40) Clayey SAND, tan/light gray, slightly moist, moderately unconsolidated, very fine grain, some silt, trace red staining, medium to coarse nodules of very dry indurated sandy clay interbedded, trace black staining |
| 35 | | 9.6/10.0 | | |
| 40 | | | | |
| 45 | | 9.0/10.0 | | |
| 50 | | | CL | (40 - 60) Silty CLAY, light gray, moist, slightly unconsolidated, some purple clay bands, silt decreasing with depth, wet below 50', trace orange staining |
| 55 | | 9.8/10.0 | | |
| 60 | | | | |

STATE OF TEXAS
WILLIAM F VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
11/11/2022


**PBW**

**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446




Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(+3.35 - 50.3) Casing, 2" Sch 40 FJT PVC
(50.3 - 60.3) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-46') Grout
(46'-48') Bentonite chips
(48'-60') 20/40 sand

# RECORD OF BOREHOLE MW-ALF-02

SHEET 1 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 10-Sep-2008
BORING FINISHED: 10-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2103.59
EASTING (ft): 1625.59
ELEVATION (ft): 459.89

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Damp with shallow vegetation | | | | | | | | | | |
| | | GROUND SURFACE | | 459.9 | | | | | | | | |
| 0 | | Loose, brown, silty SAND, some organics, damp | | 0.0 | SB-1 | | 2<br>4<br>5<br>N9 | 53 | | | | |
| 2 | | Loose to compact, brown, clayey SAND, some organics, some roots, dry | | 2.0 | SB-2 | | 5<br>12<br>24<br>N10 | 47 | | | | |
| 4 | | dense at 4' | | | SB-3 | | 12<br>20<br>24<br>N44 | 53 | | | | |
| 6 | | Hard, gray and yellow, mottled, silty CLAY, dry | | 6.5 | SB-4 | | 5<br>13<br>20<br>N33 | 73 | | | | |
| 8 | | very stiff at 8' | | | SB-5 | | 5<br>11<br>15<br>N26 | 73 | | | | |
| 10 | | some iron oxide at 11' | | | SB-6 | | 5<br>12<br>17<br>N29 | 87 | | | | |
| 12 | | dark brown at 12.3' | | | SB-7 | | 4<br>7<br>12<br>N19 | 87 | | | | |
| 14 | | Hard, light grayish brown at 14' | | | SB-8 | | 8<br>15<br>24<br>N39 | 87 | | | | |
| 16 | | Hard, dark brown, CLAY, trace iron oxide, damp | | 16.0 | SB-9 | | 6<br>13<br>19<br>N32 | 100 | | | | |
| 18 | | | | | SB-10 | | 6<br>14<br>40<br>N54 | 87 | | | | |
| | | Very dense, gray, clayey SAND, dry | | 19.5 | | | | | | | | |
| 20 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

# RECORD OF BOREHOLE MW-ALF-02

SHEET 2 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 10-Sep-2008
BORING FINISHED: 10-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2103.59
EASTING (ft): 1625.59
ELEVATION (ft): 459.89

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| | | Hard, dark brown, CLAY, damp | | 20.0 | | | | | | | | |
| | | Dense, gray and yellow, mottled, clayey SAND, dry | | 20.5 | SB-11 | | 13<br>22<br>27<br>N49 | 80 | | | | |
| 22 | | | | | SB-12 | | 9<br>17<br>32<br>N49 | 73 | | | | |
| | | some iron oxide at 23.5' | | | | | | | | | | |
| 24 | | very dense at 24' | | | | | | | | | | |
| | | grayish brown at 24.5' | | | SB-13 | | 10<br>22<br>37<br>N59 | 93 | | | | |
| 26 | | Hard, gray, clayey SILT, with iron oxide, dry | | 26.0 | SB-14 | | 11<br>32<br>40<br>N72 | 100 | | | | |
| 28 | | | | | SB-15 | | 16<br>25<br>40<br>N65 | 100 | | | | |
| 30 | | | | | SB-16 | | 22<br>35<br>50/5" | 87 | | | | |
| 32 | | Hard, gray, silty CLAY, dry | | 32.0 | SB-17 | | 22<br>35<br>50/5" | 93 | | | | |
| 34 | | gray and yellow, mottled at 34' | | | | | | | | | | |
| | | dark gray at 35' | | | SB-18 | | 16<br>24<br>50/5" | 87 | | | | |
| 36 | | black at 36.5' | | | SB-19 | | 22<br>50/2" | 67 | | | | |
| 38 | | light gray at 38' | | | SB-20 | | 17<br>27<br>50/2" | 87 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-02

SHEET 3 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 10-Sep-2008
BORING FINISHED: 10-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2103.59
EASTING (ft): 1625.59
ELEVATION (ft): 459.89

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | | | 40.0 | SB-21 | | 15<br>25<br>38<br>N63 | 100 | | | | |
| 42 | | | | | SB-22 | | 15<br>27<br>42<br>N69 | 93 | | | | |
| 44 | | Very dense, gray, clayey SAND, damp | | 44.0 | SB-23 | | 16<br>27<br>50/1" | 93 | | | | |
| 46 | | moist at 46' | | | SB-24 | | 22<br>46<br>50/3" | 87 | | | | *46' 09/10/2008* |
| 48 | | wet at 48' | | | SB-25 | | 22<br>45<br>50/3" | 93 | | | | |
| 50 | | Very dense, gray, silty SAND, wet | | 50.0 | SB-26 | | 22<br>50/5" | 67 | | | | |
| 52 | | some cemented clayey sand at 53' | | | SB-27 | | 23<br>46<br>50/2" | 87 | | | | |
| 54 | | | | | SB-28 | | 25<br>50/5" | 67 | | | | |
| 56 | | Very dense, gray, SAND, wet | | 56.0 | SB-29 | | 45<br>50/5" | 80 | | | | |
| 58 | | | | | SB-30 | | 45<br>50/5" | 67 | | | | |
| 60 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-02

SHEET 4 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 10-Sep-2008
BORING FINISHED: 10-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2103.59
EASTING (ft): 1625.59
ELEVATION (ft): 459.89

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 60 | | | | 60.0 | SB-31 | | 37<br>50/5" | *87* | | | | |
| 62 | | | | | SB-32 | | 35<br>50/5" | | | | | |
| 64 | | No recovery | | 64.0 | | | | | | | | |
| 66 | | BORING TERMINATED AT 66' | | 66.0 | | | | | | | | |
| 68 | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | |
| 72 | | | | | | | | | | | | |
| 74 | | | | | | | | | | | | |
| 76 | | | | | | | | | | | | |
| 78 | | | | | | | | | | | | |
| 80 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-05

SHEET 1 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 05-Sep-2008
BORING FINISHED: 08-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 1758.08
EASTING (ft): 1973.71
ELEVATION (ft): 434.77

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dry with vegetation | | | | | | | | | | |
| | | GROUND SURFACE | | 434.8 | | | | | | | | |
| 0 | | Soft to firm, dark brown, silty CLAY, with organics, dry | | 0.0 | SB-1 | | 2<br>1<br>3<br>N4 | 87 | | | | |
| 2 | | Very stiff, light brown and yellow, mottled, CLAY, some organics, dry | | 2.5 | SB-2 | | 3<br>7<br>13<br>N20 | 67 | | | | |
| 4 | | hard at 4' | | | SB-3 | | 7<br>17<br>23<br>N40 | 67 | | | | |
| 6 | | very stiff, light gray, with silt at 6' | | | SB-4 | | 5<br>12<br>14<br>N26 | 53 | | | | |
| 8 | | light grayish brown at 8' | | | SB-5 | | 4<br>8<br>14<br>N22 | 87 | | | | |
| 10 | | gray and dark brown, mottled, some iron oxide at 11' | | | SB-6 | | 5<br>12<br>16<br>N28 | 80 | | | | |
| 12 | | Hard, grayish brown and red, mottled, silty CLAY, dry | | 12.0 | SB-7 | | 6<br>13<br>22<br>N35 | 80 | | | | |
| 14 | | Hard, light gray, clayey SILT, dry | | 15.0 | SB-8 | | 8<br>29<br>32<br>N66 | 93 | | | | |
| 16 | | | | | SB-9 | | 14<br>38<br>50/5" | 87 | | | | |
| 18 | | reddish gray at 19' | | | SB-10 | | 20<br>35<br>46<br>N81 | 93 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

# RECORD OF BOREHOLE MW-ALF-05

SHEET 2 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 05-Sep-2008
BORING FINISHED: 08-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 1758.08
EASTING (ft): 1973.71
ELEVATION (ft): 434.77

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | light grayish brown, damp at 20' | | 20.0 | SB-11 | | 16<br>37<br>38<br>N75 | 100 | | | | |
| 22 | | | | | SB-12 | | 6<br>17<br>25<br>N42 | 87 | | | | |
| 24 | | Very dense, yellowish gray, clayey SAND, damp | | 24.0 | SB-13 | | 11<br>24<br>32<br>N56 | 100 | | | | |
| 26 | | grayish brown at 26' | | | SB-14 | | 11<br>26<br>40<br>N66 | 87 | | | | |
| | | Very dense, yellowish gray, silty SAND, damp | | 27.0 | | | | | | | | |
| 28 | | dense, seam of clayey SAND at 28' | | 28.0 | | | | | | | | |
| | | dense, light gray and brown, mottled, moist at 28.5' | | 29.0 | SB-15 | | 11<br>21<br>27<br>N48 | 87 | | | | |
| 30 | | very dense, wet at 30' | | | SB-16 | | 13<br>24<br>35<br>N59 | 100 | | | | ▼ 30' 09/05/2008 |
| 32 | | grayish brown, moist at 32' | | | SB-17 | | 13<br>23<br>32<br>N55 | 93 | | | | |
| 34 | | some iron oxide at 34' | | | | | | | | | | |
| | | seam of brown at 34.5' | | | SB-18 | | 9<br>28<br>45<br>N73 | 100 | | | | |
| 36 | | dense at 36' | | | SB-19 | | 9<br>19<br>20<br>N39 | 100 | | | | |
| 38 | | | | | SB-20 | | 9<br>17<br>22<br>N39 | 100 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

# RECORD OF BOREHOLE MW-ALF-05

SHEET 3 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 05-Sep-2008
BORING FINISHED: 08-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 1758.08
EASTING (ft): 1973.71
ELEVATION (ft): 434.77

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| | | very dense, yellowish brown, some clay at 40' | | 40.0 | SB-21 | | 11<br>21<br>32<br>N53 | 100 | | | | |
| 42 | | dense at 42' | | | SB-22 | | 12<br>22<br>40<br>N62 | 100 | | | | |
| | | Hard, dark grayish brown, clayey SILT, some iron oxide, damp | | 43.0 | SB-23 | | 12<br>27<br>45<br>N72 | 100 | | | | |
| 44 | | | | | | | | | | | | |
| 46 | | seam of yellowish SAND | | 46.5 | SB-24 | | 15<br>31<br>38<br>N69 | 100 | | | | |
| | | Very dense, gray and black, mottled, clayey SAND, some iron oxide, moist | | 47.0 | | | | | | | | |
| 48 | | | | | SB-25 | | 15<br>31<br>45<br>N76 | 100 | | | | |
| | | Very dense, gray, SAND, wet | | 49.0 | | | | | | | | |
| 50 | | BORING TERMINATED AT 50' | | 50.0 | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-06

SHEET 1 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 09-Sep-2008
BORING FINISHED: 09-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2788.65
EASTING (ft): 2054.72
ELEVATION (ft): 436.52

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Damp | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 436.5 | | | | | | | | |
| | | Compact, light gray, SAND, with gravel | | 0.0 | SB-1 | | 8<br>5<br>6<br>N11 | 13 | | | | |
| 2 | | Very stiff, reddish brown, CLAY, some sand, dry | | 2.2 | SB-2 | | 4<br>10<br>19<br>N29 | 67 | | | | |
| 4 | | Hard, reddish brown, silty CLAY, some angular gravel, dry | | 4.0 | SB-3 | | 9<br>25<br>32<br>N57 | 67 | | | | |
| 6 | | Very dense, yellowish light gray, clayey SAND, dry, some gravel, some organics, dry | | 6.0 | SB-4 | | 10<br>25<br>39<br>N64 | 87 | | | | |
| 8 | | | | | SB-5 | | 20<br>50/5" | 53 | | | | |
| 10 | | dark red, some iron oxide at 9.5' | | | SB-6 | | 15<br>35<br>50/5" | 93 | | | | |
| 12 | | light brown and gray, mottled, possible clayey silt at 11' | | | | | | | | | | |
| | | Very dense, light yellowish brown, silty SAND, dry | | 12.0 | SB-7 | | 12<br>27<br>35<br>N62 | 80 | | | | |
| 14 | | Very dense, light brown, clayey SAND, some iron oxide, dry | | 14.0 | SB-8 | | 18<br>29<br>47<br>N76 | 93 | | | | |
| 16 | | Very dense, light grayish brown, silty SAND, dry | | 16.5 | SB-9 | | 10<br>19<br>37<br>N56 | 93 | | | | |
| | | Very dense, gray, clayey SAND, some iron oxide, dry | | 17.5 | | | | | | | | |
| 18 | | Very dense, yellowish gray, silty SAND, dry | | 18.0 | SB-10 | | 12<br>33<br>50/5" | 87 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-06

SHEET 2 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 09-Sep-2008
BORING FINISHED: 09-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2788.65
EASTING (ft): 2054.72
ELEVATION (ft): 436.52

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | | | 20.0 | SB-11 | | 22<br>47<br>50/5" | 80 | | | | |
| | | Very dense, clayey SAND, some iron oxide seam | | 21.5 | | | | | | | | |
| 22 | | Very dense, yellowish gray, silty SAND, dry | | 22.0 | SB-12 | | 16<br>28<br>39<br>N67 | 87 | | | | |
| 24 | | Very dense, yellowish brown, SAND, with clay seam | | 24.0 | SB-13 | | 13<br>31<br>40<br>N71 | 80 | | | | |
| | | Very dense, yellowish gray, silty SAND, damp | | 25.0 | | | | | | | | |
| 26 | | Compact, yellowish gray, clayey SAND, damp<br><br>some iron oxide at 27.5' | | 26.0 | SB-14 | | 3<br>13<br>13<br>N26 | 87 | | | | |
| 28 | | Very dense, grayish brown, SAND, with clay, damp | | 28.0 | SB-15 | | 12<br>22<br>50/5" | 93 | | | | |
| 30 | | wet at 30' | | | SB-16 | | 8<br>28<br>46<br>N74 | 93 | | | | ▼ 30' 09/09/2008 |
| 32 | | Very dense, yellowish gray, silty SAND, wet | | 32.0 | SB-17 | | 25<br>43<br>48<br>N91 | 80 | | | | |
| 34 | | some iron oxide at 35.5' | | | SB-18 | | 8<br>31<br>27<br>N58 | 100 | | | | |
| 36 | | Very dense, dark gray, clayey SAND, moist | | 36.0 | SB-19 | | 12<br>28<br>50/5" | 100 | | | | |
| 38 | | yellowish brown at 38.5'<br><br>light gray at 39'<br><br>dark gray, trace iron oxide at 39.5' | | | SB-20 | | 12<br>25<br>40<br>N65 | 93 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-06

SHEET 3 OF 3
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 09-Sep-2008
BORING FINISHED: 09-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 2788.65
EASTING (ft): 2054.72
ELEVATION (ft): 436.52

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | | | 40.0 | SB-21 | | 11<br>26<br>42<br>N68 | 100 | | | | |
| | | Very dense, yellowish brown, silty SAND, damp | | 41.0 | | | | | | | | |
| 42 | | Hard, brown, yellow, and gray, mottled, sandy CLAY, moist | | 42.0 | SB-22 | | 15<br>34<br>42<br>N76 | 100 | | | | |
| | | Very dense, yellowish brown and gray, mottled, clayey SAND, moist<br>dark brown at 43.5' | | 43.0 | | | | | | | | |
| 44 | | | | | SB-23 | | 22<br>40<br>50/5" | 100 | | | | |
| 46 | | Very dense, gray and yellowish brown, mottled, SAND, moist | | 46.0 | SB-24 | | 22<br>40<br>50/5" | 60 | | | | |
| 48 | | gray and dark gray, mottled, some clay at 48' | | | SB-25 | | 30<br>50/5" | 67 | | | | |
| 50 | | BORING TERMINATED AT 50' | | 50.0 | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

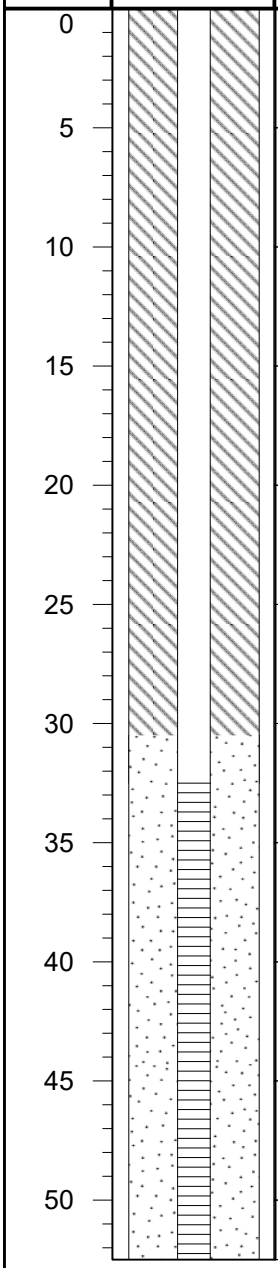
# Luminant

# Log of Boring: MW-8R

Oak Grove Steam Electric Station
Robertson County, TX

PBW Project No. 5164D

| | | | |
|---|---|---|---|
| Completion Date: | 11/9/2016 | Drilling Method: | HSA |
| Drilling Company: | Sunbelt Industrial Services | Borehole Diameter (in.): | 8.25 |
| Driller: | Juan R. Alcala | Total Depth (ft): | 52.5 |
| Driller's License: | 59430 | TOC Elevation (ft. AMSL): | 443.84 |
| Logged By: | Michelle Hermiston | Northing: | 570970 |
| Sampling Method: | 2.25" X 5' Split Spoon | Easting: | 3199809 |

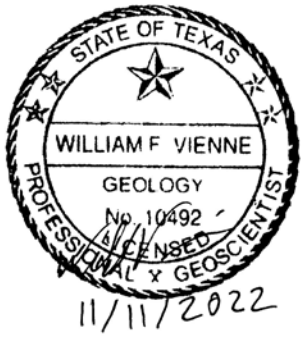



Lithologic Description

(0 - 3) Silty SAND, dark brown, abundant roots, very fine grained sand, unconsolidated, damp, gradational basal contact

(3 - 10.5) Silty CLAY, mottled gray, orange, and red, firm, very firm from 4.0' to 5.0', pieces of lignite present throughout, moderate plasticity, damp, sharp basal contact

(10.5 - 27.5) Sandy CLAY, laminated light gray and orange/brown, trace black laminations present, no to low plasticity, moderate plasticity at 17.5' to 27.5', higher sand content at 15.0' to 17.5', purplish gray clay lenses from 23.0' to 27.5', soft, firm to very firm from 17.5' to 27.5', damp, gradational basal contact




(27.5 - 52.5) Silty SAND, light gray, laminated dark gray and orange (28.5'-31.0', 38.0'-42.0'), unconsolidated, trace clay present, 0.25" thick clay lenses at 31.5', 37.5', and 41.0',dark brown/red around clay lense at 37.5', trace black laminae at 38.0' to 40.0', moist, wet at 35.0', interbedded dark brownish red and light gray sand and clay at 42.0' to 45.5', orange/brown from 45.5' to 50.0', gray with some orange staining from 50.0' to 52.5'


**PBW**

**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 • Fax (512) 671-3446




Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(+2.5 - 32.5) Casing, 2" Sch 40 FJT PVC
(32.5 - 52.5) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-30.5') Bentonite Grout
(30.5'-52.5') 20/40 sand

# RECORD OF BOREHOLE MW-ALF-08

SHEET 1 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 29-Aug-2008
BORING FINISHED: 01-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 3681.62
EASTING (ft): 266.62
ELEVATION (ft): 458.55

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80 / WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Damp with shallow vegetation | | | | | | | | | | |
| | | GROUND SURFACE | | 458.6 | | | | | | | | |
| 0 | | Stiff, dark brown, gray, and red, mottled, CLAY, with silt, some organics, damp | | 0.0 | SB-1 | | 3<br>3<br>3<br>N9 | 33 | | | | |
| 2 | | Very stiff, reddish brown, silty CLAY, dry | | 2.0 | SB-2 | | 6<br>11<br>16<br>N27 | 67 | | | | |
| | | red and light gray, mottled, some organics at 3' | | | | | | | | | | |
| 4 | | light gray at 4' | | | SB-3 | | 6<br>12<br>15<br>N27 | 67 | | | | |
| | | yellow to orange, mottled, dry at 5' | | | | | | | | | | |
| 6 | | hard at 6' | | | SB-4 | | 8<br>17<br>19<br>N36 | 100 | | | | |
| | | some organics at 7' | | | | | | | | | | |
| | | reddish gray at 7.5' | | | | | | | | | | |
| 8 | | very stiff at 8' | | | SB-5 | | 7<br>12<br>16<br>N23 | 93 | | | | |
| | | light gray, damp at 9' | | | | | | | | | | |
| 10 | | Very stiff, gray, CLAY, damp | | 10.0 | SB-6 | | 3<br>8<br>11<br>N19 | 87 | | | | |
| 12 | | hard, yellowish gray at 12' | | | SB-7 | | 5<br>9<br>22<br>N31 | 100 | | | | |
| | | Dense, light gray, SAND, with silt, dry | | 13.5 | | | | | | | | |
| 14 | | | | | SB-8 | | 8<br>13<br>22<br>N35 | 100 | | | | |
| 16 | | seam of yellow clayey sand at 16' | | | SB-9 | | 11<br>18<br>27<br>N45 | 100 | | | | |
| 18 | | Dense, light brown and yellow, mottled, clayey SAND, damp | | 18.0 | SB-10 | | 8<br>17<br>28<br>N45 | 100 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-08

SHEET 2 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 29-Aug-2008
BORING FINISHED: 01-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 3681.62
EASTING (ft): 266.62
ELEVATION (ft): 458.55

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | very dense, grayish brown, some silt at 20' | | 20.0 | SB-11 | | 13<br>26<br>39<br>N65 | 100 | | | | |
| 22 | | dense at 22' | | | SB-12 | | 14<br>20<br>28<br>N48 | 100 | | | | |
| 24 | | | | | SB-13 | | 11<br>19<br>28<br>N47 | 100 | | | | |
| 26 | | Very dense, grayish brown, SAND, with clay, damp | | 26.0 | SB-14 | | 14<br>28<br>42<br>N70 | 100 | | | | |
| 28 | | | | | SB-15 | | 10<br>22<br>36<br>N58 | 87 | | | | |
| 30 | | Very dense, yellowish brown, clayey SAND, damp | | 30.0 | SB-16 | | 12<br>26<br>41<br>N67 | 100 | | | | |
| 32 | | compact, light gray, some silt at 32' | | | SB-17 | | 8<br>12<br>15<br>N27 | 100 | | | | |
| | | Very stiff, light gray, silty CLAY, damp | | 33.0 | | | | | | | | |
| 34 | | | | | SB-18 | | 6<br>11<br>13<br>N24 | 100 | | | | |
| 36 | | dark gray at 35.5'<br>hard, grayish black, dry at 36' | | | SB-19 | | 20<br>45<br>50/5" | 100 | | | | |
| 38 | | black at 37' | | | SB-20 | | 15<br>45<br>50/5" | 100 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-08

SHEET 3 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 29-Aug-2008
BORING FINISHED: 01-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 3681.62
EASTING (ft): 266.62
ELEVATION (ft): 458.55

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | | | 40.0 | SB-21 | | 10<br>41<br>50/5" | 100 | | | | |
| 42 | | | | | SB-22 | | 18<br>50/5" | 87 | | | | |
| 44 | | | | | SB-23 | | 20<br>46<br>50/5" | 100 | | | | |
| 46 | | | | | SB-24 | | 22<br>50/5" | 87 | | | | ▼<br>47' 08/29/2008 |
| 48 | | Very dense, gray, silty SAND, moist | | 47.0 | SB-25 | | 25<br>50/5" | 53 | | | | |
| 50 | | | | | SB-26 | | 30<br>50/5" | 73 | | | | |
| 52 | | Hard, black, CLAY | | 52.5 | | | | | | | | |
| | | Very dense, gray, silty SAND, moist | | 52.8 | SB-27 | | 23<br>50/5" | 67 | | | | |
| 54 | | | | | SB-28 | | 18<br>50/5" | 67 | | | | |
| 56 | | | | | SB-29 | | 27<br>50/5" | 67 | | | | |
| 58 | | | | | SB-30 | | 27<br>50/5" | 87 | | | | |
| 60 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-ALF-08

SHEET 4 OF 4
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 29-Aug-2008
BORING FINISHED: 01-Sep-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 3681.62
EASTING (ft): 266.62
ELEVATION (ft): 458.55

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 60 | | Very dense, gray, silty SAND, moist | | | SB-31 | | 24<br>41<br>50/5" | 100 | | | | |
| 62 | | | | | SB-32 | | 23<br>50/5" | 80 | | | | |
| 64 | | Very dense, gray, SAND, layered with clay, moist | | 64.0 | SB-33 | | 17<br>41<br>50/5" | 87 | | | | |
| | | | | 64.9<br>65.2<br>65.4<br>65.7<br>66.0<br>66.4 | | | | | | | | |
| 66 | | | | | SB-34 | | 17<br>42<br>50/5" | 100 | | | | |
| | | BORING TERMINATED AT 67' | | 67.0 | | | | | | | | |
| 68 | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | |
| 72 | | | | | | | | | | | | |
| 74 | | | | | | | | | | | | |
| 76 | | | | | | | | | | | | |
| 78 | | | | | | | | | | | | |
| 80 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

**REPORT**

# Groundwater Monitoring Plan - Revision 2

*Oak Grove Steam Electric Station - FGD Ponds*
*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

Submitted by:

**WSP GOLDER**

1601 S MoPac Expressway
Suite 325D
Austin, Texas, USA 78746
+1 737 703 3900

31404097.007

November 2022

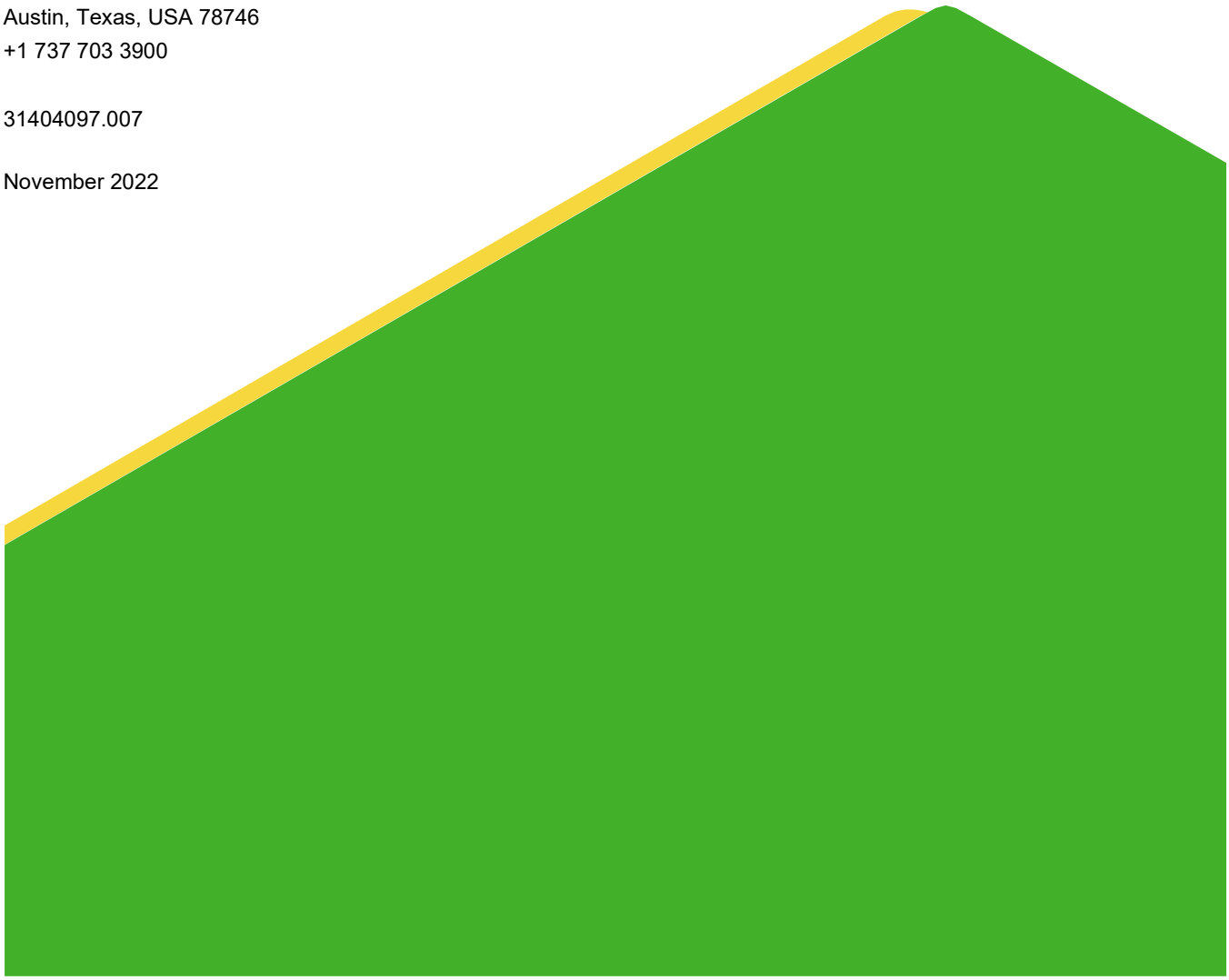


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Figure 1 Site Location Map

Figure 2 Site Plan

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Appendix A CCR Monitoring Well Logs

## DOCUMENT REVISION RECORD

| Issue No. | Date | Details of Revisions |
|---|---|---|
| **Revision 0** | October 2017 | Original Document |
| **Revision 1** | January 2022 | Updated information on data evaluation procedures, updated well information |
| **Revision 2** | November 2022 | Signed/sealed report and added professional geoscientist seal to figures that contain geological interpretations (e.g., boring logs), addressed sample shipment and quality assurance/quality control procedures, specified that the rate and direction of groundwater flow will be determined each sampling event, provided additional information on the statistical methods used to develop background values and evaluate sample data, specified that Alternate Source Demonstrations must be certified by a professional engineer, and updated groundwater protection standard information for cobalt, lithium, molybdenum |

# 1.0 INTRODUCTION

Oak Grove Management Company LLC operates the Oak Grove Steam Electric Station (OGSES) located approximately 10 miles north of Franklin, Robertson County, Texas (Figure 1). The OGSES consists of two 800-megawatt power generation units which burn lignite and coal. Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operations. CCRs generated at the OGSES are managed in the FGD Pond Area (FGD-A, FGD-B and FGD-C) and Ash Landfill 1. This report discusses the FGD Pond Area (the Site)..

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the EPA to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D.

The CCR Rule establishes national minimum criteria for existing and new CCR landfills, existing and new CCR surface impoundments, and lateral expansions to landfills/impoundments. The FGD Ponds are considered “existing surface impoundments” under 40 CFR 257.53.

A groundwater monitoring plan was developed for the Site in accordance with Sections 257.90 through 257.95 of the CCR Rule (PBW, 2017a). The CCR groundwater monitoring system at the Site was certified by a professional engineer in accordance with Section 257.91 of the CCR Rule as part of a separate report (PBW, 2017b). This revised groundwater monitoring plan updates and replaces the previous groundwater monitoring plan for the FGD Pond Area.

## 1.1 CCR Unit Groundwater Monitoring Applicability

Section 257.90 of the CCR Rule requires that existing CCR landfills and surface impoundments be in compliance with the following groundwater monitoring requirements:

- Install a groundwater monitoring system as required under Section 257.91;
- Develop a groundwater sampling and analysis program to include selection of the statistical procedures to be used for evaluating groundwater monitoring data as required under Section 257.93;
- Initiate a detection monitoring program to include obtaining a minimum of eight independent samples for each background and downgradient monitoring well as required under Section 257.94; and

- Begin evaluating the groundwater monitoring data for statistically significant increases over background levels for the constituents listed in Appendix III of this part as required under Section 257.94.

Once a groundwater monitoring system and groundwater monitoring program has been established at the CCR unit, the owner or operator must conduct groundwater monitoring and, if necessary, corrective action throughout the active life and post-closure care period of the CCR unit. In the event of a release from a CCR unit, the owner or operator must take all necessary measures to control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of contaminants into the environment.

For existing CCR landfills and surface impoundments, the owner or operator must prepare an annual groundwater monitoring and corrective action report to document the status of the groundwater monitoring and corrective action program for the CCR unit for the previous calendar year. .

## 1.2 Groundwater Sampling and Analysis Requirements

The CCR Rule establishes groundwater sampling and analysis criteria that are designed to create consistency and ensure that monitoring results provide accurate representations of groundwater quality at the CCR groundwater monitoring wells. A sampling and analysis program must be developed for each unit that includes procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, chain of custody control, and quality assurance and quality control. Depending on the constituents and concentrations detected, groundwater monitoring at each CCR unit may consist of detection monitoring (Section 257.94) only or a combination of detection monitoring and assessment monitoring (Section 257.95). Selected technical groundwater sampling and analysis criteria are described in detail below; however, the complete CCR Rule should be referenced for notification requirements and other criteria.

### 1.2.1 Groundwater Elevations

Groundwater elevations must be measured in each well immediately prior to purging, each time groundwater is sampled.

### 1.2.2 General Groundwater Analytical Requirements

The CCR groundwater monitoring program must include sampling and analytical methods that are appropriate for groundwater sampling and that accurately measure hazardous constituents and other

monitoring parameters in groundwater samples. The EPA publication *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)*, is EPA'S official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with the RCRA regulations (EPA, 2015).

Groundwater monitoring under the CCR Rule includes analyses for inorganic parameters and metals. All metals analyses must be reported as "total recoverable metals" to capture both the particulate fraction and dissolved fraction of metals in the groundwater. The CCR Rule stipulates that groundwater samples cannot be field filtered prior to analysis.

### 1.2.3 Background Groundwater Quality Determination

Background groundwater quality must be established in a hydraulically upgradient or background well(s) for each of the groundwater constituents required in the detection monitoring or assessment monitoring program that applies to the CCR unit. Background groundwater quality may be established at wells that are not located hydraulically upgradient from the CCR unit if the samples accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit.

### 1.2.4 Detection Monitoring Requirements

Groundwater detection monitoring must be performed at each CCR unit (CCR Rule Section 257.94). The following constituents must be included in the detection monitoring program (from Appendix III to the CCR Rule):

- Boron
- Calcium
- Chloride
- Fluoride
- pH
- Sulfate
- Total Dissolved Solids (TDS)

The monitoring frequency for these constituents must be at least semi-annual during the active life of the CCR unit and post-closure period. The reported concentrations of the detection monitoring constituents must be compared to the respective CCR unit background concentration developed for each constituent. If a statistically significant increase over background levels is determined for one or

more of the constituents listed above at any monitoring well at the CCR unit waste boundary, within 90 days the owner or operator must:

- Establish an assessment monitoring program as described in Section 257.95 of the Rule, or
- Demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with the detection monitoring program.

### 1.2.5 Assessment Monitoring Requirements

Assessment monitoring is required under the CCR Rule whenever a statistically significant increase over background levels has been detected for one or more of the detection monitoring constituents listed above (CCR Rule Section 257.95). The following constituents must be included in the assessment monitoring program (from Appendix IV to the CCR Rule):

- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Fluoride
- Lead
- Lithium
- Mercury
- Molybdenum
- Selenium
- Thallium
- Radium 226 and 228 combined

Within 90 days of triggering an assessment monitoring program, and annually thereafter, the owner or operator of the CCR unit must sample and analyze the groundwater for all assessment monitoring constituents (Appendix IV) listed above. At least one sample must be collected from each well associated with the CCR unit.

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, the owner or operator of the CCR unit must resample all wells associated with the CCR unit, conduct

analyses for all detection monitoring parameters (Appendix III) and for those assessment monitoring constituents (Appendix IV) that have been detected as part of assessment monitoring. At least one sample must be collected from each well associated with the CCR unit. This monitoring must be performed on at least a semi-annual basis thereafter. The owner or operator of a CCR unit may demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for these constituents during the active life and the post-closure care period based on the availability of groundwater. If there is not adequate groundwater flow to sample wells semi-annually, the alternative frequency shall be no less than annual.

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, groundwater protection standards (GWPSs) must be established for all assessment monitoring constituents (Appendix IV) detected in the CCR unit monitoring wells. The GWPS shall be:

- For constituents for which a federal maximum contaminant level (MCL) has been established under 40 CFR 141.62 and 141.66, the MCL for that constituent; or
- For constituents for which an MCL has not been established, the background concentration or approved regional screening level for the constituent established in accordance with CCR Rule Section 257.91; or
- For constituents for which the background level is higher than the MCL, the background concentration.

Following are the GWPSs that have been established for the assessment monitoring constituents (Appendix IV) identified in the Rule:

| Constituent | GWPS (mg/L) |
|---|---|
| Antimony | 0.006 |
| Arsenic | 0.0146 |
| Barium | 2.0 |
| Beryllium | 0.004 |
| Cadmium | 0.005 |
| Chromium | 0.1 |
| Cobalt | 0.0158 |
| Fluoride | 4.0 |
| Lead | 0.015 |

| Constituent | GWPS (mg/L) |
|---|---|
| Lithium | 0.149 |
| Mercury | 0.002 |
| Molybdenum | 0.10 |
| Selenium | 0.05 |
| Thallium | 0.002 |
| Radium 226/228 Combined | 11.2 pCi/L** |

** pCi/L = picocuries per liter

If the concentrations of all detection monitoring constituents (Appendix III) and assessment monitoring constituents (Appendix IV) are shown to be statistically at or below background values for two consecutive sampling events, the owner or operator may return to performing only detection monitoring of the CCR unit. If the concentrations of any detection monitoring constituents (Appendix III) and assessment monitoring constituents (Appendix IV) are shown to be statistically above background values, but all concentrations are below their respective GWPS, the owner or operator must continue assessment monitoring of the CCR Unit.

Within 90 days of finding that any of the assessment monitoring constituents (Appendix IV) have been detected at a statistically significant level exceeding their respective GWPS, the owner or operator of the CCR unit must either:

- Initiate an assessment of corrective measures for the CCR unit (CCR Rule Section 257.96); or
- Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. If a successful demonstration is made, the owner or operator must continue assessment monitoring. If a successful demonstration has not been made at the end of the 90 day period, the owner or operator of the CCR unit must initiate an assessment of corrective measures for the CCR unit.

If one or more assessment monitoring constituents (Appendix IV) are detected at statistically significant levels above their respective GWPS, the owner or operator of the CCR unit must characterize the nature and extent of the release. Characterization of the release includes the following minimum measures:

- Install additional monitoring wells necessary to define the contaminant plume(s);
- Collect data on the nature and estimated quantity of material released including specific

information on the assessment monitoring constituents (Appendix IV) and the levels at which they are present in the material released;

- Install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well for all detection monitoring parameters (Appendix III) and for those assessment monitoring constituents (Appendix IV) that have been detected as part of assessment monitoring. This monitoring must be performed on at least a semi-annual basis thereafter.

- Sample all CCR unit wells for all detection monitoring parameters (Appendix III) and for those assessment monitoring constituents (Appendix IV) that have been detected as part of assessment monitoring. This monitoring must be performed on at least a semi-annual basis thereafter.

If an assessment of corrective measures is required as a result of assessment monitoring, and if the CCR unit being monitored is considered an existing unlined CCR surface impoundment under the CCR Rule, then the CCR unit is required to retrofit or close in accordance with the applicable parts of the CCR Rule.

## 1.3 Groundwater Statistical Evaluation Requirements

Statistical analysis of the groundwater monitoring data is required as part of detection monitoring and assessment monitoring under the CCR Rule. One of the following statistical methods must be used to evaluate groundwater monitoring data for each monitored constituent:

- A parametric analysis of variance followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent; or

- An analysis of variance based on ranks followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent; or

- A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data. The level of each constituent in each compliance well is compared to the upper tolerance or prediction limit established from the background data; or

- A control chart approach that gives control limits for each constituent; or

- Another statistical test method that meets the performance standards.

Any statistical method chosen must comply with the following performance standards:

- The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of constituents. Probability distributions of data values shall use parametric methods, and non-probability distributions of data values shall use non-parametric methods. If the distribution of the constituents is shown to be inappropriate for a probability theory test, the data must be transformed or a distribution-free (non-parametric) theory test must be used. If the distributions for the constituents differ, more than one statistical method may be needed;

- If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a GWPS, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparison procedure is used, the Type I experiment wise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparison must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals, or control charts;

- If a control chart approach is used to evaluate groundwater monitoring data, the specific type of chart and its associated parameter values shall be such that this approach is at least as effective as any other approach in this section for evaluating groundwater data. The parameter values shall be determined after considering the number of samples in the background database, the data distribution, and the range of the concentration values for each constituent of concern;

- If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be such that this approach is at least as effective as any other approach in this section for evaluating groundwater data. These parameters shall be determined after considering the number of samples in the background database, the data distribution, and the range of the concentration values for each constituent of concern;

- The statistical method must account for data below the limit of detection with one or more statistical procedures that shall be at least as effective as any other approach in this section for evaluating groundwater data. Any practical quantitation limit that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility; and

- If necessary, the statistical method must include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

The owner/operator of the CCR unit must determine if there has been a statistically significant increase over background (detection monitoring) or MCLs/background (assessment monitoring) for each constituent required in the particular groundwater monitoring program that applies to the CCR unit. The determination of statistical increase over background/MCLs for each constituent at each monitoring well must be made within 90 days after completing sampling and analysis.

# 2.0 GROUNDWATER MONITORING PROCEDURES

This section describes groundwater sampling and analysis procedures for monitoring the CCR unit wells to comply with the requirements of 40 CFR 257.90 - 257.95 of the CCR Rule.

## 2.1 FGD Pond Area Groundwater Monitoring System

The CCR groundwater monitoring system at the FGD Pond Area consists of the following nine monitoring wells:

| Upgradient/Background Wells | Downgradient Wells |
|---|---|
| FGD-8<br>FGD-11 | FGD-1<br>FGD-2<br>FGD-3<br>FGD-4<br>FGD-5<br>FGD-6<br>FGD-12 |

A detailed Site Plan showing the locations of the CCR monitoring wells is provided on Figure 2. Boring logs for the wells are provided in Appendix A. The CCR groundwater monitoring system was certified by a professional engineer in accordance with Section 257.91 of the CCR Rule as part of a separate report (PBW, 2017b).

## 2.2 Groundwater Sampling Procedures

### 2.2.1 Equipment Assembly and Preparation

Activities that occur during groundwater sampling are summarized as follows:

- pre-arrangement of sample analytical requests with analytical testing laboratory;
- assembly and preparation of sampling equipment and supplies;
- groundwater sampling;
- water-level measurements;
- well purging;
- field parameter measurements;
- sample collection;
- sample preservation;
- sample labeling;
- completion of sample records;
- completion of chain-of-custody records; and
- sample shipment.

Prior to each sampling event, equipment to be used is assembled, properly cleaned and its operating condition verified. In addition, all record-keeping materials are prepared. Sampling procedures are conducted in general accordance with EPA SW-846 methods.

Decontamination of all non-disposable or non-dedicated field measurement, purging, and sampling equipment are performed for each sampling event before any purging/sampling activities begin, after each well is sampled, and at the end of the sampling event. Decontamination procedures are summarized below:

(1) Wash equipment with low-residue soap and/or detergent solution.
(2) Rinse with distilled water; and
(3) Repeat steps (1) and (2) above, as necessary.

### 2.2.2 General Groundwater Sampling Procedures

Prior to collecting samples, each well is inspected for signs of damage to the well protective casing and well pad. Each field instrument is calibrated according to the manufacturer's instructions prior to use.

Special care should be exercised to prevent contamination of the groundwater and extracted samples during the sampling activities. The primary way in which such contamination can occur is contact with improperly cleaned equipment. To prevent such contamination, all non-dedicated sampling equipment is thoroughly cleaned before and between uses at different sampling locations. In addition to the use of properly cleaned equipment, a new pair of disposable latex (or similar) gloves is worn for each well.

### 2.2.3 Groundwater Level Measurements

Groundwater levels are measured prior to purging the wells. Using a pre-cleaned water level meter, the groundwater surface is measured from the casing datum to the nearest 0.01-foot. Total depth measurements are also collected on, at least, an annual basis. The rate and direction of groundwater flow should be determined for each groundwater monitoring event.

### 2.2.4 Well Purging and Sampling

Well purging and sampling is conducted using either a submersible pump or peristaltic pump in accordance with standard low flow sampling procedures. The sampler withdraws water in a manner that minimized stress (drawdown) to the system to the extent practicable. When the pump intake is located within the screened interval, the water pumped is drawn in directly from the formation with little mixing of casing water or disturbance to the sampling zone. Thus, sample results are more representative of the constituents present in the groundwater.

Purging rates during sample collection are generally performed at 0.5 liters per minute (L/min) or less. Field parameters (pH, temperature, conductivity and turbidity) are measured to evaluate when the well is adequately purged. Turbidity in the samples should be minimized as much as possible. By using minimal pumping rates, dedicated equipment whenever possible, and positioning the intake for the sample tubing or submersible pump off of the bottom of the well.

For groundwater samples, at least three field measurements should be taken during the course of purging the well. If the parameters have not stabilized at that time, field measurements and purging will continue until two consecutive readings have stabilized to within the following limits:

- Temperature: +/-1° C
- pH: +/-0.1 pH units
- Specific conductance: +/-10%
- Turbidity: +/- 10%

Sample extraction is accomplished by using the pump that was previously used to purge the well. The sample bottle is filled directly from the pump line. The pumping rate and parameter measurements are recorded on groundwater sampling forms in the field. If a well goes dry during purging, sampling is performed after the well has sufficiently recharged to allow sample collection.

Groundwater samples will not be filtered in the field prior to collection in accordance with Section 257.93(i) of the CCR Rule.

### 2.2.5 Container, Labels, and Shipment

Samples are collected in laboratory-supplied containers. The following information is legibly and indelibly written on the label:

- project identification;
- sample identification;
- name or initials of collector;
- date and time of collection;
- analysis requested; and
- sample preservative, if applicable.

After the samples are collected, the sample containers are placed in a cooler or similar container, preserved with ice, and shipped to the laboratory for analysis.

### 2.2.6 Chain-of-Custody Control

After samples are collected, chain-of-custody procedures are followed to establish a written record concerning sample movement between the sampling site and the testing laboratory. Each shipping container has a chain-of-custody form completed by the sampling personnel packing the samples. The chain-of-custody form for each container is completed and sealed in the shipping container.

## 2.3 Analytical Procedures

The laboratory analytical methods utilized for the analysis of detection monitoring and assessment monitoring programs are appropriate and commonly utilized EPA methodologies, or other similar standard methodologies. Typical methodologies used to analyze the detection and assessment program constituents are presented below:

Detection Monitoring Program (Appendix III Constituents)

- Boron and calcium by EPA Method SW6020;
- Chloride, fluoride, and sulfate by EPA Method E300;
- pH by Standard Method M4500-H + B (field measurement); and
- TDS by Standard Method M2540.

Assessment Monitoring Program (Appendix IV Constituents)

- Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, lithium, molybdenum, selenium, and thallium by EPA Method SW6020;
- Fluoride EPA Method E300;
- Mercury by EPA Method SW7470; and
- Radium 226 and 228 by EPA Methods 904.0/SW9320 Modified and 903.1 Modified.

All metals analyses shall be reported as “total recoverable metals” in accordance with Section 257.93(1) of the CCR Rule. Filtering of samples prior to analysis is not permitted.

### 2.3.1 Data Quality Assurance/Quality Control

A quality assurance/quality control (QA/QC) program will be implemented to confirm the validity of the analytical results. Laboratory QC samples will include method blanks, laboratory control samples, and matrix spike/matrix spike duplicates. Field QC samples will include one field duplicate per sampling event. The selected laboratory must have in place documented quality assurance protocols and quality control checks to demonstrate the laboratory’s procedures and practices are consistent with the National Environmental Laboratory Accreditation Conference (NELAC) standards. Potential issues regarding the quality of the data should be evaluated through the examination of:

- The project objectives;
- Laboratory review checklist and associated exceptions report;
- The reportable data; and
- The field notes and data associated with the sampling event(s).

In the case where quality control criteria are outside applicable limits, a summary must be presented that indicates the affected samples, the quality control parameter reviewed, the qualifiers and bias code(s) applied to the data point, and the determination made concerning the usability of data.

## 3.0 STATISTICAL EVALUATION PROCEDURESSTATISTICAL EVALUATION PROCEDURES

The following statistical evaluation approaches were selected to demonstrate groundwater compliance for the FGD Pond Area under the CCR Rule:

- Use of interwell data evaluations, which compare new sample data to data from upgradient or background monitoring wells.

- Use of upper prediction limits (UPLs) to develop site-specific background concentrations for all Appendix III and Appendix IV constituents. This approach is a common statistical method used to evaluate groundwater compliance for Subtitle D landfill facilities and is one of the approved options for groundwater quality data statistical evaluation under the CCR Rule.

- After every detection monitoring event, Appendix III constituent concentrations from each well are compared to background UPLs to ascertain if a statistically significant increase above background exists. Background UPLs are based on a 1-of-2 resampling approach, meaning that if zero or one concentration measurement from a series of two independent samples collected from a well do not exceed the appropriate UPL, then a statistically significant increase over background has not occurred at a CCR unit.

- If in assessment monitoring, the 95% lower confidence limit of the mean (LCL) is calculated after each assessment monitoring event for each Appendix IV constituent. The set of data used to calculate LCLs is based on current and historical constituent concentrations. A statistically significant increase over the GWPS has occurred at a CCR unit when the LCL for at least one assessment monitoring constituent at a well is greater than the appropriate GWPS.

The statistical evaluation procedures proposed for the FGD Pond Area groundwater data conforms with the Rule requirements shown in Section 1.3, as well as the Statistical Analysis Plan for the FGD Ponds (Golder, 2022), EPA's *Unified Guidance: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities* (EPA, 2009) and the American Society for Testing and Materials (ASTM) standard D6312-17, *Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at waste Disposal Facilities* (ASTM, 2017).

Eight independent groundwater samples were evaluated for each Appendix III parameter at each well to statistically establish detection monitoring prediction limits. Eight independent groundwater samples were also evaluated for each Appendix IV parameter at each well to establish assessment monitoring GWPSs.

- For constituents for which a federal maximum contaminant level (MCL) has been established, the MCL for that constituent; or

- For constituents for which an MCL has not been established, the background concentration

(prediction limit) or approved regional screening standard for the constituent; or

- For constituents for which the background level (prediction limit) is higher than the MCL, the background concentration (prediction limit) for the constituent.

## 4.0 DETECTION MONITORING DATA EVALUATION

CCR groundwater detection monitoring will be performed on a semi-annual basis during the active life of the CCR units and during the post-closure period. Each CCR monitoring well will be sampled for the following Appendix III constituents as part of the detection monitoring program:

- Boron
- Calcium
- Chloride
- Fluoride
- pH
- Sulfate
- Total Dissolved Solids (TDS)

Sampling and analytical procedures will be as described in previous sections of this plan.

After each detection monitoring event, the reported concentrations of the detection monitoring constituents at each well will be compared to the background concentration prediction limits developed for each constituent as described in Section 3 of this plan to ascertain if a statistically significant increase above background concentrations does or no does not exist. Possible outcomes from comparing the detection monitoring constituent concentrations in each well to their respective background concentration prediction limits are as follows:

- All detection monitoring constituent concentrations in each well are less than or equal to their respective background concentration prediction limits in the well; or
- One or more detection monitoring constituent concentrations in each well are above their respective background concentration prediction limits in the well.

### 4.1 No Statistically Significant Increase Over Background Concentrations

The background concentration prediction limits were developed based on a one-of-two resampling approach, meaning that if concentrations in at least one sample in a series of two independent samples collected from a well do not exceed their prediction limits, then a statistically significant increase over background concentrations has not occurred. This conclusion will be reached if the data indicate either of the following:

- All detection monitoring constituent concentrations in each well are less than or equal to their respective background concentration prediction limits; or

- One or more detection monitoring constituent concentration in any well is above the respective background concentration prediction limits. If this occurs, the well or wells with concentrations above the prediction limits will be resampled and analyzed for the detection monitoring constituent or constituents that exceed the prediction limits. If the resample indicates that the target detection monitoring constituent concentrations in the well or wells are less than or equal to their respective background concentration prediction limits, then it can be concluded that a statistically significant increase over background concentrations for all detection monitoring constituents does not exist, since concentrations in one sample of the two independent samples do not exceed their prediction limits.

If the groundwater monitoring data indicate that a statistically significant increase over background does not exist at the CCR wells, detection monitoring at all CCR wells will continue on a semi-annual basis.

## 4.2 Statistically Significant Increase Over Background Concentrations

If one or more detection monitoring constituent concentrations in any well is above the respective background concentration prediction limit in both the original detection monitoring sample and the resample, then a statistically significant increase over background concentrations for the target detection monitoring constituents can be concluded. If a statistically significant increase is indicated, within 90 days the owner/operator must:

- Establish an assessment monitoring program as described in this plan, or
- Demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The demonstration must be summarized in a report that is certified by a professional engineer. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with the detection monitoring program.

## 5.0 ASSESSMENT MONITORING DATA EVALUATION

CCR groundwater assessment monitoring will be performed at the FGD Pond Area groundwater monitoring system whenever a statistically significant increase over GWPSs has been confirmed for one or more of the detection monitoring constituents listed in this plan. Within 90 days of triggering the assessment monitoring program, and annually thereafter, each CCR monitoring well in the FGD Pond Area groundwater monitoring system will be sampled for the following Appendix IV parameters as part of the assessment monitoring program:

- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Fluoride
- Lead
- Lithium
- Mercury
- Molybdenum
- Selenium
- Thallium
- Radium 226 and 228 combined

Sampling and analytical procedures will be as described in previous sections of this plan.

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, all wells in the groundwater monitoring system will be resampled and analyzed for:

- All Appendix III detection monitoring parameters; and
- The Appendix IV assessment monitoring parameters that were detected as part of the assessment monitoring event.

This monitoring will be performed on at least a semi-annual basis thereafter, unless the owner/operator can demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for these constituents during the active life and the post-closure care period based on the availability of groundwater. If there is not adequate groundwater flow to sample wells semi-annually, the alternative frequency shall be no less than annual.

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, GWPSs will be established for all Appendix IV assessment monitoring constituents that were detected in the groundwater monitoring system wells as follows:

- For constituents for which a federal maximum contaminant level (MCL) has been established, the MCL for that constituent; or

  For constituents for which an MCL has not been established, the background concentration or approved regional background levels for the constituent; or

- For constituents for which the background level is higher than the MCL, the background concentration for the constituent.

The 95% LCL of each Appendix IV constituent concentration at each well will be compared to the GWPS established for each constituent to ascertain if a statistically significant increase above the GWPS does or does not exist.

## 5.1 No Statistically Significant Increase Over Groundwater Protection Standards

If the groundwater monitoring data indicate that a statistically significant increase over GWPSs does not exist at the CCR wells, all wells in the groundwater monitoring system will be sampled on a semi-annual basis and analyzed for:

- All Appendix III detection monitoring parameters; and
- The Appendix IV assessment monitoring parameters that were detected as part of the initial assessment monitoring event.

This monitoring will be performed on at least a semi-annual basis unless the owner/operator can demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for these constituents during the active life and the post-closure care period based on the availability of groundwater.

If the concentrations of all Appendix III detection monitoring constituents and Appendix IV assessment monitoring constituents are shown to be statistically at or below background values for two consecutive assessment monitoring sampling events, assessment monitoring will be terminated and detection monitoring as described in this plan will resume. If the concentrations of any Appendix III detection monitoring constituents and Appendix IV assessment monitoring constituents are shown to be

statistically above background values, but all concentrations are below their respective GWPS, assessment monitoring will continue.

## 5.2 Statistically Significant Increase Over Groundwater Protection Standards

If a statistically significant increase over GWPSs for any Appendix IV assessment monitoring constituent is confirmed, within 90 days of the initial assessment monitoring event, the owner/operator will either:

- Initiate an assessment of corrective measures for the CCR unit in accordance with CCR Rule Section 257.96; or
- Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The demonstration must be summarized in a report that is certified by a professional engineer. If a successful demonstration is made, the owner or operator must continue assessment monitoring. If a successful demonstration has not been made at the end of the 90 day period, the owner or operator of the CCR unit must initiate an assessment of corrective measures for the CCR unit.

If one or more Appendix IV assessment monitoring constituents are detected at statistically significant levels above their respective GWPS in any sampling event, and if a source other than the CCR unit cannot be demonstrated to have caused the contamination, a release from the CCR unit is likely and the nature and extent of the release will be further characterized as follows:

- Install additional monitoring wells necessary to define the contaminant plume(s);
- Collect data on the nature and estimated quantity of material released including specific information on the Appendix IV assessment monitoring constituents and the levels at which they are present in the material released;
- Install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well for all Appendix III detection monitoring parameters and for those Appendix IV assessment monitoring constituents that have been detected as part of assessment monitoring. This monitoring must be performed on at least a semi-annual basis thereafter.
- Sample all CCR unit wells for all Appendix III detection monitoring parameters and for those Appendix IV assessment monitoring constituents hat have been detected as part of assessment monitoring. This monitoring must be performed on at least a semi-annual basis thereafter.

## 6.0 REPORTING REQUIREMENTS

The results of the CCR groundwater monitoring program will be reported each year in an Annual Groundwater Monitoring and Corrective Action Report. The annual report will document the status of the groundwater monitoring and corrective action program, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. At a minimum, the Annual Groundwater Monitoring and Corrective Action Report will contain the following information:

- A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;
- In addition to all the monitoring data obtained under CCR Rule Sections 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;
- A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and
- Other information required to be included in the annual report as specified in CCR Rule Sections 257.90 through 257.98.

The Groundwater Monitoring and Corrective Action Reports must be placed in the facility operating record no later than January 31 of the year following completion of the groundwater monitoring program from the preceding calendar year.

## 7.0 REFERENCES

ASTM, 2017. Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at Waste Disposal Facilities - D6312-17.

EPA, 2015. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). On-Line.

EPA, 2009. Unified Guidance Document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, EPA 530/R-09-007, March.

Golder Associates USA, Inc. (Golder), 2022. Statistical Analysis Plan, Revision No. 1, Ash Landfill 1, Oak Grove Steam Electric Station. November 16.

PBW, 2017a. Groundwater Monitoring Plan – Oak Grove Steam Electric Station, FGD Pond Area, Robertson County, Texas, August.

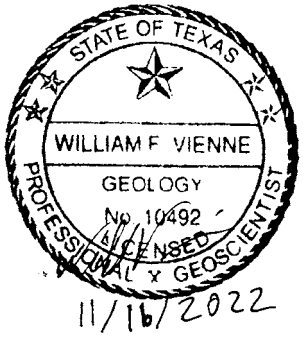
PBW, 2017b. CCR Groundwater Monitoring System Certification – Oak Grove Steam Electric Station, FGD Pond Area, Robertson County, Texas, August.

## SIGNATURE PAGE

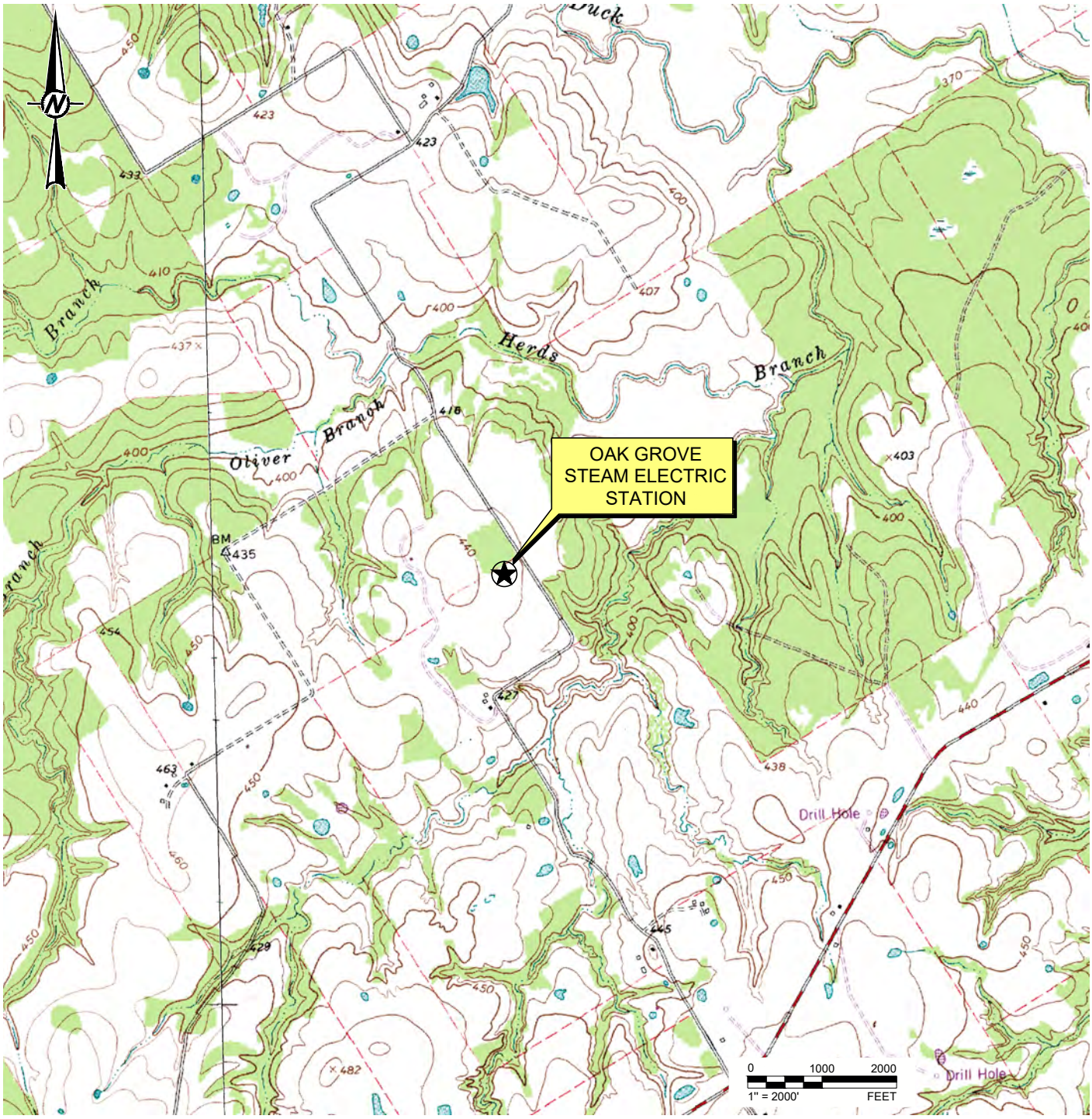
**Golder Associates Inc., Member of WSP**

Patrick J. Behling
*Principal Engineer*

William F. Vienne
*Senior Hydrogeologist*

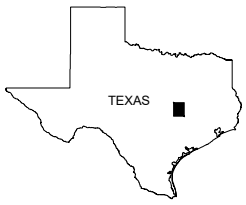


# FIGURES




**REFERENCE(S)**

BASE MAP TAKEN FROM TNRIS.GOV, BALD PRAIRIE, TX 7.5 MIN. USGS QUADRANGLE DATED 1965, REVISED 1982.




QUADRANGLE LOCATION

CLIENT
OAK GROVE MANAGEMENT COMPANY LLC

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**SITE LOCATION MAP**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2021-12-07 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 20142034 | | 0 | 1 |



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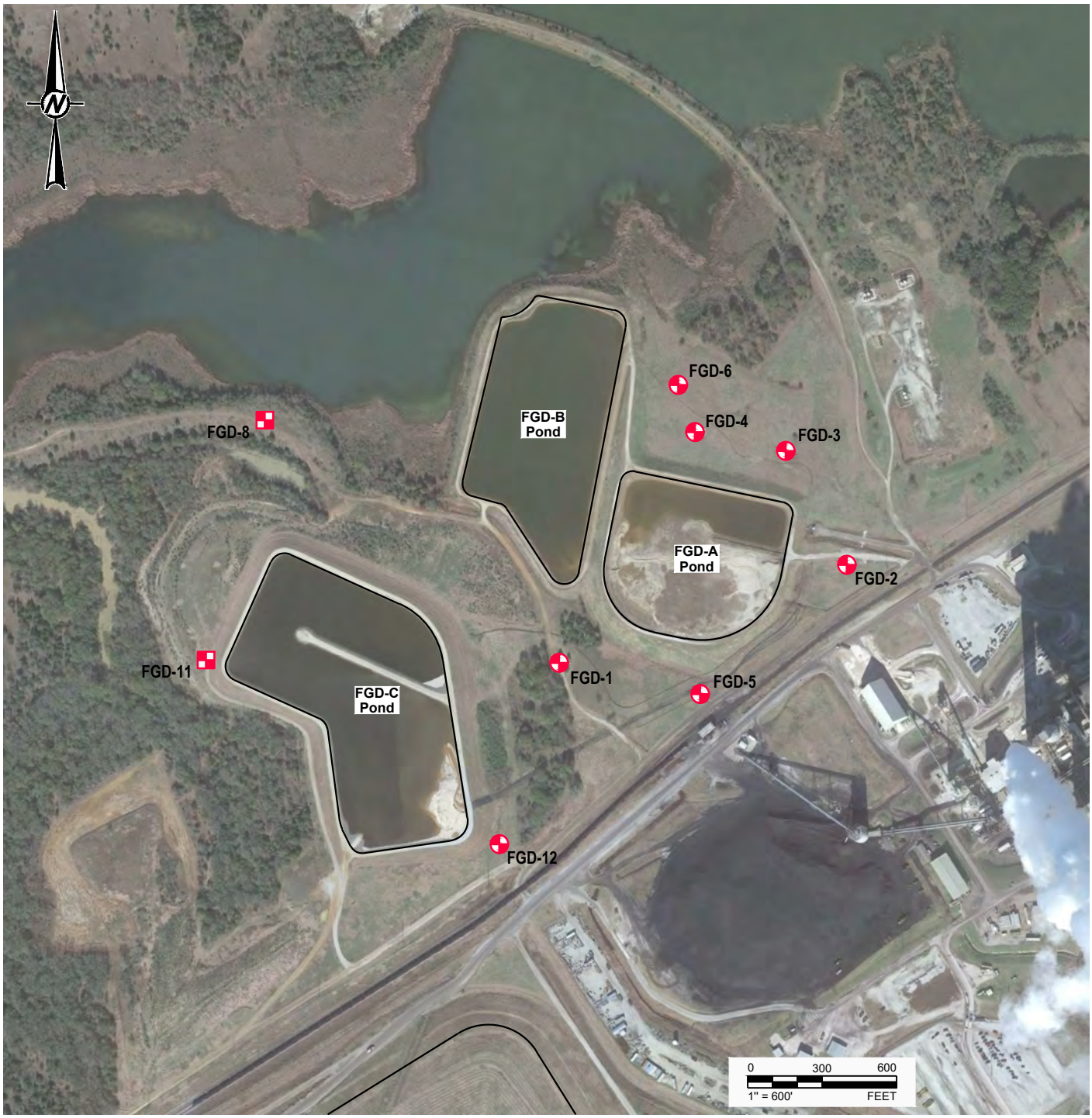


**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL

**REFERENCE(S)**
BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**SITE PLAN**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 19122262 | REV. 0 | FIGURE 2



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**APPENDIX A**

# CCR Monitoring Well Logs

# RECORD OF BOREHOLE MW-FGD-01



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 27-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4549.42
EASTING (ft): 2454.41
ELEVATION (ft): 421.91

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy with vegetation | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 421.9 | | | | | | | | |
| | | Firm, brown to light brown, sandy CLAY, some vegetative presence, dry | | 0.0 | SB-1 | | 2<br>3<br>3<br>N6 | 40 | | | | |
| | | trace red at 1.5' | | | | | | | | | | |
| 2 | | Hard, grayish brown with red, CLAY, with sand, dry | | 2.0 | SB-2 | | 8<br>20<br>32<br>N52 | 67 | | | | |
| 4 | | Hard, gray, trace red, silty CLAY, dry | | 4.0 | SB-3 | | 10<br>14<br>18<br>N32 | 73 | | | | |
| 6 | | red, some iron oxide at 6' | | | | | | | | | | |
| | | Compact, grayish brown, SAND, with silt, damp | | 7.0 | SB-4 | | 7<br>13<br>14<br>N27 | 87 | | | | |
| 8 | | reddish brown, some clay at 8' | | | SB-5 | | 6<br>7<br>8<br>N15 | 87 | | | | |
| 10 | | trace red at 10' | | | SB-6 | | 7<br>8<br>8<br>N16 | 87 | | | | |
| 12 | | | | | SB-7 | | 3<br>10<br>13<br>N23 | 67 | | | | |
| 14 | | wet at 14' | | | SB-8 | | 7<br>9<br>9<br>N18 | 100 | | | | ▼ 14' 08/27/2008 |
| 16 | | | | | SB-9 | | 1<br>10<br>12<br>N22 | 87 | | | | |
| 18 | | | | | SB-10 | | 1<br>10<br>19<br>N29 | 93 | | | | |
| 20 | | some yellowish brown at 19.5' | | | | | | | | | | |
| | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

# RECORD OF BOREHOLE MW-FGD-01



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 27-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4549.42
EASTING (ft): 2454.41
ELEVATION (ft): 421.91

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | very dense at 20' | | 20.0 | SB-11 | | 15<br>26<br>35<br>N61 | 87 | | | | |
| 22 | | dense, grayish brown and mottled yellow at 22' | | | SB-12 | | 17<br>21<br>27<br>N48 | 100 | | | | |
| 24 | | very dense, moist at 24' | | | SB-13 | | 18<br>25<br>35<br>N60 | 87 | | | | |
| 26 | | | | | SB-14 | | 16<br>17<br>35<br>N52 | 93 | | | | |
| 28 | | | | | SB-15 | | 20<br>35<br>36<br>N71 | 100 | | | | |
| 30 | | | | | SB-16 | | 18<br>28<br>32<br>N60 | 87 | | | | |
| 32 | | | | | SB-17 | | 21<br>36<br>50/5" | 93 | | | | |
| 34 | | Very dense, dark brownish gray, clayey SAND, trace iron oxide, damp | | 33.0 | | | | | | | | |
| 36 | | BORING TERMINATED AT 34' | | 34.0 | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-02



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 436.2 | | | | | | | | |
| | | Stiff, brown with some dark brown, sandy CLAY, some gravel, damp | | 0.0 | SB-1 | | 4<br>4<br>5<br>N9 | 27 | | | | |
| 2 | | very stiff, dark brown at 2' | | | SB-2 | | 4<br>7<br>16<br>N23 | 47 | | | | |
| 4 | | very stiff, brown to yellowish brown, some iron oxide traces, possible lignite traces, dry at 4' | | | SB-3 | | 7<br>10<br>13<br>N23 | 53 | | | | |
| 6 | | Very stiff, mottled gray and brown, CLAY, some gravel, dry | | 6.0 | SB-4 | | 5<br>13<br>15<br>N28 | 67 | | | | |
| 8 | | Very stiff, brown, yellow, and gray, mottled, sandy CLAY | | 8.0 | SB-5 | | 5<br>13<br>16<br>N29 | 53 | | | | |
| 10 | | hard at 10' | | | SB-6 | | 7<br>13<br>20<br>N33 | 80 | | | | |
| | | gray at 11' | | | | | | | | | | |
| 12 | | Dense, light gray, fine, silty SAND, with a seam of clay, damp | | 12.0 | SB-7 | | 14<br>17<br>21<br>N38 | 87 | | | | |
| 14 | | | | | SB-8 | | 10<br>19<br>27<br>N46 | 93 | | | | |
| 16 | | | | | SB-9 | | 16<br>23<br>24<br>N47 | 87 | | | | |
| | | seam of hard CLAY | | 17.5 | | | | | | | | |
| 18 | | very dense at 18' | | | | | | | | | | |
| | | | | 18.5 | | | | | | | | |
| | | seam of very hard CLAY | | 18.8 | SB-10 | | 10<br>25<br>36<br>N61 | 87 | | | | |
| | | | | 19.8 | | | | | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

# RECORD OF BOREHOLE MW-FGD-02



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | dense at 20' | | 20.0 | SB-11 | | 14<br>19<br>27<br>N46 | 92 | | | | |
| | | seam of hard CLAY | | 21.0 | | | | | | | | |
| 22 | | very dense at 22' | | 22.0 | SB-12 | | 13<br>27<br>37<br>N64 | 100 | | | | |
| 24 | | | | | SB-13 | | 17<br>29<br>28<br>N57 | 87 | | | | |
| 26 | | | | | SB-14 | | 17<br>25<br>42<br>N67 | 67 | | | | |
| | | yellow at 27.5' | | | | | | | | | | |
| 28 | | | | | SB-15 | | 20<br>39<br>50/5" | 87 | | | | |
| 30 | | gray at 30.5' | | | SB-16 | | 25<br>45<br>24<br>N69 | 87 | | | | |
| 32 | | | | | | | | | | | | ▼ 32' 08/22/2008 |
| | | Very loose, brown, SAND, moist | | 33.0 | SB-17 | | 4<br>1<br>2<br>N3 | 80 | | | | |
| 34 | | | | | SB-18 | | 7<br>14<br>14<br>N28 | 73 | | | | |
| | | Very stiff, brown, sandy CLAY, moist | | 35.0 | | | | | | | | |
| 36 | | Hard, brown, CLAY, with silt, moist | | 36.0 | SB-19 | | 8<br>25<br>50/4" | 93 | | | | |
| | | Very dense, brown, SAND | | 37.5 | | | | | | | | |
| 38 | | gray and yellow, mottled at 39' | | | SB-20 | | 20<br>45<br>50/3" | 80 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-02



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | brownish gray at 40' | | 40.0 | SB-21 | | 24<br>42<br>50/4" | 87 | | | | |
| 42 | | gray at 41'<br>dense at 42' | | | SB-22 | | 32<br>25<br>22<br>N47 | 100 | | | | |
| 44 | | seam of hard, yellowish gray and brown, CLAY at 43.5' | | 43.5 | SB-23 | | 18<br>36<br>50/4" | 100 | | | | |
| | | very dense at 44' | | 44.5 | SB-24 | | 32<br>45<br>50/3" | 73 | | | | |
| 48 | | | | | SB-25 | | 24<br>24<br>50/5" | 80 | | | | |
| 50 | | | | | SB-26 | | 32<br>45<br>50/3" | 87 | | | | |
| 52 | | BORING TERMINATED AT 52' | | 52.0 | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | GROUND SURFACE | | 432.0 | | | | | | | | |
| | | Soft to firm, reddish brown, CLAY, with sand, some gravel | | 0.0 | SB-1 | | 2<br>2<br>2<br>N4 | 33 | | | | |
| 2 | | | | | ST-2 | | | 70 | ⊕ | | | |
| 4 | | very stiff, brown, mottled at 4' | | | SB-3 | | 5<br>7<br>12<br>N19 | 83 | | | | |
| 6 | | | | | SB-4 | | 5<br>12<br>15<br>N27 | 93 | | | | |
| | | Very stiff, gray, silty CLAY | | 7.5 | | | | | | | | |
| 8 | | | | | SB-5 | | 5<br>8<br>12<br>N20 | 87 | | | | |
| 10 | | trace brown at 10' | | | SB-6 | | 4<br>7<br>9<br>N16 | 93 | | | | |
| 12 | | stiff, light brown at 12' | | | SB-7 | | 3<br>5<br>7<br>N12 | 73 | | | | |
| 14 | | | | | SB-8 | | 3<br>5<br>6<br>N11 | 87 | | | | |
| 16 | | | | | ST-9 | | | 55 | ⊕ | | | |
| | | Stiff, brown, CLAY, damp | | 17.0 | | | | | | | | |
| 18 | | firm to stiff at 18' | | | SB-10 | | 2<br>3<br>5<br>N8 | 100 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL ⊖W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | firm at 20' | | 20.0 | SB-11 | | 2<br>2<br>3<br>N5 | 100 | | | | |
| 22 | | firm to stiff at 22' | | | SB-12 | | 2<br>3<br>5<br>N8 | 100 | | | | |
| 24 | | dark brown, some silt at 24' | | | SB-13 | | 2<br>3<br>5<br>N8 | 87 | | | | |
| 26 | | Dense, light brown, SAND, moist | | 26.0 | SB-14 | | 12<br>15<br>30<br>N45 | 73 | | | | ▼ *26' 08/21/2008* |
| 28 | | very dense, gray at 28' | | | SB-15 | | 12<br>31<br>30<br>N61 | 73 | | | | |
| 30 | | dense, trace yellowish brown at 30' | | | SB-16 | | 5<br>14<br>17<br>N31 | 67 | | | | |
| 32 | | | | | SB-17 | | 3<br>13<br>21<br>N34 | 67 | | | | |
| | | Hard, brown, some mottled dark brown, CLAY, damp | | 33.0 | | | | | | | | |
| 34 | | Hard, gray and yellowish brown mottled, sandy CLAY, some iron staining | | 34.0 | SB-18 | | 6<br>21<br>23<br>N44 | 67 | | | | |
| 36 | | | | | SB-19 | | 5<br>13<br>20<br>N33 | 87 | | | | |
| 38 | | | | | SB-20 | | 7<br>16<br>25<br>N41 | 80 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | trace iron oxide at 40' | | 40.0 | SB-21 | | 7<br>16<br>25<br>N41 | 80 | | | | |
| 42 | | | | | SB-22 | | 10<br>19<br>29<br>N48 | 74 | | | | |
| 44 | | | | | ST-23 | | | 100 | | | | |
| 46 | | | | | SB-24 | | 13<br>23<br>36<br>N59 | 73 | | | | |
| 48 | | BORING TERMINATED AT 48' | | 48.0 | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-04



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 429.2 | | | | | | | | |
| | | Brown, sandy CLAY, damp | | 0.0 | ST-1 | | | 75 | | | | |
| 2 | | Brown, CLAY, with silt, damp | | 2.0 | ST-2 | | | 65 | | | | |
| 4 | | very stiff, reddish and yellowish brown, mottled, with occasional calcareous nodules at 4' | | | SB-3 | | 4<br>6<br>10<br>N16 | 67 | | | | |
| 6 | | | | | ST-4 | | | 87 | | | | |
| 8 | | | | | SB-5 | | 9<br>11<br>14<br>N25 | 27 | | | | |
| | | Very stiff, brown, sandy CLAY, damp | | 9.0 | | | | | | | | |
| 10 | | with occasional coarse, angular gravel at 9.5'<br>reddish brown at 10' | | | SB-6 | | 7<br>9<br>9<br>N18 | 53 | | | | |
| 12 | | stiff at 12' | | | SB-7 | | 10<br>5<br>4<br>N9 | 40 | | | | |
| 14 | | Stiff, reddish brown, CLAY, with sand, damp | | 14.0 | SB-8 | | 4<br>6<br>5<br>N11 | 27 | | | | |
| | | Compact, brown, fine, silty SAND, damp | | 15.5 | | | | | | | | |
| 16 | | light brown at 16.25' | | | SB-9 | | 7<br>12<br>14<br>N26 | 93 | | | | |
| | | reddish brown at 17.25' | | | | | | | | | | |
| 18 | | Compact, reddish brown, clayey SAND, moist | | 18.0 | SB-10 | | 5<br>8<br>15<br>N23 | 87 | | | | |
| | | Compact, light brown, fine, SAND, moist | | 19.0 | | | | | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: BLT

# RECORD OF BOREHOLE MW-FGD-04



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | dense, occasional seams of gray at 20' | | 20.0 | SB-11 | | 6<br>20<br>20<br>N40 | 100 | | | | |
| 22 | | occasional streaks of yellowish brown at 22' | | | SB-12 | | 12<br>15<br>19<br>N34 | 93 | | | | ▼ 22' 08/20/2008 |
| 24 | | very dense, gray with mottled reddish brown at 24' | | | SB-13 | | 14<br>28<br>30<br>N58 | 100 | | | | |
| 26 | | dense, mottled, reddish brown, yellowish brown, and gray at 26' | | | SB-14 | | 13<br>21<br>22<br>N43 | 100 | | | | |
| 28 | | very dense at 28' | | | SB-15 | | 11<br>15<br>50<br>N65 | 87 | | | | |
| 30 | | dense at 30' | | | SB-16 | | 8<br>15<br>21<br>N36 | 87 | | | | |
| 32 | | | | | SB-17 | | 14<br>18<br>27<br>N45 | 80 | | | | |
| 34 | | very dense at 34' | | | SB-18 | | 20<br>31<br>35<br>N66 | 100 | | | | |
| 36 | | | | | SB-19 | | 20<br>31<br>31<br>N62 | 100 | | | | |
| 38 | | | | | SB-20 | | 21<br>42<br>50/5" | 100 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-04



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | | | 40.0 | SB-21 | | 18<br>35<br>33<br>N68 | 100 | | | | |
| 42 | | Hard, gray, CLAY, with sand | | 42.0 | SB-22 | | 11<br>21<br>34<br>N55 | 100 | | | | |
| 44 | | BORING TERMINATED AT 43.5' | | 43.5 | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# Luminant Power

# Log of Boring: FGD-5

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/3/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 50 |
| Driller's License: | 3121 | Northing: | 571950.33 |
| Field Supervisor: | Chris Moore | Easting: | 3200628.33 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 430.54 |

| Depth (ft) | Well Materials | Recovery (ft/ft) | USCS | Lithologic Description |
|---|---|---|---|---|
| 0 | | 3.5/5.0 | SM | SILTY SAND, SM, brown, moist, soft. |
| 5 | | 4.0/5.0 | CL | SILTY CLAY, CL, mottled yellowish brown and yellowish red, moist, firm, with sand from 6'-8'. |
| 10 | | 4.0/5.0 | SM | SILTY SAND, SM, banded very pale brown and brownish yellow, moist, soft to firm, laminated, very fine grained, trace thinly laminated silt lenses. |
| 15 | | 4.5/5.0 | | |
| 20 | ▼ | 4.0/5.0 | | |
| 25 | | 4.5/5.0 | | |
| 30 | | 5.0/5.0 | ML | SILT, ML, brown, moist to wet, very soft to soft. |
| | | | CL | CLAY, CL, dark gray, moist, firm to hard, with thinly laminated silt and sand lenses. |
| 35 | | 3.0/5.0 | SM | SILTY SAND, SM, dark gray to gray, moist, soft to firm, very fine grained, some thinly laminated silt lenses, trace thin carbonaceous lenses, wet at 40', clayey lenses at: 40.5' -41', 44'-44.5, and, 47'-48'. |
| 40 | | | | |

STATE OF TEXAS
WILLIAM F VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
11/11/2022

**PBW**

**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 23.67 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 36.0) Cement/Bentonite Grout
(36.0 - 38.0) Bentonite Chips
(38.0 - 50.0) 12/20 Silica Sand

Well Materials
(+2.4 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

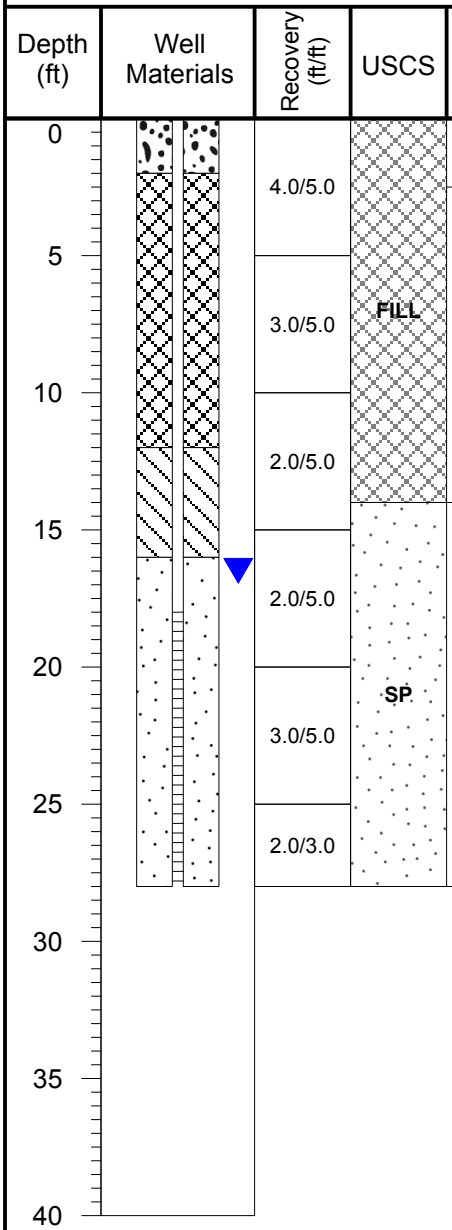
# Luminant Power

# Log of Boring: FGD-6

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/4/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 28 |
| Driller's License: | 3121 | Northing: | 573195.06 |
| Field Supervisor: | Chris Moore | Easting: | 3200525.61 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 425.63 |

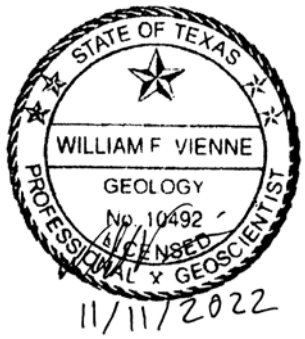



**Lithologic Description**

FILL, sandy clay, yellowish brown, moist, soft to firm, very fine grained sand.

FILL, clay, olive gray, moist, firm, with concrete fragments.

SAND, SP, yellowish brown, wet, soft, laminated, very fine grained, becomes gray at 26'.





**PBW**

**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446


Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 19.48 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 14.0) Cement/Bentonite Grout
(14.0 - 16.0) Bentonite Chips
(16.0 - 28.0) 12/20 Silica Sand

Well Materials
(+3.0 - 18.0) Casing, 2" Sch 40 FJT PVC
(18.0 - 28.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

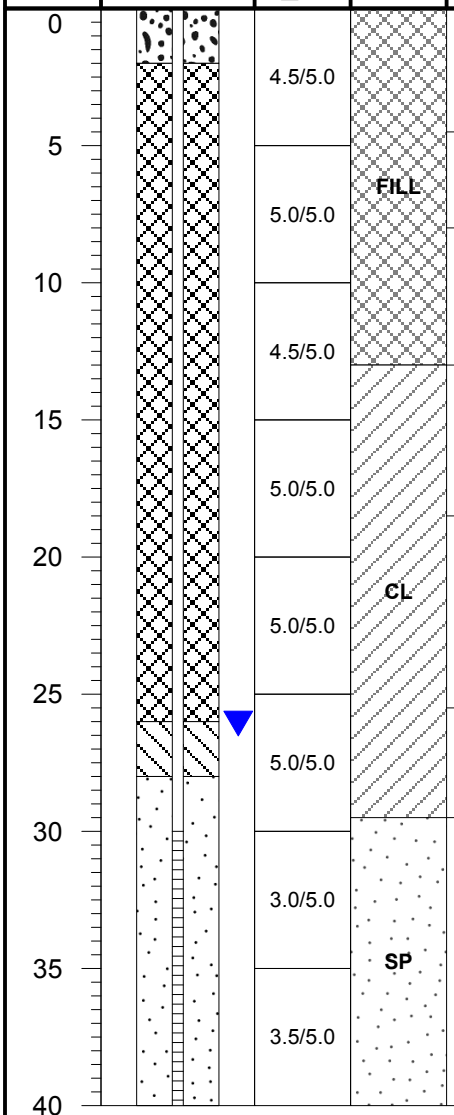
# Luminant Power

# Log of Boring: FGD-8

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/4/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 40 |
| Driller's License: | 3121 | Northing: | 573033.29 |
| Field Supervisor: | Chris Moore | Easting: | 3198862.3 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 437.06 |




FILL, silty clay, CL, brown, moist, soft to firm.

FILL, silty sand, SM, very pale brown, dry to moist, soft, very fine grained.

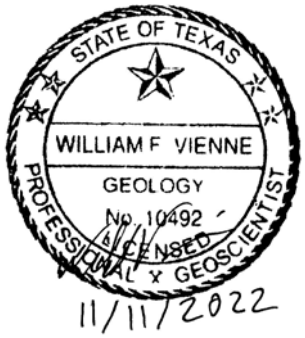
FILL, silty clay, CL, dark gray, moist, firm, crumbles easily, some sand layers.

SANDY, CLAY, CL, strong brown, moist, firm, laminated, very fine grained sand

SILTY CLAY, CL, dark gray, moist, firm, with sand laminae.

SILTY CLAY, CL, mottled gray and brown, moist, firm to hard, some sand laminae, some oxidized staining.

SAND, SP, dark gray, wet, very soft to soft, very fine grained, some silty laminae.





**PBW**

**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446


Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 29.11 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 26.0) Cement/Bentonite Grout
(26.0 - 28.0) Bentonite Chips
(28.0 - 40.0) 12/20 Silica Sand

Well Materials
(+3.0 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-11



**CLIENT** Luminant Power
**PROJECT NAME** Luminant
**PROJECT NUMBER** 1406296
**PROJECT LOCATION** Oak Grove SES
**DATE STARTED** 11/25/14 **COMPLETED** 11/26/14
**GROUND ELEVATION** 448.67 ft **HOLE SIZE** 6 inches
**DRILLING CONTRACTOR** Envirotech
**GROUND WATER LEVELS:**
**DRILLING METHOD** Auger
▽ **AT TIME OF DRILLING 40** 40' bgs
**LOGGED BY** DMW **CHECKED BY** CFR
**AT END OF DRILLING**
**NOTES**
**AFTER DRILLING**

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) | ▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL / □ FINES CONTENT (%) □ 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|
| 0 | | Firm, brown and green, CLAY, and topsoil, moist | ST | 75 | | 1.0 | | |
| | | Hard, brown and tan, SANDY CLAY, moist | ST | 50 | | 4.5 | | |
| 5 | | | ST | 54 | | 4.5 | | |
| | | | SS | 58 | 3-5-7-10 (12) | | | |
| | | | SS | 79 | 6-8-8-9 (16) | | | |
| 10 | | | SS | 67 | 5-9-10-12 (19) | | | |
| | | | SS | 71 | 6-8-9-12 (17) | | | |
| | | Very stiff, red and black, CLAY, with brown sand, moist | | | | | | |
| 15 | | Stiff, brown and tan, SANDY CLAY, moist | SS | 67 | 6-8-6-7 (14) | | | |
| | | maroon, gravel sized rocks at 15.0' | SS | 92 | 5-6-8-9 (14) | | | |
| | | | SS | 79 | 4-6-8-9 (14) | | | |
| 20 | | Compact, brown and tan, CLAYEY SAND, moist | SS | 71 | 6-8-7-8 (15) | | | |
| | | with gray and brown clay lenses at 21.0' | SS | 79 | 7-8-11-15 (19) | | | |
| | | loosely consolidated sand at 23.0' | SS | 83 | 9-13-17-19 (30) | | | |
| 25 | | orange mottlings at 25.0' | SS | 83 | 9-10-14-16 (24) | | | |
| | | | SS | 92 | 8-9-18-21 (27) | | | |
| 30 | | Very stiff, gray, SAND and CLAY, moist dense at 29.5' | | | | | | |

*(Continued Next Page)*

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Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-11

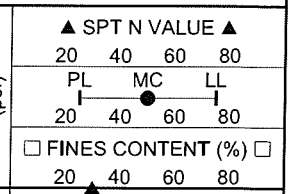


**CLIENT** Luminant Power **PROJECT NAME** Luminant

**PROJECT NUMBER** 1406296 **PROJECT LOCATION** Oak Grove SES

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 30 | | Very stiff, gray, SAND and CLAY, moist *(continued)* | SS | 83 | 9-13-17-19 (30) | | |
| | | without clay at 31.0' | SS | 88 | 10-16-22-22 (38) | | |
| | | Dense, gray and tan, SILTY SAND, moist | | | | | |
| | | poorly consoldiated at 33.0' | SS | 83 | 7-11-17-17 (28) | | |
| 35 | | | SS | 71 | 6-13-14-15 (27) | | |
| | | Very stiff, gray, SILTY CLAY, moist | SS | 75 | 4-6-13-17 (19) | | |
| | | Dense, gray and tan, SILTY SAND, moist<br>moist to wet at 38.0' | SS | 71 | 6-5-8-10 (13) | | |
| 40 | | Compact, gray and tan, SAND, moist to wet | SS | 67 | 3-4-4-7 (8) | | |
| | | Compact, gray and tan, SILTY SAND, wet<br>Very stiff, gray, SILTY CLAY, moist | SS | 88 | 7-9-10-13 (19) | | |
| 45 | | Dense, gray and tan, SILTY SAND, moist to wet | SS | 92 | 3-8-24-28 (32) | | |
| | | moist at 46.0' | SS | 83 | 4-8-26-40 (34) | | |
| | | slightly wet at 48.0' | SS | 75 | 14-28-29-34 (57) | | |
| 50 | | very dense at 50.0' | SS | 92 | 9-38-50 (88) | | |
| | | moist at 52.0' | SS | 83 | 15-28-46-50 (74) | | |
| | | moist to wet at 54.0' | SS | 71 | 14-36-50 (86) | | |
| 55 | | | SS | | 21-39-48-113 (87) | | |

Bottom of borehole at 58.0 feet.

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Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-12



**CLIENT** Luminant Power
**PROJECT NAME** Luminant
**PROJECT NUMBER** 1406296
**PROJECT LOCATION** Oak Grove SES
**DATE STARTED** 11/26/14 **COMPLETED** 11/26/14
**GROUND ELEVATION** 439.48 ft **HOLE SIZE** 6 inches
**DRILLING CONTRACTOR** Envirotech
**GROUND WATER LEVELS:**
**DRILLING METHOD** Auger
▽ **AT TIME OF DRILLING 32** 32' bgs
**LOGGED BY** DMW **CHECKED BY** CFR
**AT END OF DRILLING**
**NOTES**
**AFTER DRILLING**

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) | ▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|
| 0 | | Firm, brown, CLAY, topsoil, moist | ST | 46 | | 1.0 | | |
| | | Hard, brown, SANDY CLAY, moist | ST | 63 | | 4.5 | | |
| 5 | | | ST | 42 | | 4.5 | | |
| | | | SS | 75 | 6-8-10-7 (18) | | | ▲ |
| | | Firm, red, orange and gray, CLAY, moist, with red and orange mottling | SS | 75 | 5-8-10-11 (18) | | | ▲ |
| 10 | | | SS | 75 | 6-8-12-14 (20) | | | ▲ |
| | | Very stiff, gray and red, SILTY CLAY, moist, silt partings | SS | 71 | 4-8-14-15 (22) | | | ▲ |
| 15 | | increasing silt at 15.0' | SS | 63 | 8-10-19-16 (29) | | | ▲ |
| | | decreasing silt at 16.0' | SS | 75 | 5-9-12-16 (21) | | | ▲ |
| | | Dense, red and gray, SANDY SILT, moist<br>increasing silt at 17.5' | SS | 79 | 8-14-12-8 (26) | | | ▲ |
| | | Compact, orange and tan, SILTY SAND, moist | SS | 63 | 7-5-5-6 (10) | | | ▲ |
| 20 | | loosely consoldiated at 19.0' | SS | 83 | 9-12-13-15 (25) | | | ▲ |
| | | increased clay at 20.0' | SS | | 17-11-16-20 (27) | | | ▲ |
| | | more consolidated at 21.0' | SS | | 12-18-14-15 (32) | | | ▲ |
| 25 | | Stiff, gray, SILTY CLAY, moist, silt partings | SS | 83 | 9-19-19-17 (38) | | | ▲ |
| | | intervals of gray sand mixed with silty clay at 25.0' | | | | | | |
| | | Dense, gray, SAND, moist | | | | | | |
| | | Stiff, gray, SILTY CLAY, moist | | | | | | |
| 30 | | Dense, gray, SILTY SAND, with interbedded clay, moist, with red staining | | | | | | |

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*(Continued Next Page)*

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-12



**CLIENT** Luminant Power **PROJECT NAME** Luminant

**PROJECT NUMBER** 1406296 **PROJECT LOCATION** Oak Grove SES

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 30 | | Dense, gray, SILTY SAND, with interbedded clay, moist, with red staining *(continued)* | SS | 88 | 4-5-15-24 (20) | | |
| | | ▽ red to moist, turning red at 32.0' | SS | 67 | 10-16-30-28 (46) | | |
| 35 | | brown to gray at 34.0' | SS | 63 | 14-24-48-42 (72) | | |
| | | | SS | 92 | 8-18-32-42 (50) | | |
| | | increasing sand at 38.0' | SS | 92 | 8-26-48-50 (74) | | |
| 40 | | | SS | 92 | 3-4-10-26 (14) | | |
| | | gray and tan at 42.0' | SS | 92 | 13-24-42-43 (66) | | |
| 45 | | | SS | 92 | 16-30-45-50 (75) | | |
| | | | SS | 58 | 20-36-50 (86) | | |
| 50 | | | SS | 88 | 16-40-50 (90) | | |
| | | | SS | 71 | 18-26-50 (76) | | |
| | | | SS | 63 | 4-30-50 (80) | | |
| 55 | | | SS | 50 | 7-24-50 (74) | | |
| | | | SS | 58 | 22-48-50 (98) | | |
| | | | SS | 54 | 24-48-50 (98) | | |
| 60 | | dark gray at 60.0' | SS | 46 | 25-48-50 (98) | | |
| | | | SS | 50 | 30-50 | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 64.0 feet.

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# COAL COMBUSTION RESIDUAL RULE
# STATISTICAL ANALYSIS PLAN

## REVISION NO. 1

## OAK GROVE STEAM ELECTRIC STATION
## ASH LANDFILL 1
## ROBERTSON COUNTY, TEXAS

**NOVEMBER 16, 2022**

***Prepared For:***

Luminant Generation Company LLC

***Prepared By:***

Golder Associates USA , Inc.
1601 S. Mopac Expy, Suite 325D
Austin, Texas 78746
Texas Engineering Firm Registration No. 22771

## PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Golder Associates USA, Inc. under my direction or supervision. I hereby certify that the proposed statistical method is appropriate for evaluating groundwater data in accordance with the requirements of Sections 257.93 through 257.95 of the CCR Rule.

Patrick J. Behling, P.E.
Principal Engineer
GOLDER ASSOCIATES USA, INC.

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| 2 | Process for Defining a Distribution for a Data Set |


## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ANOVA | analysis of variance |
| CCR | coal combustion residuals |
| EPA | United States Environmental Protection Agency |
| GWPS | groundwater protection standard |
| LCL | lower confidence limit of the mean |
| MCL | maximum contaminant level |
| PPCC | Filliben's probability plot correlation coefficient test |
| RROS | robust regression order statistics |
| SAP | statistical analysis plan |
| SWFPR | site-wide false positive rate |
| UPL | upper prediction limit |

# 1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) issued regulations regarding the disposal of coal combustion residuals (CCR) in certain landfills and impoundments in April 2015. These regulations, found under 40 CFR 257, Subpart D and referred to as the "CCR Rule" require facilities to design a groundwater monitoring program to monitor if landfills or impoundments with CCR materials, called CCR units, are impacting downgradient groundwater quality.

Section 257.90 of the CCR Rule requires that all existing CCR landfills and surface impoundments comply with the following groundwater monitoring requirements no later than October 17, 2017:

- Install a groundwater monitoring system as required under Section 257.91;
- Develop a groundwater sampling and analysis program to include selection of the statistical procedures to be used for evaluating groundwater monitoring data as required under Section 257.93;
- Initiate a detection monitoring program to include obtaining a minimum of eight independent samples for each background upgradient and downgradient monitoring well as required under Section 257.94; and
- Begin evaluating the groundwater monitoring data for statistically significant increases over background levels for the constituents listed in Appendix III of this part as required under Section 257.94.

Statistical analysis of groundwater monitoring data is required as part of detection monitoring and assessment monitoring under Section 257.93 of the CCR Rule. Section 257.93 of the CCR Rule provides several options for statistically evaluating groundwater data. The owner or operator of the CCR unit must select one of the statistical methods specified in paragraphs (f)(1) through (5) of Section 257.93 when evaluating constituent concentrations from the groundwater monitoring. EPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (EPA, 2009), also called the "Unified Guidance", presents acceptable statistical approaches for such evaluations and analyses. However, neither the CCR Rule nor the Unified Guidance outlines a step-by-step process to consistently evaluate groundwater monitoring data in order to satisfy the CCR Rule.

The purpose of this statistical analysis plan (SAP) is to develop a standard set of statistical approaches to follow when demonstrating groundwater compliance for each CCR unit in accordance with the CCR Rule and the Unified Guidance. Depending on the CCR unit and the evaluation of groundwater data for the CCR

unit, CCR groundwater compliance may be evaluated using either an interwell or an intrawell approach—the interwell approach being a comparison of water quality data upgradient of the CCR unit to water quality data downgradient of the CCR unit, and the intrawell approach being a comparison of water quality data of a well against background values established from that well's own historical water quality data.

This SAP describes and summarizes the statistical approach for establishing and evaluating baseline conditions to use for detection monitoring and assessment monitoring. The plan is designed to detect a release from a CCR facility. The plan conforms with EPA "Unified Guidance Document: Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities," March 2009, and the American Society for Testing and Materials (ASTM) Standard D6312-17, Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at Waste Disposal Facilities.

## 2.0 DATA PREPARATION

Analytical data from wells in the groundwater monitoring network at a CCR unit during each sampling event are first reviewed for usability after final data packages are received from the laboratory. The analytical data are then prepared for statistical analysis. Methods for handling duplicate and non-detect data are implemented during this data preparation phase in order to comply with the performance standards outlined in 40 CFR 257.93. During the data preparation, anomalously low or high constituent concentrations are also considered for usability. The following subsections provide further details.

### 2.1 Handling Duplicate Data

Field duplicates and data rejected after data validation are removed from the data set. Only the primary samples are retained for the statistical evaluation.

### 2.2 Handling Non-Detect Data

A non-detected constituent concentration is defined as any analytical result that either has an instrument response but is below a sample detection limit or that has no instrument response. A non-detected concentration is handled by using one of two approaches, depending on the percentage of detections in the data set:

- If a data set has at least 85% of samples detected, half of the sample detection limit is substituted as a proxy concentration. In these cases, substituting a proxy concentration will not alter the results of statistical tests or summary statistics (EPA, 2009; EPA, 2000).

- If a data set has at least 50% but no more than 85% of the samples detected, the robust regression order statistics (RROS) method is used to estimate summary statistics such as the mean and standard deviation (EPA, 2009).

- If a data set has fewer than 50% of the samples detected, then nonparametric statistical approaches are used to evaluate the data and to prepare summary statistics (EPA, 2009; EPA, 2000).

It should be noted that J-flagged data (estimated concentrations between the sample detection limit and the reporting limit) are defined as detected concentrations.

### 2.3 Handling Anomalous Detections

There may be infrequent cases when an anomalously high or low detection cannot be confirmed after resampling a well. In such cases, the anomalous detection should be considered for removal from the data

set and should be replaced by the resampled concentration so that current conditions are not over- or under-estimated. This is particularly important when estimating a baseline or background value to use to compare to future constituent concentrations from the network of groundwater monitoring wells. An anomalous detection may be identified at any point after analytical laboratory results are available, based on professional judgment or based on the outlier evaluation (see Section 3.4 for more details about testing for outliers). If an analytical result is removed, documentation should be provided in the annual report stating which analytical result was removed and justifying its removal.

## 3.0 STATISTICAL ASSUMPTIONS

Before baseline or background values can be established, a number of statistical assumptions are evaluated to determine if concentrations are independent and identically distributed. A sample's constituent concentration is independent when no other sample concentrations influence its measurement, regardless of when or where the sample was collected. Statistical independence is indicated by a set of random data. But randomness is only demonstrated by the presence of mean and variance stationarity and the lack of evidence for effects such as spatial and temporal variation, autocorrelation, and trends (EPA, 2009).

The validity of statistical independence is checked by testing for:

- Spatial stationarity,
- Temporal stationarity,
- Lack of autocorrelation, and
- Lack of statistical data outliers.

For the purpose of this SAP, the statistical software R (The R Foundation, 2017) is assumed to be used to perform the statistical tests used for checking the validity of independent samples. Other applicable programs may be used as necessary.

### 3.1 Spatial Stationarity

Spatial stationarity is defined as the lack of variability across well locations. Spatial variation may be naturally occurring and unaffected by human activity, or may be caused by human activity. The presence of spatial variability does not necessarily mean that contamination is present. If spatial variability is present, regardless whether it's naturally-occurring or not, it may hinder attempts to identify the cause of a statistically significant increase in constituent concentrations between current and baseline or background conditions (EPA, 2009). In some cases, spatial variability may make upgradient-to-downgradient comparisons (also called interwell comparisons) difficult (EPA, 2009).

One way to identify spatial stationarity is to observe whether spatial variability does or does not exist across multiple wells. This is particularly true when a CCR unit has more than one upgradient well and when interwell comparisons are used for detection or assessment monitoring. Constituent concentrations from each upgradient well are taken as a single data set and then upgradient well data sets are compared. Before establishing baseline or background values for the detection monitoring or assessment monitoring

programs, two steps are taken to check for spatial stationarity for each constituent and groundwater monitoring well (recommended by the Unified Guidance):

1. Side-by-side box plots are created, and
2. The one-way analysis of variance (ANOVA) or Kruskal-Wallis test is used.

Box plots provide a quick screen for possible spatial variation. The ANOVA and Kruskal-Wallis test are more formal tests for identifying spatial variability. All of the statistical tests are performed and the box plots are generated using the statistical software R (The R Foundation, 2017) or similar software.

In some cases, spatial variability, where substantial differences in average constituent concentrations are present among upgradient wells, can make interwell comparisons difficult (EPA, 2009). Professional judgment should be used to determine whether the set of constituent concentrations from all upgradient wells appropriately represent baseline or background conditions and whether the spatial variability will prevent the detection or assessment monitoring from identifying a potential release at a CCR unit. If the spatial variability were to indicate that analytical data from a set of upgradient wells do not appropriately represent background conditions or if the spatial variability were to hinder the detection or assessment monitoring, then the data set should be adjusted accordingly.

### 3.1.1 Box Plots

A box plot is a graphical representation of the pattern and distribution of concentrations for a single constituent data set. Visually comparing box plots for upgradient well's constituent concentrations, side-by-side, is one way to identify similarities or differences across upgradient well concentrations. If box plots contain similar range of concentrations, then the concentrations for the upgradient wells are similar (spatial stationarity). Likewise, if box plots do not contain similar range of concentrations, then the concentrations for the upgradient wells are different: spatial variability. Section 3.4.1 provides more details about how to create box plots.

### 3.1.2 ANOVA and Kruskal-Wallis Tests

The ANOVA and Kruskal-Wallis tests are similar statistical tests; both tests indicate significant spatial variability by indicating whether a statistically significant difference exists among average, upgradient well concentrations. The ANOVA is a parametric approach for comparing average concentrations across two

or more wells. The Kruskal-Wallis test is a non-parametric approach to the ANOVA using the ranks of concentrations, rather than using the actual concentration measurements. Neither test can be performed if the variances across upgradient wells are unequal. A Type I error rate ($\alpha$), or level of significance, is set to $\alpha$=0.05 for identifying a statistical significant different among well averages.

Determining which test to perform, either the ANOVA or Kruskal-Wallis tests, depends upon the frequency of detected results, the validity of assuming normality or lognormality for residuals, and the validity of assuming upgradient wells have equal variances. More details about these dependencies are provided in the subsections below (Sections 3.1.2.1-3.1.2.3). Figure 1 outlines the steps taken to define which statistical test (ANOVA or Kruskal-Wallis) should be used. The method used to determine the appropriate statistical test is based on the Unified Guidance recommendations. Tests of normality and equal variances use a 0.01 level of significance, rather than a 0.05 level of significance, because the ANOVA is reasonably robust to small departures of normality and equal variances (EPA, 2009).

No statistical test is performed when there are no detected concentration measurements in any of the upgradient wells.

If there are at least 85% detected concentrations in every upgradient well, then the ANOVA may be considered. For any non-detected concentration, half of the sample detection limit is used as a proxy concentration (see Section 2.2 for more details). The assumptions of normality and equal variances are checked. To test the normality assumption, residuals are tested using two distributional tests, the Shapiro-Wilk test and Filliben's probability plot correlation coefficient (PPCC) test. The Levene's test is used to check for equal variances. Only when evidence exists that both assumptions are valid is the ANOVA using the raw concentration measurements used. If either assumption is not met, then the assumptions of normality and equal variances are checked using the log-transformed data. Only when evidence exists that both assumptions are valid is the ANOVA using the log-transformed concentration measurements used. If either assumption is not met, then an ANOVA cannot be considered.

If there are fewer than 85% detected concentrations or if the ANOVA cannot be considered, then the Kruskal-Wallis may be considered. Non-detected data are treated differently for the Kruskal-Wallis test since the ranks of the data are used rather than the concentration measurements: all data below the maximum sample detection limit are set to the same value, lower than the maximum sample detection limit (Helsel, 2012). Since the Kruskal-Wallis tests uses ranks of the data, the actual value used for data below the maximum sample detection limit is not relevant. The assumption of equal variances is checked using

the Fligner's test. If the Fligner's test indicates that the assumption of equal variances is valid, then the Kruskal-Wallis test is used. Otherwise, no test can be performed because variances are heterogeneous among upgradient well concentration measurements.

### 3.2 Temporal Stationarity

Temporal stationarity is the lack of temporal variability. Temporal variability refers to the concept that concentration measurements vary over time. Temporal variability may be present across a group of wells and/or constituents. Temporal variability can also be present at an individual well or for a single constituent. By definition, temporal variability also includes autocorrelation, which is discussed separately in Section 3.3.

Any temporal pattern can invalidate or weaken the results of statistical testing (EPA, 2009). Plotting concentrations over time for a given constituent and for a given well is one way to identify possible trends. The Mann-Kendall trend test is another way to identify possible temporal variation for a given constituent and well. The Mann-Kendall is a nonparametric method to test for an increasing or decreasing linear trend over time. The Mann-Kendall doesn't require any special treatment for non-detects, other than all non-detects should be set to a common value lower than any of the detected concentrations (EPA, 2009 p.8-32). The Mann-Kendall is performed for any set of data with at least one detected concentration.

Before establishing baseline or background values for the detection monitoring or assessment monitoring programs, two steps are taken to check for temporal stationarity for each constituent and groundwater monitoring well:

1. A time plot is created, and
2. The Mann-Kendall trend test is used.

The time plots are generated and the Mann-Kendall trend test is performed using the statistical software R (The R Foundation, 2017) and the EnvStats package (Package 'EnvStats', 2017) or similar software.

Statistically significant increasing or decreasing temporal trends are not expected for any upgradient well since, by definition, an upgradient well should not be impacted by a release at the CCR unit. If, however, there is evidence of a temporal trend, then professional judgment should be used to determine whether constituent concentrations from that upgradient well appropriately represent baseline or background conditions and whether the trend will prevent the detection or assessment monitoring from identifying a

potential release at a CCR unit. If the trend were to indicate that an upgradient well does not appropriately represent baseline or background conditions or if the trend were to hinder the detection or assessment monitoring, then the data set should be adjusted accordingly.

To identify a statistically significant temporal trend, a Type I experiment wise error rate ($\alpha$) is set to $\alpha = 0.05$. That means, a single test error rate is defined for each well across the detected Appendix III or Appendix IV constituents. Each well's single test error rate is based on the number of detected constituents, $d$, for a given constituent list. For example, a well with five detected Appendix IV constituents ($d = 5$) has a single test error rate equal to $1 - (1 - \alpha)^{1/d^*} = 1 - (1 - 0.05)^{1/5} = 0.0102$. A statistically significant linear trend is identified when the p-value for the Mann-Kendall test is less than the single test error rate.

### 3.3 Lack of Autocorrelation

Autocorrelation is the statistical dependence between pairs of constituent concentrations across a sequence of time. That is, pairs of consecutive concentrations will exhibit stronger similarity in concentration measurements than expected from pairs collected at random times (p.6-25, EPA, 2009). To identify autocorrelation, the Unified Guidance recommends using the rank von Neumann ratio test for its ease of use and robustness when applied to either normal or non-normal distributions (p.14-17 EPA, 2009). Since this test has not been designed to handle tied values such as non-detect concentrations, this test is only performed for those wells and constituents with at least 50% detected concentrations.

The rank von Neumann ratio test statistic and associated p-value are computed using the statistical software R (The R Foundation, 2017) and the EnvStats package (Package 'EnvStats', 2017) or similar software.

Before baseline or background values are established for the detection monitoring or assessment monitoring programs, the rank von Neumann ratio test is used. Statistically significant autocorrelation is not expected for any well since, by definition, constituent concentration measurements from a well should be collected with far enough time between sampling events that a more recent sample does not include the same volume of groundwater as any previous sample. If, however, there is evidence of autocorrelation, then professional judgment should be used to determine whether constituent concentrations from a well appropriately represent baseline or background conditions and whether the trend will prevent the detection or assessment monitoring from identifying a potential release at a CCR unit. If the trend were to indicate that a well does not appropriately represent baseline or background conditions or if the trend were to hinder the detection

or assessment monitoring, then the data set should be adjusted accordingly.

To identify a statistically significant autocorrelation, a Type I experiment wise error rate, $\alpha$, of 0.05 is used for each well across the detected Appendix III or Appendix IV constituents. Each well's single test error rate is based on the number of constituents detected at least 50% of the time, $d^*$, for a given constituent list. For example, a well with five detected Appendix IV constituents ($d^* = 5$), has a single test error rate equal to $1 - (1 - \alpha)^{1/d^*} = 1 - (1 - 0.05)^{1/5} = 0.0102$. A statistically significant autocorrelation is identified when the p-value for the rank von Neumann test is less than the single test error rate.

### 3.4 Lack of Statistical Outliers

Based on the Unified Guidance, outliers are "extreme, unusual-looking measurements". An outlier may be an invalid concentration measurement due to a typographical error, an equipment error, a sampling error, etc. Or an outlier may be a valid concentration measurement that reflects a "...temporary, local 'hot spot' of higher concentration" (EPA, 2009). Furthermore, outliers are "measurements (larger or smaller than other data values) that are not representative of the sample population from which they were drawn" (EPA, 2002).

The Unified Guidance recommends testing for outliers to attempt to determine whether a suspect outlier may have been drawn from the same sample population as the rest of the data. "The basic problem with including statistical outliers in analyzing groundwater data is that they do not come from the same distribution as the other measurements in the sample and so fail the identically distributed presumption of most tests" (EPA, 2009).

The consequences of keeping statistical outliers when developing a baseline or background value may lead to an unreasonably high value that will be unable to identify potential releases at a CCR unit. Professional judgment should be used to determine whether to retain or remove any outlier. The Unified Guidance states that outliers generally should not be removed unless some basis for a likely error or discrepancy can be identified. Possible errors or discrepancies include "...values significantly outside the historical ranges of background data" (EPA, 2009). "The decision to discard an outlier should be based on some scientific or quality assurance basis" (EPA, 2000). "A data point should not be eliminated from the background data set simply because it is the highest value that was observed" (EPA, 2002). EPA recommends "…that all data not known to be in error should be considered valid" (EPA, 1989). Furthermore, "[t]he general rule is that a measurement should never be deleted from a data set solely on the basis of an outlier test" (SWDIV,

1999).

Before baseline or background values are established for the detection monitoring or assessment monitoring programs, two steps are taken to check for suspect outliers for each constituent with at least 50% detected concentrations and at each well or set of upgradient wells:

1. A box plot is created to identify suspect outliers, and
2. The Dixon's test or Rosner's test is used.

Possible, or suspect, outliers are identified using a box plot. The statistical outlier tests, the Dixon's test and Rosner's test, are tests to check whether any suspect outlier is a statistical outlier. The box plots are generated and the Dixon's or Rosner's test is performed using the statistical software R (The R Foundation, 2017) or similar software.

### 3.4.1 Box Plots

Creating a box plot is a visual technique used to identify suspect outliers. Box plots can also demonstrate the pattern and distribution of constituent concentrations for a data set. The size of the vertical box in a box plot indicates where the middle half of the data fall (i.e., the interquartile range, IQR). Concentration measurements that plot further away from the others indicate suspect outliers; for a box plot, these measurements are called mild or extreme outliers (EPA, 2009).

Box plots are constructed to identify two types of suspect outliers: mild and extreme outliers. Suspect outliers are defined in terms of the IQR, represented by the range of the middle half of the data and indicated by the vertical 'box' in a box plot. The IQR is the difference between the upper quartile and the lower quartile of the data. Mild and extreme outliers are identified for small or large sample detected concentration measurements. A high, mild outlier is any detected concentration that exceeds 1.5 times the IQR, but no more than 3 times the IQR, from the upper quartile. A small, mild outlier is any detected concentration that is below 1.5 times the IQR, but no less than 3 times the IQR, from the lower quartile. A high, extreme outlier is any detected concentration greater than 3 times the IQR from the upper quartile. A low, extreme outlier is any detected concentration less than 3 times the IQR from the lower quartile. EPA, 2009 and EPA, 2017 state that mild and extreme outliers should be considered suspect outliers. Computational details for box plots are found in EPA guidance documents (EPA, 2000; EPA, 2009).

### 3.4.2 Statistical Outlier Tests

A statistical outlier test, either the Dixon's test or Rosner's test, is performed for each data set having at least one suspect outlier in order to determine if the suspect outlier is also a statistical outlier. For a data set with no more than 25 samples, the Dixon's test is used. For a data set with at least 20 samples, the Rosner's test is used. Dixon's test can only test if one detected concentration (i.e., the minimum or the maximum) is a statistical outlier. The Rosner's test can test if one or more detected concentrations are statistical outliers (EPA, 2000; EPA, 2002; EPA, 2009). Computational details for these outlier tests are outlined in EPA documents (EPA, 2000; EPA, 2009). Based on results from the statistical outlier tests, mild and extreme outliers are classified as statistical outliers.

Both statistical outlier tests assume that the data set with the suspect outlier(s) removed is normally distributed (or lognormally distributed if the data are transformed to the natural-log scale). Section 4.1.2 below discusses how to test distributional assumptions of normality or lognormality.

Any extreme, suspect outlier that is also identified as a statistical outlier is evaluated for possible errors or data discrepancies before a baseline or background value is established. Suspect outliers, including those also classified as statistical outliers, should be reviewed for having possible analytical or other quality errors. Professional judgment should be used to determine whether constituent concentrations defined as suspect or statistical outliers should be removed so that baseline or background conditions are properly represented so that detection or assessment monitoring can identify a potential release at a CCR unit. If an outlier does not represent baseline or background conditions or if the outlier hinders the detection or assessment monitoring, then the data set should be adjusted accordingly.

## 4.0 STATISTICAL APPROACH FOR DETECTION AND ASSESSMENT MONITORING

Section 257.93 of the CCR rule provides several options for statistically evaluating the groundwater data and the performance standards to follow at CCR facilities. At each CCR unit, upper prediction limits (UPLs) are calculated for each detected constituent to establish baseline or background values. To achieve UPLs with sufficient statistical power, the UPLs are designed to include retesting procedures based on the 1-of-2 approach (one assigned sample and one resample—see Section 4.1.3). Using UPLs is one of the preferred methods for comparing groundwater based on the Unified Guidance (EPA, 2009).

UPLs are computed using baseline or background data. The source of the baseline or background data may differ, depending whether interwell or intrawell comparisons are appropriate. "With interwell tests, background is derived from distinct, initially upgradient background wells" (EPA, 2009). "Future data from each of these compliance wells are then tested against this common background. On the other hand, intrawell background [also called baseline] is derived from and represents historical groundwater conditions in each individual compliance well." (EPA, 2009)

There are several considerations to make when determining whether interwell or intrawell comparisons should be performed. To consider interwell comparisons for a CCR unit, the groundwater monitoring data should meet the statistical assumptions of spatial stationarity, temporal stationarity, lack of autocorrelation, and lack of statistical outliers (see Section 3). Furthermore, the CCR unit should

- have at least one upgradient well,
- have a clearly defined groundwater flow direction without any radial flow, and
- not contain highly variable mine spoil.

If any of these conditions cannot be met or if the statistical assumptions cannot be met, then intrawell comparisons should be considered for a CCR unit. Both Gibbons and EPA's Unified guidance recommend using intrawell analyses when spatial variability exists. Both Gibbons and the Unified Guidance caution that intrawell analyses are appropriate in the absence of contamination. Since a CCR unit may be an existing landfill or impoundment that is now under the CCR rule, there is a possibility that contamination may be present. Professional judgment should be used for such CCR units to determine if contamination is likely present, and to determine which type of comparison is more appropriate.

## 4.1 Calculating UPLs

UPLs are estimated with constituent concentrations that are independent and identically distributed, as described in Section 3. The set of data used to calculate UPLs are based on constituent concentrations from the eight background sampling events and from either:

- upgradient wells for the CCR unit (for interwell comparisons), or
- individual compliance well (for intrawell comparisons).

UPLs must be calculated using a single-test error rate that accounts for the site-wide false positive rate (SWFPR) associated with all of the detection or assessment monitoring comparisons. The SWFPR is set based on the Unified Guidance recommendations and is discussed in more detail in Section 4.1.1.

After assumptions have been checked and outliers have been identified for the appropriate set of data, the data distribution is defined in accordance with EPA guidance (EPA, 2000; EPA, 2002; EPA, 2009; EPA, 2017; SWDIV, 1998). UPLs are then calculated based on the defined data distribution. Distributions are defined using the methodology outlined in Section 4.1.2, and the UPLs are calculated using the methodology described in Section 4.1.3.

The statistical software R (The R Foundation, 2017) or similar software is used to perform all statistical distribution tests and to calculate UPLs.

### 4.1.1 Defining Single-test error rate

Based on 40 CFR 257.93 (g)(2) and the Unified Guidance, the cumulative SWFPR or Type I experiment wise error rate for yearly monitoring shall be no more than 0.10. That means, a single test error rate must be considerably lower than 0.10. The single test error rate depends on the number of detected constituents and number of compliance wells evaluated in a CCR unit's monitoring program, defined as:
$1-(1-\alpha)^{1/cw}$, where:

- $\alpha$=0.10, the SWFPR;
- $c$=the number detected constituents for the monitoring program (the Appendix III constituents for detection monitoring or Appendix IV constituents for assessment monitoring); and
- w=the number of compliance wells at the CCR unit.

Sampling frequency is not included in this single-test error rate because UPL calculations are designed to account for the number of sampling events per year.

### 4.1.2 Defining a Distribution for Background

The type of UPL calculated is based on a data set's defined distribution. Figure 2 outlines the steps to take to define whether a data set follows a normal, gamma, lognormal, or nonparametric distribution. If there are no detections for a data set, no distribution is defined. For a constituent with fewer than 50% detected concentrations, the distribution is defined as nonparametric (EPA, 2000; EPA, 2009).

For each data set with at least 50% detected concentrations and at least 4 samples, the data's distribution is tested using up to three distributional tests, which include the Shapiro-Wilk test, Kolmogorov-Smirnov test, and PPCC test. A test for the gamma distribution is included because EPA, 2017 generally recommends using summary statistics from a gamma distribution before using statistics from a lognormal distribution when both the gamma and lognormal distributional assumptions are valid. All of these distributional tests are recommended by EPA (EPA, 2000; EPA, 2002; EPA, 2009; EPA, 2017). Each distributional test is performed with only the detected data, which reflects how ProUCL performs distributional tests (EPA, 2017).

The method used to define a distribution, using the largest p-value from all of the appropriate tests and comparing it to a 0.05 level of significance, is designed to follow ProUCL's distributional recommendations. It should be noted that for a data set with fewer than five detected samples, the Kolmogorov-Smirnov test and the PPCC test cannot be performed. And, the Kolmogorov-Smirnov test is not used to test for gamma distributions.

If results from any of these three tests indicate the data are normally distributed (when the largest p-value is greater than 0.05), the distribution is defined as normal. If none of the test results indicate normality, the detected data set is tested for the gamma distribution by running the Shapiro-Wilk and PPCC tests. If either test indicates the data set follow a gamma distribution (when the larger p-value is greater than 0.05), the

distribution is defined as a gamma distribution. If none of the test results indicate a gamma distribution, the data set is tested for lognormality by running the Shapiro-Wilk, Kolmogorov-Smirnov, and PPCC tests with the log-transformed detected data. If results from any of these tests indicate the data set is lognormally distributed (when the largest p-value is greater than 0.05), the distribution is defined as lognormal. If none of the distributional test results indicate normality, a gamma distribution, or lognormality, the data's distribution is defined as nonparametric.

### 4.1.3 Calculating UPLs

UPLs are calculated using a 1-of-2 retesting strategy to ensure comparisons are statistically powerful and to minimize the SWFPR. A 1-of-2 retesting strategy means that if one or more constituent concentrations in a compliance well are above their respective background concentration, a resample is collected to validate or invalidate the background concentration exceedance. According to the Unified Guidance, "A *1-of-m* retesting plan implies that up to *m* groundwater measurements may have to be collected at each compliance well, including the initial observation and *(m-1)* possible resamples. For the test to be valid, all of these sample measurements need to be statistically independent" (EPA, 2009). An independent resample may be collected between sampling events if necessary.

The Unified Guidance defines when a well is in-compliance and out-of-compliance: "If the initial groundwater observation is in-bounds [in compliance with the designed standard], the test is complete and no resamples need to be collected. Only when the first concentration exceeds the UPL, does additional sampling come into play" (EPA, 2009). If all *m* samples (the initial sample plus *m-1* resamples) exceed, then the well is considered out-of-compliance. If none of the *(m-1)* resamples exceed after the initial sample exceeded, then the well can still be considered to be in-compliance (EPA, 2009).

The type of UPL computed (e.g., parametric or nonparametric) is based on the detection frequency and the defined data distribution for each data set, as described in Section 4.1.2. For a constituent with no detected concentration measurements in the baseline or background data, the UPL is set to the reporting limit (EPA, 2009). For a constituent with at least 50% detections, the UPL calculation adjusts for non-detected concentration(s) as described in Section 2.2, and the appropriate UPL calculation is used based on results from the distributional tests. If no parametric distribution (normal, lognormal, or gamma) can be defined for a data set, then a nonparametric UPL is estimated. Since J-flagged data are defined as detected, a calculated UPL may be less than the reporting limit; in such cases, the UPL is set to the reporting limit.

## 4.2 Establishing Background Values

Background values used for detection monitoring or assessment monitoring are based on UPLs. For detection monitoring (Appendix III constituents), background values are defined as the higher of the UPL and reporting limit. For assessment monitoring (Appendix IV constituents) background values are defined as the highest of the maximum concentration level (MCL), UPL, reporting limit, or other accepted screening level for constituents without MCLs. The reporting limit is included so that a constituent having an UPL below the reporting limit does not have an unfair limitation because most or all of the baseline or background constituent concentrations are below the reporting limit. For each CCR unit, tables of statistically-derived background values will be prepared for each Appendix III and Appendix IV constituent. For interwell comparisons, background values will be developed using upgradient well data. For intrawell comparisons, background values will be developed for each monitoring well using historical data from the well.

## 4.3 Updating Background Values

As detection or assessment monitoring continues, it is recommended to update baseline or background data sets periodically with valid monitoring concentrations that are representative of groundwater unimpacted by leakage from the CCR unit. The Unified Guidance recommends reviewing and possibly updating background values when enough new concentrations have been collected to perform statistical comparisons. That means, background values should be reviewed about every two or three years during. Failure to update background will exclude factors such as natural temporal variation, changes in field or laboratory methodologies, and changes in the water table due to meteorological conditions or other influences.

## 5.0 DETECTION MONITORING DATA EVALUATION

Detection monitoring will be performed at each CCR unit's groundwater monitoring system on a semi-annual basis during the active life of the CCR unit and during the post-closure period. Each CCR monitoring well will be sampled for the following Appendix III constituents as part of the detection monitoring program:

- Boron
- Calcium
- Chloride
- Fluoride
- field-measured pH
- Sulfate
- Total Dissolved Solids (TDS)

After every detection monitoring event, the constituent concentrations from each well will be compared to the background values, as described in Section 3 of this plan, to ascertain if a statistically significant increase above background exists. Possible outcomes from comparing the detection monitoring constituent concentrations in each well to their respective background values are as follows:

- All detection monitoring constituent concentrations in a compliance well are less than or equal to their respective background values; or

- One or more detection monitoring constituent concentrations in a compliance well are above their respective background values.

### 5.1 No Statistically Significant Increase over Background Values

Baseline and background UPLs are based on a 1-of-2 resampling approach, meaning that if zero or one concentration measurements from a series of two independent samples collected from a well do not exceed the appropriate UPL, then a statistically significant increase over baseline or background has not occurred at a CCR unit. This conclusion will be reached if the data indicate either of the following:

- All detection monitoring constituent concentrations in a compliance well are less than or equal to their respective background values; or

- At least one detection monitoring constituent concentration in a well is above the respective background value. If this occurs, the well or wells with constituent concentration(s) above the background value(s) will be resampled and analyzed for the detection monitoring constituent(s) with exceedances. If the resample indicates that the target detection monitoring constituent concentration(s) in the well or wells is less than or equal to their respective background value(s),

then it can be concluded that a statistically significant increase over background for all detection monitoring constituents has not occurred, since concentrations in one sample of the two independent samples do not exceed the appropriate baseline or background value(s).

If the groundwater monitoring data indicates that a statistically significant increase over background has not occurred at the CCR wells, then detection monitoring at all CCR wells will continue on a semi-annual basis.

## 5.2 Statistically Significant Increase over Background Values

If one or more detection monitoring constituent concentrations in any well is above the respective background value in both the original detection monitoring sample and the resample, then a statistically significant increase over background for the target detection monitoring constituents can be concluded. If a statistically significant increase is indicated, within 90 days Luminant will:

- Establish an assessment monitoring program as described in this plan, or
- Demonstrate that a source other than the CCR unit caused the statistically significant increase over the baseline or background value for a constituent, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with the detection monitoring program.

## 6.0 ASSESSMENT MONITORING DATA EVALUATION

Assessment monitoring will be performed at a CCR unit's groundwater monitoring system after a statistically significant increase over background values has been confirmed in that well for one or more of the detection monitoring constituents. Within 90 days of triggering the assessment monitoring program, and annually thereafter, each CCR monitoring well requiring assessment monitoring will be sampled for the following Appendix IV parameters as part of the assessment monitoring program:

- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Fluoride
- Lead
- Lithium
- Mercury
- Molybdenum
- Selenium
- Thallium
- Radium 226 and 228 combined

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, all wells in a CCR unit's groundwater monitoring system will be resampled and analyzed for:

- All Appendix III detection monitoring parameters; and
- The Appendix IV assessment monitoring parameters that were detected as part of the assessment monitoring event.

This monitoring will be performed on at least an annual basis thereafter, unless Luminant can demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for these constituents during the active life and the post-closure care period based on the availability of groundwater.

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, a GWPS will be established for each of the Appendix IV assessment monitoring constituents that were detected in the groundwater monitoring system wells as follows:

- For constituents for which an MCL has been established, the highest of the MCL, UPL, and reporting limit for that constituent; or

- For constituents for which an MCL has not been established, the higher of the UPL, reporting limit, or levels that are equivalent to specified regional screening level (RSL) for that constituent (note: future revisions to the Rule may allow additional flexibility in establishing GWPS for states with EPA-approved CCR permit programs for Appendix IV constituents that do not have a MCL).

Each assessment monitoring constituent will be evaluated to ascertain if a statistically significant increase above the GWPS exists. Possible outcomes are as follows:

- All averages from assessment monitoring constituent concentrations at a well are not statistically greater than to their respective GWPS; or
- One or more averages from assessment monitoring constituent concentrations at a well are statistically greater than their respective GWPS.

## 6.1 Calculating LCLs

For each assessment monitoring constituent, the 95% lower confidence limit of the mean (LCL) is estimated. The set of data used to calculate LCLs are based on the constituent concentrations from the current year's sampling events and enough previous sampling events to reasonably estimate each LCL (the goal should be to have around eight to ten samples).

LCLs are calculated based on the defined data distribution. The data distribution is defined in accordance with EPA guidance (EPA, 2000; EPA, 2002; EPA, 2009; EPA, 2017; SWDIV, 1998). Distributions are defined using the methodology outlined in Section 6.1.1. The LCLs are calculated using the methodology described in Section 6.1.2.

The statistical software R (The R Foundation, 2017) or similar software is used to perform all statistical distribution tests and to calculate LCLs.

### 6.1.1 Defining a Distribution for LCLs

The type of LCL calculated is based on a data set's defined distribution. The same methodology for defining a distribution for background, described in Section 4.1.2 and outlined in Figure 2, is used to define the distribution for each assessment monitoring constituent data set as normal, gamma, lognormal, or nonparametric.

### 6.1.2 Calculating LCLs

The type of LCL computed (e.g., parametric or nonparametric) is based on the detection frequency and the defined data distribution for each data set, as described in Section 6.1.1. For a constituent with no detected concentration measurements, the LCL is set to the reporting limit (EPA, 2009). For a constituent with at least 50% detections, the LCL calculation adjusts for non-detected concentration(s) as described in Section 2.2, and the appropriate LCL calculation is used based on results from the distributional tests. If no parametric distribution (normal, lognormal, or gamma) can be defined for a data set or there are fewer than 50% detections, then a nonparametric, approximate 95% lower confidence limit of the median is estimated.

## 6.2 No Statistically Significant Increase Over GWPS

A statistically significant increase over the groundwater protection standard has not occurred at a CCR unit when the LCL for every assessment monitoring constituent at a well is less than or equal to the appropriate GWPS.

Assessment monitoring will continue on an annual basis. If for two consecutive assessment monitoring sampling events, the constituent concentrations for all Appendix III constituents are at or below background values and all Appendix IV constituents are shown to be statistically at or below their appropriate GWPS, then assessment monitoring will be terminated and detection monitoring as described in this plan will resume. If the constituent concentrations of any Appendix III constituents are shown to be statistically above background values, but all Appendix IV constituents have no statistically significant increase over their respective GWPS, then assessment monitoring will continue.

## 6.3 Statistically Significant Increase Over GWPS

A statistically significant increase over the groundwater protection standard has occurred at a CCR unit when the LCL for at least one assessment monitoring constituent at a well is greater than the appropriate GWPS. If a statistically significant increase over groundwater protection standards for any Appendix IV assessment monitoring constituent is confirmed, within 90 days of the initial assessment monitoring event, Luminant will either:

- Initiate an assessment of corrective measures for the CCR unit in accordance with CCR Rule Section 257.96; or
- Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically

significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. If a successful demonstration is made, the owner or operator must continue assessment monitoring. If a successful demonstration has not been made at the end of the 90 day period, the owner or operator of the CCR unit must initiate an assessment of corrective measures for the CCR unit.

If one or more Appendix IV assessment monitoring constituent concentrations are statistically above the respective groundwater protection standards, and if a source other than the CCR unit cannot be demonstrated to have caused the contamination, a release from the CCR unit is likely and the nature and extent of the release will be further characterized as follows:

- Install additional monitoring wells necessary to define the contaminant plume(s);
- Collect data on the nature and estimated quantity of material released including specific information on the Appendix IV assessment monitoring constituents and the levels at which they are present in the material released;
- Install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well for all Appendix III detection monitoring parameters and for those Appendix IV assessment monitoring constituents that have been detected as part of assessment monitoring. This monitoring must be performed on at least an annual basis thereafter.
- Sample all CCR unit wells for all Appendix III detection monitoring parameters and for those Appendix IV assessment monitoring constituents that have been detected as part of assessment monitoring. This monitoring must be performed on at least an annual basis thereafter.

## 7.0 REPORTING REQUIREMENTS

The results of the CCR groundwater monitoring program performed at each CCR unit will be reported yearly in an Annual Groundwater Monitoring and Corrective Action Report. A separate annual report for each CCR unit will document the status of the groundwater monitoring and corrective action program, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. At a minimum, the Annual Groundwater Monitoring and Corrective Action Report will contain the following information:

- A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

- In addition to all the monitoring data obtained under CCR Rule Sections 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs, as well as the basis for the background values and the statistical methods employed to establish the background values;

- A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

- Other information required to be included in the annual report as specified in CCR Rule Sections 257.90 through 257.98.

The Groundwater Monitoring and Corrective Action Report for the 2017 monitoring program must be placed in each facility operating record no later than January 31, 2018. Subsequent reports must be placed in the facility operating records no later than January 31 of the year following completion of the groundwater monitoring program from the preceding calendar year. The reports must also be posted to the owner or operator's CCR Rule Compliance Data and Information internet site within 30 days of placing the reports in the operating record.

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# FIGURES

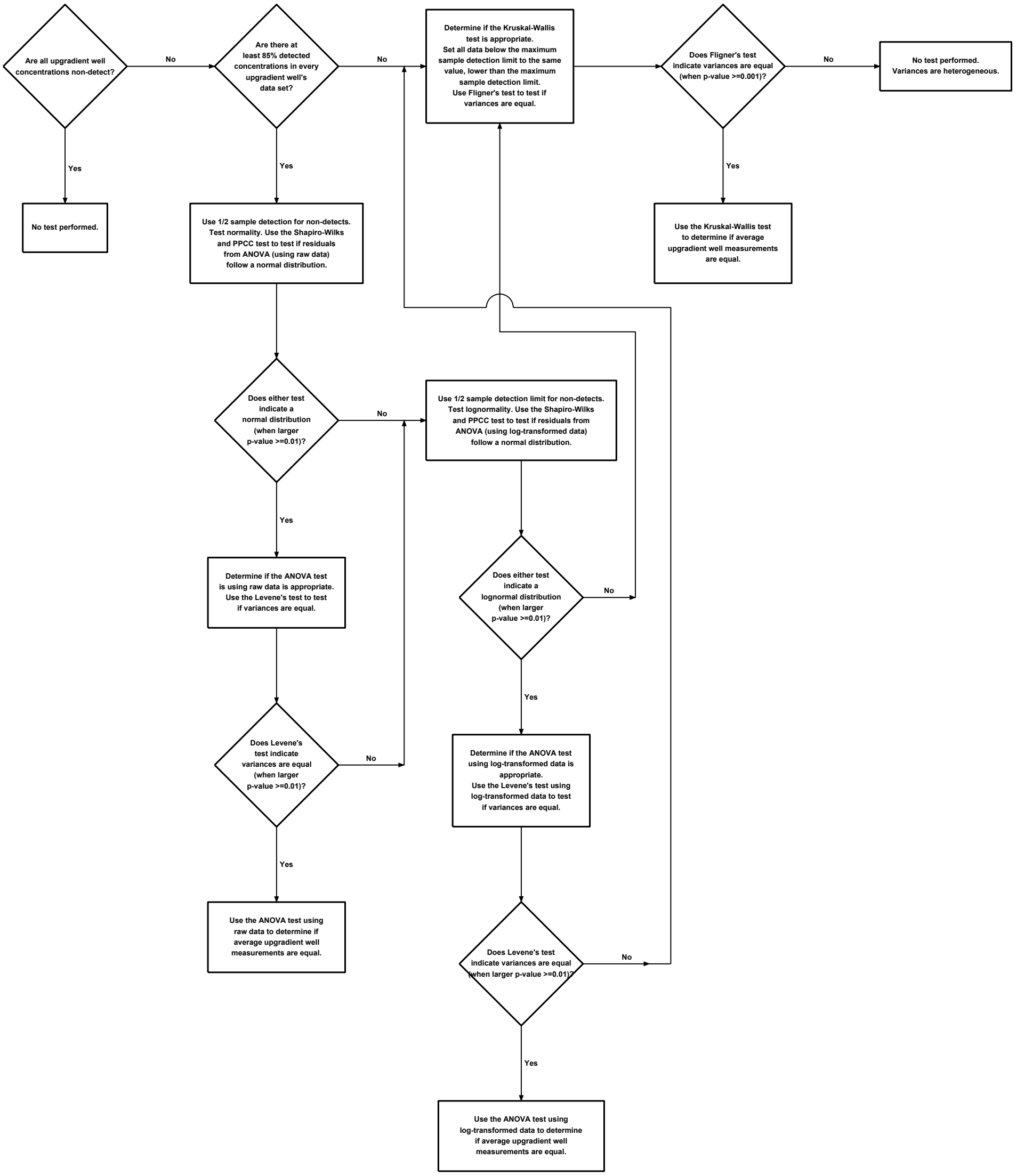


Figure 1

**PROCESS FOR SELECTING ANOVA OR KRUSKAL-WALLIS TEST TO COMPARE UPGRADIENT WELL AVERAGES**

| | | |
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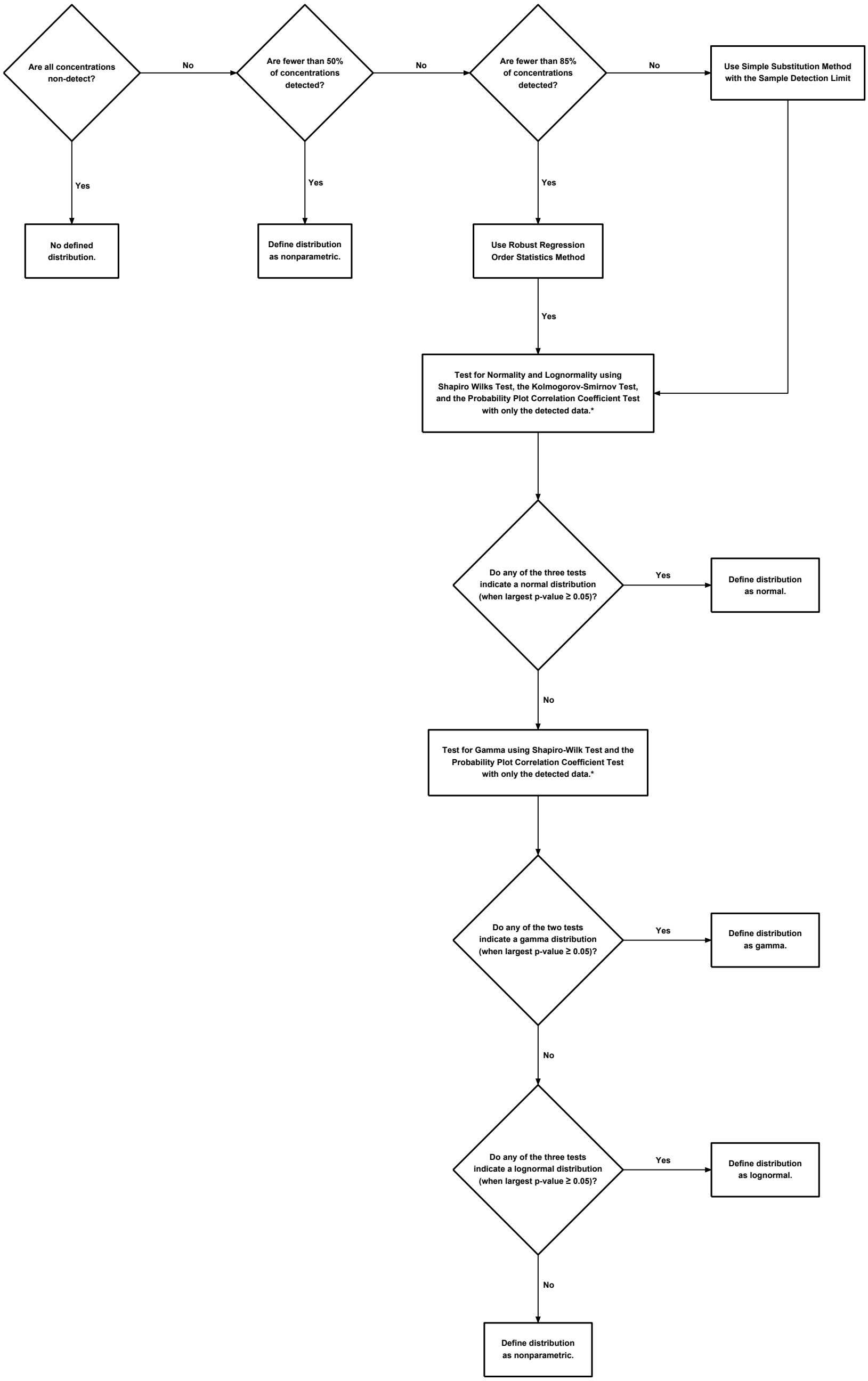
| PROJECT: 5164E | BY: AJD | REVISIONS |
| DATE: JAN 2019 | CHECKED: PJB | |

**GOLDER ASSOCIATES USA, INC.**




Note:
* - Distributional tests can not be performed for the following cases:
1. For a data group with fewer than five detected samples, the Kolmogorov-Smirnov Test and the Probability Plot Correlation Coefficient Test can not be performed using only the detected concentrations.
2. For a data group with fewer than four detected samples, the Shapiro-Wilks Test can not be performed using only the detected concentrations.

Figure 2

**PROCESS FOR DEFINING A DISTRIBUTION FOR A DATA SET**

| | | |
|---|---|---|
| PROJECT: 5164E | BY: AJD | REVISIONS |
| DATE: JAN 2019 | CHECKED: PJB | |

**GOLDER ASSOCIATES USA, INC.**

# COAL COMBUSTION RESIDUAL RULE
# STATISTICAL ANALYSIS PLAN

## REVISION NO. 1

## OAK GROVE STEAM ELECTRIC STATION
## FGD POND AREA
## ROBERTSON COUNTY, TEXAS

**NOVEMBER 16, 2022**

***Prepared For:***

Luminant Generation Company LLC

***Prepared By:***

Golder Associates USA, Inc.
1601 S. Mopac Expy, Suite 325D
Austin, Texas 78746
Texas Engineering Firm Registration No. 22771

**PROFESSIONAL CERTIFICATION**

This document and all attachments were prepared by Golder Associates USA, Inc. under my direction or supervision. I hereby certify that the proposed statistical method is appropriate for evaluating groundwater data in accordance with the requirements of Sections 257.93 through 257.95 of the CCR Rule.

Patrick J. Behling, P.E.
Principal Engineer
GOLDER ASSOCIATES USA, INC.

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## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ANOVA | analysis of variance |
| CCR | coal combustion residuals |
| EPA | United States Environmental Protection Agency |
| GWPS | groundwater protection standard |
| LCL | lower confidence limit of the mean |
| MCL | maximum contaminant level |
| PPCC | Filliben's probability plot correlation coefficient test |
| RROS | robust regression order statistics |
| SAP | statistical analysis plan |
| SWFPR | site-wide false positive rate |
| UPL | upper prediction limit |

# 1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) issued regulations regarding the disposal of coal combustion residuals (CCR) in certain landfills and impoundments in April 2015. These regulations, found under 40 CFR 257, Subpart D and referred to as the "CCR Rule" require facilities to design a groundwater monitoring program to monitor if landfills or impoundments with CCR materials, called CCR units, are impacting downgradient groundwater quality.

Section 257.90 of the CCR Rule requires that all existing CCR landfills and surface impoundments comply with the following groundwater monitoring requirements no later than October 17, 2017:

- Install a groundwater monitoring system as required under Section 257.91;
- Develop a groundwater sampling and analysis program to include selection of the statistical procedures to be used for evaluating groundwater monitoring data as required under Section 257.93;
- Initiate a detection monitoring program to include obtaining a minimum of eight independent samples for each background upgradient and downgradient monitoring well as required under Section 257.94; and
- Begin evaluating the groundwater monitoring data for statistically significant increases over background levels for the constituents listed in Appendix III of this part as required under Section 257.94.

Statistical analysis of groundwater monitoring data is required as part of detection monitoring and assessment monitoring under Section 257.93 of the CCR Rule. Section 257.93 of the CCR Rule provides several options for statistically evaluating groundwater data. The owner or operator of the CCR unit must select one of the statistical methods specified in paragraphs (f)(1) through (5) of Section 257.93 when evaluating constituent concentrations from the groundwater monitoring. EPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (EPA, 2009), also called the "Unified Guidance", presents acceptable statistical approaches for such evaluations and analyses. However, neither the CCR Rule nor the Unified Guidance outlines a step-by-step process to consistently evaluate groundwater monitoring data in order to satisfy the CCR Rule.

The purpose of this statistical analysis plan (SAP) is to develop a standard set of statistical approaches to follow when demonstrating groundwater compliance for each CCR unit in accordance with the CCR Rule and the Unified Guidance. Depending on the CCR unit and the evaluation of groundwater data for the CCR

unit, CCR groundwater compliance may be evaluated using either an interwell or an intrawell approach—the interwell approach being a comparison of water quality data upgradient of the CCR unit to water quality data downgradient of the CCR unit, and the intrawell approach being a comparison of water quality data of a well against background values established from that well's own historical water quality data.

This SAP describes and summarizes the statistical approach for establishing and evaluating baseline conditions to use for detection monitoring and assessment monitoring. The plan is designed to detect a release from a CCR facility. The plan conforms with EPA "Unified Guidance Document: Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities," March 2009, and the American Society for Testing and Materials (ASTM) Standard D6312-17, Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at Waste Disposal Facilities.

## 2.0 DATA PREPARATION

Analytical data from wells in the groundwater monitoring network at a CCR unit during each sampling event are first reviewed for usability after final data packages are received from the laboratory. The analytical data are then prepared for statistical analysis. Methods for handling duplicate and non-detect data are implemented during this data preparation phase in order to comply with the performance standards outlined in 40 CFR 257.93. During the data preparation, anomalously low or high constituent concentrations are also considered for usability. The following subsections provide further details.

### 2.1 Handling Duplicate Data

Field duplicates and data rejected after data validation are removed from the data set. Only the primary samples are retained for the statistical evaluation.

### 2.2 Handling Non-Detect Data

A non-detected constituent concentration is defined as any analytical result that either has an instrument response but is below a sample detection limit or that has no instrument response. A non-detected concentration is handled by using one of two approaches, depending on the percentage of detections in the data set:

- If a data set has at least 85% of samples detected, half of the sample detection limit is substituted as a proxy concentration. In these cases, substituting a proxy concentration will not alter the results of statistical tests or summary statistics (EPA, 2009; EPA, 2000).

- If a data set has at least 50% but no more than 85% of the samples detected, the robust regression order statistics (RROS) method is used to estimate summary statistics such as the mean and standard deviation (EPA, 2009).

- If a data set has fewer than 50% of the samples detected, then nonparametric statistical approaches are used to evaluate the data and to prepare summary statistics (EPA, 2009; EPA, 2000).

It should be noted that J-flagged data (estimated concentrations between the sample detection limit and the reporting limit) are defined as detected concentrations.

### 2.3 Handling Anomalous Detections

There may be infrequent cases when an anomalously high or low detection cannot be confirmed after resampling a well. In such cases, the anomalous detection should be considered for removal from the data

set and should be replaced by the resampled concentration so that current conditions are not over- or under-estimated. This is particularly important when estimating a baseline or background value to use to compare to future constituent concentrations from the network of groundwater monitoring wells. An anomalous detection may be identified at any point after analytical laboratory results are available, based on professional judgment or based on the outlier evaluation (see Section 3.4 for more details about testing for outliers). If an analytical result is removed, documentation should be provided in the annual report stating which analytical result was removed and justifying its removal.

## 3.0 STATISTICAL ASSUMPTIONS

Before baseline or background values can be established, a number of statistical assumptions are evaluated to determine if concentrations are independent and identically distributed. A sample's constituent concentration is independent when no other sample concentrations influence its measurement, regardless of when or where the sample was collected. Statistical independence is indicated by a set of random data. But randomness is only demonstrated by the presence of mean and variance stationarity and the lack of evidence for effects such as spatial and temporal variation, autocorrelation, and trends (EPA, 2009).

The validity of statistical independence is checked by testing for:

- Spatial stationarity,
- Temporal stationarity,
- Lack of autocorrelation, and
- Lack of statistical data outliers.

For the purpose of this SAP, the statistical software R (The R Foundation, 2017) is assumed to be used to perform the statistical tests used for checking the validity of independent samples. Other applicable programs may be used as necessary.

### 3.1 Spatial Stationarity

Spatial stationarity is defined as the lack of variability across well locations. Spatial variation may be naturally occurring and unaffected by human activity, or may be caused by human activity. The presence of spatial variability does not necessarily mean that contamination is present. If spatial variability is present, regardless whether it's naturally-occurring or not, it may hinder attempts to identify the cause of a statistically significant increase in constituent concentrations between current and baseline or background conditions (EPA, 2009). In some cases, spatial variability may make upgradient-to-downgradient comparisons (also called interwell comparisons) difficult (EPA, 2009).

One way to identify spatial stationarity is to observe whether spatial variability does or does not exist across multiple wells. This is particularly true when a CCR unit has more than one upgradient well and when interwell comparisons are used for detection or assessment monitoring. Constituent concentrations from each upgradient well are taken as a single data set and then upgradient well data sets are compared. Before establishing baseline or background values for the detection monitoring or assessment monitoring

programs, two steps are taken to check for spatial stationarity for each constituent and groundwater monitoring well (recommended by the Unified Guidance):

1. Side-by-side box plots are created, and
2. The one-way analysis of variance (ANOVA) or Kruskal-Wallis test is used.

Box plots provide a quick screen for possible spatial variation. The ANOVA and Kruskal-Wallis test are more formal tests for identifying spatial variability. All of the statistical tests are performed and the box plots are generated using the statistical software R (The R Foundation, 2017) or similar software.

In some cases, spatial variability, where substantial differences in average constituent concentrations are present among upgradient wells, can make interwell comparisons difficult (EPA, 2009). Professional judgment should be used to determine whether the set of constituent concentrations from all upgradient wells appropriately represent baseline or background conditions and whether the spatial variability will prevent the detection or assessment monitoring from identifying a potential release at a CCR unit. If the spatial variability were to indicate that analytical data from a set of upgradient wells do not appropriately represent background conditions or if the spatial variability were to hinder the detection or assessment monitoring, then the data set should be adjusted accordingly.

### 3.1.1 Box Plots

A box plot is a graphical representation of the pattern and distribution of concentrations for a single constituent data set. Visually comparing box plots for upgradient well's constituent concentrations, side-by-side, is one way to identify similarities or differences across upgradient well concentrations. If box plots contain similar range of concentrations, then the concentrations for the upgradient wells are similar (spatial stationarity). Likewise, if box plots do not contain similar range of concentrations, then the concentrations for the upgradient wells are different: spatial variability. Section 3.4.1 provides more details about how to create box plots.

### 3.1.2 ANOVA and Kruskal-Wallis Tests

The ANOVA and Kruskal-Wallis tests are similar statistical tests; both tests indicate significant spatial variability by indicating whether a statistically significant difference exists among average, upgradient well concentrations. The ANOVA is a parametric approach for comparing average concentrations across two

or more wells. The Kruskal-Wallis test is a non-parametric approach to the ANOVA using the ranks of concentrations, rather than using the actual concentration measurements. Neither test can be performed if the variances across upgradient wells are unequal. A Type I error rate ($\alpha$), or level of significance, is set to $\alpha$=0.05 for identifying a statistical significant different among well averages.

Determining which test to perform, either the ANOVA or Kruskal-Wallis tests, depends upon the frequency of detected results, the validity of assuming normality or lognormality for residuals, and the validity of assuming upgradient wells have equal variances. More details about these dependencies are provided in the subsections below (Sections 3.1.2.1-3.1.2.3). Figure 1 outlines the steps taken to define which statistical test (ANOVA or Kruskal-Wallis) should be used. The method used to determine the appropriate statistical test is based on the Unified Guidance recommendations. Tests of normality and equal variances use a 0.01 level of significance, rather than a 0.05 level of significance, because the ANOVA is reasonably robust to small departures of normality and equal variances (EPA, 2009).

No statistical test is performed when there are no detected concentration measurements in any of the upgradient wells.

If there are at least 85% detected concentrations in every upgradient well, then the ANOVA may be considered. For any non-detected concentration, half of the sample detection limit is used as a proxy concentration (see Section 2.2 for more details). The assumptions of normality and equal variances are checked. To test the normality assumption, residuals are tested using two distributional tests, the Shapiro-Wilk test and Filliben's probability plot correlation coefficient (PPCC) test. The Levene's test is used to check for equal variances. Only when evidence exists that both assumptions are valid is the ANOVA using the raw concentration measurements used. If either assumption is not met, then the assumptions of normality and equal variances are checked using the log-transformed data. Only when evidence exists that both assumptions are valid is the ANOVA using the log-transformed concentration measurements used. If either assumption is not met, then an ANOVA cannot be considered.

If there are fewer than 85% detected concentrations or if the ANOVA cannot be considered, then the Kruskal-Wallis may be considered. Non-detected data are treated differently for the Kruskal-Wallis test since the ranks of the data are used rather than the concentration measurements: all data below the maximum sample detection limit are set to the same value, lower than the maximum sample detection limit (Helsel, 2012). Since the Kruskal-Wallis tests uses ranks of the data, the actual value used for data below the maximum sample detection limit is not relevant. The assumption of equal variances is checked using

the Fligner's test. If the Fligner's test indicates that the assumption of equal variances is valid, then the Kruskal-Wallis test is used. Otherwise, no test can be performed because variances are heterogeneous among upgradient well concentration measurements.

### 3.2 Temporal Stationarity

Temporal stationarity is the lack of temporal variability. Temporal variability refers to the concept that concentration measurements vary over time. Temporal variability may be present across a group of wells and/or constituents. Temporal variability can also be present at an individual well or for a single constituent. By definition, temporal variability also includes autocorrelation, which is discussed separately in Section 3.3.

Any temporal pattern can invalidate or weaken the results of statistical testing (EPA, 2009). Plotting concentrations over time for a given constituent and for a given well is one way to identify possible trends. The Mann-Kendall trend test is another way to identify possible temporal variation for a given constituent and well. The Mann-Kendall is a nonparametric method to test for an increasing or decreasing linear trend over time. The Mann-Kendall doesn't require any special treatment for non-detects, other than all non-detects should be set to a common value lower than any of the detected concentrations (EPA, 2009 p.8-32). The Mann-Kendall is performed for any set of data with at least one detected concentration.

Before establishing baseline or background values for the detection monitoring or assessment monitoring programs, two steps are taken to check for temporal stationarity for each constituent and groundwater monitoring well:

1. A time plot is created, and
2. The Mann-Kendall trend test is used.

The time plots are generated and the Mann-Kendall trend test is performed using the statistical software R (The R Foundation, 2017) and the EnvStats package (Package 'EnvStats', 2017) or similar software.

Statistically significant increasing or decreasing temporal trends are not expected for any upgradient well since, by definition, an upgradient well should not be impacted by a release at the CCR unit. If, however, there is evidence of a temporal trend, then professional judgment should be used to determine whether constituent concentrations from that upgradient well appropriately represent baseline or background conditions and whether the trend will prevent the detection or assessment monitoring from identifying a

potential release at a CCR unit. If the trend were to indicate that an upgradient well does not appropriately represent baseline or background conditions or if the trend were to hinder the detection or assessment monitoring, then the data set should be adjusted accordingly.

To identify a statistically significant temporal trend, a Type I experiment wise error rate ($\alpha$) is set to $\alpha = 0.05$. That means, a single test error rate is defined for each well across the detected Appendix III or Appendix IV constituents. Each well's single test error rate is based on the number of detected constituents, $d$, for a given constituent list. For example, a well with five detected Appendix IV constituents ($d = 5$) has a single test error rate equal to $1 - (1 - \alpha)^{1/d^*} = 1 - (1 - 0.05)^{1/5} = 0.0102$. A statistically significant linear trend is identified when the p-value for the Mann-Kendall test is less than the single test error rate.

### 3.3 Lack of Autocorrelation

Autocorrelation is the statistical dependence between pairs of constituent concentrations across a sequence of time. That is, pairs of consecutive concentrations will exhibit stronger similarity in concentration measurements than expected from pairs collected at random times (p.6-25, EPA, 2009). To identify autocorrelation, the Unified Guidance recommends using the rank von Neumann ratio test for its ease of use and robustness when applied to either normal or non-normal distributions (p.14-17 EPA, 2009). Since this test has not been designed to handle tied values such as non-detect concentrations, this test is only performed for those wells and constituents with at least 50% detected concentrations.

The rank von Neumann ratio test statistic and associated p-value are computed using the statistical software R (The R Foundation, 2017) and the EnvStats package (Package 'EnvStats', 2017) or similar software.

Before baseline or background values are established for the detection monitoring or assessment monitoring programs, the rank von Neumann ratio test is used. Statistically significant autocorrelation is not expected for any well since, by definition, constituent concentration measurements from a well should be collected with far enough time between sampling events that a more recent sample does not include the same volume of groundwater as any previous sample. If, however, there is evidence of autocorrelation, then professional judgment should be used to determine whether constituent concentrations from a well appropriately represent baseline or background conditions and whether the trend will prevent the detection or assessment monitoring from identifying a potential release at a CCR unit. If the trend were to indicate that a well does not appropriately represent baseline or background conditions or if the trend were to hinder the detection

or assessment monitoring, then the data set should be adjusted accordingly.

To identify a statistically significant autocorrelation, a Type I experiment wise error rate, $\alpha$, of 0.05 is used for each well across the detected Appendix III or Appendix IV constituents. Each well's single test error rate is based on the number of constituents detected at least 50% of the time, $d^*$, for a given constituent list. For example, a well with five detected Appendix IV constituents ($d^* = 5$), has a single test error rate equal to $1 - (1 - \alpha)^{1/d^*} = 1 - (1 - 0.05)^{1/5} = 0.0102$. A statistically significant autocorrelation is identified when the p-value for the rank von Neumann test is less than the single test error rate.

### 3.4 Lack of Statistical Outliers

Based on the Unified Guidance, outliers are "extreme, unusual-looking measurements". An outlier may be an invalid concentration measurement due to a typographical error, an equipment error, a sampling error, etc. Or an outlier may be a valid concentration measurement that reflects a "...temporary, local 'hot spot' of higher concentration" (EPA, 2009). Furthermore, outliers are "measurements (larger or smaller than other data values) that are not representative of the sample population from which they were drawn" (EPA, 2002).

The Unified Guidance recommends testing for outliers to attempt to determine whether a suspect outlier may have been drawn from the same sample population as the rest of the data. "The basic problem with including statistical outliers in analyzing groundwater data is that they do not come from the same distribution as the other measurements in the sample and so fail the identically distributed presumption of most tests" (EPA, 2009).

The consequences of keeping statistical outliers when developing a baseline or background value may lead to an unreasonably high value that will be unable to identify potential releases at a CCR unit. Professional judgment should be used to determine whether to retain or remove any outlier. The Unified Guidance states that outliers generally should not be removed unless some basis for a likely error or discrepancy can be identified. Possible errors or discrepancies include "...values significantly outside the historical ranges of background data" (EPA, 2009). "The decision to discard an outlier should be based on some scientific or quality assurance basis" (EPA, 2000). "A data point should not be eliminated from the background data set simply because it is the highest value that was observed" (EPA, 2002). EPA recommends "…that all data not known to be in error should be considered valid" (EPA, 1989). Furthermore, "[t]he general rule is that a measurement should never be deleted from a data set solely on the basis of an outlier test" (SWDIV,

1999).

Before baseline or background values are established for the detection monitoring or assessment monitoring programs, two steps are taken to check for suspect outliers for each constituent with at least 50% detected concentrations and at each well or set of upgradient wells:

1. A box plot is created to identify suspect outliers, and
2. The Dixon's test or Rosner's test is used.

Possible, or suspect, outliers are identified using a box plot. The statistical outlier tests, the Dixon's test and Rosner's test, are tests to check whether any suspect outlier is a statistical outlier. The box plots are generated and the Dixon's or Rosner's test is performed using the statistical software R (The R Foundation, 2017) or similar software.

### 3.4.1 Box Plots

Creating a box plot is a visual technique used to identify suspect outliers. Box plots can also demonstrate the pattern and distribution of constituent concentrations for a data set. The size of the vertical box in a box plot indicates where the middle half of the data fall (i.e., the interquartile range, IQR). Concentration measurements that plot further away from the others indicate suspect outliers; for a box plot, these measurements are called mild or extreme outliers (EPA, 2009).

Box plots are constructed to identify two types of suspect outliers: mild and extreme outliers. Suspect outliers are defined in terms of the IQR, represented by the range of the middle half of the data and indicated by the vertical 'box' in a box plot. The IQR is the difference between the upper quartile and the lower quartile of the data. Mild and extreme outliers are identified for small or large sample detected concentration measurements. A high, mild outlier is any detected concentration that exceeds 1.5 times the IQR, but no more than 3 times the IQR, from the upper quartile. A small, mild outlier is any detected concentration that is below 1.5 times the IQR, but no less than 3 times the IQR, from the lower quartile. A high, extreme outlier is any detected concentration greater than 3 times the IQR from the upper quartile. A low, extreme outlier is any detected concentration less than 3 times the IQR from the lower quartile. EPA, 2009 and EPA, 2017 state that mild and extreme outliers should be considered suspect outliers. Computational details for box plots are found in EPA guidance documents (EPA, 2000; EPA, 2009).

### 3.4.2 Statistical Outlier Tests

A statistical outlier test, either the Dixon's test or Rosner's test, is performed for each data set having at least one suspect outlier in order to determine if the suspect outlier is also a statistical outlier. For a data set with no more than 25 samples, the Dixon's test is used. For a data set with at least 20 samples, the Rosner's test is used. Dixon's test can only test if one detected concentration (i.e., the minimum or the maximum) is a statistical outlier. The Rosner's test can test if one or more detected concentrations are statistical outliers (EPA, 2000; EPA, 2002; EPA, 2009). Computational details for these outlier tests are outlined in EPA documents (EPA, 2000; EPA, 2009). Based on results from the statistical outlier tests, mild and extreme outliers are classified as statistical outliers.

Both statistical outlier tests assume that the data set with the suspect outlier(s) removed is normally distributed (or lognormally distributed if the data are transformed to the natural-log scale). Section 4.1.2 below discusses how to test distributional assumptions of normality or lognormality.

Any extreme, suspect outlier that is also identified as a statistical outlier is evaluated for possible errors or data discrepancies before a baseline or background value is established. Suspect outliers, including those also classified as statistical outliers, should be reviewed for having possible analytical or other quality errors. Professional judgment should be used to determine whether constituent concentrations defined as suspect or statistical outliers should be removed so that baseline or background conditions are properly represented so that detection or assessment monitoring can identify a potential release at a CCR unit. If an outlier does not represent baseline or background conditions or if the outlier hinders the detection or assessment monitoring, then the data set should be adjusted accordingly.

## 4.0 STATISTICAL APPROACH FOR DETECTION AND ASSESSMENT MONITORING

Section 257.93 of the CCR rule provides several options for statistically evaluating the groundwater data and the performance standards to follow at CCR facilities. At each CCR unit, upper prediction limits (UPLs) are calculated for each detected constituent to establish baseline or background values. To achieve UPLs with sufficient statistical power, the UPLs are designed to include retesting procedures based on the 1-of-2 approach (one assigned sample and one resample—see Section 4.1.3). Using UPLs is one of the preferred methods for comparing groundwater based on the Unified Guidance (EPA, 2009).

UPLs are computed using baseline or background data. The source of the baseline or background data may differ, depending whether interwell or intrawell comparisons are appropriate. "With interwell tests, background is derived from distinct, initially upgradient background wells" (EPA, 2009). "Future data from each of these compliance wells are then tested against this common background. On the other hand, intrawell background [also called baseline] is derived from and represents historical groundwater conditions in each individual compliance well." (EPA, 2009)

There are several considerations to make when determining whether interwell or intrawell comparisons should be performed. To consider interwell comparisons for a CCR unit, the groundwater monitoring data should meet the statistical assumptions of spatial stationarity, temporal stationarity, lack of autocorrelation, and lack of statistical outliers (see Section 3). Furthermore, the CCR unit should

- have at least one upgradient well,
- have a clearly defined groundwater flow direction without any radial flow, and
- not contain highly variable mine spoil.

If any of these conditions cannot be met or if the statistical assumptions cannot be met, then intrawell comparisons should be considered for a CCR unit. Both Gibbons and EPA's Unified guidance recommend using intrawell analyses when spatial variability exists. Both Gibbons and the Unified Guidance caution that intrawell analyses are appropriate in the absence of contamination. Since a CCR unit may be an existing landfill or impoundment that is now under the CCR rule, there is a possibility that contamination may be present. Professional judgment should be used for such CCR units to determine if contamination is likely present, and to determine which type of comparison is more appropriate.

## 4.1 Calculating UPLs

UPLs are estimated with constituent concentrations that are independent and identically distributed, as described in Section 3. The set of data used to calculate UPLs are based on constituent concentrations from the eight background sampling events and from either:

- upgradient wells for the CCR unit (for interwell comparisons), or
- individual compliance well (for intrawell comparisons).

UPLs must be calculated using a single-test error rate that accounts for the site-wide false positive rate (SWFPR) associated with all of the detection or assessment monitoring comparisons. The SWFPR is set based on the Unified Guidance recommendations and is discussed in more detail in Section 4.1.1.

After assumptions have been checked and outliers have been identified for the appropriate set of data, the data distribution is defined in accordance with EPA guidance (EPA, 2000; EPA, 2002; EPA, 2009; EPA, 2017; SWDIV, 1998). UPLs are then calculated based on the defined data distribution. Distributions are defined using the methodology outlined in Section 4.1.2, and the UPLs are calculated using the methodology described in Section 4.1.3.

The statistical software R (The R Foundation, 2017) or similar software is used to perform all statistical distribution tests and to calculate UPLs.

### 4.1.1 Defining Single-test error rate

Based on 40 CFR 257.93 (g)(2) and the Unified Guidance, the cumulative SWFPR or Type I experiment wise error rate for yearly monitoring shall be no more than 0.10. That means, a single test error rate must be considerably lower than 0.10. The single test error rate depends on the number of detected constituents and number of compliance wells evaluated in a CCR unit's monitoring program, defined as:
$1-(1-\alpha)^{1/cw}$, where:

- $\alpha$=0.10, the SWFPR;
- $c$=the number detected constituents for the monitoring program (the Appendix III constituents for detection monitoring or Appendix IV constituents for assessment monitoring); and
- w=the number of compliance wells at the CCR unit.

Sampling frequency is not included in this single-test error rate because UPL calculations are designed to account for the number of sampling events per year.

### 4.1.2 Defining a Distribution for Background

The type of UPL calculated is based on a data set's defined distribution. Figure 2 outlines the steps to take to define whether a data set follows a normal, gamma, lognormal, or nonparametric distribution. If there are no detections for a data set, no distribution is defined. For a constituent with fewer than 50% detected concentrations, the distribution is defined as nonparametric (EPA, 2000; EPA, 2009).

For each data set with at least 50% detected concentrations and at least 4 samples, the data's distribution is tested using up to three distributional tests, which include the Shapiro-Wilk test, Kolmogorov-Smirnov test, and PPCC test. A test for the gamma distribution is included because EPA, 2017 generally recommends using summary statistics from a gamma distribution before using statistics from a lognormal distribution when both the gamma and lognormal distributional assumptions are valid. All of these distributional tests are recommended by EPA (EPA, 2000; EPA, 2002; EPA, 2009; EPA, 2017). Each distributional test is performed with only the detected data, which reflects how ProUCL performs distributional tests (EPA, 2017).

The method used to define a distribution, using the largest p-value from all of the appropriate tests and comparing it to a 0.05 level of significance, is designed to follow ProUCL's distributional recommendations. It should be noted that for a data set with fewer than five detected samples, the Kolmogorov-Smirnov test and the PPCC test cannot be performed. And, the Kolmogorov-Smirnov test is not used to test for gamma distributions.

If results from any of these three tests indicate the data are normally distributed (when the largest p-value is greater than 0.05), the distribution is defined as normal. If none of the test results indicate normality, the detected data set is tested for the gamma distribution by running the Shapiro-Wilk and PPCC tests. If either test indicates the data set follow a gamma distribution (when the larger p-value is greater than 0.05), the

distribution is defined as a gamma distribution. If none of the test results indicate a gamma distribution, the data set is tested for lognormality by running the Shapiro-Wilk, Kolmogorov-Smirnov, and PPCC tests with the log-transformed detected data. If results from any of these tests indicate the data set is lognormally distributed (when the largest p-value is greater than 0.05), the distribution is defined as lognormal. If none of the distributional test results indicate normality, a gamma distribution, or lognormality, the data's distribution is defined as nonparametric.

### 4.1.3 Calculating UPLs

UPLs are calculated using a 1-of-2 retesting strategy to ensure comparisons are statistically powerful and to minimize the SWFPR. A 1-of-2 retesting strategy means that if one or more constituent concentrations in a compliance well are above their respective background concentration, a resample is collected to validate or invalidate the background concentration exceedance. According to the Unified Guidance, "A *1-of-m* retesting plan implies that up to *m* groundwater measurements may have to be collected at each compliance well, including the initial observation and *(m-1)* possible resamples. For the test to be valid, all of these sample measurements need to be statistically independent" (EPA, 2009). An independent resample may be collected between sampling events if necessary.

The Unified Guidance defines when a well is in-compliance and out-of-compliance: "If the initial groundwater observation is in-bounds [in compliance with the designed standard], the test is complete and no resamples need to be collected. Only when the first concentration exceeds the UPL, does additional sampling come into play" (EPA, 2009). If all *m* samples (the initial sample plus *m-1* resamples) exceed, then the well is considered out-of-compliance. If none of the *(m-1)* resamples exceed after the initial sample exceeded, then the well can still be considered to be in-compliance (EPA, 2009).

The type of UPL computed (e.g., parametric or nonparametric) is based on the detection frequency and the defined data distribution for each data set, as described in Section 4.1.2. For a constituent with no detected concentration measurements in the baseline or background data, the UPL is set to the reporting limit (EPA, 2009). For a constituent with at least 50% detections, the UPL calculation adjusts for non-detected concentration(s) as described in Section 2.2, and the appropriate UPL calculation is used based on results from the distributional tests. If no parametric distribution (normal, lognormal, or gamma) can be defined for a data set, then a nonparametric UPL is estimated. Since J-flagged data are defined as detected, a calculated UPL may be less than the reporting limit; in such cases, the UPL is set to the reporting limit.

## 4.2 Establishing Background Values

Background values used for detection monitoring or assessment monitoring are based on UPLs. For detection monitoring (Appendix III constituents), background values are defined as the higher of the UPL and reporting limit. For assessment monitoring (Appendix IV constituents) background values are defined as the highest of the maximum concentration level (MCL), UPL, reporting limit, or other accepted screening level for constituents without MCLs. The reporting limit is included so that a constituent having an UPL below the reporting limit does not have an unfair limitation because most or all of the baseline or background constituent concentrations are below the reporting limit. For each CCR unit, tables of statistically-derived background values will be prepared for each Appendix III and Appendix IV constituent. For interwell comparisons, background values will be developed using upgradient well data. For intrawell comparisons, background values will be developed for each monitoring well using historical data from the well.

## 4.3 Updating Background Values

As detection or assessment monitoring continues, it is recommended to update baseline or background data sets periodically with valid monitoring concentrations that are representative of groundwater unimpacted by leakage from the CCR unit. The Unified Guidance recommends reviewing and possibly updating background values when enough new concentrations have been collected to perform statistical comparisons. That means, background values should be reviewed about every two or three years during. Failure to update background will exclude factors such as natural temporal variation, changes in field or laboratory methodologies, and changes in the water table due to meteorological conditions or other influences.

## 5.0 DETECTION MONITORING DATA EVALUATION

Detection monitoring will be performed at each CCR unit's groundwater monitoring system on a semi-annual basis during the active life of the CCR unit and during the post-closure period. Each CCR monitoring well will be sampled for the following Appendix III constituents as part of the detection monitoring program:

- Boron
- Calcium
- Chloride
- Fluoride
- field-measured pH
- Sulfate
- Total Dissolved Solids (TDS)

After every detection monitoring event, the constituent concentrations from each well will be compared to the background values, as described in Section 3 of this plan, to ascertain if a statistically significant increase above background exists. Possible outcomes from comparing the detection monitoring constituent concentrations in each well to their respective background values are as follows:

- All detection monitoring constituent concentrations in a compliance well are less than or equal to their respective background values; or

- One or more detection monitoring constituent concentrations in a compliance well are above their respective background values.

### 5.1 No Statistically Significant Increase over Background Values

Baseline and background UPLs are based on a 1-of-2 resampling approach, meaning that if zero or one concentration measurements from a series of two independent samples collected from a well do not exceed the appropriate UPL, then a statistically significant increase over baseline or background has not occurred at a CCR unit. This conclusion will be reached if the data indicate either of the following:

- All detection monitoring constituent concentrations in a compliance well are less than or equal to their respective background values; or

- At least one detection monitoring constituent concentration in a well is above the respective background value. If this occurs, the well or wells with constituent concentration(s) above the background value(s) will be resampled and analyzed for the detection monitoring constituent(s) with exceedances. If the resample indicates that the target detection monitoring constituent concentration(s) in the well or wells is less than or equal to their respective background value(s),

then it can be concluded that a statistically significant increase over background for all detection monitoring constituents has not occurred, since concentrations in one sample of the two independent samples do not exceed the appropriate baseline or background value(s).

If the groundwater monitoring data indicates that a statistically significant increase over background has not occurred at the CCR wells, then detection monitoring at all CCR wells will continue on a semi-annual basis.

## 5.2 Statistically Significant Increase over Background Values

If one or more detection monitoring constituent concentrations in any well is above the respective background value in both the original detection monitoring sample and the resample, then a statistically significant increase over background for the target detection monitoring constituents can be concluded. If a statistically significant increase is indicated, within 90 days Luminant will:

- Establish an assessment monitoring program as described in this plan, or
- Demonstrate that a source other than the CCR unit caused the statistically significant increase over the baseline or background value for a constituent, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with the detection monitoring program.

## 6.0 ASSESSMENT MONITORING DATA EVALUATION

Assessment monitoring will be performed at a CCR unit's groundwater monitoring system after a statistically significant increase over background values has been confirmed in that well for one or more of the detection monitoring constituents. Within 90 days of triggering the assessment monitoring program, and annually thereafter, each CCR monitoring well requiring assessment monitoring will be sampled for the following Appendix IV parameters as part of the assessment monitoring program:

- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Fluoride
- Lead
- Lithium
- Mercury
- Molybdenum
- Selenium
- Thallium
- Radium 226 and 228 combined

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, all wells in a CCR unit's groundwater monitoring system will be resampled and analyzed for:

- All Appendix III detection monitoring parameters; and
- The Appendix IV assessment monitoring parameters that were detected as part of the assessment monitoring event.

This monitoring will be performed on at least an annual basis thereafter, unless Luminant can demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for these constituents during the active life and the post-closure care period based on the availability of groundwater.

Within 90 days of obtaining the results from the initial assessment monitoring sampling event, a GWPS will be established for each of the Appendix IV assessment monitoring constituents that were detected in the groundwater monitoring system wells as follows:

- For constituents for which an MCL has been established, the highest of the MCL, UPL, and reporting limit for that constituent; or

- For constituents for which an MCL has not been established, the higher of the UPL, reporting limit, or levels that are equivalent to specified regional screening level (RSL) for that constituent (note: future revisions to the Rule may allow additional flexibility in establishing GWPS for states with EPA-approved CCR permit programs for Appendix IV constituents that do not have a MCL).

Each assessment monitoring constituent will be evaluated to ascertain if a statistically significant increase above the GWPS exists. Possible outcomes are as follows:

- All averages from assessment monitoring constituent concentrations at a well are not statistically greater than to their respective GWPS; or
- One or more averages from assessment monitoring constituent concentrations at a well are statistically greater than their respective GWPS.

## 6.1 Calculating LCLs

For each assessment monitoring constituent, the 95% lower confidence limit of the mean (LCL) is estimated. The set of data used to calculate LCLs are based on the constituent concentrations from the current year's sampling events and enough previous sampling events to reasonably estimate each LCL (the goal should be to have around eight to ten samples).

LCLs are calculated based on the defined data distribution. The data distribution is defined in accordance with EPA guidance (EPA, 2000; EPA, 2002; EPA, 2009; EPA, 2017; SWDIV, 1998). Distributions are defined using the methodology outlined in Section 6.1.1. The LCLs are calculated using the methodology described in Section 6.1.2.

The statistical software R (The R Foundation, 2017) or similar software is used to perform all statistical distribution tests and to calculate LCLs.

### 6.1.1 Defining a Distribution for LCLs

The type of LCL calculated is based on a data set's defined distribution. The same methodology for defining a distribution for background, described in Section 4.1.2 and outlined in Figure 2, is used to define the distribution for each assessment monitoring constituent data set as normal, gamma, lognormal, or nonparametric.

### 6.1.2 Calculating LCLs

The type of LCL computed (e.g., parametric or nonparametric) is based on the detection frequency and the defined data distribution for each data set, as described in Section 6.1.1. For a constituent with no detected concentration measurements, the LCL is set to the reporting limit (EPA, 2009). For a constituent with at least 50% detections, the LCL calculation adjusts for non-detected concentration(s) as described in Section 2.2, and the appropriate LCL calculation is used based on results from the distributional tests. If no parametric distribution (normal, lognormal, or gamma) can be defined for a data set or there are fewer than 50% detections, then a nonparametric, approximate 95% lower confidence limit of the median is estimated.

## 6.2 No Statistically Significant Increase Over GWPS

A statistically significant increase over the groundwater protection standard has not occurred at a CCR unit when the LCL for every assessment monitoring constituent at a well is less than or equal to the appropriate GWPS.

Assessment monitoring will continue on an annual basis. If for two consecutive assessment monitoring sampling events, the constituent concentrations for all Appendix III constituents are at or below background values and all Appendix IV constituents are shown to be statistically at or below their appropriate GWPS, then assessment monitoring will be terminated and detection monitoring as described in this plan will resume. If the constituent concentrations of any Appendix III constituents are shown to be statistically above background values, but all Appendix IV constituents have no statistically significant increase over their respective GWPS, then assessment monitoring will continue.

## 6.3 Statistically Significant Increase Over GWPS

A statistically significant increase over the groundwater protection standard has occurred at a CCR unit when the LCL for at least one assessment monitoring constituent at a well is greater than the appropriate GWPS. If a statistically significant increase over groundwater protection standards for any Appendix IV assessment monitoring constituent is confirmed, within 90 days of the initial assessment monitoring event, Luminant will either:

- Initiate an assessment of corrective measures for the CCR unit in accordance with CCR Rule Section 257.96; or
- Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically

significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. If a successful demonstration is made, the owner or operator must continue assessment monitoring. If a successful demonstration has not been made at the end of the 90 day period, the owner or operator of the CCR unit must initiate an assessment of corrective measures for the CCR unit.

If one or more Appendix IV assessment monitoring constituent concentrations are statistically above the respective groundwater protection standards, and if a source other than the CCR unit cannot be demonstrated to have caused the contamination, a release from the CCR unit is likely and the nature and extent of the release will be further characterized as follows:

- Install additional monitoring wells necessary to define the contaminant plume(s);
- Collect data on the nature and estimated quantity of material released including specific information on the Appendix IV assessment monitoring constituents and the levels at which they are present in the material released;
- Install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well for all Appendix III detection monitoring parameters and for those Appendix IV assessment monitoring constituents that have been detected as part of assessment monitoring. This monitoring must be performed on at least an annual basis thereafter.
- Sample all CCR unit wells for all Appendix III detection monitoring parameters and for those Appendix IV assessment monitoring constituents that have been detected as part of assessment monitoring. This monitoring must be performed on at least an annual basis thereafter.

## 7.0 REPORTING REQUIREMENTS

The results of the CCR groundwater monitoring program performed at each CCR unit will be reported yearly in an Annual Groundwater Monitoring and Corrective Action Report. A separate annual report for each CCR unit will document the status of the groundwater monitoring and corrective action program, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. At a minimum, the Annual Groundwater Monitoring and Corrective Action Report will contain the following information:

- A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

- In addition to all the monitoring data obtained under CCR Rule Sections 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs, as well as the basis for the background values and the statistical methods employed to establish the background values;

- A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

- Other information required to be included in the annual report as specified in CCR Rule Sections 257.90 through 257.98.

The Groundwater Monitoring and Corrective Action Report for the 2017 monitoring program must be placed in each facility operating record no later than January 31, 2018. Subsequent reports must be placed in the facility operating records no later than January 31 of the year following completion of the groundwater monitoring program from the preceding calendar year. The reports must also be posted to the owner or operator's CCR Rule Compliance Data and Information internet site within 30 days of placing the reports in the operating record.

## 8.0 REFERENCES


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# FIGURES

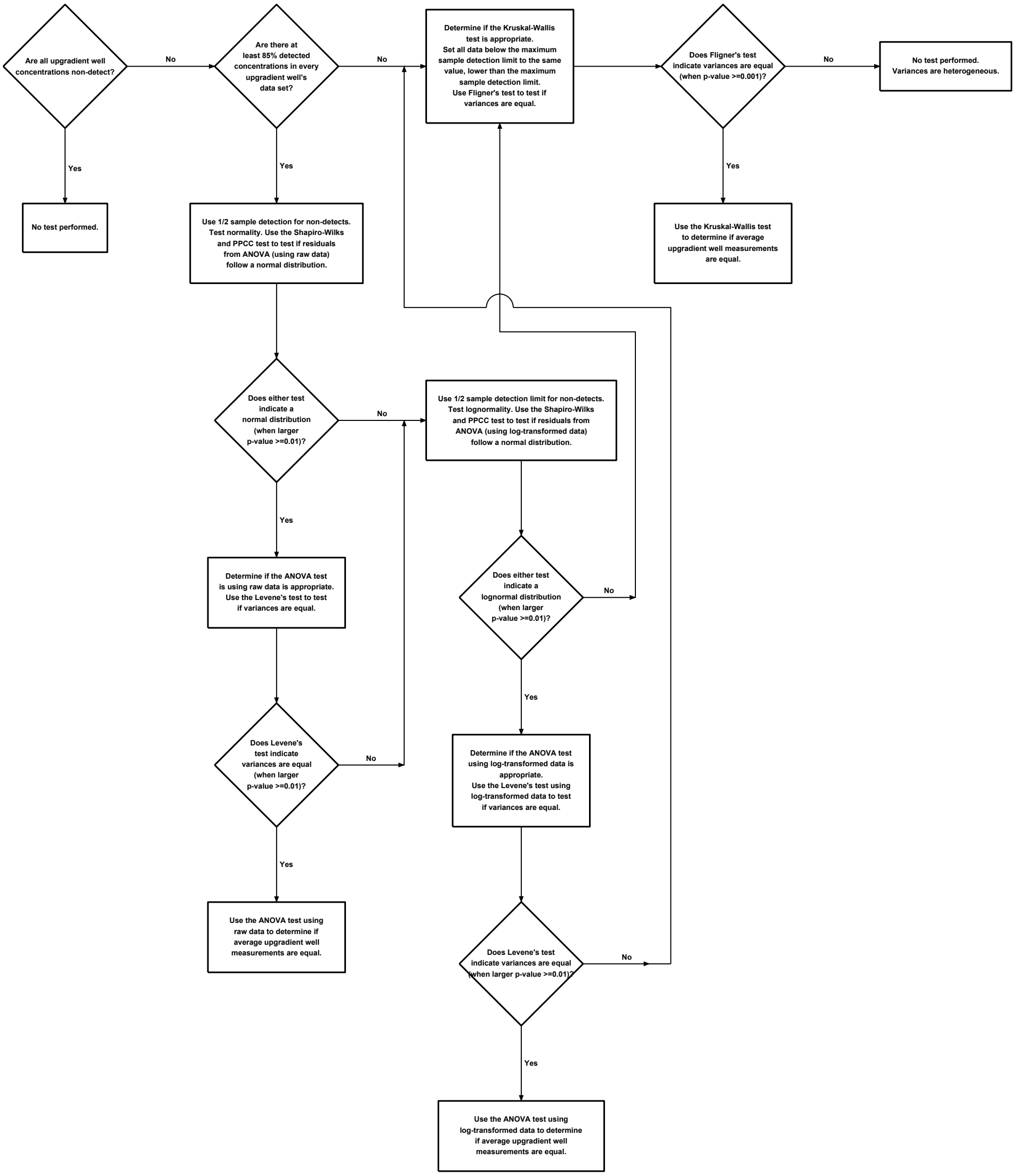
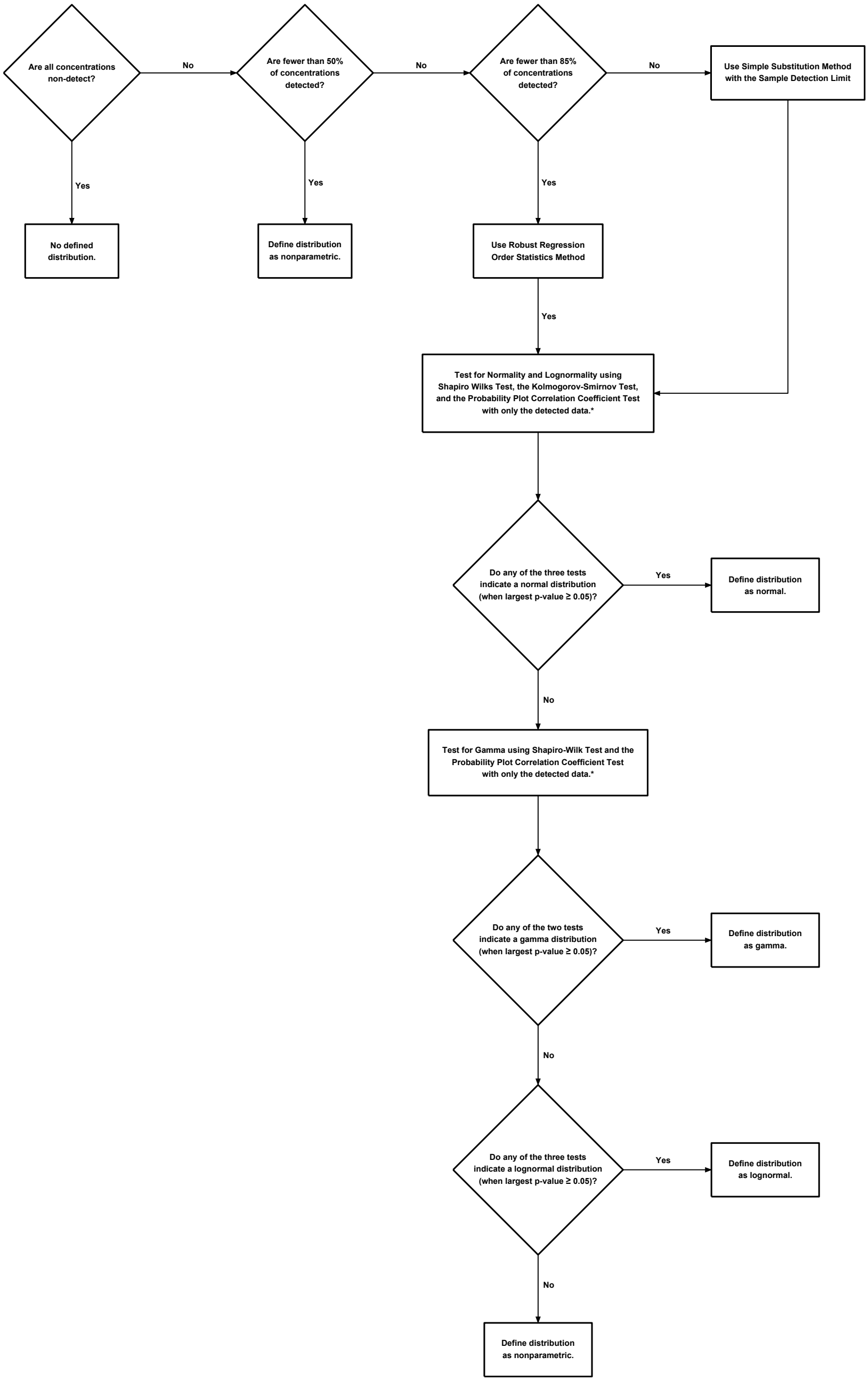



Figure 1

**PROCESS FOR SELECTING ANOVA OR KRUSKAL-WALLIS TEST TO COMPARE UPGRADIENT WELL AVERAGES**

| | | |
|---|---|---|
| PROJECT: 5164E | BY: AJD | REVISIONS |
| DATE: JAN 2019 | CHECKED: PJB | |

**GOLDER ASSOCIATES USA, INC.**




Note:
* - Distributional tests can not be performed for the following cases:
1. For a data group with fewer than five detected samples, the Kolmogorov-Smirnov Test and the Probability Plot Correlation Coefficient Test can not be performed using only the detected concentrations.
2. For a data group with fewer than four detected samples, the Shapiro-Wilks Test can not be performed using only the detected concentrations.

Figure 2

**PROCESS FOR DEFINING A DISTRIBUTION FOR A DATA SET**

| | | |
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| PROJECT: 5164E | BY: AJD | REVISIONS |
| DATE: JAN 2019 | CHECKED: PJB | |

**GOLDER ASSOCIATES USA, INC.**

**COAL COMBUSTION RESIDUAL RULE**
**2017 ANNUAL GROUNDWATER MONITORING REPORT**

**OAK GROVE STEAM ELECTRIC STATION**
**ASH LANDFILL 1**
**ROBERTSON COUNTY, TEXAS**

**JANUARY 31, 2018**

***Prepared For:***

Luminant Generation Company LLC
6555 Sierra Drive
Irving, TX 75039

***Prepared By:***

Pastor, Behling & Wheeler, LLC
2201 Double Creek Drive, Suite 4004
Round Rock, Texas 78664
Texas Engineering Firm No. 4760

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# 1.0 INTRODUCTION

Oak Grove Management Company LLC (Luminant) operates the Oak Grove Steam Electric Station (OGSES) located approximately 10 miles north of Franklin, Robertson County, Texas (Figure 1). The OGSES consists of two 800-megawatt power generation units which burn lignite and coal. Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operations. Currently, CCRs generated at the OGSES are managed by Luminant in surface impoundments located on the OGSES property or the Ash Landfill 1. Two CCR units have been identified within the OGSES operations, the FGD Pond Area and the Ash Landfill 1. This report discusses the Ash Landfill 1 (the Site), which is located approximately 3,500 feet southwest of the OGSES power plant.

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the EPA to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. The final CCR Rule was published in the Federal Register on April 17, 2015. The effective date of the CCR Rule was October 19, 2015. The Ash Landfill 1 meets the definition of a CCR landfill and is subject to groundwater monitoring system requirements of the CCR Rule.

## 1.1 CCR Unit Groundwater Monitoring Applicability

Section 257.90 of the CCR Rule requires that existing CCR landfills and surface impoundments be in compliance with the following groundwater monitoring requirements no later than October 17, 2017:

- Install a groundwater monitoring system as required under Section 257.91;
- Develop a groundwater sampling and analysis program to include selection of the statistical procedures to be used for evaluating groundwater monitoring data as required under Section 257.93;
- Initiate a detection monitoring program to include obtaining a minimum of eight independent samples for each background and downgradient monitoring well as required under Section 257.94; and
- Begin evaluating the groundwater monitoring data for statistically significant increases over background levels for the constituents listed in Appendix III of this part as required under Section 257.94.

Pastor, Behling & Wheeler, LLC (PBW) was retained by Luminant to evaluate the CCR groundwater monitoring system and develop and implement a CCR groundwater sampling and analysis program at the Site. To document these activities, PBW prepared the following reports, which were placed in the facility's operating record to comply with Section 257.105(h) of the CCR Rule:

- CCR Groundwater Monitoring System Certification (PBW, 2017a);
- CCR Monitoring Well Design, Installation, Development, and Decommissioning Report (PBW, 2017b); and
- CCR Statistical Analysis Plan (PBW, 2017c).

For existing CCR landfills and surface impoundments, the owner or operator must prepare an annual groundwater monitoring and corrective action report to document the status of the groundwater monitoring and corrective action program for the CCR unit for the previous calendar year. The CCR Rule requires that the owner or operator of a CCR unit prepare the initial annual groundwater monitoring and corrective action report for the unit no later than January 31, 2018, and annually thereafter. Per Section 257.90(e) of the CCR Rule, the report should contain the following information, to the extent available:

(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

(4) A narrative discussion of any transition between monitoring programs (*e.g.,* the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

## 1.2 Groundwater Sampling and Analysis Requirements

### 1.2.1 Background Monitoring Requirements

The CCR Rule requires that background groundwater quality be established in hydraulically upgradient or background well(s) for each of the groundwater constituents required in the detection monitoring or assessment monitoring program that applies to the CCR unit. Background groundwater quality may be established at wells that are not located hydraulically upgradient from the CCR unit if the samples accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit. Section 257.94(b) of the CCR Rule requires that a minimum of eight independent samples from each background and downgradient well associated with a CCR unit be collected and analyzed for the constituents listed in Appendix III and Appendix IV to Part 257 CCR Rule no later than October 17, 2017.

PBW was retained by Luminant to collect and analyze the required background well samples at the Site. Eight background groundwater monitoring events were performed using the Ash Landfill 1 CCR monitoring well system from October 2015 to December 2016. The background groundwater monitoring program is described in detail in Section 2 of this report.

### 1.2.2 Detection Monitoring Requirements

Groundwater detection monitoring must be performed at each CCR unit (CCR Rule Section 257.94). The following constituents must be included in the detection monitoring program (from Appendix III of the CCR Rule):

- Boron
- Calcium
- Chloride
- Fluoride
- pH
- Sulfate
- Total Dissolved Solids (TDS)

The monitoring frequency for these constituents must be at least semi-annual during the active life of the CCR unit and post-closure period. The reported concentrations of the detection monitoring constituents must be compared to the respective CCR unit background concentration developed for each constituent. If a statistically significant increase over background is determined for one or more of the constituents

listed above at any monitoring well at the CCR unit waste boundary, within 90 days the owner or operator must:

- Establish an assessment monitoring program as described in Section 257.95 of the Rule; or
- Demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with the detection monitoring program. If at the end of the 90-day period in 257.94(e)(2), the owner or operator is unable to successfully make an alternate source demonstration, the assessment monitoring program is triggered and the owner or operator has 90 days to complete the sampling required under 257.95(d).

Detection monitoring performed at the Site is discussed in Section 4.0 of this report.

### 1.2.3 Assessment Monitoring Requirements

Assessment monitoring is required under the CCR Rule whenever a statistically significant increase over background levels has been detected for one or more of the detection monitoring constituents listed above (CCR Rule Section 257.95). The following constituents must be included in the assessment monitoring program (from Appendix IV of the CCR Rule):

- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Fluoride
- Lead
- Lithium
- Mercury
- Molybdenum
- Selenium
- Thallium
- Radium 226 and 228 combined

Assessment monitoring performed at the Site is discussed in Section 5.0 of this report.

## 2.0 GROUNDWATER MONITORING SYSTEM

### 2.1 Description of Ash Landfill 1

Ash Landfill 1 is located approximately 3,500 feet southwest of the OGSES power plant (Figure 2). CCRs generated at the OGSES, including fly ash and bottom ash, are transported and managed/disposed of by Luminant in the Ash Landfill 1. Cell 1 of the Ash Landfill 1 was constructed in 2009 and the landfill was expanded in 2011. The existing liner system for the Ash Landfill 1 includes a 60-mil high density polyethylene (HDPE) geomembrane and a 3-foot thick compacted clay liner (Golder, 2015).

### 2.2 Local Geology and Hydrogeology

Ash Landfill 1 is located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1970). Based on soil borings completed in the area, the geology of the Site generally consists of relatively thick, interbedded sand and clay strata. The sand units in the Ash Landfill 1 Area are typically described as poorly sorted, silty to clayey sand with occasional zones of well sorted sand (PBW, 2017a). The uppermost aquifer occurs under unconfined conditions within the shallow sand units at the Site.

### 2.3 Ash Landfill 1 Groundwater Monitoring System

The CCR groundwater monitoring well system at the Ash Landfill 1 consists of six monitoring wells (MW-02, MW-05, MW-07, MW-08R, MW-09, and AL-10) that are each screened in the uppermost aquifer at the Site. The locations of the CCR monitoring wells are shown on Figure 2. Well construction information and survey data for the CCR wells are summarized in Table 1. The installation dates for the wells range from 1986 to 2016. No wells were added to or removed from the CCR groundwater monitoring network in 2017.

### 2.4 Groundwater Potentiometric Surface

Static water levels measured during the background monitoring period and 2017 detection monitoring event indicated water elevations ranging from 406.96 feet above mean sea level (amsl) to 419.20 feet amsl, and depths to water ranging from 26.79 feet bgs to 50.38 feet bgs (Table 2).

Groundwater elevations were generally highest southwest of the Ash Landfill 1 and lowest east of the Ash Landfill 1, with an inferred groundwater flow direction to the east (Figure 3). Based on the inferred groundwater flow direction, the location of each CCR monitoring well relative to Ash Landfill 1 is as

follows:

| Upgradient Wells | Downgradient Wells |
|---|---|
| MW-02<br>AL-10 | MW-05<br>MW-07<br>MW-08R<br>MW-09 |

## 3.0 BACKGROUND GROUNDWATER MONITORING PROGRAM

Eight background groundwater monitoring events were performed using the Ash Landfill 1 CCR monitoring well system from October 2015 to April 2017. The results of the background monitoring events are described in this section.

### 3.1 Background Groundwater Monitoring Results

The Ash Landfill 1 CCR groundwater monitoring wells were sampled approximately every two months from October 2015 to December 2016 (eight sampling events) to fulfill the background monitoring period sampling requirements of the CCR Rule. Well MW-08 was damaged by a haul truck in 2016 and replaced by well MW-08R and subsequently sampled in March and April of 2017 to fulfill the background monitoring requirements. Background sample data are summarized in Table 3 (Appendix III) and Table 4 (Appendix IV). Laboratory analytical reports for the data are presented in Appendix A.

### 3.2 Background Statistical Evaluation Procedures

Statistical analysis of groundwater monitoring data is required as part of detection monitoring and assessment monitoring under Section 257.93 of the CCR Rule. Section 257.93 of the CCR Rule provides several options for statistically evaluating the groundwater data. The owner or operator of the CCR unit must select one of the following statistical methods specified in paragraphs (f)(1) through (5) of Section 257.93 to be use in evaluating groundwater monitoring data for each specified constituent:

(1) A parametric analysis of variance followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.

(2) An analysis of variance based on ranks followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.

(3) A tolerance or prediction interval procedure, in which an interval for each constituent is established from the distribution of the background data and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.

(4) A control chart approach that gives control limits for each constituent.

(5) Another statistical test method that meets the performance standards of paragraph (g) of this

section.

The following statistical evaluation approaches were selected to demonstrate groundwater compliance for the Ash Landfill 1 under the CCR Rule:

- Use of interwell data evaluations, which compare new sample data to sample data from upgradient background well(s).
- Use of prediction limits for data comparisons. This approach is a common statistical method used to evaluate groundwater compliance for Subtitle D landfill facilities and is one of the approved options for groundwater quality data statistical evaluation under the CCR Rule.

The evaluation procedures used for the Ash Landfill 1 background groundwater data conforms with the Rule requirements shown above, as well as EPA's *Unified Guidance: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities* (EPA, 2009) and the American Society for Testing and Materials (ASTM) standard D6312-17, *Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at waste Disposal Facilities* (ASTM, 2017). The statistical approach used for establishing prediction limits based on the background data are described in detail in the Statistical Analysis Plan for the Site (PBW, 2017c).

## 4.0 DETECTION GROUNDWATER MONITORING PROGRAM

In accordance with CCR Rule Section 257.94, detection monitoring groundwater samples are collected on a semi-annual basis from the Ash Landfill 1 CCR groundwater monitoring network.

### 4.1 Detection Monitoring Results

PBW collected the initial detection monitoring groundwater samples from the Ash Landfill 1 CCR monitoring wells in October 2017 and evaluation of the data commenced by October 17, 2017. The detection monitoring results are summarized in Table 5. Laboratory analytical reports for the detection monitoring samples are included in Appendix B. The evaluation of these data will be completed in 2018, and the evaluation will be summarized in the 2018 Annual Groundwater Monitoring Report.

### 4.2 CCR Detection Monitoring Activities Planned for 2018

In accordance with CCR Rule Section 257.94, detection monitoring groundwater samples will be collected on a semi-annual basis in 2018 and the analytical data from both sampling events will be included in the 2018 Annual Groundwater Monitoring Report. A statistical evaluation of the 2017 detection monitoring data and the first semi-annual 2018 detection monitoring data will be summarized in the 2018 Annual Groundwater Monitoring Report. If a statistically significant increase over background is determined for one or more of the detection monitoring constituents at any monitoring well at the CCR unit waste boundary, Luminant will comply with the applicable CCR Rule requirements in 257.94(e)(2).

## 5.0 ASSESSMENT GROUNDWATER MONITORING PROGRAM

Assessment groundwater monitoring was not performed at the Site during 2017. Assessment monitoring will be performed during 2018 if required based on the 2017/2018 detection monitoring results.

## 6.0 REFERENCES


ASTM, 2017. Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at Waste Disposal Facilities - D6312-17.

Barnes, Virgil E., 1970. Geologic Atlas of Texas, Waco Sheet. Texas Bureau of Economic Geology.

Environmental Protection Agency (EPA), 2009. Unified Guidance Document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, EPA 530-R-09-007, March 2009.

Golder Associates (Golder), 2015. Coal Combustion Residuals Regulations and Their Effect on Existing Landfills and Surface Impoundments, Oak Grove Steam Electric Station. May 26.

Pastor, Behling & Wheeler, LLC, 2017a. Coal Combustion Residual Rule Groundwater Monitoring System Certification, Oak Grove Steam Electric Station, Ash Landfill 1, Robertson County, Texas. October 16, 2017.

Pastor, Behling & Wheeler, LLC, 2017b. Coal Combustion Residual Rule Monitoring Well Design, Installation, Development, and Decommissioning Report, Oak Grove Steam Electric Station, Ash Landfill 1, Robertson County, Texas. October 13, 2017.

Pastor, Behling & Wheeler, LLC, 2017c. Coal Combustion Residual Rule Statistical Analysis Plan, Oak Grove Steam Electric Station, Ash Landfill 1, Robertson County, Texas. October 11, 2017.

# Tables

**TABLE 1**
**CCR WELL CONSTRUCTION SUMMARY**
**ASH LANDFILL 1**
**OAK GROVE STEAM ELECTRIC STATION**

| Well ID | Date Installed | Northing | Easting | Ground Elevation (ft amsl) | TOC Elevation (ft amsl) | Top of Screen (ft bgs) | Bottom of Screen (ft bgs) | Screen Length (ft) | Total Design Depth (ft bgs) | Casing Diameter (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-04 | 11/17/86 | 568593 | 3200315 | 432.94 | 436.63 | 35 | 50 | 15 | 50 | 2 |
| MW-05 | 09/05/08 | 569467 | 3201188 | 434.73 | 436.98 | 29 | 49 | 20 | 50 | 2 |
| MW-07 | 09/06/08 | 570377 | 3200695 | 436.93 | 438.84 | 29 | 49 | 20 | 50 | 2 |
| MW-08* | 08/27/08 | 570980 | 3199824 | 440.64 | 443.38 | 31 | 51 | 20 | 52 | 2 |
| MW-08R | 11/09/16 | 570970 | 3199809 | 441.22 | 443.84 | 32.5 | 52.5 | 20 | 52.5 | 2 |
| MW-09 | 12/29/11 | 570146 | 3198709 | 459.24 | 461.46 | 46 | 66 | 20 | 67 | 2 |
| AL-10 | 9/22/15 | 568673 | 3197291 | 457.54 | 460.81 | 50.3 | 60.3 | 10 | 60.3 | 2 |

Notes:

1. Abbreviations: ft - feet; amsl - above mean sea level; bgs - below ground surface.
2. Coordinates in NAD 27 Texas State Plane Central 4208.
3. * - Well MW-08 was damaged by a haul truck in 2016 and was subsequently plugged and replaced by well MW-08R.

**TABLE 2**
**GROUNDWATER ELEVATION SUMMARY**
**ASH LANDFILL 1**
**OAK GROVE STEAM ELECTRIC STATION**

| Well ID | TOC Elevation (ft amsl) | Date | Depth to Water (ft btoc) | Water Elevation (ft amsl) |
|---|---|---|---|---|
| MW-02 | 463.65 | 11/03/15 | 47.61 | 416.04 |
| | | 12/17/15 | 47.49 | 416.16 |
| | | 02/10/16 | 45.93 | 417.72 |
| | | 04/15/16 | 46.69 | 416.96 |
| | | 06/14/16 | 44.84 | 418.81 |
| | | 08/24/16 | 44.61 | 419.04 |
| | | 10/04/16 | 45.24 | 418.41 |
| | | 12/19/16 | 46.96 | 416.69 |
| MW-05 | 436.98 | 11/03/15 | 29.94 | 407.04 |
| | | 12/17/15 | 29.71 | 407.27 |
| | | 02/10/16 | 28.93 | 408.05 |
| | | 04/15/16 | 28.02 | 408.96 |
| | | 06/14/16 | 27.57 | 409.41 |
| | | 08/24/16 | 28.38 | 408.60 |
| | | 10/04/16 | 27.94 | 409.04 |
| | | 12/19/16 | 30.02 | 406.96 |
| MW-07 | 438.84 | 11/03/15 | 28.54 | 410.30 |
| | | 12/17/15 | 28.07 | 410.77 |
| | | 02/09/16 | 27.71 | 411.13 |
| | | 04/15/16 | 27.43 | 411.41 |
| | | 06/14/16 | 27.11 | 411.73 |
| | | 08/24/16 | 27.11 | 411.73 |
| | | 10/04/16 | 27.62 | 411.22 |
| | | 12/19/16 | 26.79 | 412.05 |
| MW-08 | 443.38 | 11/03/15 | 32.77 | 410.61 |
| | | 12/17/15 | 32.63 | 410.75 |
| | | 02/09/16 | 32.47 | 410.91 |
| | | 04/15/16 | 32.12 | 411.26 |
| | | 06/14/16 | 29.96 | 413.42 |
| | | Destroyed | | |
| MW-08R | 443.84 | 12/19/16 | 33.97 | 409.87 |
| | | 03/21/17 | 31.89 | 411.95 |
| | | 04/20/17 | 31.80 | 412.04 |
| MW-09 | 461.46 | 11/03/15 | 48.43 | 413.03 |
| | | 12/17/15 | 48.71 | 412.75 |
| | | 02/09/16 | 48.20 | 413.26 |
| | | 04/15/16 | 47.69 | 413.77 |
| | | 06/14/16 | 47.31 | 414.15 |
| | | 08/24/16 | 47.56 | 413.90 |
| | | 10/04/16 | 47.22 | 414.24 |
| | | 12/19/16 | 50.38 | 411.08 |

**TABLE 2**
**GROUNDWATER ELEVATION SUMMARY**
**ASH LANDFILL 1**
**OAK GROVE STEAM ELECTRIC STATION**

| Well ID | TOC Elevation (ft amsl) | Date | Depth to Water (ft btoc) | Water Elevation (ft amsl) |
|---|---|---|---|---|
| AL-10 | 460.81 | 11/03/15 | 43.19 | 417.62 |
| | | 12/17/15 | 43.09 | 417.72 |
| | | 02/10/16 | 42.51 | 418.30 |
| | | 04/15/16 | 42.14 | 418.67 |
| | | 06/14/16 | 41.61 | 419.20 |
| | | 08/24/16 | 41.89 | 418.92 |
| | | 10/04/16 | 41.92 | 418.89 |
| | | 12/19/16 | 43.68 | 417.13 |

Notes:
1. Abbreviations: TOC - top of casing; ft - feet, amsl - above mean sea level.

**TABLE 3**
**APPENDIX III BACKGROUND GROUNDWATER ANALYTICAL DATA**
**OAK GROVE STEAM ELECTRIC STATION**
**ASH LANDFILL 1**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | Fl (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| MW-02 | 11/04/15 | 0.064 | 32.5 | 138 | 0.135 J | 6.92 | 71.4 | 539 |
| | 12/18/15 | 0.0476 | 29 | 61.7 | 0.118 J | 6.83 | 15.9 | 308 |
| | 02/10/16 | 0.0853 | 25.4 | 83.5 | 0.229 J | 6.63 | 34 | 320 |
| | 04/15/16 | 0.0597 | 39.6 | 68 | 0.102 | 6.51 | 18.1 | 440 |
| | 06/16/16 | 0.106 | 26.5 | 87.8 | 0.161 J | 6.89 | 34.8 | 343 |
| | 08/25/16 | 0.0492 | 12.9 | 21.9 | 0.164 J | 6.58 | 22.4 | 163 |
| | 10/04/16 | 0.113 | 61.4 | 222 | 0.185 J | 6.69 | 97.4 | 667 |
| | 12/21/16 | 0.11 | 47.8 | 185 | 0.293 J | 6.78 | 83.4 | 590 |
| MW-05 | 11/04/15 | 0.0628 | 15.4 | 64.8 | 0.272 J | 7.11 | 13.6 | 285 |
| | 12/18/15 | 0.0621 | 13 | 60.2 | 0.476 | 6.52 | 10.5 | 232 |
| | 02/10/16 | 0.0447 | 14 | 59.7 | 0.397 J | 6.67 | 11.9 | 235 |
| | 04/15/16 | 0.0458 | 14.3 | 55.4 | 0.284 | 6.42 | 10.7 | 288 |
| | 06/15/16 | 0.058 | 14.2 | 60.4 | 0.306 J | 6.61 | 11.8 | 269 |
| | 08/24/16 | 0.0877 | 13.1 | 63 | 0.262 J | 6.75 | 11.8 | 287 |
| | 10/04/16 | 0.059 | 15.4 | 57.9 | 0.477 | 6.87 | 10.9 | 253 |
| | 12/22/16 | 0.0759 | 61.4 | 264 | 0.446 | 6.63 | 55.6 | 778 |
| MW-07 | 11/03/15 | 0.0483 | 8.57 | 20.2 | 0.289 J | 6.42 | 11.5 | 276 |
| | 12/17/15 | 0.0539 | 8.75 | 17.7 | 0.319 J | 6.86 | 14.7 | 243 |
| | 02/09/16 | 0.0547 | 13.3 | 28.9 | 0.276 J | 7.18 | 25.3 | 283 |
| | 04/15/16 | 0.0567 | 10 | 20.9 | 0.187 | 6.71 | 16 | 341 |
| | 06/15/16 | 0.0639 | 10.5 | 22.9 | 0.226 J | 6.75 | 23.2 | 294 |
| | 08/24/16 | 0.0691 | 9.58 | 20.4 | 0.159 J | 6.89 | 21.8 | 290 |
| | 10/04/16 | 0.0549 | 10.3 | 15.6 | 0.277 J | 6.82 | 17.1 | 256 |
| | 12/22/16 | 0.054 | 12.5 | 22.9 | 0.229 J | 6.29 | 34.7 | 262 |
| MW-08 | 11/04/15 | 0.0631 | 120 | 599 | 0.17 J | 6.81 | 138 | 2,070 |
| | 12/18/15 | 0.0604 | 70.4 | 488 | 0.158 J | 6.78 | 49.8 | 1,140 |
| | 02/09/16 | 0.0695 | 140 | 612 | 0.175 J | 6.42 | 170 | 1,530 |
| | 04/15/16 | 0.0726 | 133 | 566 | <0.1 | 6.61 | 139 | 1,680 |
| | 06/16/16 | 0.0677 | 76.6 | 520 | <0.1 | 6.76 | 83.6 | 1,090 |
| | 8/2016 | Destroyed | | | | | | |
| MW-08R | 12/22/16 | 0.0702 | 32.4 | 166 | 0.355 J | 6.93 | 39.7 | 617 |
| | 03/21/17 | 0.0662 | 117 | 563 | 0.2 J | 5.83 | 98.3 | 1,220 |
| | 04/20/17 | 0.0696 | 115 | 560 | 0.149 J | 5.91 | 94.9 | 1,190 |
| MW-09 | 11/03/15 | 0.0722 | 36.4 | 155 | 0.149 J | 6.45 | 74.9 | 583 |
| | 12/18/15 | 0.077 | 40.3 | 157 | 0.266 J | 6.48 | 83.1 | 528 |
| | 02/09/16 | 0.072 | 38.4 | 158 | 0.152 J | 6.16 | 80 | 445 |
| | 04/15/16 | 0.0734 | 42.2 | 151 | <0.1 | 6.41 | 80.9 | 568 |
| | 06/15/16 | 0.0778 | 43.1 | 174 | <0.1 | 6.52 | 98.7 | 574 |
| | 08/25/16 | 0.0829 | 45.6 | 195 | <0.1 | 6.76 | 116 | 715 |
| | 10/04/16 | 0.0803 | 47.8 | 179 | 0.256 J | 6.64 | 108 | 648 |
| | 12/22/16 | 0.0776 | 42.6 | 290 | 0.159 J | 6.87 | 116 | 791 |
| AL-10 | 11/04/15 | 0.0682 | 34.5 | 149 | 0.149 J | 6.86 | 72.6 | 590 |
| | 12/18/15 | 0.0539 | 37.5 | 81 | 0.15 J | 6.45 | 20.6 | 414 |
| | 02/10/16 | 0.0637 | 48.6 | 108 | 0.197 J | 6.75 | 34.9 | 599 |
| | 04/15/16 | 0.0573 | 44.8 | 86 | 0.133 | 6.51 | 23.6 | 549 |
| | 06/16/16 | 0.0915 | 34.7 | 66.7 | 0.155 J | 6.44 | 23.5 | 436 |
| | 08/25/16 | 0.105 | 87.5 | 444 | <0.1 | 6.61 | 96.3 | 1,120 |
| | 10/04/16 | 0.0756 | 35.1 | 57.3 | 0.278 J | 6.92 | 20.1 | 507 |
| | 12/22/16 | 0.0759 | 32.5 | 57.2 | 0.195 J | 6.78 | 21.5 | 527 |

**TABLE 3**
**APPENDIX III BACKGROUND GROUNDWATER ANALYTICAL DATA**
**OAK GROVE STEAM ELECTRIC STATION**
**ASH LANDFILL 1**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | Fl (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| ***Equipment Blank*** | | | | | | | | |
| EB | 04/15/16 | 0.0379 | 3.07 | 8.24 | <0.1 | 6.24 | 1.92 J | 47 |
| | 06/16/16 | 0.0274 J | 1.03 | 4.47 | <0.1 | 7.16 | 2.34 J | 43 |
| | 08/24/16 | 0.113 | 5.55 | 11.6 | <0.1 | 7.23 | 24.8 | <10 |
| | 10/05/16 | 0.0577 | 1.83 | 7.19 | <0.1 | 6.98 | 3.07 | <10 |
| | 12/22/16 | 0.0182 J | 3.02 | 8.39 | <0.1 | 6.07 | 1.67 J | <10 |

Notes:
1. Abbreviations: mg/L - milligrams per liter; TDS - total dissolved solids; s.u. - standard units.
2. J - concentration is below method quantitation limit; result is an estimate.

**TABLE 4**
**APPENDIX IV BACKGROUND GROUNDWATER ANALYTICAL DATA**
**OAK GROVE STEAM ELECTRIC STATION**
**ASH LANDFILL 1**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | Fl (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Th (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-02 | 11/04/15 | <0.0008 | <0.002 | 0.0813 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.135 J | <0.0003 | 0.0471 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.07 | 3.49 | 4.56 |
| | 12/18/15 | <0.0008 | <0.002 | 0.175 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.118 J | <0.0003 | 0.00927 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.652 | <1.49 | 2.14 |
| | 02/10/16 | <0.0008 | <0.002 | 0.0933 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.229 J | <0.0003 | 0.0681 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.445 | 1.61 | 2.06 |
| | 04/15/16 | <0.0008 | <0.002 | 0.164 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.102 J | <0.0003 | 0.00868 J | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.651 | <1.74 | 2.39 |
| | 06/16/16 | <0.0008 | <0.002 | 0.117 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.161 J | 0.00079 J | 0.0684 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.11 | 3.28 | 4.39 |
| | 08/25/16 | <0.0008 | <0.002 | 0.0415 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.164 J | <0.0003 | 0.0113 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.182 | 0.922 | 1.10 |
| | 10/04/16 | <0.0008 | <0.002 | 0.119 | <0.0003 | <0.0003 | 0.0022 J | <0.003 | 0.185 J | 0.00112 | 0.1 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.292 | 1.93 | 2.22 |
| | 12/21/16 | <0.0008 | <0.002 | 0.11 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.293 J | 0.000403 J | 0.0971 | <0.00008 | <0.002 | 0.00232 J | <0.0005 | 0.342 | 1.86 | 2.20 |
| MW-05 | 11/04/15 | <0.0008 | 0.00348 J | 0.0395 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.272 J | <0.0003 | 0.0466 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.507 | <1.48 | 1.99 |
| | 12/18/15 | <0.0008 | 0.00803 | 0.0662 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.476 | 0.000743 J | 0.0407 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.651 | <1.22 | 1.87 |
| | 02/10/16 | <0.0008 | <0.002 | 0.039 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.397 J | <0.0003 | 0.0459 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.883 | <1.57 | 2.45 |
| | 04/15/16 | <0.0008 | 0.0103 | 0.0686 | <0.0003 | <0.0003 | <0.002 | 0.00419 J | 0.284 J | 0.00042 J | 0.0421 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.10 | 2.73 | 3.83 |
| | 06/15/16 | <0.0008 | 0.0207 | 0.127 | <0.0003 | <0.0003 | <0.002 | 0.00373 J | 0.306 J | 0.00146 | 0.0433 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.679 | 1.08 | 1.76 |
| | 08/24/16 | <0.0008 | 0.00799 | 0.0624 | <0.0003 | <0.0003 | 0.00233 J | 0.00312 J | 0.262 J | 0.00111 | 0.0375 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.562 | 2.80 | 3.36 |
| | 10/04/16 | <0.0008 | 0.0139 J | 0.081 | 0.000342 J | <0.0003 | 0.00469 J | 0.00333 J | 0.477 | 0.00213 J | 0.0416 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.677 | <0.652 | 1.33 |
| | 12/22/16 | <0.0008 | <0.002 | 0.0415 | <0.0003 | <0.0003 | 0.0197 | <0.003 | 0.446 | 0.00057 J | 0.114 | <0.00008 | <0.002 | 0.00371 J | <0.0005 | <0.27 | <0.672 | 0.94 |
| MW-07 | 11/03/15 | <0.0008 | <0.002 | 0.0425 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.289 J | <0.0003 | 0.0136 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.10 | 1.58 | 2.68 |
| | 12/17/15 | <0.0008 | <0.002 | 0.0441 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.319 J | 0.000537 J | 0.0128 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.40 | <1.25 | 2.65 |
| | 02/09/16 | <0.0008 | <0.002 | 0.0397 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.276 J | <0.0003 | 0.0213 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.663 | <2.14 | 2.80 |
| | 04/15/16 | <0.0008 | <0.002 | 0.0405 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.187 J | <0.0003 | 0.0152 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.344 | <1.43 | 1.77 |
| | 06/15/16 | <0.0008 | <0.002 | 0.0467 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.226 J | <0.0003 | 0.0151 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.245 | <0.722 | 0.97 |
| | 08/24/16 | <0.0008 | <0.002 | 0.0438 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.159 J | <0.0003 | 0.0124 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.213 | 1.61 | 1.82 |
| | 10/04/16 | <0.0008 | <0.002 | 0.0424 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.277 J | <0.0003 | 0.0125 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.560 | 0.780 | 1.34 |
| | 12/22/16 | <0.0008 | <0.002 | 0.0476 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.229 J | 0.000333 J | 0.0178 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.245 | <0.489 | 0.73 |
| MW-08 | 11/04/15 | <0.0008 | <0.002 | 0.114 | <0.0003 | 0.000441 J | 0.399 | 0.0116 | 0.17 J | 0.000714 J | 0.0955 | 0.00043 | 0.0277 | 0.0318 | <0.0005 | 0.807 | <1.60 | 2.41 |
| | 12/18/15 | <0.0008 | <0.002 | 0.257 | <0.0003 | 0.000363 J | 0.0511 | <0.003 | 0.158 J | 0.00117 | 0.0429 | 0.0000855 J | 0.00438 J | 0.0108 | <0.0005 | 1.24 | 2.11 | 3.35 |
| | 02/09/16 | <0.0008 | <0.002 | 0.0885 | <0.0003 | 0.00036 J | 0.00715 | <0.003 | 0.175 J | 0.000437 J | 0.113 | <0.00008 | <0.002 | 0.0337 | <0.0005 | 1.01 | <2.28 | 3.29 |
| | 04/15/16 | <0.0008 | <0.002 | 0.112 | <0.0003 | 0.000403 J | 0.328 | 0.00375 J | <0.1 | 0.00134 | 0.0932 | 0.000837 | 0.036 | 0.0318 | <0.0005 | 0.537 | 3.03 | 3.57 |
| | 06/16/16 | <0.0008 | <0.002 | 0.229 | <0.0003 | 0.000457 J | 0.0105 | <0.003 | <0.1 | 0.00216 | 0.0492 | 0.000173 J | <0.002 | 0.0154 | <0.0005 | 1.15 | 1.73 | 2.88 |
| | 8/2016 | Destroyed | | | | | | | | | | | | | | | | |
| MW-08R | 12/22/16 | <0.0008 | <0.002 | 0.0855 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.355 J | <0.0003 | 0.00656 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.604 | 1.61 | 2.21 |
| | 03/21/17 | <0.0008 | <0.002 | 0.249 | <0.0003 | 0.000374 J | 0.0116 | <0.003 | 0.2 J | <0.0003 | 0.0927 | <0.00008 | <0.002 | 0.0243 | <0.0005 | 2.06 | 2.44 | 4.50 |
| | 04/20/17 | <0.0008 | <0.002 | 0.262 | <0.0003 | 0.000426 J | 0.0207 | <0.003 | 0.149 J | <0.0003 | 0.0811 | <0.00008 | <0.002 | 0.0257 | <0.0005 | | | |
| MW-09 | 11/03/15 | <0.0008 | <0.002 | 0.0983 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.149 J | <0.0003 | 0.0524 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.812 | 2.09 | 2.90 |
| | 12/18/15 | <0.0008 | 0.0026 J | 0.107 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.266 J | 0.00118 | 0.0544 | <0.00008 | <0.002 | <0.002 | <0.0005 | 2.21 | 2.88 | 5.09 |
| | 02/09/16 | <0.0008 | <0.002 | 0.0991 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.152 J | <0.0003 | 0.0559 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.820 | <1.46 | 2.28 |
| | 04/15/16 | <0.0008 | 0.00201 J | 0.104 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | 0.0004 J | 0.055 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.883 | 2.68 | 3.56 |
| | 06/15/16 | <0.0008 | 0.00524 | 0.144 | 0.000435 J | <0.0003 | 0.00587 | <0.003 | <0.1 | 0.002 | 0.0634 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.794 | 2.38 | 3.17 |
| | 08/25/16 | <0.0008 | 0.00411 J | 0.133 | <0.0003 | <0.0003 | 0.00673 | <0.003 | <0.1 | 0.00178 | 0.0569 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.06 | 2.34 | 3.40 |
| | 10/04/16 | <0.0008 | <0.002 | 0.125 | <0.0003 | <0.0003 | 0.00302 J | <0.003 | 0.256 J | 0.00104 | 0.0635 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.33 | <1.04 | 2.37 |
| | 12/22/16 | <0.0008 | <0.002 | 0.123 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.159 J | 0.000411 J | 0.0636 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.935 | 1.68 | 2.62 |
| AL-10 | 11/04/15 | <0.0008 | <0.002 | 0.0933 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.149 J | <0.0003 | 0.0515 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.615 | 2.04 | 2.66 |
| | 12/18/15 | <0.0008 | <0.002 | 0.23 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.15 J | 0.00339 | 0.0115 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.80 | <1.9 | 3.70 |
| | 02/10/16 | <0.0008 | 0.00218 J | 0.143 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.197 J | <0.0003 | 0.00719 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.979 | <1.19 | 2.17 |
| | 04/15/16 | <0.0008 | <0.002 | 0.18 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.133 J | <0.0003 | 0.00971 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.586 | <2.76 | 3.35 |
| | 06/16/16 | <0.0008 | <0.002 | 0.103 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.155 J | <0.0003 | 0.00591 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.527 | <0.76 | 1.29 |
| | 08/25/16 | <0.0008 | 0.00364 J | 0.306 | 0.000436 J | <0.0003 | 0.00842 | 0.00314 J | <0.1 | 0.00285 | 0.0337 | <0.00008 | <0.002 | <0.002 | <0.0005 | 2.34 | 1.11 | 3.45 |
| | 10/04/16 | <0.0008 | <0.002 | 0.0815 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.278 J | <0.0003 | 0.00646 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.718 | <0.459 | 1.18 |
| | 12/22/16 | <0.0008 | <0.002 | 0.0846 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.195 J | <0.0003 | 0.00647 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.467 | 1.59 | 2.06 |

**TABLE 4**
**APPENDIX IV BACKGROUND GROUNDWATER ANALYTICAL DATA**
**OAK GROVE STEAM ELECTRIC STATION**
**ASH LANDFILL 1**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | Fl (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Th (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Equipment Blank*** | | | | | | | | | | | | | | | | | | |
| EB | 04/15/16 | <0.0008 | <0.002 | 0.0694 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | <0.005 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.412 | <1.59 | 2.00 |
| | 06/16/16 | <0.0008 | <0.002 | 0.0191 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | <0.005 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.187 | <0.983 | 1.17 |
| | 08/24/16 | <0.0008 | <0.002 | <0.003 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | <0.005 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.156 | <0.47 | 0.63 |
| | 10/05/16 | <0.0008 | <0.002 | 0.0279 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | <0.005 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.523 | 0.604 | 1.13 |
| | 12/22/16 | <0.0008 | <0.002 | 0.0748 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | <0.005 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.402 | 0.774 | 1.18 |

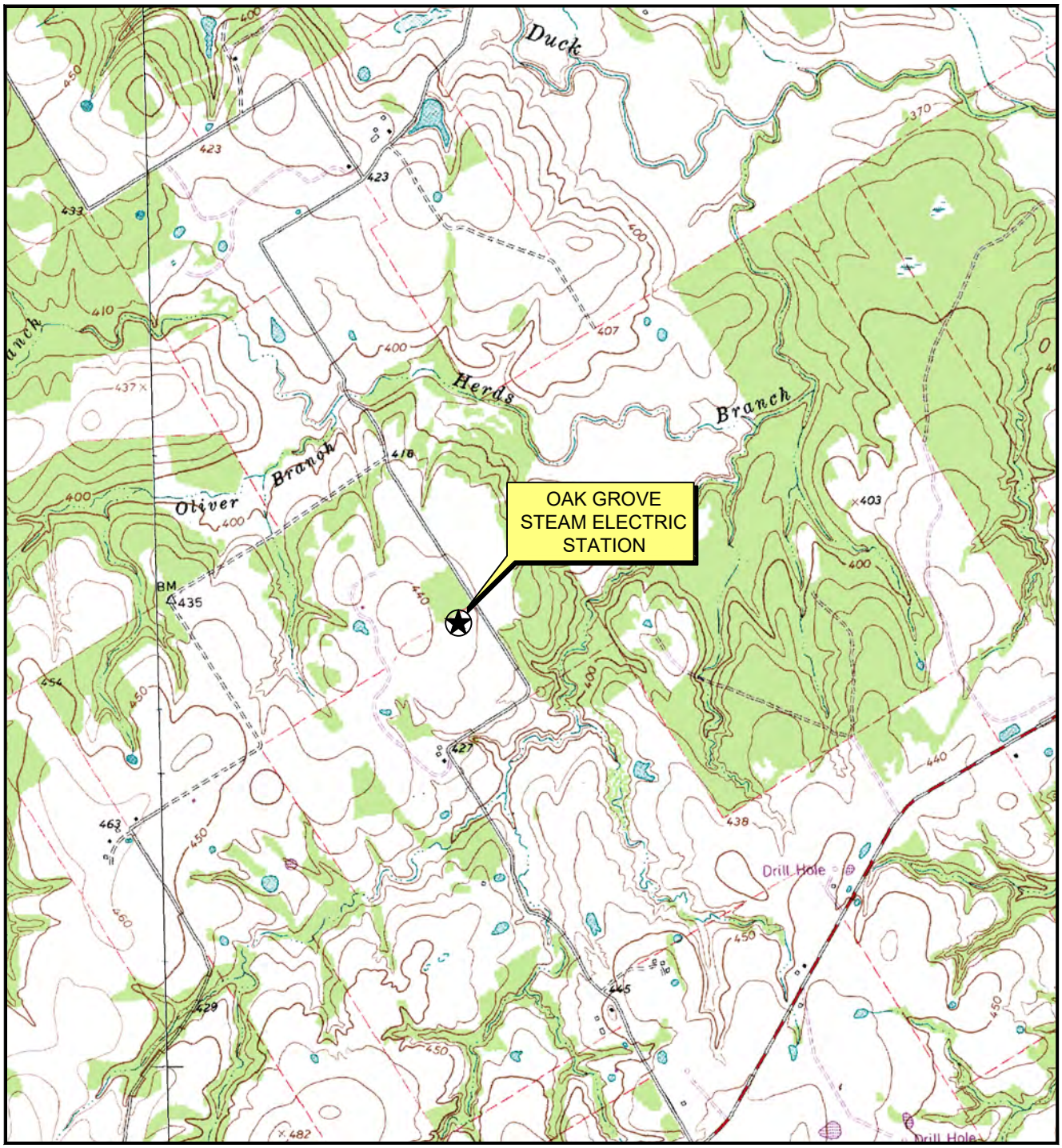
Notes:
1. Abbreviations: mg/L - milligrams per liter; pCi/L - picocuries per liter.
2. ^ - Sum of Ra 226 and Ra 228 concentrations. Non-detect isotope results were assigned a value equal to the minimum detectable concentration.
3. J - concentration is below method quantitation limit; result is an estimate.

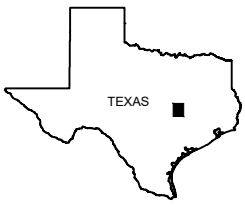
**TABLE 5**
**APPENDIX III DETECTION MONITORING GROUNDWATER ANALYTICAL DATA**
**OAK GROVE STEAM ELECTRIC STATION**
**ASH LANDFILL 1**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | Fl (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| MW-02 | 10/02/17 | 0.0567 | 22.2 | 42.4 | <0.100 | 6.68 | 9.67 | 310 |
| MW-05 | 10/02/17 | 0.0665 | 17.5 | 58.6 | 0.295 J | 6.89 | 10.4 | 246 |
| MW-07 | 10/02/17 | 0.0733 | 13.9 | 15.8 | 0.178 J | 6.59 | 38.4 | 298 |
| MW-08R | 10/02/17 | 0.061 | 13.1 | 14.4 | <0.100 | 6.63 | 28.7 | 243 |
| MW-09 | 10/02/17 | 0.106 | 58.2 | 140 | <0.100 | 6.76 | 95.3 | 433 |
| AL-10 | 10/02/17 | 0.0973 | 27 | 50.6 | 0.120 J | 6.85 | 12.2 | 398 |

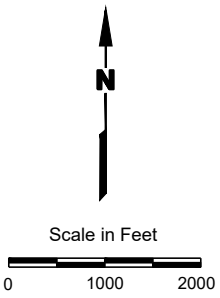
Notes:
1. Abbreviations: mg/L - milligrams per liter; TDS - total dissolved solids; s.u. - standard units.
2. J - concentration is below method quantitation limit; result is an estimate.

# Figures




QUADRANGLE LOCATION




SOURCE:
Base map from www.tnris.gov, Bald Prairie, TX 7.5 min. USGS quadrangle dated 1965, revised 1982.

**OAK GROVE STEAM ELECTRIC STATION**

Ash Landfill 1

Figure 1

# SITE LOCATION MAP

| | | |
|---|---|---|
| PROJECT: 5164D | BY: AJD | REVISIONS |
| DATE: NOV, 2015 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**

CONSULTING ENGINEERS AND SCIENTISTS

**EXPLANATION**

CCR Monitoring Well

N

Scale in Feet

0 400 800

SOURCE:
Imagery from Google Earth dated 10/30/2014.

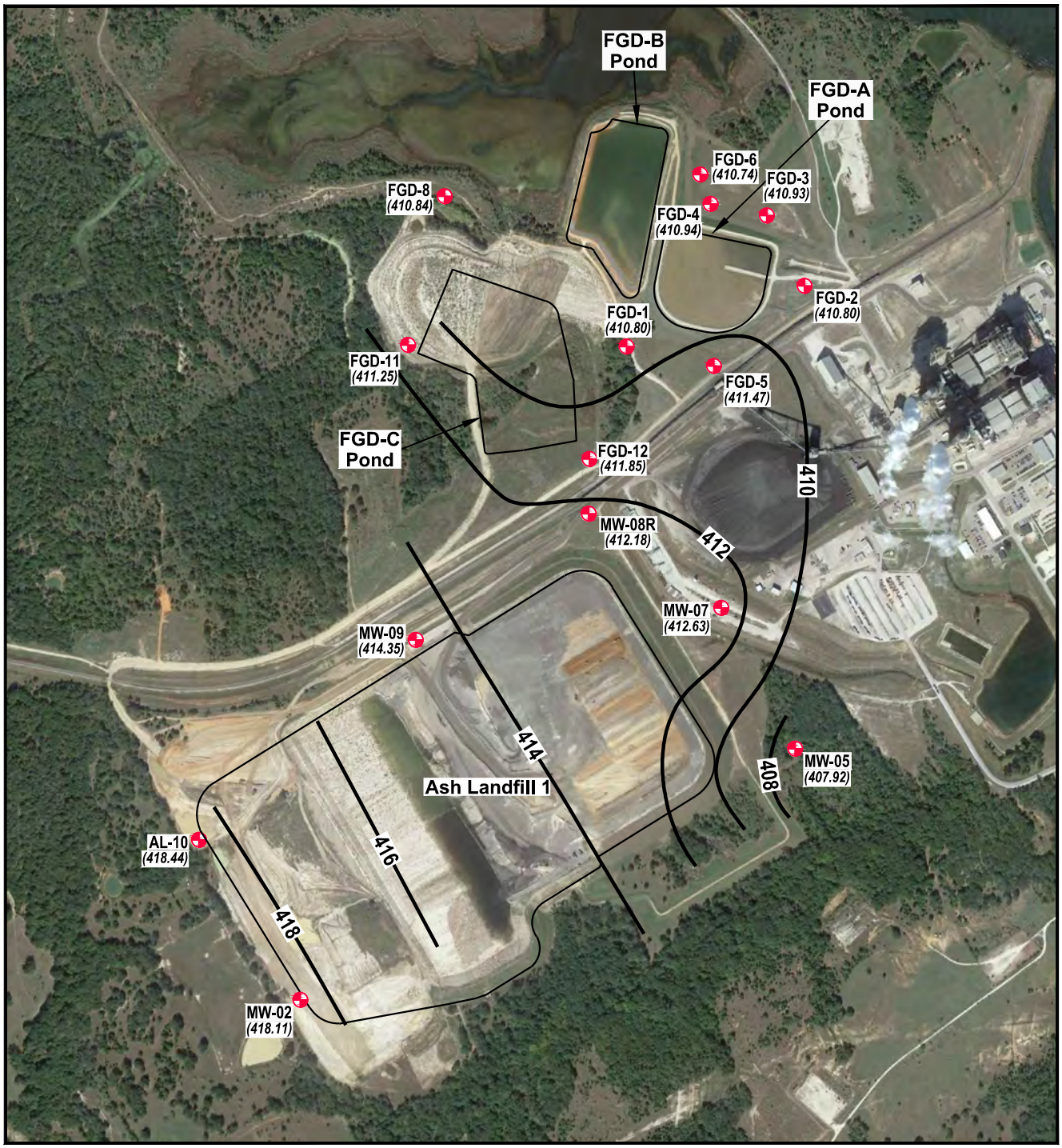
**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 2

**DETAILED SITE PLAN**

| | | |
|---|---|---|
| PROJECT: 5164D | BY: AJD | REVISIONS |
| DATE: SEPT., 2017 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS




## EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

**OAK GROVE STEAM ELECTRIC STATION**
ROBERTSON COUNTY, TEXAS

Figure 3

# GROUNDWATER POTENTIOMETRIC SURFACE MAP OCTOBER 3, 2017

| | | |
|---|---|---|
| PROJECT: 5347D | BY: AJD | REVISIONS |
| DATE: JAN., 2018 | CHECKED: PJB | |

**PASTOR, BEHLING & WHEELER, LLC**
CONSULTING ENGINEERS AND SCIENTISTS

# Appendix A

# Laboratory Analytical Reports – Background Data

December 14, 2015

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1511075

RE: Luminant - Oak Grove

Dear Will Vienne:

DHL Analytical, Inc. received 15 sample(s) on 11/6/2015 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-15-15

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 68804

# CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 11-4-15 PAGE 1 OF 1
PO #: 5164-D DHL WORK ORDER #: 1511075
PROJECT LOCATION OR NAME: LUMINANT - OAK GROVE
CLENT PROJECT #: 5164-D COLLECTOR: J. BRAUTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT
P=PAINT SL=SLUDGE O=OTHER SO=SOLID

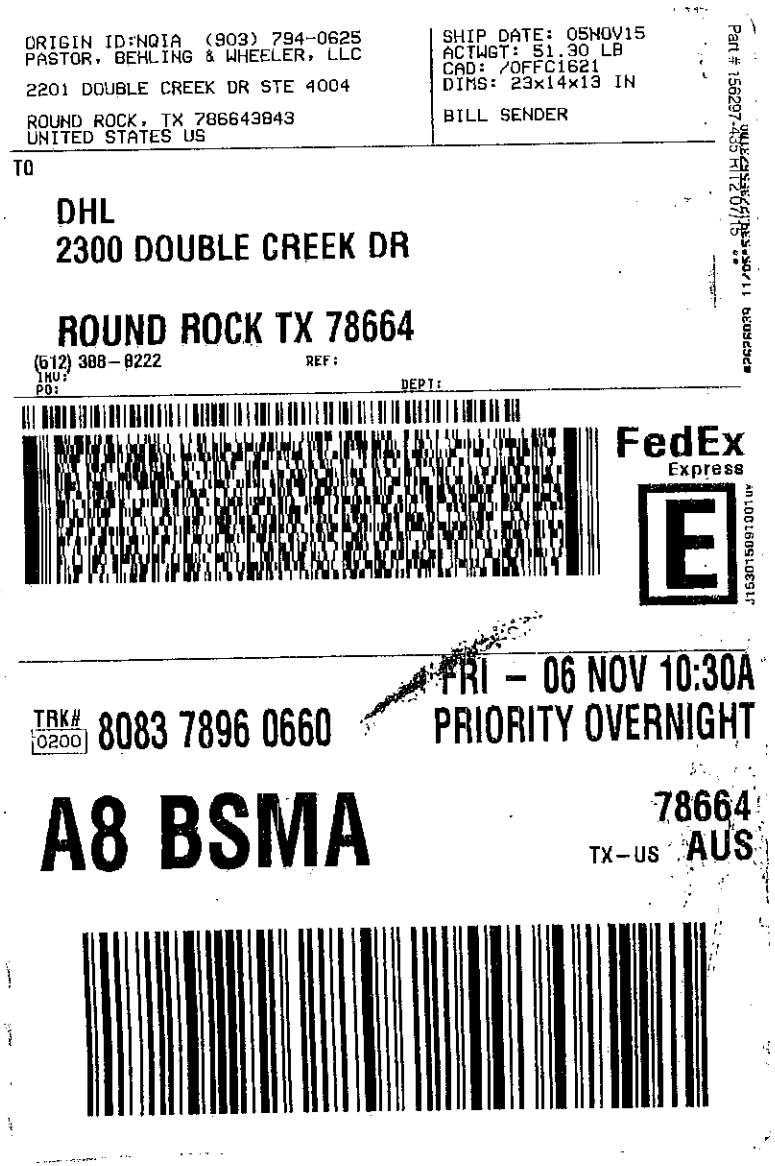
| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ | RCRA ☐ TX11 ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | SEE ATTACHED | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-1 | 01 | 11-3-15 | 1050 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| MW-09 | 02 | | 1150 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| MW-07 | 03 | | 1240 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| FGD-2 | 04 | | 1415 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| FGD-3 | 05 | | 1505 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| FGD-4 | 06 | | 1600 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| FGD-5 | 07 | | 1650 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| AL-10 | 08 | 11-4-15 | 0815 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| MW-02 | 09 | | 0905 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| MW-08 | 10 | | 1010 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| MW-05 | 11 | | 1105 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| FGD-12 | 12 | | 1155 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| FGD-11 | 13 | | 1300 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| FGD-6 | 14 | | 1355 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |
| FGD-8 | 15 | | 1450 | W | P | 4 | | | | | | | | | | | | | | | | | | | | | | X | |

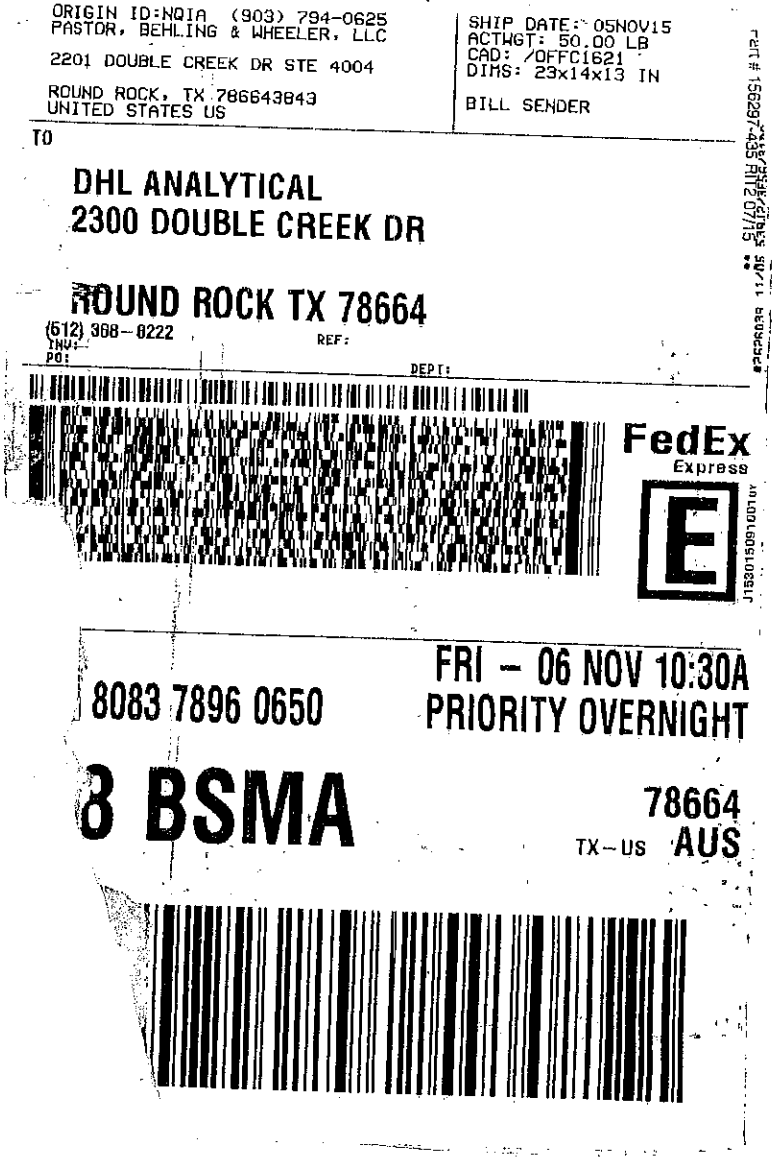
RELINQUISHED BY: (Signature) DATE/TIME 11-5-15 1815 RECEIVED BY: (Signature) Fedex
RELINQUISHED BY: (Signature) Fedex DATE/TIME 11/6/15 9:45 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

☐ DHL DISPOSAL @ $5.00 each ☐ Return

**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP 2.1, 2.8 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED


ORIGIN ID:NQIA (903) 794-0625
PASTOR, BEHLING & WHEELER, LLC
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 786643843
UNITED STATES US
SHIP DATE: 05NOV15
ACTWGT: 51.30 LB
CAD: /OFFC1621
DIMS: 23x14x13 IN
BILL SENDER
TO
DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
REF:
INV:
PO:
DEPT:
FedEx
Express
TRK# 0200 8083 7896 0660
FRI - 06 NOV 10:30A
PRIORITY OVERNIGHT
A8 BSMA
78664
TX-US AUS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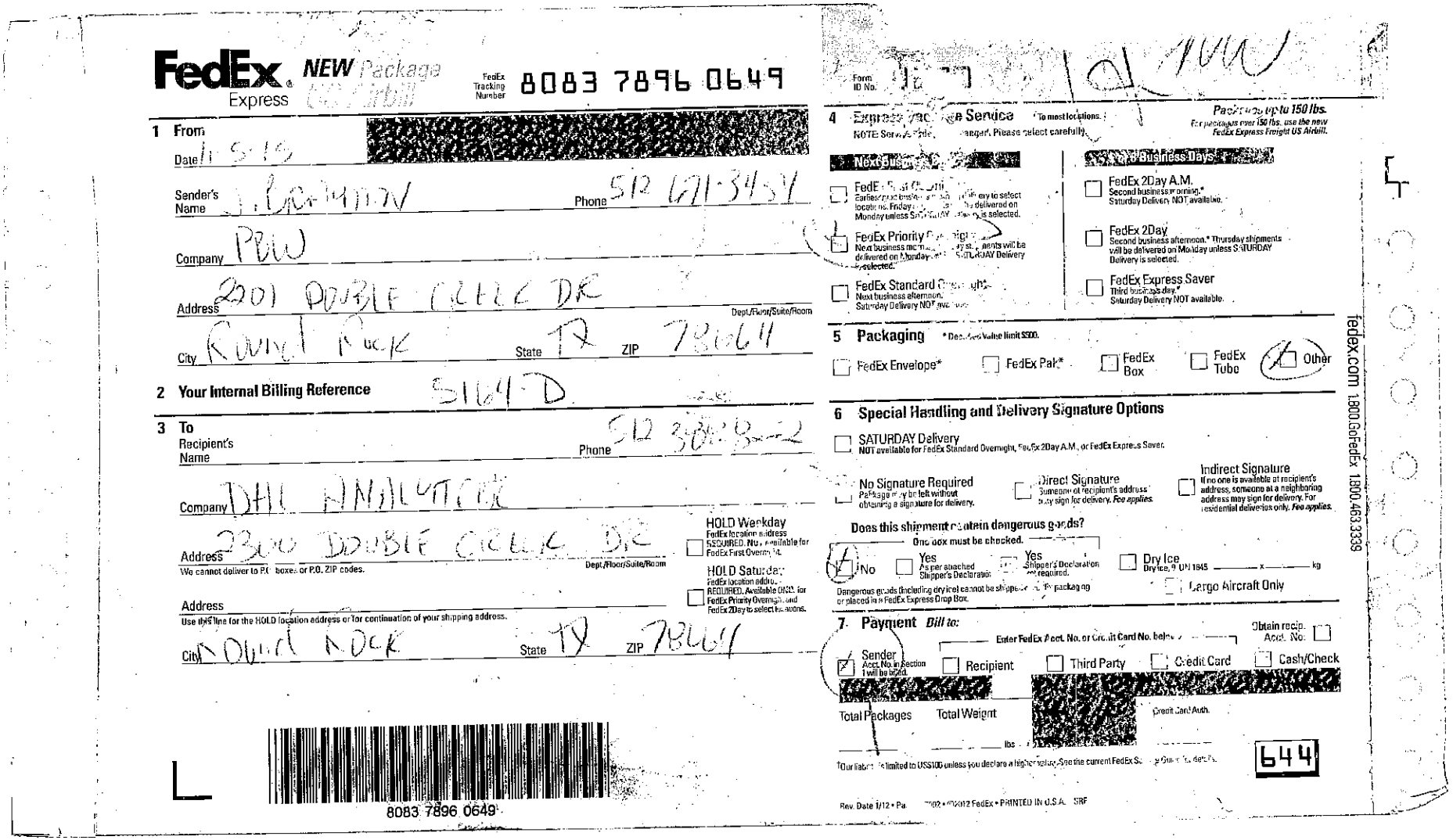
BILL SENDER
TO
DHL ANALYTICAL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
REF:
INV:
PO:
DEPT:
FedEx
Express
8083 7896 0650
FRI - 06 NOV 10:30A
PRIORITY OVERNIGHT
8 BSMA
78664
TX-US AUS



FedEx Express NEW Package

FedEx Tracking Number 8083 7896 0649

1 From

Date 11-5-19

Sender's Name J. [redacted] Phone 512 671-3451

Company PBW

Address 201 DOUBLE CREEK DR

City ROUND ROCK State TX ZIP 78664

Dept/Floor/Suite/Room

2 Your Internal Billing Reference 5164-D

3 To

Recipient's Name Phone 512 380-8662

Company DHL ANALYTICS

Address 2300 DOUBLE CREEK DR

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Dept./Floor/Suite/Room

Address

Use this line for the HOLD location address or for continuation of your shipping address.

City ROUND ROCK State TX ZIP 78664

HOLD Weekday
FedEx location address REQUIRED. Not available for FedEx First Overnight.

HOLD Saturday
FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

8083 7896 0649

Form ID No.

4 Express Package Service * To most locations.

NOTE Service Guide. Please select carefully.

Packages up to 150 lbs.
For packages over 150 lbs., use the new FedEx Express Freight US Airbill.

Next Business Day

- FedEx First Overnight — Earliest next business morning delivery to select locations. Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- FedEx Standard Overnight — Next business afternoon. Saturday Delivery NOT available.

2nd Business Days

- FedEx 2Day A.M. — Second business morning.* Saturday Delivery NOT available.
- FedEx 2Day — Second business afternoon.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- FedEx Express Saver — Third business day.* Saturday Delivery NOT available.

5 Packaging * Declared Value limit $500.

FedEx Envelope* FedEx Pak* FedEx Box FedEx Tube Other

6 Special Handling and Delivery Signature Options

SATURDAY Delivery
NOT available for FedEx Standard Overnight, FedEx 2Day A.M., or FedEx Express Saver.

No Signature Required
Package may be left without obtaining a signature for delivery.

Direct Signature
Someone at recipient's address may sign for delivery. Fee applies.

Indirect Signature
If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. Fee applies.

Does this shipment contain dangerous goods?
One box must be checked.

No Yes As per attached Shipper's Declaration Yes Shipper's Declaration not required. Dry Ice Dry Ice, 9, UN 1845 ____ x ____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box. Cargo Aircraft Only

7 Payment Bill to:

Enter FedEx Acct. No. or Credit Card No. below

Obtain recip. Acct. No.

Sender Acct. No. in Section 1 will be billed. Recipient Third Party Credit Card Cash/Check

Total Packages Total Weight lbs. Credit Card Auth.

644

*Our liability is limited to US$100 unless you declare a higher value. See the current FedEx Service Guide for details.

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fedex.com 1.800.GoFedEx 1.800.463.3339

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Pastor, Behling & Wheeler

Date Received: 11/6/2015

Work Order Number 1511075

Received by JB

Checklist completed by: Signature 11/6/2015 Date

Reviewed by Initials 11/6/2015 Date

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 2.1 °C ,2.8 ,2.7 |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? NO | | Checked by |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding _____

Comments: _____

Corrective Action _____

Page 1 of 1

**DHL Analytical, Inc.** **Date:** *14-Dec-15*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1511075

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis

## LOG IN

The samples were received and log-in performed on 11/6/15. A total of 15 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 11/11/15 Boron was detected below the reporting limit in the method blank (MB-72244). All samples may be biased high for this analyte. No further corrective actions were taken.

For Metals analysis performed on 11/11/15 the matrix spike recovery was slightly below control limits for Calcium. This is flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *14-Dec-15*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1511075

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1511075-01 | FGD-1 | | 11/03/15 10:50 AM | 11/6/2015 |
| 1511075-02 | MW-09 | | 11/03/15 11:50 AM | 11/6/2015 |
| 1511075-03 | MW-07 | | 11/03/15 12:40 PM | 11/6/2015 |
| 1511075-04 | FGD-2 | | 11/03/15 02:15 PM | 11/6/2015 |
| 1511075-05 | FGD-3 | | 11/03/15 03:05 PM | 11/6/2015 |
| 1511075-06 | FGD-4 | | 11/03/15 04:00 PM | 11/7/2015 |
| 1511075-07 | FGD-5 | | 11/03/15 04:50 PM | 11/6/2015 |
| 1511075-08 | AL-10 | | 11/04/15 08:15 AM | 11/7/2015 |
| 1511075-09 | MW-02 | | 11/04/15 09:05 AM | 11/7/2015 |
| 1511075-10 | MW-08 | | 11/04/15 10:10 AM | 11/7/2015 |
| 1511075-11 | MW-05 | | 11/04/15 11:05 AM | 11/7/2015 |
| 1511075-12 | FGD-12 | | 11/04/15 11:55 AM | 11/6/2015 |
| 1511075-13 | FGD-11 | | 11/04/15 01:00 PM | 11/6/2015 |
| 1511075-14 | FGD-6 | | 11/04/15 01:55 PM | 11/6/2015 |
| 1511075-15 | FGD-8 | | 11/04/15 02:50 PM | 11/6/2015 |

**Lab Order:** 1511075
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1511075-01A | FGD-1 | 11/03/15 10:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-1 | 11/03/15 10:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-1 | 11/03/15 10:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-1 | 11/03/15 10:50 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-01D | FGD-1 | 11/03/15 10:50 AM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | FGD-1 | 11/03/15 10:50 AM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | FGD-1 | 11/03/15 10:50 AM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-02A | MW-09 | 11/03/15 11:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-09 | 11/03/15 11:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-09 | 11/03/15 11:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-09 | 11/03/15 11:50 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-02D | MW-09 | 11/03/15 11:50 AM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | MW-09 | 11/03/15 11:50 AM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | MW-09 | 11/03/15 11:50 AM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | MW-09 | 11/03/15 11:50 AM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-03A | MW-07 | 11/03/15 12:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-07 | 11/03/15 12:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-07 | 11/03/15 12:40 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-03D | MW-07 | 11/03/15 12:40 PM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | MW-07 | 11/03/15 12:40 PM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | MW-07 | 11/03/15 12:40 PM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-04A | FGD-2 | 11/03/15 02:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-2 | 11/03/15 02:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-2 | 11/03/15 02:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-2 | 11/03/15 02:15 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-04D | FGD-2 | 11/03/15 02:15 PM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | FGD-2 | 11/03/15 02:15 PM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | FGD-2 | 11/03/15 02:15 PM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |

**Lab Order:** 1511075
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1511075-04D | FGD-2 | 11/03/15 02:15 PM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-05A | FGD-3 | 11/03/15 03:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-3 | 11/03/15 03:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-3 | 11/03/15 03:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-3 | 11/03/15 03:05 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-05D | FGD-3 | 11/03/15 03:05 PM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | FGD-3 | 11/03/15 03:05 PM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | FGD-3 | 11/03/15 03:05 PM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | FGD-3 | 11/03/15 03:05 PM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-06A | FGD-4 | 11/03/15 04:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-4 | 11/03/15 04:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-4 | 11/03/15 04:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-4 | 11/03/15 04:00 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-06D | FGD-4 | 11/03/15 04:00 PM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | FGD-4 | 11/03/15 04:00 PM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | FGD-4 | 11/03/15 04:00 PM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | FGD-4 | 11/03/15 04:00 PM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-07A | FGD-5 | 11/03/15 04:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-5 | 11/03/15 04:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-5 | 11/03/15 04:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-5 | 11/03/15 04:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-07D | FGD-5 | 11/03/15 04:50 PM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | FGD-5 | 11/03/15 04:50 PM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | FGD-5 | 11/03/15 04:50 PM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | FGD-5 | 11/03/15 04:50 PM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-08A | AL-10 | 11/04/15 08:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | AL-10 | 11/04/15 08:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | AL-10 | 11/04/15 08:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |

**Lab Order:** 1511075
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1511075-08A | AL-10 | 11/04/15 08:15 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-08D | AL-10 | 11/04/15 08:15 AM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | AL-10 | 11/04/15 08:15 AM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | AL-10 | 11/04/15 08:15 AM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | AL-10 | 11/04/15 08:15 AM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-09A | MW-02 | 11/04/15 09:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-02 | 11/04/15 09:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-02 | 11/04/15 09:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-02 | 11/04/15 09:05 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-09D | MW-02 | 11/04/15 09:05 AM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | MW-02 | 11/04/15 09:05 AM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | MW-02 | 11/04/15 09:05 AM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | MW-02 | 11/04/15 09:05 AM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-10A | MW-08 | 11/04/15 10:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-08 | 11/04/15 10:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-08 | 11/04/15 10:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-08 | 11/04/15 10:10 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-10D | MW-08 | 11/04/15 10:10 AM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | MW-08 | 11/04/15 10:10 AM | Aqueous | E300 | Anion Preparation | 11/09/15 10:40 AM | 72226 |
| | MW-08 | 11/04/15 10:10 AM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | MW-08 | 11/04/15 10:10 AM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-11A | MW-05 | 11/04/15 11:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-05 | 11/04/15 11:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | MW-05 | 11/04/15 11:05 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-11D | MW-05 | 11/04/15 11:05 AM | Aqueous | E300 | Anion Preparation | 11/10/15 09:47 AM | 72247 |
| | MW-05 | 11/04/15 11:05 AM | Aqueous | E300 | Anion Preparation | 11/10/15 09:47 AM | 72247 |
| | MW-05 | 11/04/15 11:05 AM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | MW-05 | 11/04/15 11:05 AM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |

**Lab Order:** 1511075
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1511075-12A | FGD-12 | 11/04/15 11:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-12 | 11/04/15 11:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-12 | 11/04/15 11:55 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-12D | FGD-12 | 11/04/15 11:55 AM | Aqueous | E300 | Anion Preparation | 11/10/15 09:47 AM | 72247 |
| | FGD-12 | 11/04/15 11:55 AM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | FGD-12 | 11/04/15 11:55 AM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-13A | FGD-11 | 11/04/15 01:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-11 | 11/04/15 01:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-11 | 11/04/15 01:00 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-13D | FGD-11 | 11/04/15 01:00 PM | Aqueous | E300 | Anion Preparation | 11/10/15 09:47 AM | 72247 |
| | FGD-11 | 11/04/15 01:00 PM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | FGD-11 | 11/04/15 01:00 PM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-14A | FGD-6 | 11/04/15 01:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-6 | 11/04/15 01:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-6 | 11/04/15 01:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-6 | 11/04/15 01:55 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-14D | FGD-6 | 11/04/15 01:55 PM | Aqueous | E300 | Anion Preparation | 11/10/15 09:47 AM | 72247 |
| | FGD-6 | 11/04/15 01:55 PM | Aqueous | E300 | Anion Preparation | 11/10/15 09:47 AM | 72247 |
| | FGD-6 | 11/04/15 01:55 PM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | FGD-6 | 11/04/15 01:55 PM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |
| 1511075-15A | FGD-8 | 11/04/15 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-8 | 11/04/15 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-8 | 11/04/15 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 11/10/15 09:11 AM | 72244 |
| | FGD-8 | 11/04/15 02:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 11/10/15 12:54 PM | 72254 |
| 1511075-15D | FGD-8 | 11/04/15 02:50 PM | Aqueous | E300 | Anion Preparation | 11/10/15 09:47 AM | 72247 |
| | FGD-8 | 11/04/15 02:50 PM | Aqueous | E300 | Anion Preparation | 11/10/15 09:47 AM | 72247 |
| | FGD-8 | 11/04/15 02:50 PM | Aqueous | M4500-H+ B | pH Preparation | 11/11/15 08:27 AM | 72258 |
| | FGD-8 | 11/04/15 02:50 PM | Aqueous | M2540C | TDS Preparation | 11/09/15 12:18 PM | 72232 |

**Lab Order:** 1511075
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1511075-01A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 03:46 PM | CETAC2_HG_151113C |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 01:44 PM | ICP-MS3_151118A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 12:21 PM | ICP-MS4_151111C |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 10 | 11/11/15 01:57 PM | ICP-MS4_151111C |
| 1511075-01D | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 72226 | 1 | 11/09/15 11:55 AM | IC3_151109A |
| | FGD-1 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:27 AM | TITRATOR_151111A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-02A | MW-09 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 03:57 PM | CETAC2_HG_151113C |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 01:57 PM | ICP-MS3_151118A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 12:34 PM | ICP-MS4_151111C |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 10 | 11/11/15 02:01 PM | ICP-MS4_151111C |
| 1511075-02D | MW-09 | Aqueous | E300 | Anions by IC method - Water | 72226 | 1 | 11/09/15 12:19 PM | IC3_151109A |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 72226 | 10 | 11/09/15 04:42 PM | IC3_151109A |
| | MW-09 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:30 AM | TITRATOR_151111A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-03A | MW-07 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 03:59 PM | CETAC2_HG_151113C |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 02:03 PM | ICP-MS3_151118A |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 12:36 PM | ICP-MS4_151111C |
| 1511075-03D | MW-07 | Aqueous | E300 | Anions by IC method - Water | 72226 | 1 | 11/09/15 12:39 PM | IC3_151109A |
| | MW-07 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:31 AM | TITRATOR_151111A |
| | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-04A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:02 PM | CETAC2_HG_151113C |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 02:09 PM | ICP-MS3_151118A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 12:38 PM | ICP-MS4_151111C |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 10 | 11/11/15 02:03 PM | ICP-MS4_151111C |
| 1511075-04D | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 72226 | 1 | 11/09/15 01:00 PM | IC3_151109A |

**Lab Order:** 1511075
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1511075-04D | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 72226 | 100 | 11/09/15 05:06 PM | IC3_151109A |
| | FGD-2 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:32 AM | TITRATOR_151111A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-05A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:04 PM | CETAC2_HG_151113C |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 02:15 PM | ICP-MS3_151118A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 12:40 PM | ICP-MS4_151111C |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 50 | 11/11/15 02:05 PM | ICP-MS4_151111C |
| 1511075-05D | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 72226 | 1 | 11/09/15 01:21 PM | IC3_151109A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 72226 | 100 | 11/09/15 05:27 PM | IC3_151109A |
| | FGD-3 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:35 AM | TITRATOR_151111A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-06A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:06 PM | CETAC2_HG_151113C |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 02:21 PM | ICP-MS3_151118A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 01:12 PM | ICP-MS4_151111C |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 10 | 11/11/15 02:07 PM | ICP-MS4_151111C |
| 1511075-06D | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 72226 | 1 | 11/09/15 01:41 PM | IC3_151109A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 72226 | 10 | 11/09/15 06:29 PM | IC3_151109A |
| | FGD-4 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:36 AM | TITRATOR_151111A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-07A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:08 PM | CETAC2_HG_151113C |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 02:27 PM | ICP-MS3_151118A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 01:14 PM | ICP-MS4_151111C |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 10 | 11/11/15 02:09 PM | ICP-MS4_151111C |
| 1511075-07D | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 72226 | 1 | 11/09/15 02:02 PM | IC3_151109A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 72226 | 100 | 11/09/15 06:49 PM | IC3_151109A |
| | FGD-5 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:38 AM | TITRATOR_151111A |

**Lab Order:** 1511075
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1511075-07D | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-08A | AL-10 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:11 PM | CETAC2_HG_151113C |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 01:16 PM | ICP-MS4_151111C |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 10 | 11/11/15 02:11 PM | ICP-MS4_151111C |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 02:33 PM | ICP-MS3_151118A |
| 1511075-08D | AL-10 | Aqueous | E300 | Anions by IC method - Water | 72226 | 1 | 11/09/15 02:23 PM | IC3_151109A |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 72226 | 10 | 11/09/15 07:10 PM | IC3_151109A |
| | AL-10 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:41 AM | TITRATOR_151111A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-09A | MW-02 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:13 PM | CETAC2_HG_151113C |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 02:39 PM | ICP-MS3_151118A |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 01:18 PM | ICP-MS4_151111C |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 10 | 11/11/15 02:13 PM | ICP-MS4_151111C |
| 1511075-09D | MW-02 | Aqueous | E300 | Anions by IC method - Water | 72226 | 1 | 11/09/15 02:43 PM | IC3_151109A |
| | MW-02 | Aqueous | E300 | Anions by IC method - Water | 72226 | 10 | 11/09/15 07:30 PM | IC3_151109A |
| | MW-02 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:43 AM | TITRATOR_151111A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-10A | MW-08 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:15 PM | CETAC2_HG_151113C |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 50 | 11/11/15 02:15 PM | ICP-MS4_151111C |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 02:45 PM | ICP-MS3_151118A |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 01:20 PM | ICP-MS4_151111C |
| 1511075-10D | MW-08 | Aqueous | E300 | Anions by IC method - Water | 72226 | 1 | 11/09/15 03:04 PM | IC3_151109A |
| | MW-08 | Aqueous | E300 | Anions by IC method - Water | 72226 | 100 | 11/09/15 07:51 PM | IC3_151109A |
| | MW-08 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:47 AM | TITRATOR_151111A |
| | MW-08 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-11A | MW-05 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:22 PM | CETAC2_HG_151113C |

**Lab Order:** 1511075
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1511075-11A | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 03:45 PM | ICP-MS3_151118A |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 01:22 PM | ICP-MS4_151111C |
| 1511075-11D | MW-05 | Aqueous | E300 | Anions by IC method - Water | 72247 | 1 | 11/10/15 11:47 AM | IC2_151110A |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 72247 | 10 | 11/10/15 01:07 PM | IC2_151110A |
| | MW-05 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:49 AM | TITRATOR_151111A |
| | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-12A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:24 PM | CETAC2_HG_151113C |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 03:51 PM | ICP-MS3_151118A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 01:24 PM | ICP-MS4_151111C |
| 1511075-12D | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 72247 | 1 | 11/10/15 12:01 PM | IC2_151110A |
| | FGD-12 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:51 AM | TITRATOR_151111A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-13A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:27 PM | CETAC2_HG_151113C |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 03:57 PM | ICP-MS3_151118A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 01:26 PM | ICP-MS4_151111C |
| 1511075-13D | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 72247 | 1 | 11/10/15 12:16 PM | IC2_151110A |
| | FGD-11 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:53 AM | TITRATOR_151111A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |
| 1511075-14A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:29 PM | CETAC2_HG_151113C |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 04:03 PM | ICP-MS3_151118A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 01:28 PM | ICP-MS4_151111C |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 10 | 11/11/15 02:17 PM | ICP-MS4_151111C |
| 1511075-14D | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 72247 | 1 | 11/10/15 12:30 PM | IC2_151110A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 72247 | 10 | 11/10/15 01:21 PM | IC2_151110A |
| | FGD-6 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:56 AM | TITRATOR_151111A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |

**Lab Order:** 1511075
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1511075-15A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 72254 | 1 | 11/13/15 04:31 PM | CETAC2_HG_151113C |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/18/15 04:10 PM | ICP-MS3_151118A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 1 | 11/11/15 01:30 PM | ICP-MS4_151111C |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72244 | 10 | 11/11/15 02:29 PM | ICP-MS4_151111C |
| 1511075-15D | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 72247 | 1 | 11/10/15 12:45 PM | IC2_151110A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 72247 | 10 | 11/10/15 01:36 PM | IC2_151110A |
| | FGD-8 | Aqueous | M4500-H+ B | pH | 72258 | 1 | 11/11/15 09:59 AM | TITRATOR_151111A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 72232 | 1 | 11/10/15 09:00 AM | WC_151109B |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-01 |
| **Project No:** | 5164-D | **Collection Date:** | 11/03/15 10:50 AM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 03:46 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 12:21 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:21 PM |
| Barium | 0.0311 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 12:21 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:21 PM |
| Boron | 0.0650 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 12:21 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:21 PM |
| Calcium | 11.0 | 1.00 | 3.00 | | mg/L | 10 | 11/11/15 01:57 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:21 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 01:44 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:21 PM |
| Lithium | 0.0340 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 01:44 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:21 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:21 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 12:21 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 36.4 | 0.300 | 1.00 | | mg/L | 1 | 11/09/15 11:55 AM |
| Fluoride | 0.363 | 0.100 | 0.400 | J | mg/L | 1 | 11/09/15 11:55 AM |
| Sulfate | 32.0 | 1.00 | 3.00 | | mg/L | 1 | 11/09/15 11:55 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.80 | 0 | 0 | | pH Units@12.9℃ | 1 | 11/11/15 09:27 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 245 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-09 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-02 |
| **Project No:** | 5164-D | **Collection Date:** | 11/03/15 11:50 AM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 03:57 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 12:34 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:34 PM |
| Barium | 0.0983 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 12:34 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:34 PM |
| Boron | 0.0722 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 12:34 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:34 PM |
| Calcium | 36.4 | 1.00 | 3.00 | | mg/L | 10 | 11/11/15 02:01 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:34 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 01:57 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:34 PM |
| Lithium | 0.0524 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 01:57 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:34 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:34 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 12:34 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 155 | 3.00 | 10.0 | | mg/L | 10 | 11/09/15 04:42 PM |
| Fluoride | 0.149 | 0.100 | 0.400 | J | mg/L | 1 | 11/09/15 12:19 PM |
| Sulfate | 74.9 | 1.00 | 3.00 | | mg/L | 1 | 11/09/15 12:19 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.44 | 0 | 0 | | pH Units@13.2℃ | 1 | 11/11/15 09:30 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 583 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-07 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-03 |
| **Project No:** | 5164-D | **Collection Date:** | 11/03/15 12:40 PM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 03:59 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 12:36 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:36 PM |
| Barium | 0.0425 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 12:36 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:36 PM |
| Boron | 0.0483 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 12:36 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:36 PM |
| Calcium | 8.57 | 0.100 | 0.300 | | mg/L | 1 | 11/11/15 12:36 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:36 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 02:03 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:36 PM |
| Lithium | 0.0136 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 02:03 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:36 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:36 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 12:36 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 20.2 | 0.300 | 1.00 | | mg/L | 1 | 11/09/15 12:39 PM |
| Fluoride | 0.289 | 0.100 | 0.400 | J | mg/L | 1 | 11/09/15 12:39 PM |
| Sulfate | 11.5 | 1.00 | 3.00 | | mg/L | 1 | 11/09/15 12:39 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 7.02 | 0 | 0 | | pH Units@13.4℃ | 1 | 11/11/15 09:31 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 276 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-04 |
| **Project No:** | 5164-D | **Collection Date:** | 11/03/15 02:15 PM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:02 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 12:38 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:38 PM |
| Barium | 0.146 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 12:38 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:38 PM |
| Boron | 0.100 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 12:38 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:38 PM |
| Calcium | 77.1 | 1.00 | 3.00 | | mg/L | 10 | 11/11/15 02:03 PM |
| Chromium | 0.00244 | 0.00200 | 0.00500 | J | mg/L | 1 | 11/11/15 12:38 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 02:09 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:38 PM |
| Lithium | 0.0224 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 02:09 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:38 PM |
| Selenium | 0.0203 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:38 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 12:38 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 460 | 30.0 | 100 | | mg/L | 100 | 11/09/15 05:06 PM |
| Fluoride | 0.224 | 0.100 | 0.400 | J | mg/L | 1 | 11/09/15 01:00 PM |
| Sulfate | 147 | 1.00 | 3.00 | | mg/L | 1 | 11/09/15 01:00 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.86 | 0 | 0 | | pH Units@13.7℃ | 1 | 11/11/15 09:32 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 1370 | 50.0 | 50.0 | | mg/L | 1 | 11/10/15 09:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-05 |
| **Project No:** | 5164-D | **Collection Date:** | 11/03/15 03:05 PM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:04 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 12:40 PM |
| Arsenic | 0.00226 | 0.00200 | 0.00500 | J | mg/L | 1 | 11/11/15 12:40 PM |
| Barium | 0.0417 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 12:40 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:40 PM |
| Boron | 0.343 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 12:40 PM |
| Cadmium | 0.00492 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:40 PM |
| Calcium | 108 | 5.00 | 15.0 | | mg/L | 50 | 11/11/15 02:05 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:40 PM |
| Cobalt | 0.0436 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 02:15 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 12:40 PM |
| Lithium | 0.176 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 02:15 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:40 PM |
| Selenium | 0.0881 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 12:40 PM |
| Thallium | 0.00170 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 12:40 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 439 | 30.0 | 100 | | mg/L | 100 | 11/09/15 05:27 PM |
| Fluoride | 0.505 | 0.100 | 0.400 | | mg/L | 1 | 11/09/15 01:21 PM |
| Sulfate | 479 | 100 | 300 | | mg/L | 100 | 11/09/15 05:27 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.52 | 0 | 0 | | pH Units@14℃ | 1 | 11/11/15 09:35 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 1950 | 50.0 | 50.0 | | mg/L | 1 | 11/10/15 09:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-06 |
| **Project No:** | 5164-D | **Collection Date:** | 11/03/15 04:00 PM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:06 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 01:12 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:12 PM |
| Barium | 0.126 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 01:12 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:12 PM |
| Boron | 0.0694 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 01:12 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:12 PM |
| Calcium | 46.1 | 1.00 | 3.00 | | mg/L | 10 | 11/11/15 02:07 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:12 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 02:21 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:12 PM |
| Lithium | 0.0433 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 02:21 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:12 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:12 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 01:12 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 200 | 3.00 | 10.0 | | mg/L | 10 | 11/09/15 06:29 PM |
| Fluoride | 0.294 | 0.100 | 0.400 | J | mg/L | 1 | 11/09/15 01:41 PM |
| Sulfate | 37.8 | 1.00 | 3.00 | | mg/L | 1 | 11/09/15 01:41 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.91 | 0 | 0 | | pH Units@14.4℃ | 1 | 11/11/15 09:36 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 679 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-07 |
| **Project No:** | 5164-D | **Collection Date:** | 11/03/15 04:50 PM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:08 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 01:14 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:14 PM |
| Barium | 0.124 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 01:14 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:14 PM |
| Boron | 0.0719 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 01:14 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:14 PM |
| Calcium | 30.2 | 1.00 | 3.00 | | mg/L | 10 | 11/11/15 02:09 PM |
| Chromium | 0.00253 | 0.00200 | 0.00500 | J | mg/L | 1 | 11/11/15 01:14 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 02:27 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:14 PM |
| Lithium | 0.0112 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 02:27 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:14 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:14 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 01:14 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 230 | 30.0 | 100 | | mg/L | 100 | 11/09/15 06:49 PM |
| Fluoride | 0.334 | 0.100 | 0.400 | J | mg/L | 1 | 11/09/15 02:02 PM |
| Sulfate | 54.7 | 1.00 | 3.00 | | mg/L | 1 | 11/09/15 02:02 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 7.01 | 0 | 0 | | pH Units@14.6℃ | 1 | 11/11/15 09:38 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 1040 | 50.0 | 50.0 | | mg/L | 1 | 11/10/15 09:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | AL-10 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-08 |
| **Project No:** | 5164-D | **Collection Date:** | 11/04/15 08:15 AM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:11 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 01:16 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:16 PM |
| Barium | 0.0933 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 01:16 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:16 PM |
| Boron | 0.0682 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 01:16 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:16 PM |
| Calcium | 34.5 | 1.00 | 3.00 | | mg/L | 10 | 11/11/15 02:11 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:16 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 02:33 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:16 PM |
| Lithium | 0.0515 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 02:33 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:16 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:16 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 01:16 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 149 | 3.00 | 10.0 | | mg/L | 10 | 11/09/15 07:10 PM |
| Fluoride | 0.149 | 0.100 | 0.400 | J | mg/L | 1 | 11/09/15 02:23 PM |
| Sulfate | 72.6 | 1.00 | 3.00 | | mg/L | 1 | 11/09/15 02:23 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.49 | 0 | 0 | | pH Units@15.2℃ | 1 | 11/11/15 09:41 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 590 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-02 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-09 |
| **Project No:** | 5164-D | **Collection Date:** | 11/04/15 09:05 AM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:13 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 01:18 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:18 PM |
| Barium | 0.0813 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 01:18 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:18 PM |
| Boron | 0.0640 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 01:18 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:18 PM |
| Calcium | 32.5 | 1.00 | 3.00 | | mg/L | 10 | 11/11/15 02:13 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:18 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 02:39 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:18 PM |
| Lithium | 0.0471 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 02:39 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:18 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:18 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 01:18 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 138 | 3.00 | 10.0 | | mg/L | 10 | 11/09/15 07:30 PM |
| Fluoride | 0.135 | 0.100 | 0.400 | J | mg/L | 1 | 11/09/15 02:43 PM |
| Sulfate | 71.4 | 1.00 | 3.00 | | mg/L | 1 | 11/09/15 02:43 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.52 | 0 | 0 | | pH Units@15.6℃ | 1 | 11/11/15 09:43 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 539 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-08 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-10 |
| **Project No:** | 5164-D | **Collection Date:** | 11/04/15 10:10 AM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | 0.000430 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:15 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 01:20 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:20 PM |
| Barium | 0.114 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 01:20 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:20 PM |
| Boron | 0.0631 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 01:20 PM |
| Cadmium | 0.000441 | 0.000300 | 0.00100 | J | mg/L | 1 | 11/11/15 01:20 PM |
| Calcium | 120 | 5.00 | 15.0 | | mg/L | 50 | 11/11/15 02:15 PM |
| Chromium | 0.399 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:20 PM |
| Cobalt | 0.0116 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 02:45 PM |
| Lead | 0.000714 | 0.000300 | 0.00100 | J | mg/L | 1 | 11/11/15 01:20 PM |
| Lithium | 0.0955 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 02:45 PM |
| Molybdenum | 0.0277 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:20 PM |
| Selenium | 0.0318 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:20 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 01:20 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 599 | 30.0 | 100 | | mg/L | 100 | 11/09/15 07:51 PM |
| Fluoride | 0.170 | 0.100 | 0.400 | J | mg/L | 1 | 11/09/15 03:04 PM |
| Sulfate | 138 | 1.00 | 3.00 | | mg/L | 1 | 11/09/15 03:04 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.47 | 0 | 0 | | pH Units@15.9℃ | 1 | 11/11/15 09:47 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 2070 | 50.0 | 50.0 | | mg/L | 1 | 11/10/15 09:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-05 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-11 |
| **Project No:** | 5164-D | **Collection Date:** | 11/04/15 11:05 AM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:22 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 01:22 PM |
| Arsenic | 0.00348 | 0.00200 | 0.00500 | J | mg/L | 1 | 11/11/15 01:22 PM |
| Barium | 0.0395 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 01:22 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:22 PM |
| Boron | 0.0628 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 01:22 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:22 PM |
| Calcium | 15.4 | 0.100 | 0.300 | | mg/L | 1 | 11/18/15 03:45 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:22 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 03:45 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:22 PM |
| Lithium | 0.0466 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 03:45 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:22 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:22 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 01:22 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 64.8 | 3.00 | 10.0 | | mg/L | 10 | 11/10/15 01:07 PM |
| Fluoride | 0.272 | 0.100 | 0.400 | J | mg/L | 1 | 11/10/15 11:47 AM |
| Sulfate | 13.6 | 1.00 | 3.00 | | mg/L | 1 | 11/10/15 11:47 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 7.10 | 0 | 0 | | pH Units@16.1℃ | 1 | 11/11/15 09:49 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 285 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-12 |
| **Project No:** | 5164-D | **Collection Date:** | 11/04/15 11:55 AM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:24 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 01:24 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:24 PM |
| Barium | 0.0884 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 01:24 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:24 PM |
| Boron | 0.0651 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 01:24 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:24 PM |
| Calcium | 16.6 | 0.100 | 0.300 | | mg/L | 1 | 11/18/15 03:51 PM |
| Chromium | 0.0124 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:24 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 03:51 PM |
| Lead | 0.000678 | 0.000300 | 0.00100 | J | mg/L | 1 | 11/11/15 01:24 PM |
| Lithium | 0.0234 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 03:51 PM |
| Molybdenum | 0.00221 | 0.00200 | 0.00500 | J | mg/L | 1 | 11/11/15 01:24 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:24 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 01:24 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 19.4 | 0.300 | 1.00 | | mg/L | 1 | 11/10/15 12:01 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 11/10/15 12:01 PM |
| Sulfate | 20.0 | 1.00 | 3.00 | | mg/L | 1 | 11/10/15 12:01 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 7.10 | 0 | 0 | | pH Units@15.7℃ | 1 | 11/11/15 09:51 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 217 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-13 |
| **Project No:** | 5164-D | **Collection Date:** | 11/04/15 01:00 PM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:27 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 01:26 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:26 PM |
| Barium | 0.0527 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 01:26 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:26 PM |
| Boron | 0.0480 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 01:26 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:26 PM |
| Calcium | 9.57 | 0.100 | 0.300 | | mg/L | 1 | 11/11/15 01:26 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:26 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 03:57 PM |
| Lead | 0.000727 | 0.000300 | 0.00100 | J | mg/L | 1 | 11/11/15 01:26 PM |
| Lithium | 0.0144 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 03:57 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:26 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:26 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 01:26 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 15.0 | 0.300 | 1.00 | | mg/L | 1 | 11/10/15 12:16 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 11/10/15 12:16 PM |
| Sulfate | 9.96 | 1.00 | 3.00 | | mg/L | 1 | 11/10/15 12:16 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 7.06 | 0 | 0 | | pH Units@15.6℃ | 1 | 11/11/15 09:53 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 145 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-14 |
| **Project No:** | 5164-D | **Collection Date:** | 11/04/15 01:55 PM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:29 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 01:28 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:28 PM |
| Barium | 0.130 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 01:28 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:28 PM |
| Boron | 0.0968 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 01:28 PM |
| Cadmium | 0.000557 | 0.000300 | 0.00100 | J | mg/L | 1 | 11/11/15 01:28 PM |
| Calcium | 79.3 | 1.00 | 3.00 | | mg/L | 10 | 11/11/15 02:17 PM |
| Chromium | 0.0121 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:28 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 04:03 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:28 PM |
| Lithium | 0.170 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 04:03 PM |
| Molybdenum | 0.0445 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:28 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:28 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 01:28 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 355 | 3.00 | 10.0 | | mg/L | 10 | 11/10/15 01:21 PM |
| Fluoride | 0.227 | 0.100 | 0.400 | J | mg/L | 1 | 11/10/15 12:30 PM |
| Sulfate | 33.8 | 1.00 | 3.00 | | mg/L | 1 | 11/10/15 12:30 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 7.29 | 0 | 0 | | pH Units@16.1℃ | 1 | 11/11/15 09:56 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 1070 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *14-Dec-15*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1511075-15 |
| **Project No:** | 5164-D | **Collection Date:** | 11/04/15 02:50 PM |
| **Lab Order:** | 1511075 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 11/13/15 04:31 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 11/11/15 01:30 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:30 PM |
| Barium | 0.119 | 0.00300 | 0.0100 | | mg/L | 1 | 11/11/15 01:30 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:30 PM |
| Boron | 0.0843 | 0.0100 | 0.0300 | | mg/L | 1 | 11/11/15 01:30 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:30 PM |
| Calcium | 69.2 | 1.00 | 3.00 | | mg/L | 10 | 11/11/15 02:29 PM |
| Chromium | 0.00542 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:30 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 11/18/15 04:10 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 11/11/15 01:30 PM |
| Lithium | 0.149 | 0.00500 | 0.0100 | | mg/L | 1 | 11/18/15 04:10 PM |
| Molybdenum | 0.0261 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:30 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 11/11/15 01:30 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 11/11/15 01:30 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 271 | 3.00 | 10.0 | | mg/L | 10 | 11/10/15 01:36 PM |
| Fluoride | 0.173 | 0.100 | 0.400 | J | mg/L | 1 | 11/10/15 12:45 PM |
| Sulfate | 24.4 | 1.00 | 3.00 | | mg/L | 1 | 11/10/15 12:45 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 7.38 | 0 | 0 | | pH Units@16.8℃ | 1 | 11/11/15 09:59 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 803 | 10.0 | 10.0 | | mg/L | 1 | 11/10/15 09:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_151113C**

The QC data in batch 72254 applies to the following samples: 1511075-01A, 1511075-02A, 1511075-03A, 1511075-04A, 1511075-05A, 1511075-06A, 1511075-07A, 1511075-08A, 1511075-09A, 1511075-10A, 1511075-11A, 1511075-12A, 1511075-13A, 1511075-14A, 1511075-15A

| Sample ID | **MB-72254** | Batch ID: | **72254** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 3:39:21 PM** | Prep Date: | **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-72254** | Batch ID: | **72254** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 3:41:37 PM** | Prep Date: | **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00204 | 0.000200 | 0.00200 | 0 | 102 | 85 | 115 | | | |

| Sample ID | **LCSD-72254** | Batch ID: | **72254** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 3:43:52 PM** | Prep Date: | **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00206 | 0.000200 | 0.00200 | 0 | 103 | 85 | 115 | 0.976 | 15 | |

| Sample ID | **1511075-01A SD** | Batch ID: | **72254** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 3:48:25 PM** | Prep Date: | **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1511075-01A PDS** | Batch ID: | **72254** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 3:50:40 PM** | Prep Date: | **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00247 | 0.000200 | 0.00250 | 0 | 98.8 | 85 | 115 | | | |

| Sample ID | **1511075-01A MS** | Batch ID: | **72254** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 3:52:56 PM** | Prep Date: | **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00208 | 0.000200 | 0.00200 | 0 | 104 | 80 | 120 | | | |

| Sample ID | **1511075-01A MSD** | Batch ID: | **72254** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 3:55:12 PM** | Prep Date: | **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00208 | 0.000200 | 0.00200 | 0 | 104 | 80 | 120 | 0 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_151113C**

| Sample ID | **ICV-151113** | Batch ID: | **R82670** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 1:38:46 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00386 | 0.000200 | 0.00400 | 0 | 96.5 | 90 | 110 | | | |

| Sample ID | **CCV3-151113** | Batch ID: | **R82670** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 3:34:48 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00196 | 0.000200 | 0.00200 | 0 | 98.0 | 90 | 110 | | | |

| Sample ID | **CCV4-151113** | Batch ID: | **R82670** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 4:17:55 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00197 | 0.000200 | 0.00200 | 0 | 98.5 | 90 | 110 | | | |

| Sample ID | **CCV5-151113** | Batch ID: | **R82670** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_151113C** | Analysis Date: | **11/13/2015 4:33:53 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00196 | 0.000200 | 0.00200 | 0 | 98.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_151118A**

The QC data in batch 72244 applies to the following samples: 1511075-01A, 1511075-02A, 1511075-03A, 1511075-04A, 1511075-05A, 1511075-06A, 1511075-07A, 1511075-08A, 1511075-09A, 1511075-10A, 1511075-11A, 1511075-12A, 1511075-13A, 1511075-14A, 1511075-15A

Sample ID **MB-72244** Batch ID: **72244** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS3_151118A** Analysis Date: **11/18/2015 1:20:00 PM** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |

Sample ID **LCS-72244** Batch ID: **72244** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS3_151118A** Analysis Date: **11/18/2015 1:26:00 PM** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.194 | 0.00500 | 0.200 | 0 | 96.8 | 80 | 120 | | | |
| Lithium | 0.197 | 0.0100 | 0.200 | 0 | 98.4 | 80 | 120 | | | |

Sample ID **LCSD-72244** Batch ID: **72244** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS3_151118A** Analysis Date: **11/18/2015 1:32:00 PM** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.197 | 0.00500 | 0.200 | 0 | 98.7 | 80 | 120 | 1.89 | 15 | |
| Lithium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 80 | 120 | 1.76 | 15 | |

Sample ID **1511075-01A SD** Batch ID: **72244** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS3_151118A** Analysis Date: **11/18/2015 1:51:00 PM** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.0338 | 0.0500 | 0 | 0.0340 | | | | 0.605 | 10 | |

Sample ID **1511075-01A PDS** Batch ID: **72244** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS3_151118A** Analysis Date: **11/18/2015 2:51:00 PM** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.216 | 0.00500 | 0.200 | 0 | 108 | 80 | 120 | | | |
| Lithium | 0.240 | 0.0100 | 0.200 | 0.0340 | 103 | 80 | 120 | | | |

Sample ID **1511075-01A MS** Batch ID: **72244** TestNo: **SW6020A** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS3_151118A** Analysis Date: **11/18/2015 2:57:00 PM** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 80 | 120 | | | |
| Lithium | 0.235 | 0.0100 | 0.200 | 0.0340 | 101 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_151118A**

Sample ID **1511075-01A MSD** Batch ID: **72244** TestNo: **SW6020A** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS3_151118A** Analysis Date: **11/18/2015 3:03:00 PM** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 2.15 | 15 | |
| Lithium | 0.239 | 0.0100 | 0.200 | 0.0340 | 103 | 80 | 120 | 1.77 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_151118A**

| Sample ID | **ICV1-151118** | Batch ID: | **R82720** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **ICP-MS3_151118A** | Analysis Date: | **11/18/2015 12:50:00 P** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.44 | 0.300 | 2.50 | 0 | 97.6 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Lithium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |

| Sample ID | **ILCVL-151118** | Batch ID: | **R82720** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS3_151118A** | Analysis Date: | **11/18/2015 1:08:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0968 | 0.300 | 0.100 | 0 | 96.8 | 70 | 130 | | | |
| Cobalt | 0.00521 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |

| Sample ID | **CCV1-151118** | Batch ID: | **R82720** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS3_151118A** | Analysis Date: | **11/18/2015 3:27:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.80 | 0.300 | 5.00 | 0 | 95.9 | 90 | 110 | | | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Lithium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |

| Sample ID | **LCVL1-151118** | Batch ID: | **R82720** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS3_151118A** | Analysis Date: | **11/18/2015 3:39:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.104 | 0.300 | 0.100 | 0 | 104 | 70 | 130 | | | |
| Cobalt | 0.00549 | 0.00500 | 0.00500 | 0 | 110 | 70 | 130 | | | |
| Lithium | 0.0110 | 0.0100 | 0.0100 | 0 | 110 | 70 | 130 | | | |

| Sample ID | **CCV2-151118** | Batch ID: | **R82720** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS3_151118A** | Analysis Date: | **11/18/2015 4:16:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.59 | 0.300 | 5.00 | 0 | 91.9 | 90 | 110 | | | |
| Cobalt | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 90 | 110 | | | |
| Lithium | 0.197 | 0.0100 | 0.200 | 0 | 98.4 | 90 | 110 | | | |

| Sample ID | **LCVL2-151118** | Batch ID: | **R82720** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS3_151118A** | Analysis Date: | **11/18/2015 4:28:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.103 | 0.300 | 0.100 | 0 | 103 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_151118A**

Sample ID **LCVL2-151118** Batch ID: **R82720** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS3_151118A** Analysis Date: **11/18/2015 4:28:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.00539 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Lithium | 0.0105 | 0.0100 | 0.0100 | 0 | 105 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_151111C**

The QC data in batch 72244 applies to the following samples: 1511075-01A, 1511075-02A, 1511075-03A, 1511075-04A, 1511075-05A, 1511075-06A, 1511075-07A, 1511075-08A, 1511075-09A, 1511075-10A, 1511075-11A, 1511075-12A, 1511075-13A, 1511075-14A, 1511075-15A

Sample ID **MB-72244** Batch ID: **72244** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_151111C** Analysis Date: **11/11/2015 12:11:00 P** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | 0.0218 | 0.0300 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-72244** Batch ID: **72244** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_151111C** Analysis Date: **11/11/2015 12:15:00 P** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 98.8 | 80 | 120 | | | |
| Arsenic | 0.195 | 0.00500 | 0.200 | 0 | 97.7 | 80 | 120 | | | |
| Barium | 0.191 | 0.0100 | 0.200 | 0 | 95.6 | 80 | 120 | | | |
| Beryllium | 0.190 | 0.00100 | 0.200 | 0 | 94.9 | 80 | 120 | | | |
| Boron | 0.211 | 0.0300 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0 | 96.2 | 80 | 120 | | | |
| Calcium | 4.83 | 0.300 | 5.00 | 0 | 96.6 | 80 | 120 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 95.9 | 80 | 120 | | | |
| Molybdenum | 0.188 | 0.00500 | 0.200 | 0 | 93.8 | 80 | 120 | | | |
| Selenium | 0.194 | 0.00500 | 0.200 | 0 | 97.2 | 80 | 120 | | | |
| Thallium | 0.191 | 0.00150 | 0.200 | 0 | 95.4 | 80 | 120 | | | |

Sample ID **LCSD-72244** Batch ID: **72244** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_151111C** Analysis Date: **11/11/2015 12:17:00 P** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.196 | 0.00250 | 0.200 | 0 | 98.1 | 80 | 120 | 0.658 | 15 | |
| Arsenic | 0.196 | 0.00500 | 0.200 | 0 | 97.8 | 80 | 120 | 0.169 | 15 | |
| Barium | 0.192 | 0.0100 | 0.200 | 0 | 95.8 | 80 | 120 | 0.189 | 15 | |
| Beryllium | 0.192 | 0.00100 | 0.200 | 0 | 95.9 | 80 | 120 | 1.04 | 15 | |
| Boron | 0.210 | 0.0300 | 0.200 | 0 | 105 | 80 | 120 | 0.587 | 15 | |

**Qualifiers:**

| | |
|---|---|
| B | Analyte detected in the associated Method Blank |
| J | Analyte detected between MDL and RL |
| ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit |
| J | Analyte detected between SDL and RL |
| DF | Dilution Factor |
| MDL | Method Detection Limit |
| R | RPD outside accepted control limits |
| S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_151111C**

| Sample ID **LCSD-72244** | Batch ID: **72244** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 12:17:00 P** | Prep Date: **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.196 | 0.00100 | 0.200 | 0 | 97.9 | 80 | 120 | 1.74 | 15 | |
| Calcium | 4.74 | 0.300 | 5.00 | 0 | 94.8 | 80 | 120 | 1.91 | 15 | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 1.30 | 15 | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 96.9 | 80 | 120 | 1.10 | 15 | |
| Molybdenum | 0.191 | 0.00500 | 0.200 | 0 | 95.4 | 80 | 120 | 1.69 | 15 | |
| Selenium | 0.193 | 0.00500 | 0.200 | 0 | 96.3 | 80 | 120 | 0.871 | 15 | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 97.9 | 80 | 120 | 2.57 | 15 | |

| Sample ID **1511075-01A SD** | Batch ID: **72244** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 12:23:00 P** | Prep Date: **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0308 | 0.0500 | 0 | 0.0311 | | | | 0.982 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Boron | 0.0663 | 0.150 | 0 | 0.0650 | | | | 2.01 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1511075-01A PDS** | Batch ID: **72244** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 12:42:00 P** | Prep Date: **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.185 | 0.00250 | 0.200 | 0 | 92.7 | 80 | 120 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Barium | 0.229 | 0.0100 | 0.200 | 0.0311 | 98.8 | 80 | 120 | | | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.7 | 80 | 120 | | | |
| Boron | 0.250 | 0.0300 | 0.200 | 0.0650 | 92.7 | 80 | 120 | | | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Chromium | 0.209 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Molybdenum | 0.192 | 0.00500 | 0.200 | 0 | 96.1 | 80 | 120 | | | |
| Selenium | 0.198 | 0.00500 | 0.200 | 0 | 98.8 | 80 | 120 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.4 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_151111C**

| Sample ID **1511075-01A MS** | Batch ID: **72244** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 12:44:00 P** | Prep Date: **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 98.8 | 80 | 120 | | | |
| Arsenic | 0.191 | 0.00500 | 0.200 | 0 | 95.3 | 80 | 120 | | | |
| Barium | 0.220 | 0.0100 | 0.200 | 0.0311 | 94.3 | 80 | 120 | | | |
| Beryllium | 0.186 | 0.00100 | 0.200 | 0 | 93.0 | 80 | 120 | | | |
| Boron | 0.253 | 0.0300 | 0.200 | 0.0650 | 93.8 | 80 | 120 | | | |
| Cadmium | 0.189 | 0.00100 | 0.200 | 0 | 94.6 | 80 | 120 | | | |
| Calcium | 15.0 | 0.300 | 5.00 | 11.2 | 77.0 | 80 | 120 | | | S |
| Chromium | 0.192 | 0.00500 | 0.200 | 0 | 96.0 | 80 | 120 | | | |
| Lead | 0.181 | 0.00100 | 0.200 | 0 | 90.7 | 80 | 120 | | | |
| Molybdenum | 0.186 | 0.00500 | 0.200 | 0 | 92.9 | 80 | 120 | | | |
| Selenium | 0.187 | 0.00500 | 0.200 | 0 | 93.3 | 80 | 120 | | | |
| Thallium | 0.181 | 0.00150 | 0.200 | 0 | 90.6 | 80 | 120 | | | |

| Sample ID **1511075-01A MSD** | Batch ID: **72244** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 12:46:00 P** | Prep Date: **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | 2.06 | 15 | |
| Arsenic | 0.196 | 0.00500 | 0.200 | 0 | 97.9 | 80 | 120 | 2.69 | 15 | |
| Barium | 0.222 | 0.0100 | 0.200 | 0.0311 | 95.3 | 80 | 120 | 0.903 | 15 | |
| Beryllium | 0.188 | 0.00100 | 0.200 | 0 | 94.0 | 80 | 120 | 1.06 | 15 | |
| Boron | 0.249 | 0.0300 | 0.200 | 0.0650 | 92.0 | 80 | 120 | 1.47 | 15 | |
| Cadmium | 0.194 | 0.00100 | 0.200 | 0 | 97.0 | 80 | 120 | 2.41 | 15 | |
| Calcium | 15.7 | 0.300 | 5.00 | 11.2 | 90.9 | 80 | 120 | 4.50 | 15 | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 80 | 120 | 3.04 | 15 | |
| Lead | 0.189 | 0.00100 | 0.200 | 0 | 94.4 | 80 | 120 | 3.99 | 15 | |
| Molybdenum | 0.188 | 0.00500 | 0.200 | 0 | 93.9 | 80 | 120 | 1.14 | 15 | |
| Selenium | 0.190 | 0.00500 | 0.200 | 0 | 95.2 | 80 | 120 | 1.98 | 15 | |
| Thallium | 0.190 | 0.00150 | 0.200 | 0 | 95.1 | 80 | 120 | 4.89 | 15 | |

| Sample ID **1511075-01A SD** | Batch ID: **72244** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 1:59:00 PM** | Prep Date: **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 10.8 | 15.0 | 0 | 11.0 | | | | 1.27 | 10 | |

| Sample ID **1511075-01A PDS** | Batch ID: **72244** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 2:19:00 PM** | Prep Date: **11/10/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 55.3 | 3.00 | 50.0 | 11.0 | 88.7 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_151111C**

| Sample ID **ICV-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 10:50:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.102 | 0.00250 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.103 | 0.00500 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.103 | 0.0100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Beryllium | 0.0984 | 0.00100 | 0.100 | 0 | 98.4 | 90 | 110 | | | |
| Boron | 0.100 | 0.0300 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.36 | 0.300 | 2.50 | 0 | 94.5 | 90 | 110 | | | |
| Chromium | 0.110 | 0.00500 | 0.100 | 0 | 110 | 90 | 110 | | | |
| Lead | 0.103 | 0.00100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.0989 | 0.00500 | 0.100 | 0 | 98.9 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.102 | 0.00150 | 0.100 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 10:58:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00208 | 0.00250 | 0.00200 | 0 | 104 | 70 | 130 | | | |
| Arsenic | 0.00513 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Barium | 0.00530 | 0.0100 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Beryllium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Boron | 0.0208 | 0.0300 | 0.0200 | 0 | 104 | 70 | 130 | | | |
| Cadmium | 0.00106 | 0.00100 | 0.00100 | 0 | 106 | 70 | 130 | | | |
| Calcium | 0.0993 | 0.300 | 0.100 | 0 | 99.3 | 70 | 130 | | | |
| Chromium | 0.00538 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Lead | 0.00106 | 0.00100 | 0.00100 | 0 | 106 | 70 | 130 | | | |
| Molybdenum | 0.00532 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Selenium | 0.00583 | 0.00500 | 0.00500 | 0 | 117 | 70 | 130 | | | |
| Thallium | 0.00103 | 0.00150 | 0.00100 | 0 | 103 | 70 | 130 | | | |

| Sample ID **CCV1-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 11:34:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Arsenic | 0.195 | 0.00500 | 0.200 | 0 | 97.6 | 90 | 110 | | | |
| Barium | 0.194 | 0.0100 | 0.200 | 0 | 97.0 | 90 | 110 | | | |
| Beryllium | 0.191 | 0.00100 | 0.200 | 0 | 95.4 | 90 | 110 | | | |
| Cadmium | 0.193 | 0.00100 | 0.200 | 0 | 96.7 | 90 | 110 | | | |
| Calcium | 4.84 | 0.300 | 5.00 | 0 | 96.8 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_151111C**

| Sample ID **CCV1-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 11:34:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 96.9 | 90 | 110 | | | |
| Molybdenum | 0.189 | 0.00500 | 0.200 | 0 | 94.5 | 90 | 110 | | | |
| Selenium | 0.195 | 0.00500 | 0.200 | 0 | 97.7 | 90 | 110 | | | |
| Thallium | 0.194 | 0.00150 | 0.200 | 0 | 96.8 | 90 | 110 | | | |

| Sample ID **CCV1-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 11:47:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.206 | 0.0300 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL1-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 12:07:00 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00197 | 0.00250 | 0.00200 | 0 | 98.6 | 70 | 130 | | | |
| Arsenic | 0.00518 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Barium | 0.00510 | 0.0100 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Beryllium | 0.000969 | 0.00100 | 0.00100 | 0 | 96.9 | 70 | 130 | | | |
| Boron | 0.0189 | 0.0300 | 0.0200 | 0 | 94.7 | 70 | 130 | | | |
| Cadmium | 0.00100 | 0.00100 | 0.00100 | 0 | 100 | 70 | 130 | | | |
| Calcium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |
| Chromium | 0.00555 | 0.00500 | 0.00500 | 0 | 111 | 70 | 130 | | | |
| Lead | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Molybdenum | 0.00494 | 0.00500 | 0.00500 | 0 | 98.7 | 70 | 130 | | | |
| Selenium | 0.00525 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

| Sample ID **CCV2-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 12:56:00 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Barium | 0.195 | 0.0100 | 0.200 | 0 | 97.7 | 90 | 110 | | | |
| Beryllium | 0.189 | 0.00100 | 0.200 | 0 | 94.6 | 90 | 110 | | | |
| Boron | 0.194 | 0.0300 | 0.200 | 0 | 97.1 | 90 | 110 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Calcium | 4.72 | 0.300 | 5.00 | 0 | 94.3 | 90 | 110 | | | |
| Chromium | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.3 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_151111C**

| Sample ID **CCV2-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 12:56:00 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.193 | 0.00500 | 0.200 | 0 | 96.3 | 90 | 110 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.7 | 90 | 110 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.5 | 90 | 110 | | | |

| Sample ID **LCVL2-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 1:08:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00203 | 0.00250 | 0.00200 | 0 | 102 | 70 | 130 | | | |
| Arsenic | 0.00520 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Barium | 0.00518 | 0.0100 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Beryllium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Boron | 0.0182 | 0.0300 | 0.0200 | 0 | 90.8 | 70 | 130 | | | |
| Cadmium | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Calcium | 0.0970 | 0.300 | 0.100 | 0 | 97.0 | 70 | 130 | | | |
| Chromium | 0.00561 | 0.00500 | 0.00500 | 0 | 112 | 70 | 130 | | | |
| Lead | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Molybdenum | 0.00487 | 0.00500 | 0.00500 | 0 | 97.3 | 70 | 130 | | | |
| Selenium | 0.00571 | 0.00500 | 0.00500 | 0 | 114 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

| Sample ID **CCV3-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 1:44:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Arsenic | 0.195 | 0.00500 | 0.200 | 0 | 97.6 | 90 | 110 | | | |
| Barium | 0.191 | 0.0100 | 0.200 | 0 | 95.7 | 90 | 110 | | | |
| Beryllium | 0.190 | 0.00100 | 0.200 | 0 | 95.1 | 90 | 110 | | | |
| Boron | 0.180 | 0.0300 | 0.200 | 0 | 90.1 | 90 | 110 | | | |
| Cadmium | 0.195 | 0.00100 | 0.200 | 0 | 97.5 | 90 | 110 | | | |
| Calcium | 4.61 | 0.300 | 5.00 | 0 | 92.2 | 90 | 110 | | | |
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.189 | 0.00100 | 0.200 | 0 | 94.7 | 90 | 110 | | | |
| Molybdenum | 0.194 | 0.00500 | 0.200 | 0 | 97.0 | 90 | 110 | | | |
| Selenium | 0.189 | 0.00500 | 0.200 | 0 | 94.4 | 90 | 110 | | | |
| Thallium | 0.190 | 0.00150 | 0.200 | 0 | 95.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

| Sample ID **LCVL3-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 1:50:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00223 | 0.00250 | 0.00200 | 0 | 112 | 70 | 130 | | | |
| Arsenic | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Barium | 0.00520 | 0.0100 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Beryllium | 0.000953 | 0.00100 | 0.00100 | 0 | 95.3 | 70 | 130 | | | |
| Boron | 0.0235 | 0.0300 | 0.0200 | 0 | 118 | 70 | 130 | | | |
| Cadmium | 0.00106 | 0.00100 | 0.00100 | 0 | 106 | 70 | 130 | | | |
| Calcium | 0.103 | 0.300 | 0.100 | 0 | 103 | 70 | 130 | | | |
| Chromium | 0.00564 | 0.00500 | 0.00500 | 0 | 113 | 70 | 130 | | | |
| Lead | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Molybdenum | 0.00545 | 0.00500 | 0.00500 | 0 | 109 | 70 | 130 | | | |
| Selenium | 0.00526 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

| Sample ID **CCV4-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 2:21:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.91 | 0.300 | 5.00 | 0 | 98.1 | 90 | 110 | | | |

| Sample ID **LCVL4-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 2:25:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0962 | 0.300 | 0.100 | 0 | 96.2 | 70 | 130 | | | |

| Sample ID **CCV5-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 2:31:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.91 | 0.300 | 5.00 | 0 | 98.2 | 90 | 110 | | | |

| Sample ID **LCVL5-151111** | Batch ID: **R82614** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_151111C** | Analysis Date: **11/11/2015 2:35:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0986 | 0.300 | 0.100 | 0 | 98.6 | 70 | 130 | | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_151110A**

The QC data in batch 72247 applies to the following samples: 1511075-11D, 1511075-12D, 1511075-13D, 1511075-14D, 1511075-15D

Sample ID **MB-72247** Batch ID: **72247** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_151110A** Analysis Date: **11/10/2015 10:18:43 A** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-72247** Batch ID: **72247** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_151110A** Analysis Date: **11/10/2015 10:33:17 A** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.1 | 1.00 | 10.00 | 0 | 101 | 90 | 110 | | | |
| Fluoride | 3.68 | 0.400 | 4.000 | 0 | 92.1 | 90 | 110 | | | |
| Sulfate | 30.0 | 3.00 | 30.00 | 0 | 99.9 | 90 | 110 | | | |

Sample ID **LCSD-72247** Batch ID: **72247** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_151110A** Analysis Date: **11/10/2015 10:47:51 A** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | 0.838 | 20 | |
| Fluoride | 3.81 | 0.400 | 4.000 | 0 | 95.3 | 90 | 110 | 3.42 | 20 | |
| Sulfate | 30.3 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | 1.12 | 20 | |

Sample ID **1511075-11DMS** Batch ID: **72247** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_151110A** Analysis Date: **11/10/2015 1:56:20 PM** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 263 | 10.0 | 200.0 | 64.79 | 99.2 | 90 | 110 | | | |
| Fluoride | 195 | 4.00 | 200.0 | 0 | 97.3 | 90 | 110 | | | |
| Sulfate | 214 | 30.0 | 200.0 | 12.78 | 100 | 90 | 110 | | | |

Sample ID **1511075-11DMSD** Batch ID: **72247** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_151110A** Analysis Date: **11/10/2015 2:10:54 PM** Prep Date: **11/10/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 264 | 10.0 | 200.0 | 64.79 | 99.7 | 90 | 110 | 0.383 | 20 | |
| Fluoride | 198 | 4.00 | 200.0 | 0 | 99.2 | 90 | 110 | 1.93 | 20 | |
| Sulfate | 216 | 30.0 | 200.0 | 12.78 | 102 | 90 | 110 | 1.03 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_151110A**

| Sample ID **ICV-151110** | Batch ID: **R82597** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_151110A** | Analysis Date: **11/10/2015 9:33:38 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.5 | 1.00 | 25.00 | 0 | 98.0 | 90 | 110 | | | |
| Fluoride | 9.67 | 0.400 | 10.00 | 0 | 96.7 | 90 | 110 | | | |
| Sulfate | 75.6 | 3.00 | 75.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **CCV1-151110** | Batch ID: **R82597** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_151110A** | Analysis Date: **11/10/2015 2:35:54 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.0 | 1.00 | 10.00 | 0 | 100 | 90 | 110 | | | |
| Fluoride | 3.89 | 0.400 | 4.000 | 0 | 97.2 | 90 | 110 | | | |
| Sulfate | 29.9 | 3.00 | 30.00 | 0 | 99.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC3_151109A**

The QC data in batch 72226 applies to the following samples: 1511075-01D, 1511075-02D, 1511075-03D, 1511075-04D, 1511075-05D, 1511075-06D, 1511075-07D, 1511075-08D, 1511075-09D, 1511075-10D

Sample ID **MB-72226** Batch ID: **72226** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC3_151109A** Analysis Date: **11/9/2015 10:46:30 AM** Prep Date: **11/9/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-72226** Batch ID: **72226** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC3_151109A** Analysis Date: **11/9/2015 11:10:00 AM** Prep Date: **11/9/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.71 | 1.00 | 10.00 | 0 | 97.1 | 90 | 110 | | | |
| Fluoride | 3.98 | 0.400 | 4.000 | 0 | 99.6 | 90 | 110 | | | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

Sample ID **LCSD-72226** Batch ID: **72226** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC3_151109A** Analysis Date: **11/9/2015 11:30:38 AM** Prep Date: **11/9/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.67 | 1.00 | 10.00 | 0 | 96.7 | 90 | 110 | 0.454 | 20 | |
| Fluoride | 3.97 | 0.400 | 4.000 | 0 | 99.2 | 90 | 110 | 0.453 | 20 | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | 0.069 | 20 | |

Sample ID **1511075-05DMS** Batch ID: **72226** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC3_151109A** Analysis Date: **11/9/2015 5:47:49 PM** Prep Date: **11/9/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2390 | 100 | 2000 | 439.3 | 97.7 | 90 | 110 | | | |
| Fluoride | 1930 | 40.0 | 2000 | 0 | 96.7 | 90 | 110 | | | |
| Sulfate | 2500 | 300 | 2000 | 479.1 | 101 | 90 | 110 | | | |

Sample ID **1511075-05DMSD** Batch ID: **72226** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC3_151109A** Analysis Date: **11/9/2015 6:08:27 PM** Prep Date: **11/9/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2380 | 100 | 2000 | 439.3 | 97.0 | 90 | 110 | 0.604 | 20 | |
| Fluoride | 1930 | 40.0 | 2000 | 0 | 96.5 | 90 | 110 | 0.192 | 20 | |
| Sulfate | 2510 | 300 | 2000 | 479.1 | 102 | 90 | 110 | 0.558 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC3_151109A**

| Sample ID **ICV-151109** | Batch ID: **R82592** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC3_151109A** | Analysis Date: **11/9/2015 9:57:34 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.4 | 1.00 | 25.00 | 0 | 97.7 | 90 | 110 | | | |
| Fluoride | 9.75 | 0.400 | 10.00 | 0 | 97.5 | 90 | 110 | | | |
| Sulfate | 74.4 | 3.00 | 75.00 | 0 | 99.2 | 90 | 110 | | | |

| Sample ID **CCV1-151109** | Batch ID: **R82592** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC3_151109A** | Analysis Date: **11/9/2015 3:51:30 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.66 | 1.00 | 10.00 | 0 | 96.6 | 90 | 110 | | | |
| Fluoride | 3.94 | 0.400 | 4.000 | 0 | 98.4 | 90 | 110 | | | |
| Sulfate | 30.1 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV2-151109** | Batch ID: **R82592** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC3_151109A** | Analysis Date: **11/9/2015 8:32:48 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.70 | 1.00 | 10.00 | 0 | 97.0 | 90 | 110 | | | |
| Fluoride | 3.97 | 0.400 | 4.000 | 0 | 99.3 | 90 | 110 | | | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1511075

**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_151111A**

The QC data in batch 72258 applies to the following samples: 1511075-01D, 1511075-02D, 1511075-03D, 1511075-04D, 1511075-05D, 1511075-06D, 1511075-07D, 1511075-08D, 1511075-09D, 1511075-10D, 1511075-11D, 1511075-12D, 1511075-13D, 1511075-14D, 1511075-15D

| Sample ID | **1511075-09D DUP** | Batch ID: | **72258** | TestNo: | **M4500-H+ B** | Units: | **pH Units@16.2℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **TITRATOR_151111A** | Analysis Date: | **11/11/2015 9:46:00 AM** | Prep Date: | **11/11/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.37 | 0 | 0 | 6.520 | | | | 2.33 | 5 | |

| Sample ID | **1511093-11B DUP** | Batch ID: | **72258** | TestNo: | **M4500-H+ B** | Units: | **pH Units@19.4℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **TITRATOR_151111A** | Analysis Date: | **11/11/2015 10:06:00 A** | Prep Date: | **11/11/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.65 | 0 | 0 | 7.650 | | | | 0 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_151111A**

| Sample ID | **ICV-151111** | Batch ID: | **R82615** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.8℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_151111A** | Analysis Date: | **11/11/2015 9:13:00 AM** | Prep Date: | **11/11/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.97 | 0 | 10.00 | 0 | 99.7 | 99 | 101 | | | |

| Sample ID | **CCV1-151111** | Batch ID: | **R82615** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.3℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_151111A** | Analysis Date: | **11/11/2015 9:45:00 AM** | Prep Date: | **11/11/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV2-151111** | Batch ID: | **R82615** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.5℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_151111A** | Analysis Date: | **11/11/2015 10:21:00 A** | Prep Date: | **11/11/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.98 | 0 | 7.000 | 0 | 99.7 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1511075
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_151109B**

The QC data in batch 72232 applies to the following samples: 1511075-01D, 1511075-02D, 1511075-03D, 1511075-04D, 1511075-05D, 1511075-06D, 1511075-07D, 1511075-08D, 1511075-09D, 1511075-10D, 1511075-11D, 1511075-12D, 1511075-13D, 1511075-14D, 1511075-15D

Sample ID **MB-72232** Batch ID: **72232** TestNo: **M2540C** Units: **mg/L**
SampType: **MBLK** Run ID: **WC_151109B** Analysis Date: **11/10/2015 9:00:00 AM** Prep Date: **11/9/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

Sample ID **LCS-72232** Batch ID: **72232** TestNo: **M2540C** Units: **mg/L**
SampType: **LCS** Run ID: **WC_151109B** Analysis Date: **11/10/2015 9:00:00 AM** Prep Date: **11/9/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 760 | 10.0 | 745.6 | 0 | 102 | 90 | 113 | | | |

Sample ID **1511069-01B-DUP** Batch ID: **72232** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_151109B** Analysis Date: **11/10/2015 9:00:00 AM** Prep Date: **11/9/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 591 | 10.0 | 0 | 581.0 | | | | 1.71 | 5 | |

Sample ID **1511069-02B-DUP** Batch ID: **72232** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_151109B** Analysis Date: **11/10/2015 9:00:00 AM** Prep Date: **11/9/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 594 | 10.0 | 0 | 590.0 | | | | 0.676 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

December 09, 2015

Mr. John DuPont
DHL Analytical
2300 Double Creek Drive
Round Rock, Texas 78664

Re: Routine Analysis
Work Order: 385405
SDG: 1511075

Dear Mr. DuPont:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on November 12, 2015. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4707.

Sincerely,

Anna C Day

Anna Day
Project Manager

Purchase Order: 14003
Enclosures

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 − (843) 556−8171 − www.gel.com

# Certificate of Analysis Report
for

DHLA002 DHL Analytical

Client SDG: 1511075 GEL Work Order: 385405

**The Qualifiers in this report are defined as follows:**

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a Tracer compound

** Analyte is a surrogate compound

U Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Anna Day.

Reviewed by Anna C Day

**There are no "Data Exception Reports" associated with this analytical report.**

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



385405

Work Order: 1511075

**Subcontractor:**

GEL Laboratories
PO Box 30712
Charleston, SC 29417

TEL: (843) 556-8171
FAX:
Acct #:

09-Nov-15

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E903.1 | E904.0 | | | | |
| FGD-1 | Aqueous | -01B | 11/03/15 10:50 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-1 | Aqueous | -01C | 11/03/15 10:50 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-09 | Aqueous | -02B | 11/03/15 11:50 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-09 | Aqueous | -02C | 11/03/15 11:50 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-07 | Aqueous | -03B | 11/03/15 12:40 PM | 500HDPEHNO3 | | 1 | | | | |
| MW-07 | Aqueous | -03C | 11/03/15 12:40 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-2 | Aqueous | -04B | 11/03/15 02:15 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-2 | Aqueous | -04C | 11/03/15 02:15 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-3 | Aqueous | -05B | 11/03/15 03:05 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-3 | Aqueous | -05C | 11/03/15 03:05 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-4 | Aqueous | -06B | 11/03/15 04:00 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-4 | Aqueous | -06C | 11/03/15 04:00 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-5 | Aqueous | -07B | 11/03/15 04:50 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-5 | Aqueous | -07C | 11/03/15 04:50 PM | 500HDPEHNO3 | 1 | | | | | |
| AL-10 | Aqueous | -08B | 11/04/15 08:15 AM | 500HDPEHNO3 | | 1 | | | | |
| AL-10 | Aqueous | -08C | 11/04/15 08:15 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-02 | Aqueous | -09B | 11/04/15 09:05 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-02 | Aqueous | -09C | 11/04/15 09:05 AM | 500HDPEHNO3 | 1 | | | | | |

General Comments:

Please analyze these samples with a Standard Turnaround Time.
Call John DuPont if you have questions.
Quality Control Package Needed: Standard / _____
EMAIL report to both cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | Date/Time |
|---|---|---|---|---|
| **Relinquished by:** | | 11/9/15 1730 | **Received by:** | 11/9/15 1730 |
| **Relinquished by:** | | | **Received by:** | 11/12/15 0840 |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1511075

**Subcontractor:**

GEL Laboratories
PO Box 30712
Charleston, SC 29417

TEL: (843) 556-8171
FAX:
Acct #:

09-Nov-15

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E903.1 | E904.0 | | | | |
| MW-08 | Aqueous | -10B | 11/04/15 10:10 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-08 | Aqueous | -10C | 11/04/15 10:10 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-05 | Aqueous | -11B | 11/04/15 11:05 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-05 | Aqueous | -11C | 11/04/15 11:05 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-12 | Aqueous | -12B | 11/04/15 11:55 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-12 | Aqueous | -12C | 11/04/15 11:55 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-11 | Aqueous | -13B | 11/04/15 01:00 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-11 | Aqueous | -13C | 11/04/15 01:00 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-6 | Aqueous | -14B | 11/04/15 01:55 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-6 | Aqueous | -14C | 11/04/15 01:55 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-8 | Aqueous | -15B | 11/04/15 02:50 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-8 | Aqueous | -15C | 11/04/15 02:50 PM | 500HDPEHNO3 | 1 | | | | | |

General Comments:

Please analyze these samples with a Standard Turnaround Time.
Call John DuPont if you have questions.
Quality Control Package Needed: Standard / _____
EMAIL report to both cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | [signature] | 11/9/15 | **Received by:** | [signature] | 11/9/15 1733 |
| **Relinquished by:** | | | **Received by:** | B. Luthman | 11/12/15 0840 |

GEL Laboratories LLC

# SAMPLE RECEIPT & REVIEW FORM

| | |
|---|---|
| **Client:** DHHA | **SDG/AR/COC/Work Order:** 385404 |
| **Received By:** Brielle Luthman | **Date Received:** 11/12/15 0840 |

| **Suspected Hazard Information** | **Yes** | **No** | *If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation. |
|---|---|---|---|
| COC/Samples marked as radioactive? | | / | Maximum Net Counts Observed* (Observed Counts - Area Background Counts): Ø |
| Classified Radioactive II or III by RSO? | | / | If yes, Were swipes taken of sample containers < action levels? / |
| COC/Samples marked containing PCBs? | | / | |
| Package, COC, and/or Samples marked as beryllium or asbestos containing? | | / | If yes, samples are to be segregated as Safety Controlled Samples, and opened by the GEL Safety Group. |
| Shipped as a DOT Hazardous? | | / | Hazard Class Shipped: UN#: |
| Samples identified as Foreign Soil? | | / | |

| | **Sample Receipt Criteria** | **Yes** | **NA** | **No** | **Comments/Qualifiers (Required for Non-Conforming Items)** |
|---|---|---|---|---|---|
| 1 | Shipping containers received intact and sealed? | / | | | Circle Applicable: Seals broken Damaged container Leaking container Other (describe) |
| 2 | Samples requiring cold preservation within (0 ≤ 6 deg. C)?* | | / | | Preservation Method: Ice bags Blue ice Dry ice (None) Other (describe)<br>*all temperatures are recorded in Celsius 20° |
| 2a | Daily check performed and passed on IR temperature gun? | / | | | Temperature Device Serial #:<br>Secondary Temperature Device Serial # (If Applicable): 150340071 |
| 3 | Chain of custody documents included with shipment? | / | | | |
| 4 | Sample containers intact and sealed? | / | | | Circle Applicable: Seals broken Damaged container Leaking container Other (describe) |
| 5 | Samples requiring chemical preservation at proper pH? | / | | | Sample ID's, containers affected and observed pH:<br>If Preservation added, Lot#: |
| 6 | Do Low Level Perchlorate samples have headspace as required? | | / | | Sample ID's and containers affected: |
| 7 | VOA vials contain acid preservation? | | / | | (If unknown, select No) |
| 8 | VOA vials free of headspace (defined as < 6mm bubble)? | | / | | Sample ID's and containers affected: |
| 9 | Are Encore containers present? | | | / | (If yes, immediately deliver to Volatiles laboratory) |
| 10 | Samples received within holding time? | / | | | ID's and tests affected: |
| 11 | Sample ID's on COC match ID's on bottles? | / | | | Sample ID's and containers affected: |
| 12 | Date & time on COC match date & time on bottles? | / | | | Sample ID's affected: |
| 13 | Number of containers received match number indicated on COC? | / | | | Sample ID's affected: |
| 14 | Are sample containers identifiable as GEL provided? | | | / | |
| 15 | COC form is properly signed in relinquished/received sections? | / | | | |
| 16 | Carrier and tracking number. | | | | Circle Applicable:<br>FedEx Air FedEx Ground UPS Field Services Courier Other<br>7749 3118 2946 |

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials AMD Date 11/13/15 Page 1 of 1 GL-CHL-SR-001 Rev 2

**List of current GEL Certifications as of 09 December 2015**

| State | Certification |
|---|---|
| Alaska | UST−110 |
| Arkansas | 88−0651 |
| CLIA | 42D0904046 |
| California | 2940 Interim |
| Colorado | SC00012 |
| Connecticut | PH−0169 |
| Delaware | SC000122013−10 |
| DoD ELAP/ ISO17025 A2LA | 2567.01 |
| Florida NELAP | E87156 |
| Foreign Soils Permit | P330−15−00283, P330−15−00253 |
| Georgia | SC00012 |
| Georgia SDWA | 967 |
| Hawaii | SC000122013−10 |
| Idaho Chemistry | SC00012 |
| Idaho Radiochemistry | SC00012 |
| Illinois NELAP | 200029 |
| Indiana | C−SC−01 |
| Kansas NELAP | E−10332 |
| Kentucky SDWA | 90129 |
| Kentucky Wastewater | 90129 |
| Louisiana NELAP | 03046 (AI33904) |
| Louisiana SDWA | LA150001 |
| Maryland | 270 |
| Massachusetts | M−SC012 |
| Michigan | 9976 |
| Mississippi | SC000122013−10 |
| Nebraska | NE−OS−26−13 |
| Nevada | SC000122016−1 |
| New Hampshire NELAP | 2054 |
| New Jersey NELAP | SC002 |
| New Mexico | SC00012 |
| New York NELAP | 11501 |
| North Carolina | 233 |
| North Carolina SDWA | 45709 |
| North Dakota | R−158 |
| Oklahoma | 9904 |
| Pennsylvania NELAP | 68−00485 |
| S.Carolina Radchem | 10120002 |
| South Carolina Chemistry | 10120001 |
| Tennessee | TN 02934 |
| Texas NELAP | T104704235−15−10 |
| Utah NELAP | SC000122015−19 |
| Vermont | VT87156 |
| Virginia NELAP | 460202 |
| Washington | C780 |
| West Virginia | 997404 |

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: December 9, 2015

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FDG-1
Sample ID: 385405001
Matrix: Water
Collect Date: 03-NOV-15 10:50
Receive Date: 12-NOV-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.874 | +/-0.854 | 1.40 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1054 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.718 | +/-0.360 | 0.464 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0535 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 92.1 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: December 9, 2015

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | MW-09 | Project: | DHLA00112 |
| Sample ID: | 385405002 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 03-NOV-15 11:50 | | |
| Receive Date: | 12-NOV-15 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 2.09 | +/-1.09 | 1.61 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1054 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.812 | +/-0.368 | 0.453 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0605 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 100 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: December 9, 2015

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: MW-07
Sample ID: 385405003
Matrix: Water
Collect Date: 03-NOV-15 12:40
Receive Date: 12-NOV-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 1.58 | +/-0.876 | 1.26 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1054 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.10 | +/-0.458 | 0.540 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0605 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 97.4 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: December 9, 2015

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FDG-2
Sample ID: 385405004
Matrix: Water
Collect Date: 03-NOV-15 14:15
Receive Date: 12-NOV-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 1.97 | +/-1.19 | 1.85 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1054 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | U | 0.234 | +/-0.184 | 0.249 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0605 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 106 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: December 9, 2015

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | FDG-3 | Project: | DHLA00112 |
| Sample ID: | 385405005 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 03-NOV-15 15:05 | | |
| Receive Date: | 12-NOV-15 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 3.18 | +/-1.03 | 1.24 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1054 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.930 | +/-0.379 | 0.442 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0605 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 102 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: December 9, 2015

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FDG-4
Sample ID: 385405006
Matrix: Water
Collect Date: 03-NOV-15 16:00
Receive Date: 12-NOV-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 1.00 | +/-0.867 | 1.39 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1054 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.01 | +/-0.398 | 0.455 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0605 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 92.2 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: December 9, 2015

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | FDG-5 | Project: | DHLA00112 |
| Sample ID: | 385405007 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 03-NOV-15 16:50 | | |
| Receive Date: | 12-NOV-15 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 1.57 | +/-1.08 | 1.70 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1054 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.470 | +/-0.299 | 0.422 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0635 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 99.1 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: December 9, 2015

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: AL-10
Sample ID: 385405008
Matrix: Water
Collect Date: 04-NOV-15 08:15
Receive Date: 12-NOV-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 2.04 | +/-1.11 | 1.61 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1054 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.615 | +/-0.349 | 0.473 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0635 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 101 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: December 9, 2015

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | MW-02 | Project: | DHLA00112 |
| Sample ID: | 385405009 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 04-NOV-15 09:05 | | |
| Receive Date: | 12-NOV-15 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 3.49 | +/-1.45 | 2.13 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1055 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.07 | +/-0.392 | 0.376 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0635 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 97 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: December 9, 2015

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | MW-08 | Project: | DHLA00112 |
| Sample ID: | 385405010 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 04-NOV-15 10:10 | | |
| Receive Date: | 12-NOV-15 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 1.11 | +/-0.985 | 1.60 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1055 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.801 | +/-0.363 | 0.446 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0635 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 90.3 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: December 9, 2015

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: MW-05
Sample ID: 385405011
Matrix: Water
Collect Date: 04-NOV-15 11:05
Receive Date: 12-NOV-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | -0.0318 | +/-0.777 | 1.48 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1055 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.507 | +/-0.309 | 0.431 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0720 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 96 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: December 9, 2015

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FDG-12
Sample ID: 385405012
Matrix: Water
Collect Date: 04-NOV-15 11:55
Receive Date: 12-NOV-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 1.51 | +/-0.998 | 1.55 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1055 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.07 | +/-0.453 | 0.539 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0720 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 98 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: December 9, 2015

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | FDG-11 | Project: | DHLA00112 |
| Sample ID: | 385405013 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 04-NOV-15 13:00 | | |
| Receive Date: | 12-NOV-15 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 1.35 | +/-0.917 | 1.41 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1055 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.928 | +/-0.431 | 0.536 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0720 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 92.4 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: December 9, 2015

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | FDG-6 | Project: | DHLA00112 |
| Sample ID: | 385405014 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 04-NOV-15 13:55 | | |
| Receive Date: | 12-NOV-15 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 1.52 | +/-0.954 | 1.44 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1055 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.449 | +/-0.297 | 0.427 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0720 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 94.6 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: December 9, 2015

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FDG-8
Sample ID: 385405015
Matrix: Water
Collect Date: 04-NOV-15 14:50
Receive Date: 12-NOV-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 1.38 | +/-0.743 | 1.04 | 3.00 | pCi/L | | AXM6 | 12/08/15 | 1055 | 1525795 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.671 | +/-0.394 | 0.542 | 1.00 | pCi/L | | CXP3 | 12/09/15 | 0810 | 1523137 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 104 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

## QC Summary

**Report Date: December 9, 2015**



**DHL Analytical**
**2300 Double Creek Drive**
**Round Rock, Texas**

**Contact:** **Mr. John DuPont**

**Workorder:** **385405**

| Parmname | NOM | Sample | Qual | QC | Units | RPD% | REC% | Range | Anlst | Date Time |
|---|---|---|---|---|---|---|---|---|---|---|
| **Rad Gas Flow** | | | | | | | | | | |
| Batch 1525795 | | | | | | | | | | |
| QC1203439747 385405008 DUP | | | | | | | | | | |
| Radium-228 | | 2.04 | U | 0.270 | pCi/L | 153* | | (0% - 100%) | AXM6 | 12/08/15 10:58 |
| | Uncertainty | +/-1.11 | | +/-0.927 | | | | | | |
| QC1203439748 LCS | | | | | | | | | | |
| Radium-228 | 29.1 | | | 30.3 | pCi/L | | 104 | (75%-125%) | | 12/08/15 10:58 |
| | Uncertainty | | | +/-2.59 | | | | | | |
| QC1203439746 MB | | | | | | | | | | |
| Radium-228 | | | U | 0.916 | pCi/L | | | | | 12/08/15 10:55 |
| | Uncertainty | | | +/-0.823 | | | | | | |
| **Rad Ra-226** | | | | | | | | | | |
| Batch 1523137 | | | | | | | | | | |
| QC1203432999 385400001 DUP | | | | | | | | | | |
| Radium-226 | | 3.00 | | 1.69 | pCi/L | 55.7 | | (0% - 100%) | CXP3 | 12/09/15 08:10 |
| | Uncertainty | +/-1.22 | | +/-0.961 | | | | | | |
| QC1203433001 LCS | | | | | | | | | | |
| Radium-226 | 24.4 | | | 23.6 | pCi/L | | 96.7 | (75%-125%) | | 12/09/15 09:10 |
| | Uncertainty | | | +/-1.65 | | | | | | |
| QC1203432998 MB | | | | | | | | | | |
| Radium-226 | | | U | 0.0978 | pCi/L | | | | | 12/09/15 08:10 |
| | Uncertainty | | | +/-0.214 | | | | | | |
| QC1203433000 385400001 MS | | | | | | | | | | |
| Radium-226 | 61.0 | 3.00 | | 77.3 | pCi/L | | 122 | (75%-125%) | | 12/09/15 08:10 |
| | Uncertainty | +/-1.22 | | +/-4.58 | | | | | | |

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

| | |
|---|---|
| ** | Analyte is a Tracer compound |
| < | Result is less than value reported |
| > | Result is greater than value reported |
| BD | Results are either below the MDC or tracer recovery is low |
| FA | Failed analysis. |
| H | Analytical holding time was exceeded |
| J | Value is estimated |
| K | Analyte present. Reported value may be biased high. Actual value is expected to be lower. |
| L | Analyte present. Reported value may be biased low. Actual value is expected to be higher. |
| M | M if above MDC and less than LLD |
| M | REMP Result > MDC/CL and < RDL |
| N/A | RPD or %Recovery limits do not apply. |

## QC Summary

**Workorder:** **385405**



| Parmname | NOM | Sample | Qual | QC | Units | RPD% | REC% | Range | Anlst | Date | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|

N1 See case narrative

ND Analyte concentration is not detected above the detection limit

NJ Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

Q One or more quality control criteria have not been met. Refer to the applicable narrative or DER.

R Sample results are rejected

U Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.

UI Gamma Spectroscopy--Uncertain identification

UJ Gamma Spectroscopy--Uncertain identification

UL Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.

X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

Y Other specific qualifiers were required to properly define the results. Consult case narrative.

^ RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.

h Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

January 25, 2016

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1512286

RE: Luminant - Oak Grove

Dear Will Vienne:

DHL Analytical, Inc. received 15 sample(s) on 12/19/2015 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-15-15

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# CHAIN-OF-CUSTODY

№ 69463

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 12-18-15 PAGE 1 OF 1
PO #: 5164-D DHL WORK ORDER #: 1512286
PROJECT LOCATION OR NAME: LUMINANT - OAK GROVE
CLENT PROJECT #: 5164-D COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL P=PAINT
W=WATER SL=SLUDGE
A=AIR O=OTHER
L=LIQUID SO=SOLID
SE=SEDIMENT

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS ❑ | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | SEE ATTACHED

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | SEE ATTACHED | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-3 | 01 | 12-17-15 | 0935 | W | P | 4 | | | | | | X | |
| FGD-4 | 02 | | 1025 | W | P | 4 | | | | | | X | |
| FGD-5 | 03 | | 1115 | W | P | 4 | | | | | | X | |
| FGD-2 | 04 | | 1200 | W | P | 4 | | | | | | X | |
| FGD-1 | 05 | | 1250 | W | P | 4 | | | | | | X | |
| FGD-6 | 06 | | 1345 | W | P | 4 | | | | | | X | |
| FGD-8 | 07 | | 1450 | W | P | 4 | | | | | | X | |
| FGD-12 | 08 | | 1540 | W | P | 4 | | | | | | X | |
| FGD-11 | 09 | | 1630 | W | P | 4 | | | | | | X | |
| MW07 | 10 | | 1815 | W | P | 4 | | | | | | X | |
| MW05 | 11 | 12-18-15 | 0740 | W | P | 4 | | | | | | X | |
| MW02 | 12 | | 0825 | W | P | 4 | | | | | | X | |
| AL-10 | 13 | | 0920 | W | P | 4 | | | | | | X | |
| MW09 | 14 | | 1020 | W | P | 4 | | | | | | X | |
| MW08 | 15 | | 1115 | W | P | 4 | | | | | | X | |

RELINQUISHED BY: (Signature) DATE/TIME 12-18-15 RECEIVED BY: (Signature) 1745
RELINQUISHED BY: (Signature) DATE/TIME 12/19/15 RECEIVED BY: (Signature) 1020
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

TURN AROUND TIME
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑

LABORATORY USE ONLY:
RECEIVING TEMP: 3.6, 4.6, 4.1 THERM #: 78
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ☒ NOT USED
CARRIER: ❑ LONE STAR ☒ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED

APPENDIX F-Revision 1 November 21, 2022
❑ DHL DISPOSAL @ $5.00 each ❑ Return

**John Dupont**

**From:** Sara Taube [Sara.Taube@pbwllc.com]
**Sent:** Wednesday, July 22, 2015 12:05 PM
**To:** John Dupont
**Subject:** CCR Appendix III and IV
**Follow Up Flag:** Follow up
**Flag Status:** Completed

Hi John,

Here are the Appendix III and Appendix IV constituents that we will need to have analyzed under the CCR Rule.

Appendix III
Boron
Calcium
Chloride
Fluoride
pH
sulfate
TDS

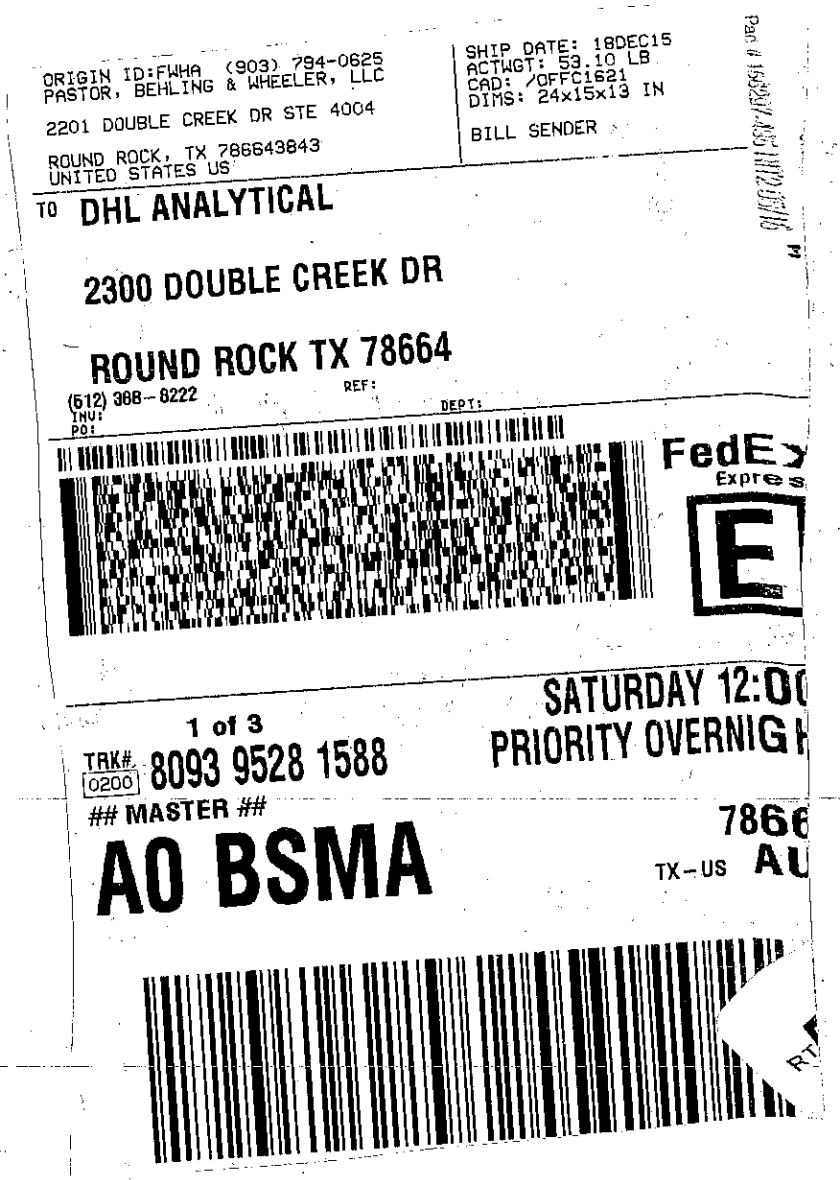
Appendix IV
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228

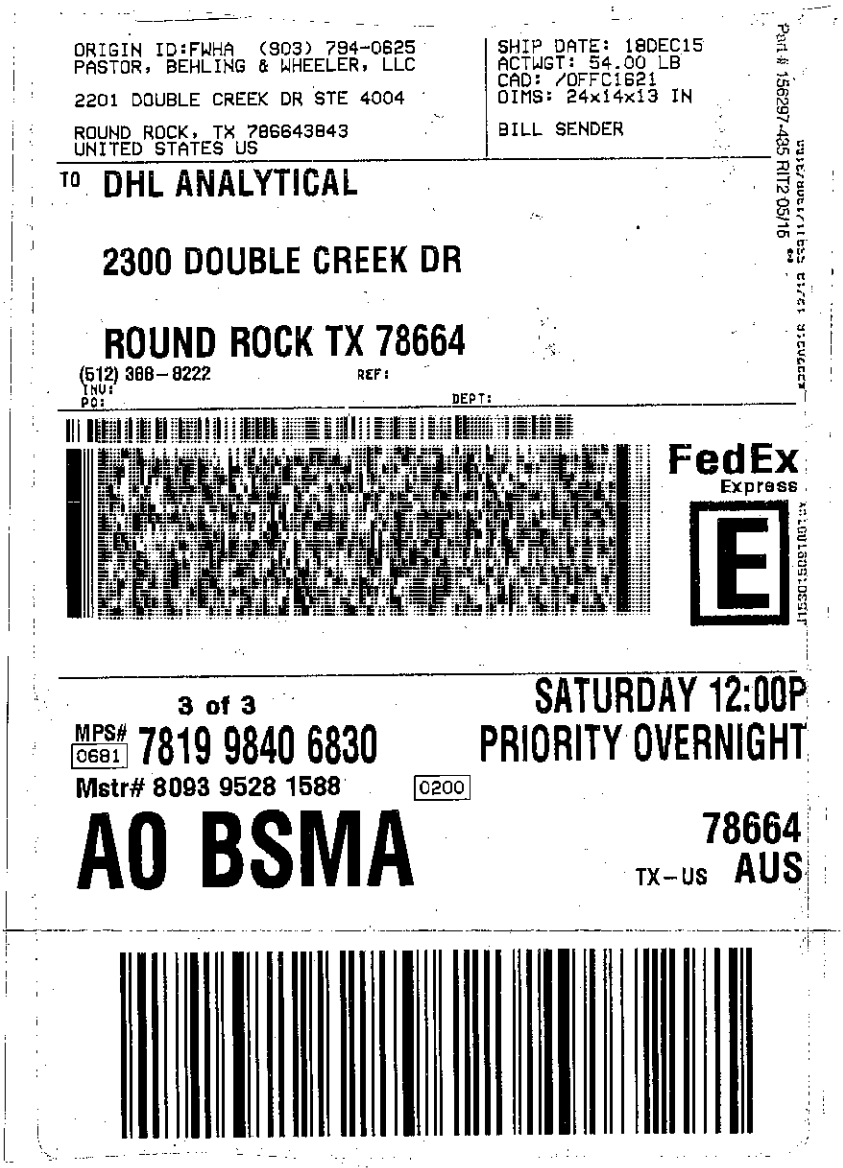
We are looking to have approximately 74 wells sampled 8 times over the course of the next two years. Please let me know if there is any more information you might need.

Cheers,

Sara

10/26/2015


ORIGIN ID:FWHA (903) 794-0625
PASTOR, BEHLING & WHEELER, LLC
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 786643843
UNITED STATES US
SHIP DATE: 18DEC15
ACTWGT: 53.10 LB
CAD: /0FFC1621
DIMS: 24x15x13 IN
BILL SENDER
TO DHL ANALYTICAL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
REF:
INV:
PO:
DEPT:
FedEx
Expres
1 of 3
TRK# 0200 8093 9528 1588
SATURDAY 12:0
PRIORITY OVERNIG
## MASTER ##
AO BSMA
TX-US



ORIGIN ID:FWHA (903) 794-0625
PASTOR, BEHLING & WHEELER, LLC
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 786643843
UNITED STATES US

SHIP DATE: 18DEC15
ACTWGT: 54.00 LB
CAD: /OFFC1621
DIMS: 24x14x13 IN
BILL SENDER

Part # 156297-435 RIT2 05/15

TO DHL ANALYTICAL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222 REF:
INV:
PO: DEPT:

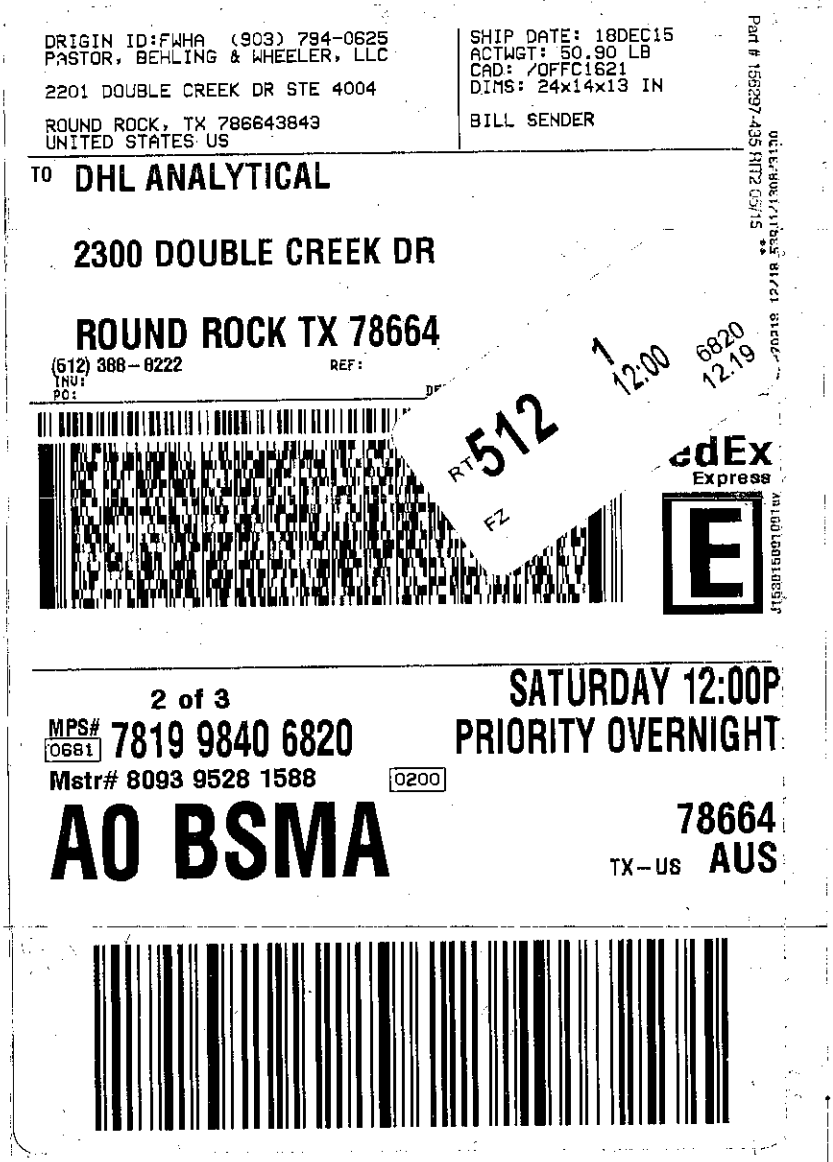
FedEx Express

3 of 3
MPS# 0681 7819 9840 6830
Mstr# 8093 9528 1588 0200

SATURDAY 12:00P
PRIORITY OVERNIGHT

AO BSMA

78664
TX-US AUS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PASTOR, BEHLING & WHEELER, LLC
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 786643843
UNITED STATES US
SHIP DATE: 18DEC15
ACTWGT: 50.90 LB
CAD: /OFFC1621
DIMS: 24x14x13 IN
BILL SENDER
TO DHL ANALYTICAL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
REF:
INV:
PO:
RT 512
FZ
1
12:00
6820
12.19
FedEx Express
2 of 3
MPS# 0681 7819 9840 6820
Mstr# 8093 9528 1588
0200
SATURDAY 12:00P
PRIORITY OVERNIGHT
AO BSMA
78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Pastor, Behling & Wheeler** Date Received: **12/19/2015**

Work Order Number **1512286** Received by **JB**

Checklist completed by: Signature 12/21/2015 Date Reviewed by Initials 12/21/2015 Date

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 3.6 °C 4.6.4.1 |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? NO | | Checked by |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *25-Jan-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1512286

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904.0/SW8469320 Modified and E903.1 Modified. Analyzed at GEL Laboratory.

## LOG IN

The samples were received and log-in performed on 12/19/15. A total of 15 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 1/4/16 the matrix spike duplicate recovery was slightly above control limits for Calcium. This is flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *25-Jan-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1512286

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1512286-01 | FGD-3 | | 12/17/15 09:35 AM | 12/21/2015 |
| 1512286-02 | FGD-4 | | 12/17/15 10:25 AM | 12/21/2015 |
| 1512286-03 | FGD-5 | | 12/17/15 11:15 AM | 12/21/2015 |
| 1512286-04 | FGD-2 | | 12/17/15 12:00 PM | 12/21/2015 |
| 1512286-05 | FGD-1 | | 12/17/15 12:50 PM | 12/21/2015 |
| 1512286-06 | FGD-6 | | 12/17/15 01:45 PM | 12/21/2015 |
| 1512286-07 | FGD-8 | | 12/17/15 02:50 PM | 12/21/2015 |
| 1512286-08 | FGD-12 | | 12/17/15 03:40 PM | 12/21/2015 |
| 1512286-09 | FGD-11 | | 12/17/15 04:30 PM | 12/21/2015 |
| 1512286-10 | MW-07 | | 12/17/15 06:15 PM | 12/21/2015 |
| 1512286-11 | MW-05 | | 12/18/15 07:40 AM | 12/21/2015 |
| 1512286-12 | MW-02 | | 12/18/15 08:25 AM | 12/21/2015 |
| 1512286-13 | AL-10 | | 12/18/15 09:20 AM | 12/21/2015 |
| 1512286-14 | MW-09 | | 12/18/15 10:20 AM | 12/21/2015 |
| 1512286-15 | MW-08 | | 12/18/15 11:15 AM | 12/21/2015 |

**Lab Order:** 1512286
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1512286-01A | FGD-3 | 12/17/15 09:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-3 | 12/17/15 09:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-3 | 12/17/15 09:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-3 | 12/17/15 09:35 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-01D | FGD-3 | 12/17/15 09:35 AM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-3 | 12/17/15 09:35 AM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-3 | 12/17/15 09:35 AM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | FGD-3 | 12/17/15 09:35 AM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-02A | FGD-4 | 12/17/15 10:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-4 | 12/17/15 10:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-4 | 12/17/15 10:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-4 | 12/17/15 10:25 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-02D | FGD-4 | 12/17/15 10:25 AM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-4 | 12/17/15 10:25 AM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-4 | 12/17/15 10:25 AM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | FGD-4 | 12/17/15 10:25 AM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-03A | FGD-5 | 12/17/15 11:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-5 | 12/17/15 11:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-5 | 12/17/15 11:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-5 | 12/17/15 11:15 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-03D | FGD-5 | 12/17/15 11:15 AM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-5 | 12/17/15 11:15 AM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-5 | 12/17/15 11:15 AM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | FGD-5 | 12/17/15 11:15 AM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-04A | FGD-2 | 12/17/15 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-2 | 12/17/15 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-2 | 12/17/15 12:00 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-04D | FGD-2 | 12/17/15 12:00 PM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |

**Lab Order:** 1512286
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1512286-04D | FGD-2 | 12/17/15 12:00 PM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-2 | 12/17/15 12:00 PM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | FGD-2 | 12/17/15 12:00 PM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-05A | FGD-1 | 12/17/15 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-1 | 12/17/15 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-1 | 12/17/15 12:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-05D | FGD-1 | 12/17/15 12:50 PM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-1 | 12/17/15 12:50 PM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | FGD-1 | 12/17/15 12:50 PM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-06A | FGD-6 | 12/17/15 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-6 | 12/17/15 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-6 | 12/17/15 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-6 | 12/17/15 01:45 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-06D | FGD-6 | 12/17/15 01:45 PM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-6 | 12/17/15 01:45 PM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-6 | 12/17/15 01:45 PM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | FGD-6 | 12/17/15 01:45 PM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-07A | FGD-8 | 12/17/15 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-8 | 12/17/15 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-8 | 12/17/15 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-8 | 12/17/15 02:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-07D | FGD-8 | 12/17/15 02:50 PM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-8 | 12/17/15 02:50 PM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-8 | 12/17/15 02:50 PM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | FGD-8 | 12/17/15 02:50 PM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-08A | FGD-12 | 12/17/15 03:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-12 | 12/17/15 03:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-12 | 12/17/15 03:40 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |

**Lab Order:** 1512286
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1512286-08D | FGD-12 | 12/17/15 03:40 PM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-12 | 12/17/15 03:40 PM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | FGD-12 | 12/17/15 03:40 PM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-09A | FGD-11 | 12/17/15 04:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-11 | 12/17/15 04:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | FGD-11 | 12/17/15 04:30 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-09D | FGD-11 | 12/17/15 04:30 PM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | FGD-11 | 12/17/15 04:30 PM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | FGD-11 | 12/17/15 04:30 PM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-10A | MW-07 | 12/17/15 06:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-07 | 12/17/15 06:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-07 | 12/17/15 06:15 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-10D | MW-07 | 12/17/15 06:15 PM | Aqueous | E300 | Anion Preparation | 12/29/15 10:57 AM | 72974 |
| | MW-07 | 12/17/15 06:15 PM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | MW-07 | 12/17/15 06:15 PM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-11A | MW-05 | 12/18/15 07:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-05 | 12/18/15 07:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-05 | 12/18/15 07:40 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-11D | MW-05 | 12/18/15 07:40 AM | Aqueous | E300 | Anion Preparation | 12/29/15 11:48 AM | 72978 |
| | MW-05 | 12/18/15 07:40 AM | Aqueous | E300 | Anion Preparation | 12/29/15 11:48 AM | 72978 |
| | MW-05 | 12/18/15 07:40 AM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | MW-05 | 12/18/15 07:40 AM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-12A | MW-02 | 12/18/15 08:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-02 | 12/18/15 08:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-02 | 12/18/15 08:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-02 | 12/18/15 08:25 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-12D | MW-02 | 12/18/15 08:25 AM | Aqueous | E300 | Anion Preparation | 12/29/15 11:48 AM | 72978 |
| | MW-02 | 12/18/15 08:25 AM | Aqueous | E300 | Anion Preparation | 12/29/15 11:48 AM | 72978 |

**Lab Order:** 1512286
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1512286-12D | MW-02 | 12/18/15 08:25 AM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | MW-02 | 12/18/15 08:25 AM | Aqueous | M2540C | TDS Preparation | 12/22/15 02:43 PM | 72907 |
| 1512286-13A | AL-10 | 12/18/15 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | AL-10 | 12/18/15 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | AL-10 | 12/18/15 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | AL-10 | 12/18/15 09:20 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-13D | AL-10 | 12/18/15 09:20 AM | Aqueous | E300 | Anion Preparation | 12/29/15 11:48 AM | 72978 |
| | AL-10 | 12/18/15 09:20 AM | Aqueous | E300 | Anion Preparation | 12/29/15 11:48 AM | 72978 |
| | AL-10 | 12/18/15 09:20 AM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | AL-10 | 12/18/15 09:20 AM | Aqueous | M2540C | TDS Preparation | 12/23/15 02:05 PM | 72925 |
| 1512286-14A | MW-09 | 12/18/15 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-09 | 12/18/15 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-09 | 12/18/15 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-09 | 12/18/15 10:20 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-14D | MW-09 | 12/18/15 10:20 AM | Aqueous | E300 | Anion Preparation | 12/29/15 11:48 AM | 72978 |
| | MW-09 | 12/18/15 10:20 AM | Aqueous | E300 | Anion Preparation | 12/29/15 11:48 AM | 72978 |
| | MW-09 | 12/18/15 10:20 AM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | MW-09 | 12/18/15 10:20 AM | Aqueous | M2540C | TDS Preparation | 12/23/15 02:05 PM | 72925 |
| 1512286-15A | MW-08 | 12/18/15 11:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-08 | 12/18/15 11:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-08 | 12/18/15 11:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/29/15 10:15 AM | 72973 |
| | MW-08 | 12/18/15 11:15 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/21/15 12:22 PM | 72872 |
| 1512286-15D | MW-08 | 12/18/15 11:15 AM | Aqueous | E300 | Anion Preparation | 12/29/15 11:48 AM | 72978 |
| | MW-08 | 12/18/15 11:15 AM | Aqueous | E300 | Anion Preparation | 12/29/15 11:48 AM | 72978 |
| | MW-08 | 12/18/15 11:15 AM | Aqueous | M4500-H+ B | pH Preparation | 12/22/15 09:46 AM | 72889 |
| | MW-08 | 12/18/15 11:15 AM | Aqueous | M2540C | TDS Preparation | 12/23/15 02:05 PM | 72925 |

**Lab Order:** 1512286
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1512286-01A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 03:42 PM | CETAC2_HG_151222A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 10:20 AM | ICP-MS4_160104A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 10 | 01/04/16 02:04 PM | ICP-MS4_160104A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 09:27 PM | ICP-MS4_160106B |
| 1512286-01D | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 72974 | 1 | 12/29/15 12:18 PM | IC3_151229A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 72974 | 100 | 12/29/15 05:51 PM | IC3_151229A |
| | FGD-3 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:31 AM | TITRATOR_151222A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-02A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 03:53 PM | CETAC2_HG_151222A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 10:32 AM | ICP-MS4_160104A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 10 | 01/04/16 02:08 PM | ICP-MS4_160104A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 09:31 PM | ICP-MS4_160106B |
| 1512286-02D | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 72974 | 1 | 12/29/15 12:41 PM | IC3_151229A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 72974 | 10 | 12/29/15 06:11 PM | IC3_151229A |
| | FGD-4 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:33 AM | TITRATOR_151222A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-03A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 03:56 PM | CETAC2_HG_151222A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 10:34 AM | ICP-MS4_160104A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 10 | 01/04/16 02:10 PM | ICP-MS4_160104A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 09:33 PM | ICP-MS4_160106B |
| 1512286-03D | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 72974 | 1 | 12/29/15 01:02 PM | IC3_151229A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 72974 | 10 | 12/29/15 06:32 PM | IC3_151229A |
| | FGD-5 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:34 AM | TITRATOR_151222A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-04A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 03:58 PM | CETAC2_HG_151222A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 09:35 PM | ICP-MS4_160106B |

**Lab Order:** 1512286
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1512286-04A | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 10:36 AM | ICP-MS4_160104A |
| 1512286-04D | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 72974 | 10 | 12/29/15 06:52 PM | IC3_151229A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 72974 | 1 | 12/29/15 01:23 PM | IC3_151229A |
| | FGD-2 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:35 AM | TITRATOR_151222A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-05A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:00 PM | CETAC2_HG_151222A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 10:38 AM | ICP-MS4_160104A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 09:37 PM | ICP-MS4_160106B |
| 1512286-05D | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 72974 | 1 | 12/29/15 01:43 PM | IC3_151229A |
| | FGD-1 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:38 AM | TITRATOR_151222A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-06A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:03 PM | CETAC2_HG_151222A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 09:39 PM | ICP-MS4_160106B |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 10:40 AM | ICP-MS4_160104A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 10 | 01/04/16 02:12 PM | ICP-MS4_160104A |
| 1512286-06D | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 72974 | 1 | 12/29/15 02:04 PM | IC3_151229A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 72974 | 100 | 12/29/15 07:13 PM | IC3_151229A |
| | FGD-6 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:41 AM | TITRATOR_151222A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-07A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:05 PM | CETAC2_HG_151222A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 11:32 AM | ICP-MS4_160104A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 10 | 01/04/16 02:14 PM | ICP-MS4_160104A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 09:41 PM | ICP-MS4_160106B |
| 1512286-07D | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 72974 | 1 | 12/29/15 02:25 PM | IC3_151229A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 72974 | 100 | 12/29/15 07:34 PM | IC3_151229A |
| | FGD-8 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:42 AM | TITRATOR_151222A |

**Lab Order:** 1512286
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1512286-07D | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-08A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:07 PM | CETAC2_HG_151222A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 09:43 PM | ICP-MS4_160106B |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 11:33 AM | ICP-MS4_160104A |
| 1512286-08D | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 72974 | 1 | 12/29/15 02:45 PM | IC3_151229A |
| | FGD-12 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:45 AM | TITRATOR_151222A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-09A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:09 PM | CETAC2_HG_151222A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 11:36 AM | ICP-MS4_160104A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 09:45 PM | ICP-MS4_160106B |
| 1512286-09D | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 72974 | 1 | 12/29/15 03:06 PM | IC3_151229A |
| | FGD-11 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:47 AM | TITRATOR_151222A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-10A | MW-07 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:12 PM | CETAC2_HG_151222A |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 09:47 PM | ICP-MS4_160106B |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 11:38 AM | ICP-MS4_160104A |
| 1512286-10D | MW-07 | Aqueous | E300 | Anions by IC method - Water | 72974 | 1 | 12/29/15 03:26 PM | IC3_151229A |
| | MW-07 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:49 AM | TITRATOR_151222A |
| | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-11A | MW-05 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:18 PM | CETAC2_HG_151222A |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 11:40 AM | ICP-MS4_160104A |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 10:03 PM | ICP-MS4_160106B |
| 1512286-11D | MW-05 | Aqueous | E300 | Anions by IC method - Water | 72978 | 1 | 12/29/15 12:58 PM | IC2_151229B |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 72978 | 10 | 12/29/15 02:15 PM | IC2_151229B |
| | MW-05 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:55 AM | TITRATOR_151222A |
| | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |

**Lab Order:** 1512286
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1512286-12A | MW-02 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:21 PM | CETAC2_HG_151222A |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 10:05 PM | ICP-MS4_160106B |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 11:42 AM | ICP-MS4_160104A |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 10 | 01/04/16 02:16 PM | ICP-MS4_160104A |
| 1512286-12D | MW-02 | Aqueous | E300 | Anions by IC method - Water | 72978 | 10 | 12/29/15 02:59 PM | IC2_151229B |
| | MW-02 | Aqueous | E300 | Anions by IC method - Water | 72978 | 1 | 12/29/15 01:12 PM | IC2_151229B |
| | MW-02 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 11:58 AM | TITRATOR_151222A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 72907 | 1 | 12/23/15 08:05 AM | WC_151222B |
| 1512286-13A | AL-10 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:23 PM | CETAC2_HG_151222A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 11:44 AM | ICP-MS4_160104A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 10 | 01/04/16 02:19 PM | ICP-MS4_160104A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 10:07 PM | ICP-MS4_160106B |
| 1512286-13D | AL-10 | Aqueous | E300 | Anions by IC method - Water | 72978 | 1 | 12/29/15 01:27 PM | IC2_151229B |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 72978 | 10 | 12/29/15 03:13 PM | IC2_151229B |
| | AL-10 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 12:01 PM | TITRATOR_151222A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 72925 | 1 | 12/24/15 08:00 AM | WC_151223B |
| 1512286-14A | MW-09 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:25 PM | CETAC2_HG_151222A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 11:46 AM | ICP-MS4_160104A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 10 | 01/04/16 02:21 PM | ICP-MS4_160104A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 10:09 PM | ICP-MS4_160106B |
| 1512286-14D | MW-09 | Aqueous | E300 | Anions by IC method - Water | 72978 | 1 | 12/29/15 01:41 PM | IC2_151229B |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 72978 | 10 | 12/29/15 03:28 PM | IC2_151229B |
| | MW-09 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 12:04 PM | TITRATOR_151222A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 72925 | 1 | 12/24/15 08:00 AM | WC_151223B |
| 1512286-15A | MW-08 | Aqueous | SW7470A | Mercury Total: Aqueous | 72872 | 1 | 12/22/15 04:28 PM | CETAC2_HG_151222A |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/04/16 11:48 AM | ICP-MS4_160104A |

**Lab Order:** 1512286
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1512286-15A | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 10 | 01/04/16 02:23 PM | ICP-MS4_160104A |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 72973 | 1 | 01/06/16 10:11 PM | ICP-MS4_160106B |
| 1512286-15D | MW-08 | Aqueous | E300 | Anions by IC method - Water | 72978 | 1 | 12/29/15 01:56 PM | IC2_151229B |
| | MW-08 | Aqueous | E300 | Anions by IC method - Water | 72978 | 100 | 12/29/15 03:43 PM | IC2_151229B |
| | MW-08 | Aqueous | M4500-H+ B | pH | 72889 | 1 | 12/22/15 12:05 PM | TITRATOR_151222A |
| | MW-08 | Aqueous | M2540C | Total Dissolved Solids | 72925 | 1 | 12/24/15 08:00 AM | WC_151223B |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-01 |
| **Project No:** | 5164-D | **Collection Date:** | 12/17/15 09:35 AM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 03:42 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 10:20 AM |
| Arsenic | 0.00215 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/04/16 10:20 AM |
| Barium | 0.0371 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 10:20 AM |
| Beryllium | 0.000475 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/04/16 10:20 AM |
| Boron | 0.255 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 10:20 AM |
| Cadmium | 0.00372 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:20 AM |
| Calcium | 109 | 1.00 | 3.00 | | mg/L | 10 | 01/04/16 02:04 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:20 AM |
| Cobalt | 0.0399 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 10:20 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:20 AM |
| Lithium | 0.140 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 10:20 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:20 AM |
| Selenium | 0.0798 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:20 AM |
| Thallium | 0.00160 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 09:27 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 399 | 30.0 | 100 | | mg/L | 100 | 12/29/15 05:51 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 12/29/15 12:18 PM |
| Sulfate | 478 | 100 | 300 | | mg/L | 100 | 12/29/15 05:51 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.34 | 0 | 0 | | pH Units@15.3℃ | 1 | 12/22/15 11:31 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 1640 | 50.0 | 50.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-02 |
| **Project No:** | 5164-D | **Collection Date:** | 12/17/15 10:25 AM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | 0.000229 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 03:53 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 10:32 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:32 AM |
| Barium | 0.105 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 10:32 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:32 AM |
| Boron | 0.0777 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 10:32 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:32 AM |
| Calcium | 47.8 | 1.00 | 3.00 | | mg/L | 10 | 01/04/16 02:08 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:32 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 10:32 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:32 AM |
| Lithium | 0.0436 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 10:32 AM |
| Molybdenum | 0.00211 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/04/16 10:32 AM |
| Selenium | 0.00214 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/04/16 10:32 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 09:31 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 211 | 3.00 | 10.0 | | mg/L | 10 | 12/29/15 06:11 PM |
| Fluoride | 0.295 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 12:41 PM |
| Sulfate | 38.2 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 12:41 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.61 | 0 | 0 | | pH Units@14.5℃ | 1 | 12/22/15 11:33 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 647 | 10.0 | 10.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-03 |
| **Project No:** | 5164-D | **Collection Date:** | 12/17/15 11:15 AM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 03:56 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 10:34 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:34 AM |
| Barium | 0.135 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 10:34 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:34 AM |
| Boron | 0.0798 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 10:34 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:34 AM |
| Calcium | 32.5 | 1.00 | 3.00 | | mg/L | 10 | 01/04/16 02:10 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:34 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 10:34 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:34 AM |
| Lithium | 0.00964 | 0.00500 | 0.0100 | J | mg/L | 1 | 01/04/16 10:34 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:34 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:34 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 09:33 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 254 | 3.00 | 10.0 | | mg/L | 10 | 12/29/15 06:32 PM |
| Fluoride | 0.333 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 01:02 PM |
| Sulfate | 56.1 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 01:02 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.78 | 0 | 0 | | pH Units@14.4℃ | 1 | 12/22/15 11:34 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 845 | 50.0 | 50.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-04 |
| **Project No:** | 5164-D | **Collection Date:** | 12/17/15 12:00 PM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 03:58 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 10:36 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:36 AM |
| Barium | 0.103 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 10:36 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:36 AM |
| Boron | 0.0636 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 10:36 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:36 AM |
| Calcium | 24.8 | 0.100 | 0.300 | | mg/L | 1 | 01/04/16 10:36 AM |
| Chromium | 0.00386 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/04/16 10:36 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 10:36 AM |
| Lead | 0.00145 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:36 AM |
| Lithium | 0.0183 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 10:36 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:36 AM |
| Selenium | 0.0127 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:36 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 09:35 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 133 | 3.00 | 10.0 | | mg/L | 10 | 12/29/15 06:52 PM |
| Fluoride | 0.347 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 01:23 PM |
| Sulfate | 53.2 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 01:23 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.89 | 0 | 0 | | pH Units@14℃ | 1 | 12/22/15 11:35 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 515 | 10.0 | 10.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-05 |
| **Project No:** | 5164-D | **Collection Date:** | 12/17/15 12:50 PM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 04:00 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 10:38 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:38 AM |
| Barium | 0.0263 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 10:38 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:38 AM |
| Boron | 0.0706 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 10:38 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:38 AM |
| Calcium | 10.6 | 0.100 | 0.300 | | mg/L | 1 | 01/04/16 10:38 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:38 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 10:38 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:38 AM |
| Lithium | 0.0306 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 10:38 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:38 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:38 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 09:37 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 37.7 | 0.300 | 1.00 | | mg/L | 1 | 12/29/15 01:43 PM |
| Fluoride | 0.384 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 01:43 PM |
| Sulfate | 33.3 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 01:43 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.47 | 0 | 0 | | pH Units@15.1℃ | 1 | 12/22/15 11:38 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 224 | 10.0 | 10.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-06 |
| **Project No:** | 5164-D | **Collection Date:** | 12/17/15 01:45 PM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 04:03 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 10:40 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:40 AM |
| Barium | 0.237 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 10:40 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 10:40 AM |
| Boron | 0.103 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 10:40 AM |
| Cadmium | 0.000593 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/04/16 10:40 AM |
| Calcium | 89.9 | 1.00 | 3.00 | | mg/L | 10 | 01/04/16 02:12 PM |
| Chromium | 0.0391 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:40 AM |
| Cobalt | 0.0164 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 10:40 AM |
| Lead | 0.000369 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/04/16 10:40 AM |
| Lithium | 0.156 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 10:40 AM |
| Molybdenum | 0.0203 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:40 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 10:40 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 09:39 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 342 | 30.0 | 100 | | mg/L | 100 | 12/29/15 07:13 PM |
| Fluoride | 0.469 | 0.100 | 0.400 | | mg/L | 1 | 12/29/15 02:04 PM |
| Sulfate | 65.9 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 02:04 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.56 | 0 | 0 | | pH Units@15.6℃ | 1 | 12/22/15 11:41 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 940 | 50.0 | 50.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-07 |
| **Project No:** | 5164-D | **Collection Date:** | 12/17/15 02:50 PM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 04:05 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 11:32 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:32 AM |
| Barium | 0.179 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 11:32 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:32 AM |
| Boron | 0.0791 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 11:32 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:32 AM |
| Calcium | 65.2 | 1.00 | 3.00 | | mg/L | 10 | 01/04/16 02:14 PM |
| Chromium | 0.00373 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/04/16 11:32 AM |
| Cobalt | 0.00646 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 11:32 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:32 AM |
| Lithium | 0.116 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 11:32 AM |
| Molybdenum | 0.00404 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/04/16 11:32 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:32 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 09:41 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 248 | 30.0 | 100 | | mg/L | 100 | 12/29/15 07:34 PM |
| Fluoride | 0.361 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 02:25 PM |
| Sulfate | 50.1 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 02:25 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.52 | 0 | 0 | | pH Units@15.2℃ | 1 | 12/22/15 11:42 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 721 | 10.0 | 10.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-08 |
| **Project No:** | 5164-D | **Collection Date:** | 12/17/15 03:40 PM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 04:07 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 11:33 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:33 AM |
| Barium | 0.0781 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 11:33 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:33 AM |
| Boron | 0.0671 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 11:33 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:33 AM |
| Calcium | 13.2 | 0.100 | 0.300 | | mg/L | 1 | 01/04/16 11:33 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:33 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 11:33 AM |
| Lead | 0.000775 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/04/16 11:33 AM |
| Lithium | 0.0220 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 11:33 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:33 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:33 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 09:43 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 15.5 | 0.300 | 1.00 | | mg/L | 1 | 12/29/15 02:45 PM |
| Fluoride | 0.159 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 02:45 PM |
| Sulfate | 16.6 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 02:45 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.64 | 0 | 0 | | pH Units@15.5℃ | 1 | 12/22/15 11:45 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 161 | 10.0 | 10.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-09 |
| **Project No:** | 5164-D | **Collection Date:** | 12/17/15 04:30 PM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 04:09 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 11:36 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:36 AM |
| Barium | 0.0676 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 11:36 AM |
| Beryllium | 0.000303 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/04/16 11:36 AM |
| Boron | 0.0544 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 11:36 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:36 AM |
| Calcium | 10.7 | 0.100 | 0.300 | | mg/L | 1 | 01/04/16 11:36 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:36 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 11:36 AM |
| Lead | 0.000987 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/04/16 11:36 AM |
| Lithium | 0.0160 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 11:36 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:36 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:36 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 09:45 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 9.85 | 0.300 | 1.00 | | mg/L | 1 | 12/29/15 03:06 PM |
| Fluoride | 0.130 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 03:06 PM |
| Sulfate | 11.0 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 03:06 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.70 | 0 | 0 | | pH Units@16.1℃ | 1 | 12/22/15 11:47 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 115 | 10.0 | 10.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-07 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-10 |
| **Project No:** | 5164-D | **Collection Date:** | 12/17/15 06:15 PM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 04:12 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 11:38 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:38 AM |
| Barium | 0.0441 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 11:38 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:38 AM |
| Boron | 0.0539 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 11:38 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:38 AM |
| Calcium | 8.75 | 0.100 | 0.300 | | mg/L | 1 | 01/04/16 11:38 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:38 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 11:38 AM |
| Lead | 0.000537 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/04/16 11:38 AM |
| Lithium | 0.0128 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 11:38 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:38 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:38 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 09:47 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 17.7 | 0.300 | 1.00 | | mg/L | 1 | 12/29/15 03:26 PM |
| Fluoride | 0.319 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 03:26 PM |
| Sulfate | 14.7 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 03:26 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.76 | 0 | 0 | | pH Units@16.7℃ | 1 | 12/22/15 11:49 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 243 | 10.0 | 10.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-05 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-11 |
| **Project No:** | 5164-D | **Collection Date:** | 12/18/15 07:40 AM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 04:18 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 11:40 AM |
| Arsenic | 0.00803 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:40 AM |
| Barium | 0.0662 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 11:40 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:40 AM |
| Boron | 0.0621 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 11:40 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:40 AM |
| Calcium | 13.0 | 0.100 | 0.300 | | mg/L | 1 | 01/04/16 11:40 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:40 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 11:40 AM |
| Lead | 0.000743 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/04/16 11:40 AM |
| Lithium | 0.0407 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 11:40 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:40 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:40 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 10:03 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 60.2 | 3.00 | 10.0 | | mg/L | 10 | 12/29/15 02:15 PM |
| Fluoride | 0.476 | 0.100 | 0.400 | | mg/L | 1 | 12/29/15 12:58 PM |
| Sulfate | 10.5 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 12:58 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.54 | 0 | 0 | | pH Units@17.7℃ | 1 | 12/22/15 11:55 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 232 | 10.0 | 10.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-02 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-12 |
| **Project No:** | 5164-D | **Collection Date:** | 12/18/15 08:25 AM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 04:21 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 11:42 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:42 AM |
| Barium | 0.175 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 11:42 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:42 AM |
| Boron | 0.0476 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 11:42 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:42 AM |
| Calcium | 29.0 | 1.00 | 3.00 | | mg/L | 10 | 01/04/16 02:16 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:42 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 11:42 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:42 AM |
| Lithium | 0.00927 | 0.00500 | 0.0100 | J | mg/L | 1 | 01/04/16 11:42 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:42 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:42 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 10:05 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 61.7 | 3.00 | 10.0 | | mg/L | 10 | 12/29/15 02:59 PM |
| Fluoride | 0.118 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 01:12 PM |
| Sulfate | 15.9 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 01:12 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 7.06 | 0 | 0 | | pH Units@17.3℃ | 1 | 12/22/15 11:58 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 308 | 10.0 | 10.0 | | mg/L | 1 | 12/23/15 08:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | AL-10 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-13 |
| **Project No:** | 5164-D | **Collection Date:** | 12/18/15 09:20 AM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 04:23 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 11:44 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:44 AM |
| Barium | 0.230 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 11:44 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:44 AM |
| Boron | 0.0539 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 11:44 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:44 AM |
| Calcium | 37.5 | 1.00 | 3.00 | | mg/L | 10 | 01/04/16 02:19 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:44 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 11:44 AM |
| Lead | 0.00339 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:44 AM |
| Lithium | 0.0115 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 11:44 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:44 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:44 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 10:07 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 81.0 | 3.00 | 10.0 | | mg/L | 10 | 12/29/15 03:13 PM |
| Fluoride | 0.150 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 01:27 PM |
| Sulfate | 20.6 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 01:27 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 7.08 | 0 | 0 | | pH Units@17.3℃ | 1 | 12/22/15 12:01 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 414 | 10.0 | 10.0 | | mg/L | 1 | 12/24/15 08:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-09 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-14 |
| **Project No:** | 5164-D | **Collection Date:** | 12/18/15 10:20 AM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/22/15 04:25 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 11:46 AM |
| Arsenic | 0.00260 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/04/16 11:46 AM |
| Barium | 0.107 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 11:46 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:46 AM |
| Boron | 0.0770 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 11:46 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:46 AM |
| Calcium | 40.3 | 1.00 | 3.00 | | mg/L | 10 | 01/04/16 02:21 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:46 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 11:46 AM |
| Lead | 0.00118 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:46 AM |
| Lithium | 0.0544 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 11:46 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:46 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:46 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 10:09 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 157 | 3.00 | 10.0 | | mg/L | 10 | 12/29/15 03:28 PM |
| Fluoride | 0.266 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 01:41 PM |
| Sulfate | 83.1 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 01:41 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.06 | 0 | 0 | | pH Units@18.2℃ | 1 | 12/22/15 12:04 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 528 | 10.0 | 10.0 | | mg/L | 1 | 12/24/15 08:00 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *25-Jan-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-08 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1512286-15 |
| **Project No:** | 5164-D | **Collection Date:** | 12/18/15 11:15 AM |
| **Lab Order:** | 1512286 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **ABO** |
| Mercury | 0.0000855 | 0.0000800 | 0.000200 | J | mg/L | 1 | 12/22/15 04:28 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/04/16 11:48 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:48 AM |
| Barium | 0.257 | 0.00300 | 0.0100 | | mg/L | 1 | 01/04/16 11:48 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:48 AM |
| Boron | 0.0604 | 0.0100 | 0.0300 | | mg/L | 1 | 01/04/16 11:48 AM |
| Cadmium | 0.000363 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/04/16 11:48 AM |
| Calcium | 70.4 | 1.00 | 3.00 | | mg/L | 10 | 01/04/16 02:23 PM |
| Chromium | 0.0511 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:48 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/04/16 11:48 AM |
| Lead | 0.00117 | 0.000300 | 0.00100 | | mg/L | 1 | 01/04/16 11:48 AM |
| Lithium | 0.0429 | 0.00500 | 0.0100 | | mg/L | 1 | 01/04/16 11:48 AM |
| Molybdenum | 0.00438 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/04/16 11:48 AM |
| Selenium | 0.0108 | 0.00200 | 0.00500 | | mg/L | 1 | 01/04/16 11:48 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/06/16 10:11 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 488 | 30.0 | 100 | | mg/L | 100 | 12/29/15 03:43 PM |
| Fluoride | 0.158 | 0.100 | 0.400 | J | mg/L | 1 | 12/29/15 01:56 PM |
| Sulfate | 49.8 | 1.00 | 3.00 | | mg/L | 1 | 12/29/15 01:56 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **LM** |
| pH | 6.40 | 0 | 0 | | pH Units@19.2℃ | 1 | 12/22/15 12:05 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **BJT** |
| Total Dissolved Solids (Residue, Filterable) | 1140 | 50.0 | 50.0 | | mg/L | 1 | 12/24/15 08:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_151222A**

The QC data in batch 72872 applies to the following samples: 1512286-01A, 1512286-02A, 1512286-03A, 1512286-04A, 1512286-05A, 1512286-06A, 1512286-07A, 1512286-08A, 1512286-09A, 1512286-10A, 1512286-11A, 1512286-12A, 1512286-13A, 1512286-14A, 1512286-15A

| Sample ID | **MB-72872** | Batch ID: | **72872** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 3:35:51 PM** | Prep Date: | **12/21/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-72872** | Batch ID: | **72872** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 3:38:06 PM** | Prep Date: | **12/21/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00200 | 0.000200 | 0.00200 | 0 | 100 | 85 | 115 | | | |

| Sample ID | **LCSD-72872** | Batch ID: | **72872** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 3:40:22 PM** | Prep Date: | **12/21/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00186 | 0.000200 | 0.00200 | 0 | 93.0 | 85 | 115 | 7.25 | 15 | |

| Sample ID | **1512286-01A SD** | Batch ID: | **72872** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 3:44:55 PM** | Prep Date: | **12/21/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1512286-01A PDS** | Batch ID: | **72872** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 3:47:11 PM** | Prep Date: | **12/21/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00234 | 0.000200 | 0.00250 | 0 | 93.6 | 85 | 115 | | | |

| Sample ID | **1512286-01A MS** | Batch ID: | **72872** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 3:49:26 PM** | Prep Date: | **12/21/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00172 | 0.000200 | 0.00200 | 0 | 86.0 | 80 | 120 | | | |

| Sample ID | **1512286-01A MSD** | Batch ID: | **72872** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 3:51:42 PM** | Prep Date: | **12/21/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00179 | 0.000200 | 0.00200 | 0 | 89.5 | 80 | 120 | 3.99 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_151222A**

| Sample ID | **ICV-151222** | Batch ID: | **R83299** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 10:31:35 A** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00397 | 0.000200 | 0.00400 | 0 | 99.2 | 90 | 110 | | | |

| Sample ID | **CCV8-151222** | Batch ID: | **R83299** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 3:31:17 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00189 | 0.000200 | 0.00200 | 0 | 94.5 | 90 | 110 | | | |

| Sample ID | **CCV9-151222** | Batch ID: | **R83299** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 4:14:23 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00190 | 0.000200 | 0.00200 | 0 | 95.0 | 90 | 110 | | | |

| Sample ID | **CCV10-151222** | Batch ID: | **R83299** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_151222A** | Analysis Date: | **12/22/2015 4:53:05 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00190 | 0.000200 | 0.00200 | 0 | 95.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160104A**

The QC data in batch 72973 applies to the following samples: 1512286-01A, 1512286-02A, 1512286-03A, 1512286-04A, 1512286-05A, 1512286-06A, 1512286-07A, 1512286-08A, 1512286-09A, 1512286-10A, 1512286-11A, 1512286-12A, 1512286-13A, 1512286-14A, 1512286-15A

Sample ID **MB-72973** Batch ID: **72973** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_160104A** Analysis Date: **1/4/2016 10:12:00 AM** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |

Sample ID **LCS-72973** Batch ID: **72973** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_160104A** Analysis Date: **1/4/2016 10:14:00 AM** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.7 | 80 | 120 | | | |
| Arsenic | 0.198 | 0.00500 | 0.200 | 0 | 99.1 | 80 | 120 | | | |
| Barium | 0.195 | 0.0100 | 0.200 | 0 | 97.5 | 80 | 120 | | | |
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Boron | 0.205 | 0.0300 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Cadmium | 0.195 | 0.00100 | 0.200 | 0 | 97.6 | 80 | 120 | | | |
| Calcium | 4.56 | 0.300 | 5.00 | 0 | 91.3 | 80 | 120 | | | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Cobalt | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 80 | 120 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 96.9 | 80 | 120 | | | |
| Lithium | 0.196 | 0.0100 | 0.200 | 0 | 98.0 | 80 | 120 | | | |
| Molybdenum | 0.188 | 0.00500 | 0.200 | 0 | 94.2 | 80 | 120 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 80 | 120 | | | |

Sample ID **LCSD-72973** Batch ID: **72973** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_160104A** Analysis Date: **1/4/2016 10:16:00 AM** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.7 | 80 | 120 | 1.01 | 15 | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | 0.707 | 15 | |
| Barium | 0.197 | 0.0100 | 0.200 | 0 | 98.6 | 80 | 120 | 1.10 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160104A**

| Sample ID **LCSD-72973** | Batch ID: **72973** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 10:16:00 AM** | Prep Date: **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | 1.76 | 15 | |
| Boron | 0.190 | 0.0300 | 0.200 | 0 | 95.2 | 80 | 120 | 7.48 | 15 | |
| Cadmium | 0.197 | 0.00100 | 0.200 | 0 | 98.5 | 80 | 120 | 0.880 | 15 | |
| Calcium | 4.60 | 0.300 | 5.00 | 0 | 92.1 | 80 | 120 | 0.869 | 15 | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.283 | 15 | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 1.33 | 15 | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.4 | 80 | 120 | 0.511 | 15 | |
| Lithium | 0.195 | 0.0100 | 0.200 | 0 | 97.7 | 80 | 120 | 0.229 | 15 | |
| Molybdenum | 0.191 | 0.00500 | 0.200 | 0 | 95.7 | 80 | 120 | 1.58 | 15 | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 80 | 120 | 0.244 | 15 | |

| Sample ID **1512286-01A SD** | Batch ID: **72973** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 10:22:00 AM** | Prep Date: **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0.00215 | | | | 0 | 10 | |
| Barium | 0.0361 | 0.0500 | 0 | 0.0371 | | | | 2.70 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0.000475 | | | | 0 | 10 | |
| Boron | 0.263 | 0.150 | 0 | 0.255 | | | | 3.30 | 10 | |
| Cadmium | 0.00358 | 0.00500 | 0 | 0.00372 | | | | 3.78 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | 0.0408 | 0.0250 | 0 | 0.0399 | | | | 2.32 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.142 | 0.0500 | 0 | 0.140 | | | | 1.68 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | 0.0798 | 0.0250 | 0 | 0.0798 | | | | 0.021 | 10 | |

| Sample ID **1512286-01A PDS** | Batch ID: **72973** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 10:42:00 AM** | Prep Date: **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.183 | 0.00250 | 0.200 | 0 | 91.7 | 80 | 120 | | | |
| Arsenic | 0.205 | 0.00500 | 0.200 | 0.00215 | 101 | 80 | 120 | | | |
| Barium | 0.231 | 0.0100 | 0.200 | 0.0371 | 97.1 | 80 | 120 | | | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0.000475 | 100 | 80 | 120 | | | |
| Boron | 0.441 | 0.0300 | 0.200 | 0.255 | 93.3 | 80 | 120 | | | |
| Cadmium | 0.197 | 0.00100 | 0.200 | 0.00372 | 96.6 | 80 | 120 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.235 | 0.00500 | 0.200 | 0.0399 | 97.7 | 80 | 120 | | | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160104A**

Sample ID **1512286-01A PDS** Batch ID: **72973** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_160104A** Analysis Date: **1/4/2016 10:42:00 AM** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.326 | 0.0100 | 0.200 | 0.140 | 93.2 | 80 | 120 | | | |
| Molybdenum | 0.192 | 0.00500 | 0.200 | 0 | 96.1 | 80 | 120 | | | |
| Selenium | 0.271 | 0.00500 | 0.200 | 0.0798 | 95.8 | 80 | 120 | | | |

Sample ID **1512286-01A MS** Batch ID: **72973** TestNo: **SW6020A** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS4_160104A** Analysis Date: **1/4/2016 10:44:00 AM** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0.00215 | 102 | 80 | 120 | | | |
| Barium | 0.234 | 0.0100 | 0.200 | 0.0371 | 98.7 | 80 | 120 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0.000475 | 101 | 80 | 120 | | | |
| Boron | 0.469 | 0.0300 | 0.200 | 0.255 | 107 | 80 | 120 | | | |
| Cadmium | 0.195 | 0.00100 | 0.200 | 0.00372 | 95.8 | 80 | 120 | | | |
| Calcium | 111 | 0.300 | 5.00 | 105 | 110 | 80 | 120 | | | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 98.8 | 80 | 120 | | | |
| Cobalt | 0.234 | 0.00500 | 0.200 | 0.0399 | 97.1 | 80 | 120 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 97.0 | 80 | 120 | | | |
| Lithium | 0.334 | 0.0100 | 0.200 | 0.140 | 97.3 | 80 | 120 | | | |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.3 | 80 | 120 | | | |
| Selenium | 0.277 | 0.00500 | 0.200 | 0.0798 | 98.4 | 80 | 120 | | | |

Sample ID **1512286-01A MSD** Batch ID: **72973** TestNo: **SW6020A** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS4_160104A** Analysis Date: **1/4/2016 10:46:00 AM** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 103 | 80 | 120 | 0.175 | 15 | |
| Arsenic | 0.209 | 0.00500 | 0.200 | 0.00215 | 104 | 80 | 120 | 1.62 | 15 | |
| Barium | 0.235 | 0.0100 | 0.200 | 0.0371 | 98.9 | 80 | 120 | 0.146 | 15 | |
| Beryllium | 0.203 | 0.00100 | 0.200 | 0.000475 | 101 | 80 | 120 | 0.443 | 15 | |
| Boron | 0.459 | 0.0300 | 0.200 | 0.255 | 102 | 80 | 120 | 2.05 | 15 | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0.00372 | 97.5 | 80 | 120 | 1.67 | 15 | |
| Calcium | 111 | 0.300 | 5.00 | 105 | 127 | 80 | 120 | 0.735 | 15 | S |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 1.42 | 15 | |
| Cobalt | 0.235 | 0.00500 | 0.200 | 0.0399 | 97.5 | 80 | 120 | 0.384 | 15 | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 80 | 120 | 2.08 | 15 | |
| Lithium | 0.341 | 0.0100 | 0.200 | 0.140 | 101 | 80 | 120 | 2.05 | 15 | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 80 | 120 | 0.593 | 15 | |
| Selenium | 0.281 | 0.00500 | 0.200 | 0.0798 | 101 | 80 | 120 | 1.53 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160104A**

| Sample ID **1512286-01A SD** | Batch ID: **72973** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 2:06:00 PM** | Prep Date: **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 106 | 15.0 | 0 | 109 | | | | 2.49 | 10 | |

| Sample ID **1512286-01A PDS** | Batch ID: **72973** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 2:25:00 PM** | Prep Date: **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 153 | 3.00 | 50.0 | 109 | 87.6 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160104A**

| Sample ID **ICV-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 10:01:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.102 | 0.00250 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Barium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Beryllium | 0.101 | 0.00100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Boron | 0.102 | 0.0300 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.37 | 0.300 | 2.50 | 0 | 94.7 | 90 | 110 | | | |
| Chromium | 0.107 | 0.00500 | 0.100 | 0 | 107 | 90 | 110 | | | |
| Cobalt | 0.106 | 0.00500 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Lead | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Lithium | 0.0985 | 0.0100 | 0.100 | 0 | 98.5 | 90 | 110 | | | |
| Molybdenum | 0.0980 | 0.00500 | 0.100 | 0 | 98.0 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 10:05:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00211 | 0.00250 | 0.00200 | 0 | 105 | 70 | 130 | | | |
| Arsenic | 0.00520 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Barium | 0.00501 | 0.0100 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Beryllium | 0.00114 | 0.00100 | 0.00100 | 0 | 114 | 70 | 130 | | | |
| Boron | 0.0248 | 0.0300 | 0.0200 | 0 | 124 | 70 | 130 | | | |
| Cadmium | 0.00100 | 0.00100 | 0.00100 | 0 | 100 | 70 | 130 | | | |
| Calcium | 0.0945 | 0.300 | 0.100 | 0 | 94.5 | 70 | 130 | | | |
| Chromium | 0.00518 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Cobalt | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Lead | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 70 | 130 | | | |
| Lithium | 0.0100 | 0.0100 | 0.0100 | 0 | 100 | 70 | 130 | | | |
| Molybdenum | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Selenium | 0.00530 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |

| Sample ID **CCV1-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 10:57:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Beryllium | 0.212 | 0.00100 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Boron | 0.201 | 0.0300 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160104A**

| Sample ID **CCV1-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 10:57:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Calcium | 4.88 | 0.300 | 5.00 | 0 | 97.6 | 90 | 110 | | | |
| Chromium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.195 | 0.00100 | 0.200 | 0 | 97.6 | 90 | 110 | | | |
| Lithium | 0.197 | 0.0100 | 0.200 | 0 | 98.3 | 90 | 110 | | | |
| Molybdenum | 0.193 | 0.00500 | 0.200 | 0 | 96.3 | 90 | 110 | | | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |

| Sample ID **LCVL1-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 11:26:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00203 | 0.00250 | 0.00200 | 0 | 102 | 70 | 130 | | | |
| Arsenic | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00495 | 0.0100 | 0.00500 | 0 | 99.0 | 70 | 130 | | | |
| Beryllium | 0.00114 | 0.00100 | 0.00100 | 0 | 114 | 70 | 130 | | | |
| Boron | 0.0203 | 0.0300 | 0.0200 | 0 | 101 | 70 | 130 | | | |
| Cadmium | 0.000957 | 0.00100 | 0.00100 | 0 | 95.7 | 70 | 130 | | | |
| Calcium | 0.0909 | 0.300 | 0.100 | 0 | 90.9 | 70 | 130 | | | |
| Chromium | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00506 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lead | 0.000925 | 0.00100 | 0.00100 | 0 | 92.5 | 70 | 130 | | | |
| Lithium | 0.0104 | 0.0100 | 0.0100 | 0 | 104 | 70 | 130 | | | |
| Molybdenum | 0.00462 | 0.00500 | 0.00500 | 0 | 92.5 | 70 | 130 | | | |
| Selenium | 0.00495 | 0.00500 | 0.00500 | 0 | 98.9 | 70 | 130 | | | |

| Sample ID **CCV2-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 11:50:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.197 | 0.0100 | 0.200 | 0 | 98.6 | 90 | 110 | | | |
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Boron | 0.196 | 0.0300 | 0.200 | 0 | 97.8 | 90 | 110 | | | |
| Cadmium | 0.195 | 0.00100 | 0.200 | 0 | 97.4 | 90 | 110 | | | |
| Calcium | 4.85 | 0.300 | 5.00 | 0 | 96.9 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 95.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

| Sample ID **CCV2-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 11:50:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.201 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.189 | 0.00500 | 0.200 | 0 | 94.3 | 90 | 110 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL2-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 11:56:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00205 | 0.00250 | 0.00200 | 0 | 102 | 70 | 130 | | | |
| Arsenic | 0.00513 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Barium | 0.00501 | 0.0100 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Beryllium | 0.000964 | 0.00100 | 0.00100 | 0 | 96.4 | 70 | 130 | | | |
| Boron | 0.0229 | 0.0300 | 0.0200 | 0 | 114 | 70 | 130 | | | |
| Cadmium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Calcium | 0.0953 | 0.300 | 0.100 | 0 | 95.3 | 70 | 130 | | | |
| Chromium | 0.00516 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Cobalt | 0.00518 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lead | 0.000913 | 0.00100 | 0.00100 | 0 | 91.3 | 70 | 130 | | | |
| Lithium | 0.00989 | 0.0100 | 0.0100 | 0 | 98.9 | 70 | 130 | | | |
| Molybdenum | 0.00472 | 0.00500 | 0.00500 | 0 | 94.5 | 70 | 130 | | | |
| Selenium | 0.00500 | 0.00500 | 0.00500 | 0 | 99.9 | 70 | 130 | | | |

| Sample ID **CCV6-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 1:55:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.11 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL6-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 2:00:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.101 | 0.300 | 0.100 | 0 | 101 | 70 | 130 | | | |

| Sample ID **CCV7-160104** | Batch ID: **R83456** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160104A** | Analysis Date: **1/4/2016 2:27:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.91 | 0.300 | 5.00 | 0 | 98.3 | 90 | 110 | | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160104A**

Sample ID **LCVL7-160104** Batch ID: **R83456** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_160104A** Analysis Date: **1/4/2016 2:37:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0949 | 0.300 | 0.100 | 0 | 94.9 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160106B**

The QC data in batch 72973 applies to the following samples: 1512286-01A, 1512286-02A, 1512286-03A, 1512286-04A, 1512286-05A, 1512286-06A, 1512286-07A, 1512286-08A, 1512286-09A, 1512286-10A, 1512286-11A, 1512286-12A, 1512286-13A, 1512286-14A, 1512286-15A

| Sample ID | **MB-72973** | Batch ID: | **72973** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:19:00 PM** | Prep Date: | **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

| Sample ID | **LCS-72973** | Batch ID: | **72973** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:21:00 PM** | Prep Date: | **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.187 | 0.00150 | 0.200 | 0 | 93.6 | 80 | 120 | | | |

| Sample ID | **LCSD-72973** | Batch ID: | **72973** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:23:00 PM** | Prep Date: | **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.186 | 0.00150 | 0.200 | 0 | 92.8 | 80 | 120 | 0.858 | 15 | |

| Sample ID | **1512286-01A SD** | Batch ID: | **72973** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:29:00 PM** | Prep Date: | **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | <0.00250 | 0.00750 | 0 | 0.00160 | | | | 0 | 10 | |

| Sample ID | **1512286-01A PDS** | Batch ID: | **72973** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:49:00 PM** | Prep Date: | **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.206 | 0.00150 | 0.200 | 0.00160 | 102 | 80 | 120 | | | |

| Sample ID | **1512286-01A MS** | Batch ID: | **72973** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:51:00 PM** | Prep Date: | **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.196 | 0.00150 | 0.200 | 0.00160 | 97.0 | 80 | 120 | | | |

| Sample ID | **1512286-01A MSD** | Batch ID: | **72973** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:53:00 PM** | Prep Date: | **12/29/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.197 | 0.00150 | 0.200 | 0.00160 | 97.5 | 80 | 120 | 0.472 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160106B**

| Sample ID | **ICV2-160106** | Batch ID: | **R83506** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 7:56:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.0956 | 0.00150 | 0.100 | 0 | 95.6 | 90 | 110 | | | |

| Sample ID | **ILCVL2-160106** | Batch ID: | **R83506** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 8:00:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.000858 | 0.00150 | 0.00100 | 0 | 85.8 | 70 | 130 | | | |

| Sample ID | **CCV2-160106** | Batch ID: | **R83506** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:10:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.7 | 90 | 110 | | | |

| Sample ID | **LCVL2-160106** | Batch ID: | **R83506** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:14:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.000892 | 0.00150 | 0.00100 | 0 | 89.2 | 70 | 130 | | | |

| Sample ID | **CCV3-160106** | Batch ID: | **R83506** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:55:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 98.0 | 90 | 110 | | | |

| Sample ID | **LCVL3-160106** | Batch ID: | **R83506** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 9:59:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.000913 | 0.00150 | 0.00100 | 0 | 91.3 | 70 | 130 | | | |

| Sample ID | **CCV4-160106** | Batch ID: | **R83506** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160106B** | Analysis Date: | **1/6/2016 10:17:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.194 | 0.00150 | 0.200 | 0 | 97.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160106B**

Sample ID **LCVL4-160106** Batch ID: **R83506** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_160106B** Analysis Date: **1/6/2016 10:21:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Thallium | 0.000872 | 0.00150 | 0.00100 | 0 | 87.2 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_151229B**

The QC data in batch 72978 applies to the following samples: 1512286-11D, 1512286-12D, 1512286-13D, 1512286-14D, 1512286-15D

Sample ID **MB-72978** Batch ID: **72978** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_151229B** Analysis Date: **12/29/2015 12:14:12 P** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-72978** Batch ID: **72978** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_151229B** Analysis Date: **12/29/2015 12:28:48 P** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.63 | 1.00 | 10.00 | 0 | 96.3 | 90 | 110 | | | |
| Fluoride | 3.97 | 0.400 | 4.000 | 0 | 99.4 | 90 | 110 | | | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 97.9 | 90 | 110 | | | |

Sample ID **LCSD-72978** Batch ID: **72978** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_151229B** Analysis Date: **12/29/2015 12:43:25 P** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.61 | 1.00 | 10.00 | 0 | 96.1 | 90 | 110 | 0.279 | 20 | |
| Fluoride | 3.98 | 0.400 | 4.000 | 0 | 99.6 | 90 | 110 | 0.189 | 20 | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.7 | 90 | 110 | 0.201 | 20 | |

Sample ID **1512286-11DMS** Batch ID: **72978** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_151229B** Analysis Date: **12/29/2015 2:30:09 PM** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 248 | 10.0 | 200.0 | 60.18 | 94.0 | 90 | 110 | | | |
| Fluoride | 195 | 4.00 | 200.0 | 0 | 97.4 | 90 | 110 | | | |
| Sulfate | 200 | 30.0 | 200.0 | 12.05 | 94.0 | 90 | 110 | | | |

Sample ID **1512286-11DMSD** Batch ID: **72978** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_151229B** Analysis Date: **12/29/2015 2:44:45 PM** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 248 | 10.0 | 200.0 | 60.18 | 93.8 | 90 | 110 | 0.157 | 20 | |
| Fluoride | 195 | 4.00 | 200.0 | 0 | 97.6 | 90 | 110 | 0.174 | 20 | |
| Sulfate | 199 | 30.0 | 200.0 | 12.05 | 93.3 | 90 | 110 | 0.635 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_151229B**

| Sample ID **ICV-151229** | Batch ID: **R83396** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_151229B** | Analysis Date: **12/29/2015 9:35:15 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.4 | 1.00 | 25.00 | 0 | 97.6 | 90 | 110 | | | |
| Fluoride | 9.95 | 0.400 | 10.00 | 0 | 99.5 | 90 | 110 | | | |
| Sulfate | 73.4 | 3.00 | 75.00 | 0 | 97.9 | 90 | 110 | | | |

| Sample ID **CCV1-151229** | Batch ID: **R83396** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_151229B** | Analysis Date: **12/29/2015 11:40:13 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.73 | 1.00 | 10.00 | 0 | 97.3 | 90 | 110 | | | |
| Fluoride | 3.98 | 0.400 | 4.000 | 0 | 99.4 | 90 | 110 | | | |
| Sulfate | 29.5 | 3.00 | 30.00 | 0 | 98.3 | 90 | 110 | | | |

| Sample ID **CCV2-151229** | Batch ID: **R83396** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_151229B** | Analysis Date: **12/29/2015 3:57:48 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.82 | 1.00 | 10.00 | 0 | 98.2 | 90 | 110 | | | |
| Fluoride | 4.11 | 0.400 | 4.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 29.7 | 3.00 | 30.00 | 0 | 98.9 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC3_151229A**

The QC data in batch 72974 applies to the following samples: 1512286-01D, 1512286-02D, 1512286-03D, 1512286-04D, 1512286-05D, 1512286-06D, 1512286-07D, 1512286-08D, 1512286-09D, 1512286-10D

Sample ID **MB-72974** Batch ID: **72974** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC3_151229A** Analysis Date: **12/29/2015 11:02:13 A** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-72974** Batch ID: **72974** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC3_151229A** Analysis Date: **12/29/2015 11:25:44 A** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.60 | 1.00 | 10.00 | 0 | 96.0 | 90 | 110 | | | |
| Fluoride | 4.18 | 0.400 | 4.000 | 0 | 105 | 90 | 110 | | | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

Sample ID **LCSD-72974** Batch ID: **72974** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC3_151229A** Analysis Date: **12/29/2015 11:46:24 A** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.60 | 1.00 | 10.00 | 0 | 96.0 | 90 | 110 | 0.041 | 20 | |
| Fluoride | 4.13 | 0.400 | 4.000 | 0 | 103 | 90 | 110 | 1.24 | 20 | |
| Sulfate | 31.2 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | 1.00 | 20 | |

Sample ID **1512286-07DMS** Batch ID: **72974** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC3_151229A** Analysis Date: **12/29/2015 7:54:48 PM** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2200 | 100 | 2000 | 248.2 | 97.5 | 90 | 110 | | | |
| Fluoride | 1940 | 40.0 | 2000 | 0 | 96.9 | 90 | 110 | | | |
| Sulfate | 2030 | 300 | 2000 | 0 | 102 | 90 | 110 | | | |

Sample ID **1512286-07DMSD** Batch ID: **72974** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC3_151229A** Analysis Date: **12/29/2015 8:15:27 PM** Prep Date: **12/29/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2230 | 100 | 2000 | 248.2 | 99.1 | 90 | 110 | 1.45 | 20 | |
| Fluoride | 1960 | 40.0 | 2000 | 0 | 97.8 | 90 | 110 | 0.860 | 20 | |
| Sulfate | 2110 | 300 | 2000 | 0 | 105 | 90 | 110 | 3.60 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC3_151229A**

| Sample ID **ICV-151229** | Batch ID: **R83402** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC3_151229A** | Analysis Date: **12/29/2015 10:03:53 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.3 | 1.00 | 25.00 | 0 | 101 | 90 | 110 | | | |
| Fluoride | 10.1 | 0.400 | 10.00 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 76.3 | 3.00 | 75.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID **CCV1-151229** | Batch ID: **R83402** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC3_151229A** | Analysis Date: **12/29/2015 5:09:43 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.4 | 1.00 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Fluoride | 4.17 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 30.9 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **CCV2-151229** | Batch ID: **R83402** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC3_151229A** | Analysis Date: **12/29/2015 8:56:45 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.69 | 1.00 | 10.00 | 0 | 96.9 | 90 | 110 | | | |
| Fluoride | 4.18 | 0.400 | 4.000 | 0 | 105 | 90 | 110 | | | |
| Sulfate | 30.9 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_151222A**

The QC data in batch 72889 applies to the following samples: 1512286-01D, 1512286-02D, 1512286-03D, 1512286-04D, 1512286-05D, 1512286-06D, 1512286-07D, 1512286-08D, 1512286-09D, 1512286-10D, 1512286-11D, 1512286-12D, 1512286-13D, 1512286-14D, 1512286-15D

Sample ID **1512286-10D DUP** Batch ID: **72889** TestNo: **M4500-H+ B** Units: **pH Units@17.2℃**
SampType: **DUP** Run ID: **TITRATOR_151222A** Analysis Date: **12/22/2015 11:53:00 A** Prep Date: **12/22/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.76 | 0 | 0 | 6.760 | | | | 0 | 5 | |

Sample ID **1512292-01C DUP** Batch ID: **72889** TestNo: **M4500-H+ B** Units: **pH Units@20.1℃**
SampType: **DUP** Run ID: **TITRATOR_151222A** Analysis Date: **12/22/2015 12:14:00 P** Prep Date: **12/22/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.63 | 0 | 0 | 7.560 | | | | 0.922 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_151222A**

| Sample ID | **ICV-151222** | Batch ID: | **R83296** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.9℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_151222A** | Analysis Date: | **12/22/2015 10:37:00 A** | Prep Date: | **12/22/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.97 | 0 | 10.00 | 0 | 99.7 | 99 | 101 | | | |

| Sample ID | **CCV1-151222** | Batch ID: | **R83296** | TestNo: | **M4500-H+ B** | Units: | **pH Units@20.2℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_151222A** | Analysis Date: | **12/22/2015 11:50:00 A** | Prep Date: | **12/22/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV2-151222** | Batch ID: | **R83296** | TestNo: | **M4500-H+ B** | Units: | **pH Units@20.5℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_151222A** | Analysis Date: | **12/22/2015 12:16:00 P** | Prep Date: | **12/22/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.99 | 0 | 7.000 | 0 | 99.9 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_151222B**

The QC data in batch 72907 applies to the following samples: 1512286-01D, 1512286-02D, 1512286-03D, 1512286-04D, 1512286-05D, 1512286-06D, 1512286-07D, 1512286-08D, 1512286-09D, 1512286-10D, 1512286-11D, 1512286-12D

Sample ID **MB-72907** Batch ID: **72907** TestNo: **M2540C** Units: **mg/L**
SampType: **MBLK** Run ID: **WC_151222B** Analysis Date: **12/23/2015 8:05:00 AM** Prep Date: **12/22/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

Sample ID **LCS-72907** Batch ID: **72907** TestNo: **M2540C** Units: **mg/L**
SampType: **LCS** Run ID: **WC_151222B** Analysis Date: **12/23/2015 8:05:00 AM** Prep Date: **12/22/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 736 | 10.0 | 745.6 | 0 | 98.7 | 90 | 113 | | | |

Sample ID **1512238-03D-DUP** Batch ID: **72907** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_151222B** Analysis Date: **12/23/2015 8:05:00 AM** Prep Date: **12/22/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 2400 | 50.0 | 0 | 2425 | | | | 1.04 | 5 | |

Sample ID **1512286-06D-DUP** Batch ID: **72907** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_151222B** Analysis Date: **12/23/2015 8:05:00 AM** Prep Date: **12/22/2015**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 960 | 50.0 | 0 | 940.0 | | | | 2.11 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1512286
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_151223B**

The QC data in batch 72925 applies to the following samples: 1512286-13D, 1512286-14D, 1512286-15D

| Sample ID | **MB-72925** | Batch ID: | **72925** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_151223B** | Analysis Date: | **12/24/2015 8:00:00 AM** | Prep Date: | **12/23/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-72925** | Batch ID: | **72925** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_151223B** | Analysis Date: | **12/24/2015 8:00:00 AM** | Prep Date: | **12/23/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 734 | 10.0 | 745.6 | 0 | 98.4 | 90 | 113 | | | |

| Sample ID | **1512286-15D-DUP** | Batch ID: | **72925** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_151223B** | Analysis Date: | **12/24/2015 8:00:00 AM** | Prep Date: | **12/23/2015** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1150 | 50.0 | 0 | 1140 | | | | 0.873 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

January 25, 2016

Mr. John DuPont
DHL Analytical
2300 Double Creek Drive
Round Rock, Texas 78664

Re: Routine Analysis
Work Order: 388114

Dear Mr. DuPont:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on December 24, 2015. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4707.

Sincerely,

Anna C Day

Anna Day
Project Manager

Purchase Order: 14097
Enclosures

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 − (843) 556−8171 − www.gel.com

# Certificate of Analysis Report
for

DHLA002 DHL Analytical

Client SDG: 388114 GEL Work Order: 388114

**The Qualifiers in this report are defined as follows:**

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a Tracer compound

** Analyte is a surrogate compound

U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Anna Day.

Reviewed by Anna C Day

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-3
Sample ID: 388114001
Matrix: Water
Collect Date: 17-DEC-15 09:35
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 2.66 | +/-1.07 | 1.40 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1117 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.70 | +/-0.651 | 0.697 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0735 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 90.4 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-4
Sample ID: 388114002
Matrix: Water
Collect Date: 17-DEC-15 10:25
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 1.01 | +/-1.04 | 1.73 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1117 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | U | 0.226 | +/-0.233 | 0.361 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0735 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 88 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-5
Sample ID: 388114003
Matrix: Water
Collect Date: 17-DEC-15 11:15
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 1.17 | +/-1.27 | 2.13 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1117 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.03 | +/-0.502 | 0.639 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0735 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 90.1 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-2
Sample ID: 388114004
Matrix: Water
Collect Date: 17-DEC-15 12:00
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 1.04 | +/-0.795 | 1.24 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1117 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.03 | +/-0.534 | 0.696 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0735 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 90.6 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-1
Sample ID: 388114005
Matrix: Water
Collect Date: 17-DEC-15 12:50
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.628 | +/-0.839 | 1.43 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1117 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.919 | +/-0.489 | 0.646 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0735 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 95.4 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-6
Sample ID: 388114006
Matrix: Water
Collect Date: 17-DEC-15 13:45
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 3.63 | +/-1.21 | 1.60 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1117 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.23 | +/-0.530 | 0.608 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0820 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 99.2 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-8
Sample ID: 388114007
Matrix: Water
Collect Date: 17-DEC-15 14:50
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 1.70 | +/-0.919 | 1.32 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1117 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | U | 0.127 | +/-0.321 | 0.609 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0820 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 89.1 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-12
Sample ID: 388114008
Matrix: Water
Collect Date: 17-DEC-15 15:40
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.831 | +/-1.46 | 2.57 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1241 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.32 | +/-0.547 | 0.644 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0820 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 89.5 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-11
Sample ID: 388114009
Matrix: Water
Collect Date: 17-DEC-15 16:30
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.316 | +/-0.901 | 1.63 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1118 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.786 | +/-0.409 | 0.515 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0820 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 87.8 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: MW-07
Sample ID: 388114010
Matrix: Water
Collect Date: 17-DEC-15 18:15
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.0522 | +/-0.650 | 1.25 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1119 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.40 | +/-0.561 | 0.648 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0820 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 90.2 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | MW-05 | Project: | DHLA00112 |
| Sample ID: | 388114011 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 18-DEC-15 07:40 | | |
| Receive Date: | 24-DEC-15 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.280 | +/-0.672 | 1.22 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1119 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | U | 0.403 | +/-0.403 | 0.651 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0855 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 92.6 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: MW-02
Sample ID: 388114012
Matrix: Water
Collect Date: 18-DEC-15 08:25
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.00433 | +/-0.793 | 1.49 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1119 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.652 | +/-0.423 | 0.587 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0855 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 98.6 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: AL-10
Sample ID: 388114013
Matrix: Water
Collect Date: 18-DEC-15 09:20
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.796 | +/-1.11 | 1.90 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1119 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.80 | +/-0.650 | 0.710 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0855 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 88 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | MW-09 | Project: | DHLA00112 |
| Sample ID: | 388114014 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 18-DEC-15 10:20 | | |
| Receive Date: | 24-DEC-15 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 2.88 | +/-1.07 | 1.40 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1119 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 2.21 | +/-0.686 | 0.685 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0855 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 95.9 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: January 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: MW-08
Sample ID: 388114015
Matrix: Water
Collect Date: 18-DEC-15 11:15
Receive Date: 24-DEC-15
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 2.11 | +/-1.07 | 1.55 | 3.00 | pCi/L | | AXM6 | 01/12/16 | 1119 | 1534820 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.24 | +/-0.524 | 0.593 | 1.00 | pCi/L | | CXP3 | 01/15/16 | 0855 | 1533727 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 90.7 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

## QC Summary

**Report Date: January 15, 2016**



**DHL Analytical**
**2300 Double Creek Drive**
**Round Rock, Texas**

**Contact:** **Mr. John DuPont**

**Workorder:** **388114**

| Parmname | NOM | Sample | Qual | QC | Units | RPD% | REC% | Range | Anlst | Date | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Rad Gas Flow** | | | | | | | | | | | |
| Batch 1534820 | | | | | | | | | | | |
| QC1203462760 388114008 DUP | | | | | | | | | | | |
| Radium-228 | U | 0.831 | U | 2.32 | pCi/L | N/A | | | N/A AXM6 | 01/12/16 | 11:19 |
| | Uncertainty | +/-1.46 | | +/-1.61 | | | | | | | |
| QC1203462761 LCS | | | | | | | | | | | |
| Radium-228 | 28.8 | | | 26.2 | pCi/L | | 91 | (75%-125%) | | 01/12/16 | 11:20 |
| | Uncertainty | | | +/-2.41 | | | | | | | |
| QC1203462759 MB | | | | | | | | | | | |
| Radium-228 | | | U | -0.811 | pCi/L | | | | | 01/12/16 | 11:19 |
| | Uncertainty | | | +/-0.782 | | | | | | | |
| **Rad Ra-226** | | | | | | | | | | | |
| Batch 1533727 | | | | | | | | | | | |
| QC1203459850 388117001 DUP | | | | | | | | | | | |
| Radium-226 | | 1.20 | | 2.19 | pCi/L | 58.1 | | (0% - 100%) | CXP3 | 01/15/16 | 09:30 |
| | Uncertainty | +/-0.640 | | +/-0.755 | | | | | | | |
| QC1203459852 LCS | | | | | | | | | | | |
| Radium-226 | 24.4 | | | 22.3 | pCi/L | | 91.2 | (75%-125%) | | 01/15/16 | 09:30 |
| | Uncertainty | | | +/-1.81 | | | | | | | |
| QC1203459849 MB | | | | | | | | | | | |
| Radium-226 | | | U | 0.371 | pCi/L | | | | | 01/15/16 | 09:30 |
| | Uncertainty | | | +/-0.406 | | | | | | | |
| QC1203459851 388117001 MS | | | | | | | | | | | |
| Radium-226 | 122 | 1.20 | | 126 | pCi/L | | 102 | (75%-125%) | | 01/15/16 | 09:30 |
| | Uncertainty | +/-0.640 | | +/-9.25 | | | | | | | |

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

| | |
|---|---|
| ** | Analyte is a Tracer compound |
| < | Result is less than value reported |
| > | Result is greater than value reported |
| BD | Results are either below the MDC or tracer recovery is low |
| FA | Failed analysis. |
| H | Analytical holding time was exceeded |
| J | Value is estimated |
| K | Analyte present. Reported value may be biased high. Actual value is expected to be lower. |
| L | Analyte present. Reported value may be biased low. Actual value is expected to be higher. |
| M | M if above MDC and less than LLD |
| M | REMP Result > MDC/CL and < RDL |
| N/A | RPD or %Recovery limits do not apply. |

## QC Summary

**Workorder:** **388114**



| Parmname | NOM | Sample | Qual | QC | Units | RPD% | REC% | Range | Anlst | Date | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | |
|---|---|
| N1 | See case narrative |
| ND | Analyte concentration is not detected above the detection limit |
| NJ | Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier |
| Q | One or more quality control criteria have not been met. Refer to the applicable narrative or DER. |
| R | Sample results are rejected |
| U | Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD. |
| UI | Gamma Spectroscopy--Uncertain identification |
| UJ | Gamma Spectroscopy--Uncertain identification |
| UL | Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias. |
| X | Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier |
| Y | Other specific qualifiers were required to properly define the results. Consult case narrative. |
| ^ | RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry. |
| h | Preparation or preservation holding time was exceeded |

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

**There are no "Data Exception Reports" associated with this analytical report.**

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

388114

# CHAIN-OF-CUSTODY RECORD



Work Order: 1512286

**Subcontractor:**

GEL Laboratories
PO Box 30712
Charleston, SC 29417

TEL: (843) 556-8171
FAX:
Acct #:

**21-Dec-15**

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E903.1 | E904.0 | | | | |
| FGD-3 | Aqueous | -01B | 12/17/15 09:35 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-3 | Aqueous | -01C | 12/17/15 09:35 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-4 | Aqueous | -02B | 12/17/15 10:25 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-4 | Aqueous | -02C | 12/17/15 10:25 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-5 | Aqueous | -03B | 12/17/15 11:15 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-5 | Aqueous | -03C | 12/17/15 11:15 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-2 | Aqueous | -04B | 12/17/15 12:00 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-2 | Aqueous | -04C | 12/17/15 12:00 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-1 | Aqueous | -05B | 12/17/15 12:50 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-1 | Aqueous | -05C | 12/17/15 12:50 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-6 | Aqueous | -06B | 12/17/15 01:45 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-6 | Aqueous | -06C | 12/17/15 01:45 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-8 | Aqueous | -07B | 12/17/15 02:50 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-8 | Aqueous | -07C | 12/17/15 02:50 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-12 | Aqueous | -08B | 12/17/15 03:40 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-12 | Aqueous | -08C | 12/17/15 03:40 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-11 | Aqueous | -09B | 12/17/15 04:30 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-11 | Aqueous | -09C | 12/17/15 04:30 PM | 500HDPEHNO3 | 1 | | | | | |

General Comments:

Please analyze these samples with a Standard Turnaround Time.
Call John DuPont if you have questions.
Quality Control Package Needed: Standard / _____
EMAIL report to both cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | | 12/21/15 1730 | **Received by:** | Fed up | 12/21/15 1730 |
| **Relinquished by:** | FedEx | | **Received by:** | | 12-24-15 0920 |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1512286

**Subcontractor:**

GEL Laboratories
PO Box 30712
Charleston, SC 29417

TEL: (843) 556-8171
FAX:
Acct #:

**21-Dec-15**

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E903.1 | E904.0 | | | | |
| MW-07 | Aqueous | -10B | 12/17/15 06:15 PM | 500HDPEHNO3 | | 1 | | | | |
| MW-07 | Aqueous | -10C | 12/17/15 06:15 PM | 500HDPEHNO3 | 1 | | | | | |
| MW-05 | Aqueous | -11B | 12/18/15 07:40 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-05 | Aqueous | -11C | 12/18/15 07:40 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-02 | Aqueous | -12B | 12/18/15 08:25 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-02 | Aqueous | -12C | 12/18/15 08:25 AM | 500HDPEHNO3 | 1 | | | | | |
| AL-10 | Aqueous | -13B | 12/18/15 09:20 AM | 500HDPEHNO3 | | 1 | | | | |
| AL-10 | Aqueous | -13C | 12/18/15 09:20 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-09 | Aqueous | -14B | 12/18/15 10:20 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-09 | Aqueous | -14C | 12/18/15 10:20 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-08 | Aqueous | -15B | 12/18/15 11:15 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-08 | Aqueous | -15C | 12/18/15 11:15 AM | 500HDPEHNO3 | 1 | | | | | |

General Comments:

Please analyze these samples with a Standard Turnaround Time.
Call John DuPont if you have questions.
Quality Control Package Needed: Standard / _____
EMAIL report to both cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | | 12/21/15 1733 | **Received by:** | | 12/21/15 1233 |
| **Relinquished by:** | FDX | | **Received by:** | | 12-24-15 0920 |

GEL Laboratories LLC

# SAMPLE RECEIPT & REVIEW FORM

| | | | |
|---|---|---|---|
| **Client:** DHL | | **SDG/AR/COC/Work Order:** 388114 | |
| **Received By:** MK | | **Date Received:** 12-24-15 | |
| **Suspected Hazard Information** | **Yes** | **No** | *If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation. |
| COC/Samples marked as radioactive? | | ✓ | Maximum Net Counts Observed* (Observed Counts - Area Background Counts): Cpm0 |
| Classified Radioactive II or III by RSO? | | ✓ | If yes, Were swipes taken of sample containers < action levels? |
| COC/Samples marked containing PCBs? | | ✓ | |
| Package, COC, and/or Samples marked as beryllium or asbestos containing? | | ✓ | If yes, samples are to be segregated as Safety Controlled Samples, and opened by the GEL Safety Group. |
| Shipped as a DOT Hazardous? | | ✓ | Hazard Class Shipped: UN#: |
| Samples identified as Foreign Soil? | | ✓ | |

| | Sample Receipt Criteria | Yes | NA | No | Comments/Qualifiers (Required for Non-Conforming Items) |
|---|---|---|---|---|---|
| 1 | Shipping containers received intact and sealed? | ✓ | | | Circle Applicable: Seals broken Damaged container Leaking container Other (describe) |
| 2 | Samples requiring cold preservation within (0 ≤ 6 deg. C)?* | | ✓ | | Preservation Method: Ice bags Blue ice Dry ice (None) Other (describe) *all temperatures are recorded in Celsius 20 C |
| 2a | Daily check performed and passed on IR temperature gun? | ✓ | | | Temperature Device Serial #: 130X61962 Secondary Temperature Device Serial # (If Applicable): |
| 3 | Chain of custody documents included with shipment? | ✓ | | | |
| 4 | Sample containers intact and sealed? | ✓ | | | Circle Applicable: Seals broken Damaged container Leaking container Other (describe) |
| 5 | Samples requiring chemical preservation at proper pH? | ✓ | | | Sample ID's, containers affected and observed pH: If Preservation added, Lot#: |
| 6 | Do Low Level Perchlorate samples have headspace as required? | | ✓ | | Sample ID's and containers affected: |
| 7 | VOA vials contain acid preservation? | | ✓ | | (If unknown, select No) |
| 8 | VOA vials free of headspace (defined as < 6mm bubble)? | | ✓ | | Sample ID's and containers affected: |
| 9 | Are Encore containers present? | | | ✓ | (If yes, immediately deliver to Volatiles laboratory) |
| 10 | Samples received within holding time? | ✓ | | | ID's and tests affected: |
| 11 | Sample ID's on COC match ID's on bottles? | ✓ | | | Sample ID's and containers affected: |
| 12 | Date & time on COC match date & time on bottles? | ✓ | | | Sample ID's affected: |
| 13 | Number of containers received match number indicated on COC? | ✓ | | | Sample ID's affected: 2 per ID |
| 14 | Are sample containers identifiable as GEL provided? | | | ✓ | |
| 15 | COC form is properly signed in relinquished/received sections? | ✓ | | | |
| 16 | Carrier and tracking number. | ✓ | | | Circle Applicable: FedEx Air (FedEx Ground) UPS Field Services Courier Other 7752 6232 9395 |

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials J.R. Date 12-24-15 Page 1 of 1 GL-CHL-SR-001 Rev 2

**List of current GEL Certifications as of 15 January 2016**

| State | Certification |
|---|---|
| Alaska | UST−110 |
| Arkansas | 88−0651 |
| CLIA | 42D0904046 |
| California | 2940 Interim |
| Colorado | SC00012 |
| Connecticut | PH−0169 |
| Delaware | SC000122013−10 |
| DoD ELAP/ ISO17025 A2LA | 2567.01 |
| Florida NELAP | E87156 |
| Foreign Soils Permit | P330−15−00283, P330−15−00253 |
| Georgia | SC00012 |
| Georgia SDWA | 967 |
| Hawaii | SC000122013−10 |
| Idaho Chemistry | SC00012 |
| Idaho Radiochemistry | SC00012 |
| Illinois NELAP | 200029 |
| Indiana | C−SC−01 |
| Kansas NELAP | E−10332 |
| Kentucky SDWA | 90129 |
| Kentucky Wastewater | 90129 |
| Louisiana NELAP | 03046 (AI33904) |
| Louisiana SDWA | LA150001 |
| Maryland | 270 |
| Massachusetts | M−SC012 |
| Michigan | 9976 |
| Mississippi | SC000122013−10 |
| Nebraska | NE−OS−26−13 |
| Nevada | SC000122016−1 |
| New Hampshire NELAP | 2054 |
| New Jersey NELAP | SC002 |
| New Mexico | SC00012 |
| New York NELAP | 11501 |
| North Carolina | 233 |
| North Carolina SDWA | 45709 |
| North Dakota | R−158 |
| Oklahoma | 9904 |
| Pennsylvania NELAP | 68−00485 |
| S.Carolina Radchem | 10120002 |
| South Carolina Chemistry | 10120001 |
| Tennessee | TN 02934 |
| Texas NELAP | T104704235−15−10 |
| Utah NELAP | SC000122015−19 |
| Vermont | VT87156 |
| Virginia NELAP | 460202 |
| Washington | C780 |
| West Virginia | 997404 |

March 15, 2016

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1602130

RE: Oak Grove CCR

Dear Will Vienne:

DHL Analytical, Inc. received 15 sample(s) on 2/11/2016 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-15-15

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# CHAIN-OF-CUSTODY

№ 70282

CLIENT: Pastor, Behling & Wheeler
ADDRESS: 2201 Double Creek Dr Ste 4004
PHONE: 512-671-3434 FAX/E-MAIL: will.vienne@pbwllc.com
DATA REPORTED TO: Will Vienne
ADDITIONAL REPORT COPIES TO: Karla Henson

DATE: 2/10/16 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 1602130
PROJECT LOCATION OR NAME: Oak Grove CCR
CLENT PROJECT #: 5164D COLLECTOR: MH/ST

Authorize 5% surcharge for TRRP Report? ☐ Yes ☒ No

S=SOIL P=PAINT
W=WATER SL=SLUDGE
A=AIR O=OTHER
L=LIQUID SO=SOLID
SE=SEDIMENT

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | PRESERVATION HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-11 | 1 | 2/10/16 | 9:25 | W | | 4 | | X | | X | | X | |
| FGD-12 | 2 | 2/10/16 | 10:00 | W | | 4 | | X | | X | | X | |
| FGD-08 | 3 | 2/10/16 | 11:25 | W | | 4 | | X | | X | | X | |
| FGD-1 | 4 | 2/10/16 | 12:00 | W | | 4 | | X | | X | | X | |
| FGD-5 | 5 | 2/10/16 | 13:05 | W | | 4 | | X | | X | | X | |
| FGD-2 | 6 | 2/10/16 | 13:50 | W | | 4 | | X | | X | | X | |
| FGD-3 | 7 | 2/10/16 | 14:50 | W | | 4 | | X | | X | | X | |
| FGD-6 | 8 | 2/10/16 | 16:15 | W | | 4 | | X | | X | | X | |
| FGD-4 | 9 | 2/10/16 | 16:50 | W | | 4 | | X | | X | | X | |
| MW-08 | 10 | 2/10/16 | 17:55 | W | | 4 | | X | | X | | X | |
| MW-07 | 11 | 2/11/16 | 7:45 | W | | 4 | | X | | X | | X | |
| MW-09 | 12 | 2/11/16 | 8:30 | W | | 4 | | X | | X | | X | |
| AL-10 | 13 | 2/11/16 | 9:05 | W | | 4 | | X | | X | | X | |
| MW-02 | 14 | 2/11/16 | 9:35 | W | | 4 | | X | | X | | X | |
| MW-05 | 15 | 2/11/16 | 10:45 | W | | 4 | | X | | X | | X | |

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ 8321 HERB ☐ T PHOS, AMMONIA ☐ METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ RCRA ☐ TX11 ☐ PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ CHLORIDE ☐ ANIONS ☐ TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ RCI ☐ FLASHPOINT ☐ DGAS ☐ TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ See attached (CCR)

RELINQUISHED BY: (Signature) DATE/TIME 2/11/16 13:30 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

TURN AROUND TIME
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

LABORATORY USE ONLY:
RECEIVING TEMP: 3.0 +0.2 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☐ NOT USED
CARRIER: ☐ LONE STAR ☐ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED



☐ DHL DISPOSAL @ $5.00 each ☐ Return

**John Dupont**

**From:** Sara Taube [Sara.Taube@pbwllc.com]
**Sent:** Wednesday, July 22, 2015 12:05 PM
**To:** John Dupont
**Subject:** CCR Appendix III and IV
**Follow Up Flag:** Follow up
**Flag Status:** Completed

Hi John,

Here are the Appendix III and Appendix IV constituents that we will need to have analyzed under the CCR Rule.

Appendix III
Boron
Calcium
Chloride
Fluoride
pH
sulfate
TDS

Appendix IV
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228

We are looking to have approximately 74 wells sampled 8 times over the course of the next two years. Please let me know if there is any more information you might need.

Cheers,

Sara

10/26/2015

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Pastor, Behling & Wheeler** Date Received: **2/11/2016**

Work Order Number **1602130** Received by **JB**

Checklist completed by _____ 2/11/2016 Reviewed by JD 2/11/2016
Signature Date Initials Date

Carrier name Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 3.3 °C ±0.9.0.2 |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? WO | | Checked by _____ |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? _____ | | Checked by _____ |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *15-Mar-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR
**Lab Order:** 1602130

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904.0/SW8469320 Modified and E903.1 Modified. Analyzed at GEL Laboratory.

## LOG IN

The samples were received and log-in performed on 2/11/16. A total of 15 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 2/23/16 (batch 73669) Boron was detected below the reporting limit in the method blank (MB-73669). All associated samples may be biased high. No further corrective actions were taken.

For Metals analysis performed on 2/23/16 (batch 73669) the matrix spike duplicate recovery was above control limits for Boron. This is flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

For Metals analysis performed on 2/17/16 and 2/23/16 (batches 73669 & 73688) the RPDs for the serial dilutions were slightly above control limits for Boron. These are flagged accordingly. The PDSs were within control limits for this analyte. No further corrective actions were taken.

## ANIONS ANALYSIS

For Anions analysis performed on 2/15/16 (batch 73678) the matrix spike duplicate recovery was slightly above control limits for Sulfate. This is flagged accordingly. The sample selected for the matrix spike and matrix spike duplicate was from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *15-Mar-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR
**Lab Order:** 1602130

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1602130-01 | FGD-11 | | 02/10/16 09:25 AM | 2/11/2016 |
| 1602130-02 | FGD-12 | | 02/10/16 10:00 AM | 2/11/2016 |
| 1602130-03 | FGD-8 | | 02/10/16 11:25 AM | 2/11/2016 |
| 1602130-04 | FGD-1 | | 02/10/16 12:00 PM | 2/11/2016 |
| 1602130-05 | FGD-5 | | 02/10/16 01:05 PM | 2/11/2016 |
| 1602130-06 | FGD-2 | | 02/10/16 01:50 PM | 2/11/2016 |
| 1602130-07 | FGD-3 | | 02/10/16 02:50 PM | 2/11/2016 |
| 1602130-08 | FGD-6 | | 02/10/16 04:15 PM | 2/11/2016 |
| 1602130-09 | FGD-4 | | 02/10/16 04:50 PM | 2/11/2016 |
| 1602130-10 | MW-08 | | 02/10/16 05:55 PM | 2/11/2016 |
| 1602130-11 | MW-07 | | 02/11/16 07:45 AM | 2/11/2016 |
| 1602130-12 | MW-09 | | 02/11/16 08:30 AM | 2/11/2016 |
| 1602130-13 | AL-10 | | 02/11/16 09:05 AM | 2/11/2016 |
| 1602130-14 | MW-02 | | 02/11/16 09:35 AM | 2/11/2016 |
| 1602130-15 | MW-05 | | 02/11/16 10:45 AM | 2/11/2016 |

**Lab Order:** 1602130
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1602130-01A | FGD-11 | 02/10/16 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-11 | 02/10/16 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-11 | 02/10/16 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-11 | 02/10/16 09:25 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-01D | FGD-11 | 02/10/16 09:25 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-11 | 02/10/16 09:25 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-11 | 02/10/16 09:25 AM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | FGD-11 | 02/10/16 09:25 AM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |
| 1602130-02A | FGD-12 | 02/10/16 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-12 | 02/10/16 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-12 | 02/10/16 10:00 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-02D | FGD-12 | 02/10/16 10:00 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-12 | 02/10/16 10:00 AM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | FGD-12 | 02/10/16 10:00 AM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |
| 1602130-03A | FGD-8 | 02/10/16 11:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-8 | 02/10/16 11:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-8 | 02/10/16 11:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-8 | 02/10/16 11:25 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-03D | FGD-8 | 02/10/16 11:25 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-8 | 02/10/16 11:25 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-8 | 02/10/16 11:25 AM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | FGD-8 | 02/10/16 11:25 AM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |
| 1602130-04A | FGD-1 | 02/10/16 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-1 | 02/10/16 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-1 | 02/10/16 12:00 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-04D | FGD-1 | 02/10/16 12:00 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-1 | 02/10/16 12:00 PM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | FGD-1 | 02/10/16 12:00 PM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |

**Lab Order:** 1602130
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1602130-05A | FGD-5 | 02/10/16 01:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-5 | 02/10/16 01:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-5 | 02/10/16 01:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-5 | 02/10/16 01:05 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-05D | FGD-5 | 02/10/16 01:05 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-5 | 02/10/16 01:05 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-5 | 02/10/16 01:05 PM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | FGD-5 | 02/10/16 01:05 PM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |
| 1602130-06A | FGD-2 | 02/10/16 01:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-2 | 02/10/16 01:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-2 | 02/10/16 01:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-2 | 02/10/16 01:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-06D | FGD-2 | 02/10/16 01:50 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-2 | 02/10/16 01:50 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-2 | 02/10/16 01:50 PM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | FGD-2 | 02/10/16 01:50 PM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |
| 1602130-07A | FGD-3 | 02/10/16 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-3 | 02/10/16 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-3 | 02/10/16 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-3 | 02/10/16 02:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-07D | FGD-3 | 02/10/16 02:50 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-3 | 02/10/16 02:50 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-3 | 02/10/16 02:50 PM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | FGD-3 | 02/10/16 02:50 PM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |
| 1602130-08A | FGD-6 | 02/10/16 04:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-6 | 02/10/16 04:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-6 | 02/10/16 04:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-6 | 02/10/16 04:15 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |

**Lab Order:** 1602130
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1602130-08D | FGD-6 | 02/10/16 04:15 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-6 | 02/10/16 04:15 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-6 | 02/10/16 04:15 PM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | FGD-6 | 02/10/16 04:15 PM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |
| 1602130-09A | FGD-4 | 02/10/16 04:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-4 | 02/10/16 04:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-4 | 02/10/16 04:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/15/16 09:11 AM | 73669 |
| | FGD-4 | 02/10/16 04:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-09D | FGD-4 | 02/10/16 04:50 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-4 | 02/10/16 04:50 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | FGD-4 | 02/10/16 04:50 PM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | FGD-4 | 02/10/16 04:50 PM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |
| 1602130-10A | MW-08 | 02/10/16 05:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-08 | 02/10/16 05:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-08 | 02/10/16 05:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-08 | 02/10/16 05:55 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-10D | MW-08 | 02/10/16 05:55 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | MW-08 | 02/10/16 05:55 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | MW-08 | 02/10/16 05:55 PM | Aqueous | E300 | Anion Preparation | 02/15/16 10:20 AM | 73677 |
| | MW-08 | 02/10/16 05:55 PM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | MW-08 | 02/10/16 05:55 PM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |
| 1602130-11A | MW-07 | 02/11/16 07:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-07 | 02/11/16 07:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-07 | 02/11/16 07:45 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-11D | MW-07 | 02/11/16 07:45 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:22 AM | 73678 |
| | MW-07 | 02/11/16 07:45 AM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | MW-07 | 02/11/16 07:45 AM | Aqueous | M2540C | TDS Preparation | 02/12/16 10:38 AM | 73653 |
| 1602130-12A | MW-09 | 02/11/16 08:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |

**Lab Order:** 1602130
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1602130-12A | MW-09 | 02/11/16 08:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-09 | 02/11/16 08:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-09 | 02/11/16 08:30 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-12D | MW-09 | 02/11/16 08:30 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:22 AM | 73678 |
| | MW-09 | 02/11/16 08:30 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:22 AM | 73678 |
| | MW-09 | 02/11/16 08:30 AM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | MW-09 | 02/11/16 08:30 AM | Aqueous | M2540C | TDS Preparation | 02/15/16 09:19 AM | 73670 |
| 1602130-13A | AL-10 | 02/11/16 09:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | AL-10 | 02/11/16 09:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | AL-10 | 02/11/16 09:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | AL-10 | 02/11/16 09:05 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/19/16 08:28 AM | 73748 |
| 1602130-13D | AL-10 | 02/11/16 09:05 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:22 AM | 73678 |
| | AL-10 | 02/11/16 09:05 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:22 AM | 73678 |
| | AL-10 | 02/11/16 09:05 AM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | AL-10 | 02/11/16 09:05 AM | Aqueous | M2540C | TDS Preparation | 02/15/16 09:19 AM | 73670 |
| 1602130-14A | MW-02 | 02/11/16 09:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-02 | 02/11/16 09:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-02 | 02/11/16 09:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-02 | 02/11/16 09:35 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/22/16 01:21 PM | 73780 |
| 1602130-14D | MW-02 | 02/11/16 09:35 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:22 AM | 73678 |
| | MW-02 | 02/11/16 09:35 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:22 AM | 73678 |
| | MW-02 | 02/11/16 09:35 AM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | MW-02 | 02/11/16 09:35 AM | Aqueous | M2540C | TDS Preparation | 02/15/16 09:19 AM | 73670 |
| 1602130-15A | MW-05 | 02/11/16 10:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-05 | 02/11/16 10:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 02/16/16 09:04 AM | 73688 |
| | MW-05 | 02/11/16 10:45 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 02/22/16 01:21 PM | 73780 |
| 1602130-15D | MW-05 | 02/11/16 10:45 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:22 AM | 73678 |
| | MW-05 | 02/11/16 10:45 AM | Aqueous | E300 | Anion Preparation | 02/15/16 10:22 AM | 73678 |

**Lab Order:** 1602130
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1602130-15D | MW-05 | 02/11/16 10:45 AM | Aqueous | M4500-H+ B | pH Preparation | 02/12/16 02:43 PM | 73662 |
| | MW-05 | 02/11/16 10:45 AM | Aqueous | M2540C | TDS Preparation | 02/15/16 09:19 AM | 73670 |

**Lab Order:** 1602130
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1602130-01A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 03:57 PM | CETAC2_HG_160219A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/16/16 12:19 PM | ICP-MS4_160216B |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 10 | 02/17/16 12:15 PM | ICP-MS4_160217A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/23/16 12:28 PM | ICP-MS4_160223A |
| 1602130-01D | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 73677 | 1 | 02/15/16 11:45 AM | IC3_160215A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 73677 | 100 | 02/15/16 04:54 PM | IC3_160215A |
| | FGD-11 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 03:40 PM | TITRATOR_160212A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |
| 1602130-02A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:00 PM | CETAC2_HG_160219A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/16/16 12:21 PM | ICP-MS4_160216B |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/23/16 12:30 PM | ICP-MS4_160223A |
| 1602130-02D | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 73677 | 1 | 02/15/16 12:06 PM | IC3_160215A |
| | FGD-12 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 03:43 PM | TITRATOR_160212A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |
| 1602130-03A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:02 PM | CETAC2_HG_160219A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 50 | 02/17/16 12:17 PM | ICP-MS4_160217A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/23/16 12:32 PM | ICP-MS4_160223A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/16/16 12:23 PM | ICP-MS4_160216B |
| 1602130-03D | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 73677 | 1 | 02/15/16 12:26 PM | IC3_160215A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 73677 | 100 | 02/16/16 08:40 AM | IC3_160215A |
| | FGD-8 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 03:44 PM | TITRATOR_160212A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |
| 1602130-04A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:04 PM | CETAC2_HG_160219A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/16/16 12:25 PM | ICP-MS4_160216B |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/23/16 12:34 PM | ICP-MS4_160223A |
| 1602130-04D | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 73677 | 1 | 02/15/16 12:47 PM | IC3_160215A |

**Lab Order:** 1602130
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1602130-04D | FGD-1 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 03:47 PM | TITRATOR_160212A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |
| 1602130-05A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:06 PM | CETAC2_HG_160219A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/16/16 12:27 PM | ICP-MS4_160216B |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 10 | 02/17/16 12:19 PM | ICP-MS4_160217A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/23/16 12:36 PM | ICP-MS4_160223A |
| 1602130-05D | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 73677 | 1 | 02/15/16 01:08 PM | IC3_160215A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 73677 | 10 | 02/16/16 09:04 AM | IC3_160215A |
| | FGD-5 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 03:48 PM | TITRATOR_160212A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |
| 1602130-06A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:09 PM | CETAC2_HG_160219A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/16/16 12:29 PM | ICP-MS4_160216B |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 10 | 02/17/16 12:21 PM | ICP-MS4_160217A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/23/16 12:38 PM | ICP-MS4_160223A |
| 1602130-06D | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 73677 | 10 | 02/16/16 09:24 AM | IC3_160215A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 73677 | 1 | 02/15/16 01:28 PM | IC3_160215A |
| | FGD-2 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 03:50 PM | TITRATOR_160212A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |
| 1602130-07A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:11 PM | CETAC2_HG_160219A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/16/16 12:31 PM | ICP-MS4_160216B |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 10 | 02/17/16 12:23 PM | ICP-MS4_160217A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/23/16 12:40 PM | ICP-MS4_160223A |
| 1602130-07D | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 73677 | 1 | 02/15/16 01:49 PM | IC3_160215A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 73677 | 100 | 02/16/16 09:45 AM | IC3_160215A |
| | FGD-3 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 03:55 PM | TITRATOR_160212A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |

**Lab Order:** 1602130
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1602130-08A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:18 PM | CETAC2_HG_160219A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/16/16 12:50 PM | ICP-MS4_160216B |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 10 | 02/17/16 12:26 PM | ICP-MS4_160217A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/23/16 12:42 PM | ICP-MS4_160223A |
| 1602130-08D | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 73677 | 10 | 02/16/16 10:06 AM | IC3_160215A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 73677 | 1 | 02/15/16 02:10 PM | IC3_160215A |
| | FGD-6 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 03:57 PM | TITRATOR_160212A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |
| 1602130-09A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:20 PM | CETAC2_HG_160219A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/16/16 12:52 PM | ICP-MS4_160216B |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 10 | 02/17/16 12:28 PM | ICP-MS4_160217A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73669 | 1 | 02/23/16 12:44 PM | ICP-MS4_160223A |
| 1602130-09D | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 73677 | 1 | 02/16/16 10:26 AM | IC3_160215A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 73677 | 10 | 02/16/16 10:47 AM | IC3_160215A |
| | FGD-4 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 03:59 PM | TITRATOR_160212A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |
| 1602130-10A | MW-08 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:22 PM | CETAC2_HG_160219A |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/23/16 01:19 PM | ICP-MS4_160223A |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 10 | 02/23/16 01:54 PM | ICP-MS4_160223A |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/18/16 06:58 PM | ICP-MS4_160218A |
| 1602130-10D | MW-08 | Aqueous | E300 | Anions by IC method - Water | 73677 | 10 | 02/16/16 11:08 AM | IC3_160215A |
| | MW-08 | Aqueous | E300 | Anions by IC method - Water | 73677 | 100 | 02/16/16 01:16 PM | IC3_160215A |
| | MW-08 | Aqueous | E300 | Anions by IC method - Water | 73677 | 1 | 02/15/16 03:08 PM | IC3_160215A |
| | MW-08 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 04:01 PM | TITRATOR_160212A |
| | MW-08 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |
| 1602130-11A | MW-07 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:25 PM | CETAC2_HG_160219A |

**Lab Order:** 1602130
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1602130-11A | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/18/16 07:02 PM | ICP-MS4_160218A |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/23/16 01:23 PM | ICP-MS4_160223A |
| 1602130-11D | MW-07 | Aqueous | E300 | Anions by IC method - Water | 73678 | 1 | 02/15/16 12:21 PM | IC2_160215A |
| | MW-07 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 04:03 PM | TITRATOR_160212A |
| | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 73653 | 1 | 02/15/16 08:39 AM | WC_160212C |
| 1602130-12A | MW-09 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:27 PM | CETAC2_HG_160219A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/18/16 07:04 PM | ICP-MS4_160218A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 10 | 02/23/16 02:07 PM | ICP-MS4_160223A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/23/16 01:25 PM | ICP-MS4_160223A |
| 1602130-12D | MW-09 | Aqueous | E300 | Anions by IC method - Water | 73678 | 1 | 02/15/16 12:36 PM | IC2_160215A |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 73678 | 10 | 02/15/16 01:50 PM | IC2_160215A |
| | MW-09 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 04:06 PM | TITRATOR_160212A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 73670 | 1 | 02/16/16 08:40 AM | WC_160215A |
| 1602130-13A | AL-10 | Aqueous | SW7470A | Mercury Total: Aqueous | 73748 | 1 | 02/19/16 04:29 PM | CETAC2_HG_160219A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/18/16 07:06 PM | ICP-MS4_160218A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/23/16 01:27 PM | ICP-MS4_160223A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 10 | 02/23/16 02:09 PM | ICP-MS4_160223A |
| 1602130-13D | AL-10 | Aqueous | E300 | Anions by IC method - Water | 73678 | 1 | 02/15/16 12:51 PM | IC2_160215A |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 73678 | 10 | 02/15/16 02:04 PM | IC2_160215A |
| | AL-10 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 04:09 PM | TITRATOR_160212A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 73670 | 1 | 02/16/16 08:40 AM | WC_160215A |
| 1602130-14A | MW-02 | Aqueous | SW7470A | Mercury Total: Aqueous | 73780 | 1 | 02/23/16 01:53 PM | CETAC2_HG_160223A |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/23/16 01:29 PM | ICP-MS4_160223A |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 5 | 02/23/16 02:11 PM | ICP-MS4_160223A |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/18/16 07:08 PM | ICP-MS4_160218A |
| 1602130-14D | MW-02 | Aqueous | E300 | Anions by IC method - Water | 73678 | 1 | 02/15/16 01:05 PM | IC2_160215A |

**Lab Order:** 1602130
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove CCR

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1602130-14D | MW-02 | Aqueous | E300 | Anions by IC method - Water | 73678 | 10 | 02/15/16 02:19 PM | IC2_160215A |
| | MW-02 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 04:12 PM | TITRATOR_160212A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 73670 | 1 | 02/16/16 08:40 AM | WC_160215A |
| 1602130-15A | MW-05 | Aqueous | SW7470A | Mercury Total: Aqueous | 73780 | 1 | 02/23/16 01:56 PM | CETAC2_HG_160223A |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/18/16 07:10 PM | ICP-MS4_160218A |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 73688 | 1 | 02/23/16 01:31 PM | ICP-MS4_160223A |
| 1602130-15D | MW-05 | Aqueous | E300 | Anions by IC method - Water | 73678 | 1 | 02/15/16 01:20 PM | IC2_160215A |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 73678 | 10 | 02/15/16 02:34 PM | IC2_160215A |
| | MW-05 | Aqueous | M4500-H+ B | pH | 73662 | 1 | 02/12/16 04:15 PM | TITRATOR_160212A |
| | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 73670 | 1 | 02/16/16 08:40 AM | WC_160215A |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-11 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-01 |
| **Project No:** | 5164D | **Collection Date:** | 02/10/16 09:25 AM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 03:57 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/16/16 12:19 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:19 PM |
| Barium | 0.271 | 0.00300 | 0.0100 | | mg/L | 1 | 02/16/16 12:19 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:19 PM |
| Boron | 0.0912 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 12:28 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:19 PM |
| Calcium | 71.5 | 1.00 | 3.00 | | mg/L | 10 | 02/17/16 12:15 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:19 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/16/16 12:19 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:19 PM |
| Lithium | 0.0110 | 0.00500 | 0.0100 | | mg/L | 1 | 02/16/16 12:19 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:19 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:19 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/16/16 12:19 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 438 | 30.0 | 100 | | mg/L | 100 | 02/15/16 04:54 PM |
| Fluoride | 0.548 | 0.100 | 0.400 | | mg/L | 1 | 02/15/16 11:45 AM |
| Sulfate | 37.5 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 11:45 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.82 | 0 | 0 | | pH Units@21℃ | 1 | 02/12/16 03:40 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1160 | 10.0 | 10.0 | | mg/L | 1 | 02/15/16 08:39 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-12 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-02 |
| **Project No:** | 5164D | **Collection Date:** | 02/10/16 10:00 AM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:00 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/16/16 12:21 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:21 PM |
| Barium | 0.0664 | 0.00300 | 0.0100 | | mg/L | 1 | 02/16/16 12:21 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:21 PM |
| Boron | 0.0650 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 12:30 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:21 PM |
| Calcium | 11.1 | 0.100 | 0.300 | | mg/L | 1 | 02/16/16 12:21 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:21 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/16/16 12:21 PM |
| Lead | 0.000339 | 0.000300 | 0.00100 | J | mg/L | 1 | 02/16/16 12:21 PM |
| Lithium | 0.0211 | 0.00500 | 0.0100 | | mg/L | 1 | 02/16/16 12:21 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:21 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:21 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/16/16 12:21 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 13.5 | 0.300 | 1.00 | | mg/L | 1 | 02/15/16 12:06 PM |
| Fluoride | 0.157 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 12:06 PM |
| Sulfate | 14.1 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 12:06 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.62 | 0 | 0 | | pH Units@20.9℃ | 1 | 02/12/16 03:43 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 179 | 10.0 | 10.0 | | mg/L | 1 | 02/15/16 08:39 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-8 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-03 |
| **Project No:** | 5164D | **Collection Date:** | 02/10/16 11:25 AM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:02 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/16/16 12:23 PM |
| Arsenic | 0.0115 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:23 PM |
| Barium | 0.892 | 0.00300 | 0.0100 | | mg/L | 1 | 02/16/16 12:23 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:23 PM |
| Boron | 0.0721 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 12:32 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:23 PM |
| Calcium | 296 | 5.00 | 15.0 | | mg/L | 50 | 02/17/16 12:17 PM |
| Chromium | 0.00234 | 0.00200 | 0.00500 | J | mg/L | 1 | 02/16/16 12:23 PM |
| Cobalt | 0.00609 | 0.00300 | 0.00500 | | mg/L | 1 | 02/16/16 12:23 PM |
| Lead | 0.000406 | 0.000300 | 0.00100 | J | mg/L | 1 | 02/16/16 12:23 PM |
| Lithium | 0.0104 | 0.00500 | 0.0100 | | mg/L | 1 | 02/16/16 12:23 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:23 PM |
| Selenium | 0.00231 | 0.00200 | 0.00500 | J | mg/L | 1 | 02/16/16 12:23 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/16/16 12:23 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 1910 | 30.0 | 100 | | mg/L | 100 | 02/16/16 08:40 AM |
| Fluoride | 0.331 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 12:26 PM |
| Sulfate | 110 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 12:26 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.38 | 0 | 0 | | pH Units@20.8℃ | 1 | 02/12/16 03:44 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 5100 | 50.0 | 50.0 | | mg/L | 1 | 02/15/16 08:39 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-1 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-04 |
| **Project No:** | 5164D | **Collection Date:** | 02/10/16 12:00 PM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:04 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/16/16 12:25 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:25 PM |
| Barium | 0.0315 | 0.00300 | 0.0100 | | mg/L | 1 | 02/16/16 12:25 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:25 PM |
| Boron | 0.0539 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 12:34 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:25 PM |
| Calcium | 11.4 | 0.100 | 0.300 | | mg/L | 1 | 02/16/16 12:25 PM |
| Chromium | 0.00437 | 0.00200 | 0.00500 | J | mg/L | 1 | 02/16/16 12:25 PM |
| Cobalt | 0.00330 | 0.00300 | 0.00500 | J | mg/L | 1 | 02/16/16 12:25 PM |
| Lead | 0.000379 | 0.000300 | 0.00100 | J | mg/L | 1 | 02/16/16 12:25 PM |
| Lithium | 0.0314 | 0.00500 | 0.0100 | | mg/L | 1 | 02/16/16 12:25 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:25 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:25 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/16/16 12:25 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 38.9 | 0.300 | 1.00 | | mg/L | 1 | 02/15/16 12:47 PM |
| Fluoride | 0.383 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 12:47 PM |
| Sulfate | 36.3 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 12:47 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.54 | 0 | 0 | | pH Units@21℃ | 1 | 02/12/16 03:47 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 235 | 10.0 | 10.0 | | mg/L | 1 | 02/15/16 08:39 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-5 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-05 |
| **Project No:** | 5164D | **Collection Date:** | 02/10/16 01:05 PM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:06 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/16/16 12:27 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:27 PM |
| Barium | 0.261 | 0.00300 | 0.0100 | | mg/L | 1 | 02/16/16 12:27 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:27 PM |
| Boron | 0.0926 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 12:36 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:27 PM |
| Calcium | 89.5 | 1.00 | 3.00 | | mg/L | 10 | 02/17/16 12:19 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:27 PM |
| Cobalt | 0.00441 | 0.00300 | 0.00500 | J | mg/L | 1 | 02/16/16 12:27 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:27 PM |
| Lithium | 0.158 | 0.00500 | 0.0100 | | mg/L | 1 | 02/16/16 12:27 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:27 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:27 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/16/16 12:27 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 356 | 3.00 | 10.0 | | mg/L | 10 | 02/16/16 09:04 AM |
| Fluoride | 0.495 | 0.100 | 0.400 | | mg/L | 1 | 02/15/16 01:08 PM |
| Sulfate | 62.8 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 01:08 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.58 | 0 | 0 | | pH Units@21℃ | 1 | 02/12/16 03:48 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 942 | 10.0 | 10.0 | | mg/L | 1 | 02/15/16 08:39 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-2 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-06 |
| **Project No:** | 5164D | **Collection Date:** | 02/10/16 01:50 PM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:09 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/16/16 12:29 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:29 PM |
| Barium | 0.133 | 0.00300 | 0.0100 | | mg/L | 1 | 02/16/16 12:29 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:29 PM |
| Boron | 0.0885 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 12:38 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:29 PM |
| Calcium | 44.6 | 1.00 | 3.00 | | mg/L | 10 | 02/17/16 12:21 PM |
| Chromium | 0.00426 | 0.00200 | 0.00500 | J | mg/L | 1 | 02/16/16 12:29 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/16/16 12:29 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:29 PM |
| Lithium | 0.0221 | 0.00500 | 0.0100 | | mg/L | 1 | 02/16/16 12:29 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:29 PM |
| Selenium | 0.0181 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:29 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/16/16 12:29 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 250 | 3.00 | 10.0 | | mg/L | 10 | 02/16/16 09:24 AM |
| Fluoride | 0.315 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 01:28 PM |
| Sulfate | 98.9 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 01:28 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.89 | 0 | 0 | | pH Units@21.2℃ | 1 | 02/12/16 03:50 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 750 | 10.0 | 10.0 | | mg/L | 1 | 02/15/16 08:39 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-3 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-07 |
| **Project No:** | 5164D | **Collection Date:** | 02/10/16 02:50 PM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:11 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/16/16 12:31 PM |
| Arsenic | 0.00206 | 0.00200 | 0.00500 | J | mg/L | 1 | 02/16/16 12:31 PM |
| Barium | 0.0407 | 0.00300 | 0.0100 | | mg/L | 1 | 02/16/16 12:31 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:31 PM |
| Boron | 0.214 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 12:40 PM |
| Cadmium | 0.00343 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:31 PM |
| Calcium | 91.4 | 1.00 | 3.00 | | mg/L | 10 | 02/17/16 12:23 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:31 PM |
| Cobalt | 0.0417 | 0.00300 | 0.00500 | | mg/L | 1 | 02/16/16 12:31 PM |
| Lead | 0.000438 | 0.000300 | 0.00100 | J | mg/L | 1 | 02/16/16 12:31 PM |
| Lithium | 0.130 | 0.00500 | 0.0100 | | mg/L | 1 | 02/16/16 12:31 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:31 PM |
| Selenium | 0.0907 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:31 PM |
| Thallium | 0.00150 | 0.000500 | 0.00150 | J | mg/L | 1 | 02/16/16 12:31 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 326 | 30.0 | 100 | | mg/L | 100 | 02/16/16 09:45 AM |
| Fluoride | 0.740 | 0.100 | 0.400 | | mg/L | 1 | 02/15/16 01:49 PM |
| Sulfate | 474 | 100 | 300 | | mg/L | 100 | 02/16/16 09:45 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.41 | 0 | 0 | | pH Units@21.5℃ | 1 | 02/12/16 03:55 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1610 | 50.0 | 50.0 | | mg/L | 1 | 02/15/16 08:39 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-6 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-08 |
| **Project No:** | 5164D | **Collection Date:** | 02/10/16 04:15 PM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:18 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/16/16 12:50 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:50 PM |
| Barium | 0.132 | 0.00300 | 0.0100 | | mg/L | 1 | 02/16/16 12:50 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:50 PM |
| Boron | 0.0791 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 12:42 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:50 PM |
| Calcium | 31.8 | 1.00 | 3.00 | | mg/L | 10 | 02/17/16 12:26 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:50 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/16/16 12:50 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:50 PM |
| Lithium | 0.0105 | 0.00500 | 0.0100 | | mg/L | 1 | 02/16/16 12:50 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:50 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:50 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/16/16 12:50 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 252 | 3.00 | 10.0 | | mg/L | 10 | 02/16/16 10:06 AM |
| Fluoride | 0.354 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 02:10 PM |
| Sulfate | 59.5 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 02:10 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.91 | 0 | 0 | | pH Units@21.4℃ | 1 | 02/12/16 03:57 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 940 | 50.0 | 50.0 | | mg/L | 1 | 02/15/16 08:39 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-4 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-09 |
| **Project No:** | 5164D | **Collection Date:** | 02/10/16 04:50 PM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | 0.000288 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:20 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/16/16 12:52 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:52 PM |
| Barium | 0.113 | 0.00300 | 0.0100 | | mg/L | 1 | 02/16/16 12:52 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:52 PM |
| Boron | 0.0581 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 12:44 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:52 PM |
| Calcium | 45.3 | 1.00 | 3.00 | | mg/L | 10 | 02/17/16 12:28 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:52 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/16/16 12:52 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/16/16 12:52 PM |
| Lithium | 0.0419 | 0.00500 | 0.0100 | | mg/L | 1 | 02/16/16 12:52 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:52 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/16/16 12:52 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/16/16 12:52 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 195 | 3.00 | 10.0 | | mg/L | 10 | 02/16/16 10:47 AM |
| Fluoride | 0.320 | 0.100 | 0.400 | J | mg/L | 1 | 02/16/16 10:26 AM |
| Sulfate | 45.0 | 1.00 | 3.00 | | mg/L | 1 | 02/16/16 10:26 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.74 | 0 | 0 | | pH Units@21.4℃ | 1 | 02/12/16 03:59 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 653 | 10.0 | 10.0 | | mg/L | 1 | 02/15/16 08:39 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-08 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-10 |
| **Project No:** | 5164D | **Collection Date:** | 02/10/16 05:55 PM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:22 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/18/16 06:58 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 06:58 PM |
| Barium | 0.0885 | 0.00300 | 0.0100 | | mg/L | 1 | 02/18/16 06:58 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 06:58 PM |
| Boron | 0.0695 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 01:19 PM |
| Cadmium | 0.000360 | 0.000300 | 0.00100 | J | mg/L | 1 | 02/18/16 06:58 PM |
| Calcium | 140 | 1.00 | 3.00 | | mg/L | 10 | 02/23/16 01:54 PM |
| Chromium | 0.00715 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 06:58 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/18/16 06:58 PM |
| Lead | 0.000437 | 0.000300 | 0.00100 | J | mg/L | 1 | 02/18/16 06:58 PM |
| Lithium | 0.113 | 0.00500 | 0.0100 | | mg/L | 1 | 02/18/16 06:58 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 06:58 PM |
| Selenium | 0.0337 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 06:58 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/18/16 06:58 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 612 | 30.0 | 100 | | mg/L | 100 | 02/16/16 01:16 PM |
| Fluoride | 0.175 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 03:08 PM |
| Sulfate | 170 | 10.0 | 30.0 | | mg/L | 10 | 02/16/16 11:08 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.37 | 0 | 0 | | pH Units@21.4℃ | 1 | 02/12/16 04:01 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1530 | 50.0 | 50.0 | | mg/L | 1 | 02/15/16 08:39 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-07 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-11 |
| **Project No:** | 5164D | **Collection Date:** | 02/11/16 07:45 AM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:25 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/18/16 07:02 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:02 PM |
| Barium | 0.0397 | 0.00300 | 0.0100 | | mg/L | 1 | 02/18/16 07:02 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:02 PM |
| Boron | 0.0547 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 01:23 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:02 PM |
| Calcium | 13.3 | 0.100 | 0.300 | | mg/L | 1 | 02/18/16 07:02 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:02 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/18/16 07:02 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:02 PM |
| Lithium | 0.0213 | 0.00500 | 0.0100 | | mg/L | 1 | 02/18/16 07:02 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:02 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:02 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/18/16 07:02 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 28.9 | 0.300 | 1.00 | | mg/L | 1 | 02/15/16 12:21 PM |
| Fluoride | 0.276 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 12:21 PM |
| Sulfate | 25.3 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 12:21 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.84 | 0 | 0 | | pH Units@21.5℃ | 1 | 02/12/16 04:03 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 283 | 10.0 | 10.0 | | mg/L | 1 | 02/15/16 08:39 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-09 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-12 |
| **Project No:** | 5164D | **Collection Date:** | 02/11/16 08:30 AM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:27 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/18/16 07:04 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:04 PM |
| Barium | 0.0991 | 0.00300 | 0.0100 | | mg/L | 1 | 02/18/16 07:04 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:04 PM |
| Boron | 0.0720 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 01:25 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:04 PM |
| Calcium | 38.4 | 1.00 | 3.00 | | mg/L | 10 | 02/23/16 02:07 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:04 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/18/16 07:04 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:04 PM |
| Lithium | 0.0559 | 0.00500 | 0.0100 | | mg/L | 1 | 02/18/16 07:04 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:04 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:04 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/18/16 07:04 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 158 | 3.00 | 10.0 | | mg/L | 10 | 02/15/16 01:50 PM |
| Fluoride | 0.152 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 12:36 PM |
| Sulfate | 80.0 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 12:36 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.32 | 0 | 0 | | pH Units@21.7℃ | 1 | 02/12/16 04:06 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 445 | 10.0 | 10.0 | | mg/L | 1 | 02/16/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | AL-10 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-13 |
| **Project No:** | 5164D | **Collection Date:** | 02/11/16 09:05 AM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/19/16 04:29 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/18/16 07:06 PM |
| Arsenic | 0.00218 | 0.00200 | 0.00500 | J | mg/L | 1 | 02/18/16 07:06 PM |
| Barium | 0.143 | 0.00300 | 0.0100 | | mg/L | 1 | 02/18/16 07:06 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:06 PM |
| Boron | 0.0637 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 01:27 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:06 PM |
| Calcium | 48.6 | 1.00 | 3.00 | | mg/L | 10 | 02/23/16 02:09 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:06 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/18/16 07:06 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:06 PM |
| Lithium | 0.00719 | 0.00500 | 0.0100 | J | mg/L | 1 | 02/18/16 07:06 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:06 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:06 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/18/16 07:06 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 108 | 3.00 | 10.0 | | mg/L | 10 | 02/15/16 02:04 PM |
| Fluoride | 0.197 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 12:51 PM |
| Sulfate | 34.9 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 12:51 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 7.08 | 0 | 0 | | pH Units@21.8℃ | 1 | 02/12/16 04:09 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 599 | 10.0 | 10.0 | | mg/L | 1 | 02/16/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-02 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-14 |
| **Project No:** | 5164D | **Collection Date:** | 02/11/16 09:35 AM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/23/16 01:53 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/18/16 07:08 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:08 PM |
| Barium | 0.0933 | 0.00300 | 0.0100 | | mg/L | 1 | 02/18/16 07:08 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:08 PM |
| Boron | 0.0853 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 01:29 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:08 PM |
| Calcium | 25.4 | 0.500 | 1.50 | | mg/L | 5 | 02/23/16 02:11 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:08 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/18/16 07:08 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:08 PM |
| Lithium | 0.0681 | 0.00500 | 0.0100 | | mg/L | 1 | 02/18/16 07:08 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:08 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:08 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/18/16 07:08 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 83.5 | 3.00 | 10.0 | | mg/L | 10 | 02/15/16 02:19 PM |
| Fluoride | 0.229 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 01:05 PM |
| Sulfate | 34.0 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 01:05 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.60 | 0 | 0 | | pH Units@21.9℃ | 1 | 02/12/16 04:12 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 320 | 10.0 | 10.0 | | mg/L | 1 | 02/16/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *15-Mar-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-05 |
| **Project:** | Oak Grove CCR | **Lab ID:** | 1602130-15 |
| **Project No:** | 5164D | **Collection Date:** | 02/11/16 10:45 AM |
| **Lab Order:** | 1602130 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 02/23/16 01:56 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 02/18/16 07:10 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:10 PM |
| Barium | 0.0390 | 0.00300 | 0.0100 | | mg/L | 1 | 02/18/16 07:10 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:10 PM |
| Boron | 0.0447 | 0.0100 | 0.0300 | | mg/L | 1 | 02/23/16 01:31 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:10 PM |
| Calcium | 14.0 | 0.100 | 0.300 | | mg/L | 1 | 02/18/16 07:10 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:10 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 02/18/16 07:10 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 02/18/16 07:10 PM |
| Lithium | 0.0459 | 0.00500 | 0.0100 | | mg/L | 1 | 02/18/16 07:10 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:10 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 02/18/16 07:10 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 02/18/16 07:10 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 59.7 | 3.00 | 10.0 | | mg/L | 10 | 02/15/16 02:34 PM |
| Fluoride | 0.397 | 0.100 | 0.400 | J | mg/L | 1 | 02/15/16 01:20 PM |
| Sulfate | 11.9 | 1.00 | 3.00 | | mg/L | 1 | 02/15/16 01:20 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **JL** |
| pH | 6.76 | 0 | 0 | | pH Units@22℃ | 1 | 02/12/16 04:15 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 235 | 10.0 | 10.0 | | mg/L | 1 | 02/16/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160219A**

The QC data in batch 73748 applies to the following samples: 1602130-01A, 1602130-02A, 1602130-03A, 1602130-04A, 1602130-05A, 1602130-06A, 1602130-07A, 1602130-08A, 1602130-09A, 1602130-10A, 1602130-11A, 1602130-12A, 1602130-13A

Sample ID **MB-73748** Batch ID: **73748** TestNo: **SW7470A** Units: **mg/L**
SampType: **MBLK** Run ID: **CETAC2_HG_160219A** Analysis Date: **2/19/2016 3:30:39 PM** Prep Date: **2/19/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

Sample ID **LCS-73748** Batch ID: **73748** TestNo: **SW7470A** Units: **mg/L**
SampType: **LCS** Run ID: **CETAC2_HG_160219A** Analysis Date: **2/19/2016 3:37:28 PM** Prep Date: **2/19/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00196 | 0.000200 | 0.00200 | 0 | 98.0 | 85 | 115 | | | |

Sample ID **LCSD-73748** Batch ID: **73748** TestNo: **SW7470A** Units: **mg/L**
SampType: **LCSD** Run ID: **CETAC2_HG_160219A** Analysis Date: **2/19/2016 3:39:44 PM** Prep Date: **2/19/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00187 | 0.000200 | 0.00200 | 0 | 93.5 | 85 | 115 | 4.70 | 15 | |

Sample ID **1602095-01A SD** Batch ID: **73748** TestNo: **SW7470A** Units: **mg/L**
SampType: **SD** Run ID: **CETAC2_HG_160219A** Analysis Date: **2/19/2016 3:44:15 PM** Prep Date: **2/19/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

Sample ID **1602095-01A PDS** Batch ID: **73748** TestNo: **SW7470A** Units: **mg/L**
SampType: **PDS** Run ID: **CETAC2_HG_160219A** Analysis Date: **2/19/2016 3:46:31 PM** Prep Date: **2/19/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00237 | 0.000200 | 0.00250 | 0 | 94.8 | 85 | 115 | | | |

Sample ID **1602095-01A MS** Batch ID: **73748** TestNo: **SW7470A** Units: **mg/L**
SampType: **MS** Run ID: **CETAC2_HG_160219A** Analysis Date: **2/19/2016 3:48:47 PM** Prep Date: **2/19/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00196 | 0.000200 | 0.00200 | 0 | 98.0 | 80 | 120 | | | |

Sample ID **1602095-01A MSD** Batch ID: **73748** TestNo: **SW7470A** Units: **mg/L**
SampType: **MSD** Run ID: **CETAC2_HG_160219A** Analysis Date: **2/19/2016 3:51:03 PM** Prep Date: **2/19/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00192 | 0.000200 | 0.00200 | 0 | 96.0 | 80 | 120 | 2.06 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160219A**

| Sample ID | **ICV-160219** | Batch ID: | **R84257** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_160219A** | Analysis Date: | **2/19/2016 2:20:12 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00388 | 0.000200 | 0.00400 | 0 | 97.0 | 90 | 110 | | | |

| Sample ID | **CCV2-160219** | Batch ID: | **R84257** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160219A** | Analysis Date: | **2/19/2016 3:26:05 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00195 | 0.000200 | 0.00200 | 0 | 97.5 | 90 | 110 | | | |

| Sample ID | **CCV3-160219** | Batch ID: | **R84257** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160219A** | Analysis Date: | **2/19/2016 4:13:44 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00196 | 0.000200 | 0.00200 | 0 | 98.0 | 90 | 110 | | | |

| Sample ID | **CCV4-160219** | Batch ID: | **R84257** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160219A** | Analysis Date: | **2/19/2016 4:38:48 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00194 | 0.000200 | 0.00200 | 0 | 97.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160223A**

The QC data in batch 73780 applies to the following samples: 1602130-14A, 1602130-15A

| Sample ID | **MB-73780** | Batch ID: | **73780** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_160223A** | Analysis Date: | **2/23/2016 1:47:10 PM** | Prep Date: | **2/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-73780** | Batch ID: | **73780** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_160223A** | Analysis Date: | **2/23/2016 1:49:26 PM** | Prep Date: | **2/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00198 | 0.000200 | 0.00200 | 0 | 99.0 | 85 | 115 | | | |

| Sample ID | **LCSD-73780** | Batch ID: | **73780** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_160223A** | Analysis Date: | **2/23/2016 1:51:42 PM** | Prep Date: | **2/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00197 | 0.000200 | 0.00200 | 0 | 98.5 | 85 | 115 | 0.506 | 15 | |

| Sample ID | **1602183-03B SD** | Batch ID: | **73780** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_160223A** | Analysis Date: | **2/23/2016 2:23:29 PM** | Prep Date: | **2/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1602183-03B PDS** | Batch ID: | **73780** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_160223A** | Analysis Date: | **2/23/2016 2:25:45 PM** | Prep Date: | **2/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00230 | 0.000200 | 0.00250 | 0 | 92.0 | 85 | 115 | | | |

| Sample ID | **1602183-03B MS** | Batch ID: | **73780** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_160223A** | Analysis Date: | **2/23/2016 2:28:01 PM** | Prep Date: | **2/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00184 | 0.000200 | 0.00200 | 0 | 92.0 | 80 | 120 | | | |

| Sample ID | **1602183-03B MSD** | Batch ID: | **73780** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_160223A** | Analysis Date: | **2/23/2016 2:30:17 PM** | Prep Date: | **2/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00181 | 0.000200 | 0.00200 | 0 | 90.5 | 80 | 120 | 1.64 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160223A**

| Sample ID **ICV-160223** | Batch ID: **R84299** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_160223A** | Analysis Date: **2/23/2016 1:42:36 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00380 | 0.000200 | 0.00400 | 0 | 95.0 | 90 | 110 | | | |

| Sample ID **CCV1-160223** | Batch ID: **R84299** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_160223A** | Analysis Date: **2/23/2016 2:16:39 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00198 | 0.000200 | 0.00200 | 0 | 99.0 | 90 | 110 | | | |

| Sample ID **CCV2-160223** | Batch ID: **R84299** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_160223A** | Analysis Date: **2/23/2016 2:53:02 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00196 | 0.000200 | 0.00200 | 0 | 98.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160216B**

The QC data in batch 73669 applies to the following samples: 1602130-01A, 1602130-02A, 1602130-03A, 1602130-04A, 1602130-05A, 1602130-06A, 1602130-07A, 1602130-08A, 1602130-09A

Sample ID **MB-73669** Batch ID: **73669** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_160216B** Analysis Date: **2/16/2016 12:03:00 PM** Prep Date: **2/15/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-73669** Batch ID: **73669** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_160216B** Analysis Date: **2/16/2016 12:05:00 PM** Prep Date: **2/15/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Barium | 0.195 | 0.0100 | 0.200 | 0 | 97.4 | 80 | 120 | | | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 80 | 120 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.0 | 80 | 120 | | | |
| Calcium | 4.72 | 0.300 | 5.00 | 0 | 94.4 | 80 | 120 | | | |
| Chromium | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 80 | 120 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 97.9 | 80 | 120 | | | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.7 | 80 | 120 | | | |
| Molybdenum | 0.190 | 0.00500 | 0.200 | 0 | 94.8 | 80 | 120 | | | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Thallium | 0.194 | 0.00150 | 0.200 | 0 | 96.9 | 80 | 120 | | | |

Sample ID **LCSD-73669** Batch ID: **73669** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_160216B** Analysis Date: **2/16/2016 12:07:00 PM** Prep Date: **2/15/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | 0.937 | 15 | |
| Arsenic | 0.198 | 0.00500 | 0.200 | 0 | 99.1 | 80 | 120 | 0.896 | 15 | |
| Barium | 0.195 | 0.0100 | 0.200 | 0 | 97.4 | 80 | 120 | 0.022 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160216B**

| Sample ID **LCSD-73669** | Batch ID: **73669** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 12:07:00 PM** | Prep Date: **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 80 | 120 | 0.012 | 15 | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 98.8 | 80 | 120 | 0.201 | 15 | |
| Calcium | 4.68 | 0.300 | 5.00 | 0 | 93.6 | 80 | 120 | 0.781 | 15 | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 80 | 120 | 0.438 | 15 | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 1.93 | 15 | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.5 | 80 | 120 | 0.582 | 15 | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.3 | 80 | 120 | 0.381 | 15 | |
| Molybdenum | 0.191 | 0.00500 | 0.200 | 0 | 95.4 | 80 | 120 | 0.558 | 15 | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 1.67 | 15 | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 98.1 | 80 | 120 | 1.23 | 15 | |

| Sample ID **1602141-03A SD** | Batch ID: **73669** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 12:13:00 PM** | Prep Date: **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0.00714 | | | | 0 | 10 | |
| Barium | 0.0861 | 0.0500 | 0 | 0.0868 | | | | 0.762 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.00818 | | | | 0 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0.00497 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1602141-03A PDS** | Batch ID: **73669** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 12:33:00 PM** | Prep Date: **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.3 | 80 | 120 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0.00714 | 96.4 | 80 | 120 | | | |
| Barium | 0.274 | 0.0100 | 0.200 | 0.0868 | 93.8 | 80 | 120 | | | |
| Beryllium | 0.191 | 0.00100 | 0.200 | 0 | 95.6 | 80 | 120 | | | |
| Cadmium | 0.186 | 0.00100 | 0.200 | 0 | 93.1 | 80 | 120 | | | |
| Chromium | 0.194 | 0.00500 | 0.200 | 0 | 97.0 | 80 | 120 | | | |
| Cobalt | 0.196 | 0.00500 | 0.200 | 0 | 97.9 | 80 | 120 | | | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Lithium | 0.196 | 0.0100 | 0.200 | 0.00818 | 93.7 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160216B**

| Sample ID **1602141-03A PDS** | Batch ID: **73669** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 12:33:00 PM** | Prep Date: **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.191 | 0.00500 | 0.200 | 0.00497 | 93.1 | 80 | 120 | | | |
| Selenium | 0.193 | 0.00500 | 0.200 | 0 | 96.6 | 80 | 120 | | | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.7 | 80 | 120 | | | |

| Sample ID **1602141-03A MS** | Batch ID: **73669** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 12:35:00 PM** | Prep Date: **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0.00714 | 99.6 | 80 | 120 | | | |
| Barium | 0.284 | 0.0100 | 0.200 | 0.0868 | 98.8 | 80 | 120 | | | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 80 | 120 | | | |
| Cadmium | 0.195 | 0.00100 | 0.200 | 0 | 97.4 | 80 | 120 | | | |
| Calcium | 52.2 | 0.300 | 5.00 | 47.0 | 103 | 80 | 120 | | | |
| Chromium | 0.195 | 0.00500 | 0.200 | 0 | 97.7 | 80 | 120 | | | |
| Cobalt | 0.198 | 0.00500 | 0.200 | 0 | 99.2 | 80 | 120 | | | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0.00818 | 98.5 | 80 | 120 | | | |
| Molybdenum | 0.196 | 0.00500 | 0.200 | 0.00497 | 95.5 | 80 | 120 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 80 | 120 | | | |

| Sample ID **1602141-03A MSD** | Batch ID: **73669** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 12:37:00 PM** | Prep Date: **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | 0.024 | 15 | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0.00714 | 100 | 80 | 120 | 0.579 | 15 | |
| Barium | 0.288 | 0.0100 | 0.200 | 0.0868 | 101 | 80 | 120 | 1.39 | 15 | |
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | 2.37 | 15 | |
| Cadmium | 0.196 | 0.00100 | 0.200 | 0 | 97.8 | 80 | 120 | 0.419 | 15 | |
| Calcium | 52.6 | 0.300 | 5.00 | 47.0 | 112 | 80 | 120 | 0.855 | 15 | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 80 | 120 | 1.32 | 15 | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 1.43 | 15 | |
| Lead | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.967 | 15 | |
| Lithium | 0.207 | 0.0100 | 0.200 | 0.00818 | 99.6 | 80 | 120 | 1.11 | 15 | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0.00497 | 96.8 | 80 | 120 | 1.25 | 15 | |
| Selenium | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | 1.41 | 15 | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 80 | 120 | 0.080 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160216B**

| Sample ID **ICV-160216** | Batch ID: **R84200** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 11:14:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.102 | 0.00250 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Beryllium | 0.105 | 0.00100 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.27 | 0.300 | 2.50 | 0 | 90.8 | 90 | 110 | | | |
| Chromium | 0.107 | 0.00500 | 0.100 | 0 | 107 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.103 | 0.00100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.101 | 0.0100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.0979 | 0.00500 | 0.100 | 0 | 97.9 | 90 | 110 | | | |
| Selenium | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Thallium | 0.101 | 0.00150 | 0.100 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL-160216** | Batch ID: **R84200** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 11:20:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00202 | 0.00250 | 0.00200 | 0 | 101 | 70 | 130 | | | |
| Arsenic | 0.00512 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00506 | 0.0100 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Beryllium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Cadmium | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 70 | 130 | | | |
| Calcium | 0.0978 | 0.300 | 0.100 | 0 | 97.8 | 70 | 130 | | | |
| Chromium | 0.00520 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Cobalt | 0.00530 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Lead | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Lithium | 0.0116 | 0.0100 | 0.0100 | 0 | 116 | 70 | 130 | | | |
| Molybdenum | 0.00495 | 0.00500 | 0.00500 | 0 | 99.1 | 70 | 130 | | | |
| Selenium | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Thallium | 0.00101 | 0.00150 | 0.00100 | 0 | 101 | 70 | 130 | | | |

| Sample ID **CCV1-160216** | Batch ID: **R84200** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 11:53:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.203 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160216B**

| Sample ID **CCV1-160216** | Batch ID: **R84200** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 11:53:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.73 | 0.300 | 5.00 | 0 | 94.6 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.207 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Molybdenum | 0.194 | 0.00500 | 0.200 | 0 | 97.1 | 90 | 110 | | | |
| Selenium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 90 | 110 | | | |

| Sample ID **LCVL1-160216** | Batch ID: **R84200** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 11:58:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00220 | 0.00250 | 0.00200 | 0 | 110 | 70 | 130 | | | |
| Arsenic | 0.00516 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Barium | 0.00511 | 0.0100 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Beryllium | 0.000976 | 0.00100 | 0.00100 | 0 | 97.6 | 70 | 130 | | | |
| Cadmium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Calcium | 0.0983 | 0.300 | 0.100 | 0 | 98.3 | 70 | 130 | | | |
| Chromium | 0.00528 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Cobalt | 0.00528 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Lead | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 70 | 130 | | | |
| Lithium | 0.0110 | 0.0100 | 0.0100 | 0 | 110 | 70 | 130 | | | |
| Molybdenum | 0.00486 | 0.00500 | 0.00500 | 0 | 97.2 | 70 | 130 | | | |
| Selenium | 0.00512 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

| Sample ID **CCV2-160216** | Batch ID: **R84200** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 12:39:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.205 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.74 | 0.300 | 5.00 | 0 | 94.8 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.211 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Lead | 0.206 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160216B**

| Sample ID **CCV2-160216** | Batch ID: **R84200** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 12:39:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 90 | 110 | | | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL2-160216** | Batch ID: **R84200** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 12:45:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00209 | 0.00250 | 0.00200 | 0 | 105 | 70 | 130 | | | |
| Arsenic | 0.00530 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Barium | 0.00498 | 0.0100 | 0.00500 | 0 | 99.6 | 70 | 130 | | | |
| Beryllium | 0.00127 | 0.00100 | 0.00100 | 0 | 127 | 70 | 130 | | | |
| Cadmium | 0.000968 | 0.00100 | 0.00100 | 0 | 96.8 | 70 | 130 | | | |
| Calcium | 0.0938 | 0.300 | 0.100 | 0 | 93.8 | 70 | 130 | | | |
| Chromium | 0.00526 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Cobalt | 0.00525 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Lead | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.0109 | 0.0100 | 0.0100 | 0 | 109 | 70 | 130 | | | |
| Molybdenum | 0.00487 | 0.00500 | 0.00500 | 0 | 97.4 | 70 | 130 | | | |
| Selenium | 0.00531 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Thallium | 0.00101 | 0.00150 | 0.00100 | 0 | 101 | 70 | 130 | | | |

| Sample ID **CCV3-160216** | Batch ID: **R84200** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 1:09:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Cobalt | 0.211 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lithium | 0.195 | 0.0100 | 0.200 | 0 | 97.7 | 90 | 110 | | | |
| Molybdenum | 0.192 | 0.00500 | 0.200 | 0 | 95.9 | 90 | 110 | | | |
| Selenium | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160216B**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **LCVL3-160216** | Batch ID: **R84200** | TestNo: **SW6020A** | Units: **mg/L** | | |
| SampType: **LCVL** | Run ID: **ICP-MS4_160216B** | Analysis Date: **2/16/2016 1:33:00 PM** | Prep Date: | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00205 | 0.00250 | 0.00200 | 0 | 102 | 70 | 130 | | | |
| Arsenic | 0.00528 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Barium | 0.00495 | 0.0100 | 0.00500 | 0 | 99.0 | 70 | 130 | | | |
| Beryllium | 0.00115 | 0.00100 | 0.00100 | 0 | 115 | 70 | 130 | | | |
| Cadmium | 0.000973 | 0.00100 | 0.00100 | 0 | 97.3 | 70 | 130 | | | |
| Chromium | 0.00513 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Cobalt | 0.00519 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lead | 0.000946 | 0.00100 | 0.00100 | 0 | 94.6 | 70 | 130 | | | |
| Lithium | 0.0111 | 0.0100 | 0.0100 | 0 | 111 | 70 | 130 | | | |
| Molybdenum | 0.00492 | 0.00500 | 0.00500 | 0 | 98.3 | 70 | 130 | | | |
| Selenium | 0.00502 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1602130

**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160217A**

The QC data in batch 73669 applies to the following samples: 1602130-01A, 1602130-02A, 1602130-03A, 1602130-04A, 1602130-05A, 1602130-06A, 1602130-07A, 1602130-08A, 1602130-09A

| Sample ID | **1602141-03A SD** | Batch ID: | **73669** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_160217A** | Analysis Date: | **2/17/2016 12:13:00 PM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 2.21 | 1.50 | 0 | 1.94 | | | | 13.0 | 10 | R |
| Calcium | 46.3 | 15.0 | 0 | 46.3 | | | | 0.013 | 10 | |

| Sample ID | **1602141-03A PDS** | Batch ID: | **73669** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_160217A** | Analysis Date: | **2/17/2016 12:34:00 PM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 3.80 | 0.300 | 2.00 | 1.94 | 93.0 | 80 | 120 | | | |
| Calcium | 90.0 | 3.00 | 50.0 | 46.3 | 87.5 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160217A**

| Sample ID **ICV-160217** | Batch ID: **R84221** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160217A** | Analysis Date: **2/17/2016 10:44:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.105 | 0.0300 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Calcium | 2.27 | 0.300 | 2.50 | 0 | 90.7 | 90 | 110 | | | |

| Sample ID **LCVL-160217** | Batch ID: **R84221** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160217A** | Analysis Date: **2/17/2016 10:49:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0238 | 0.0300 | 0.0200 | 0 | 119 | 70 | 130 | | | |
| Calcium | 0.0924 | 0.300 | 0.100 | 0 | 92.4 | 70 | 130 | | | |

| Sample ID **CCV2-160217** | Batch ID: **R84221** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160217A** | Analysis Date: **2/17/2016 11:57:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.189 | 0.0300 | 0.200 | 0 | 94.3 | 90 | 110 | | | |
| Calcium | 4.74 | 0.300 | 5.00 | 0 | 94.8 | 90 | 110 | | | |

| Sample ID **LCVL2-160217** | Batch ID: **R84221** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160217A** | Analysis Date: **2/17/2016 12:07:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0193 | 0.0300 | 0.0200 | 0 | 96.3 | 70 | 130 | | | |
| Calcium | 0.0967 | 0.300 | 0.100 | 0 | 96.7 | 70 | 130 | | | |

| Sample ID **CCV3-160217** | Batch ID: **R84221** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160217A** | Analysis Date: **2/17/2016 12:36:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.203 | 0.0300 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Calcium | 4.75 | 0.300 | 5.00 | 0 | 95.0 | 90 | 110 | | | |

| Sample ID **LCVL3-160217** | Batch ID: **R84221** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160217A** | Analysis Date: **2/17/2016 12:45:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0215 | 0.0300 | 0.0200 | 0 | 108 | 70 | 130 | | | |
| Calcium | 0.0955 | 0.300 | 0.100 | 0 | 95.5 | 70 | 130 | | | |

**Qualifiers:**

| | |
|---|---|
| B | Analyte detected in the associated Method Blank |
| J | Analyte detected between MDL and RL |
| ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit |
| J | Analyte detected between SDL and RL |
| DF | Dilution Factor |
| MDL | Method Detection Limit |
| R | RPD outside accepted control limits |
| S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160218A**

The QC data in batch 73688 applies to the following samples: 1602130-10A, 1602130-11A, 1602130-12A, 1602130-13A, 1602130-14A, 1602130-15A

Sample ID **MB-73688** Batch ID: **73688** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_160218A** Analysis Date: **2/18/2016 6:50:00 PM** Prep Date: **2/16/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-73688** Batch ID: **73688** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_160218A** Analysis Date: **2/18/2016 6:52:00 PM** Prep Date: **2/16/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Beryllium | 0.220 | 0.00100 | 0.200 | 0 | 110 | 80 | 120 | | | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Calcium | 4.99 | 0.300 | 5.00 | 0 | 99.7 | 80 | 120 | | | |
| Chromium | 0.212 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Cobalt | 0.213 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Lead | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Lithium | 0.223 | 0.0100 | 0.200 | 0 | 112 | 80 | 120 | | | |
| Molybdenum | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 80 | 120 | | | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

Sample ID **LCSD-73688** Batch ID: **73688** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_160218A** Analysis Date: **2/18/2016 6:54:00 PM** Prep Date: **2/16/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | 1.45 | 15 | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.963 | 15 | |
| Barium | 0.195 | 0.0100 | 0.200 | 0 | 97.3 | 80 | 120 | 2.36 | 15 | |
| Beryllium | 0.218 | 0.00100 | 0.200 | 0 | 109 | 80 | 120 | 1.08 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160218A**

| Sample ID **LCSD-73688** | Batch ID: **73688** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 6:54:00 PM** | Prep Date: **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 99.8 | 80 | 120 | 1.50 | 15 | |
| Calcium | 4.91 | 0.300 | 5.00 | 0 | 98.2 | 80 | 120 | 1.57 | 15 | |
| Chromium | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 1.82 | 15 | |
| Cobalt | 0.211 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | 0.956 | 15 | |
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | 1.63 | 15 | |
| Lithium | 0.220 | 0.0100 | 0.200 | 0 | 110 | 80 | 120 | 1.62 | 15 | |
| Molybdenum | 0.191 | 0.00500 | 0.200 | 0 | 95.7 | 80 | 120 | 2.60 | 15 | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.907 | 15 | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 80 | 120 | 1.66 | 15 | |

| Sample ID **1602130-10A SD** | Batch ID: **73688** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 7:00:00 PM** | Prep Date: **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0904 | 0.0500 | 0 | 0.0885 | | | | 2.11 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0.000360 | | | | 0 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0.00715 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0.000437 | | | | 0 | 10 | |
| Lithium | 0.115 | 0.0500 | 0 | 0.113 | | | | 1.55 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | 0.0350 | 0.0250 | 0 | 0.0337 | | | | 3.71 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1602130-10A PDS** | Batch ID: **73688** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 7:12:00 PM** | Prep Date: **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Arsenic | 0.196 | 0.00500 | 0.200 | 0 | 97.8 | 80 | 120 | | | |
| Barium | 0.284 | 0.0100 | 0.200 | 0.0885 | 97.6 | 80 | 120 | | | |
| Beryllium | 0.203 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0.000360 | 96.0 | 80 | 120 | | | |
| Chromium | 0.211 | 0.00500 | 0.200 | 0.00715 | 102 | 80 | 120 | | | |
| Cobalt | 0.195 | 0.00500 | 0.200 | 0 | 97.6 | 80 | 120 | | | |
| Lead | 0.199 | 0.00100 | 0.200 | 0.000437 | 99.4 | 80 | 120 | | | |
| Lithium | 0.308 | 0.0100 | 0.200 | 0.113 | 97.4 | 80 | 120 | | | |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.3 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160218A**

| Sample ID **1602130-10A PDS** | Batch ID: **73688** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 7:12:00 PM** | Prep Date: **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Selenium | 0.226 | 0.00500 | 0.200 | 0.0337 | 96.1 | 80 | 120 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.5 | 80 | 120 | | | |

| Sample ID **1602130-10A MS** | Batch ID: **73688** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 7:14:00 PM** | Prep Date: **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.207 | 0.00250 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Barium | 0.294 | 0.0100 | 0.200 | 0.0885 | 103 | 80 | 120 | | | |
| Beryllium | 0.210 | 0.00100 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0.000360 | 99.0 | 80 | 120 | | | |
| Calcium | 147 | 0.300 | 5.00 | 141 | 115 | 80 | 120 | | | |
| Chromium | 0.217 | 0.00500 | 0.200 | 0.00715 | 105 | 80 | 120 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Lead | 0.203 | 0.00100 | 0.200 | 0.000437 | 101 | 80 | 120 | | | |
| Lithium | 0.322 | 0.0100 | 0.200 | 0.113 | 105 | 80 | 120 | | | |
| Molybdenum | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Selenium | 0.232 | 0.00500 | 0.200 | 0.0337 | 99.0 | 80 | 120 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 80 | 120 | | | |

| Sample ID **1602130-10A MSD** | Batch ID: **73688** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 7:16:00 PM** | Prep Date: **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.210 | 0.00250 | 0.200 | 0 | 105 | 80 | 120 | 1.10 | 15 | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.464 | 15 | |
| Barium | 0.295 | 0.0100 | 0.200 | 0.0885 | 103 | 80 | 120 | 0.362 | 15 | |
| Beryllium | 0.213 | 0.00100 | 0.200 | 0 | 106 | 80 | 120 | 1.29 | 15 | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0.000360 | 101 | 80 | 120 | 1.77 | 15 | |
| Calcium | 146 | 0.300 | 5.00 | 141 | 99.1 | 80 | 120 | 0.541 | 15 | |
| Chromium | 0.219 | 0.00500 | 0.200 | 0.00715 | 106 | 80 | 120 | 1.06 | 15 | |
| Cobalt | 0.196 | 0.00500 | 0.200 | 0 | 97.8 | 80 | 120 | 1.80 | 15 | |
| Lead | 0.204 | 0.00100 | 0.200 | 0.000437 | 102 | 80 | 120 | 0.516 | 15 | |
| Lithium | 0.319 | 0.0100 | 0.200 | 0.113 | 103 | 80 | 120 | 1.17 | 15 | |
| Molybdenum | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 1.38 | 15 | |
| Selenium | 0.231 | 0.00500 | 0.200 | 0.0337 | 98.6 | 80 | 120 | 0.299 | 15 | |
| Thallium | 0.205 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | 0.593 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160218A**

| Sample ID **ICV-160218** | Batch ID: **R84234** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 4:47:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.101 | 0.00250 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.100 | 0.00500 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Barium | 0.100 | 0.0100 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.0986 | 0.00100 | 0.100 | 0 | 98.6 | 90 | 110 | | | |
| Cadmium | 0.0992 | 0.00100 | 0.100 | 0 | 99.2 | 90 | 110 | | | |
| Calcium | 2.33 | 0.300 | 2.50 | 0 | 93.3 | 90 | 110 | | | |
| Chromium | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.0995 | 0.00100 | 0.100 | 0 | 99.5 | 90 | 110 | | | |
| Lithium | 0.0956 | 0.0100 | 0.100 | 0 | 95.6 | 90 | 110 | | | |
| Molybdenum | 0.0963 | 0.00500 | 0.100 | 0 | 96.3 | 90 | 110 | | | |
| Selenium | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.0993 | 0.00150 | 0.100 | 0 | 99.3 | 90 | 110 | | | |

| Sample ID **LCVL-160218** | Batch ID: **R84234** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 4:51:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00202 | 0.00250 | 0.00200 | 0 | 101 | 70 | 130 | | | |
| Arsenic | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00510 | 0.0100 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Beryllium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Cadmium | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 70 | 130 | | | |
| Calcium | 0.112 | 0.300 | 0.100 | 0 | 112 | 70 | 130 | | | |
| Chromium | 0.00544 | 0.00500 | 0.00500 | 0 | 109 | 70 | 130 | | | |
| Cobalt | 0.00538 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Lead | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 70 | 130 | | | |
| Lithium | 0.0103 | 0.0100 | 0.0100 | 0 | 103 | 70 | 130 | | | |
| Molybdenum | 0.00495 | 0.00500 | 0.00500 | 0 | 98.9 | 70 | 130 | | | |
| Selenium | 0.00528 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Thallium | 0.00106 | 0.00150 | 0.00100 | 0 | 106 | 70 | 130 | | | |

| Sample ID **CCV3-160218** | Batch ID: **R84234** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 6:42:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Barium | 0.197 | 0.0100 | 0.200 | 0 | 98.7 | 90 | 110 | | | |
| Beryllium | 0.215 | 0.00100 | 0.200 | 0 | 108 | 90 | 110 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160218A**

| Sample ID **CCV3-160218** | Batch ID: **R84234** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 6:42:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.05 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Chromium | 0.207 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.201 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.216 | 0.0100 | 0.200 | 0 | 108 | 90 | 110 | | | |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.5 | 90 | 110 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL3-160218** | Batch ID: **R84234** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 6:46:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00221 | 0.00250 | 0.00200 | 0 | 111 | 70 | 130 | | | |
| Arsenic | 0.00513 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Barium | 0.00514 | 0.0100 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Beryllium | 0.00111 | 0.00100 | 0.00100 | 0 | 110 | 70 | 130 | | | |
| Cadmium | 0.00105 | 0.00100 | 0.00100 | 0 | 105 | 70 | 130 | | | |
| Calcium | 0.0973 | 0.300 | 0.100 | 0 | 97.3 | 70 | 130 | | | |
| Chromium | 0.00542 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Cobalt | 0.00533 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Lead | 0.00127 | 0.00100 | 0.00100 | 0 | 127 | 70 | 130 | | | |
| Lithium | 0.0114 | 0.0100 | 0.0100 | 0 | 114 | 70 | 130 | | | |
| Molybdenum | 0.00512 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Thallium | 0.00107 | 0.00150 | 0.00100 | 0 | 107 | 70 | 130 | | | |

| Sample ID **CCV4-160218** | Batch ID: **R84234** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 7:18:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.197 | 0.0100 | 0.200 | 0 | 98.3 | 90 | 110 | | | |
| Beryllium | 0.214 | 0.00100 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Calcium | 5.15 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Chromium | 0.209 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.212 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Lead | 0.201 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.216 | 0.0100 | 0.200 | 0 | 108 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160218A**

| Sample ID **CCV4-160218** | Batch ID: **R84234** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 7:18:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.4 | 90 | 110 | | | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL4-160218** | Batch ID: **R84234** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160218A** | Analysis Date: **2/18/2016 7:22:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00210 | 0.00250 | 0.00200 | 0 | 105 | 70 | 130 | | | |
| Arsenic | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Barium | 0.00515 | 0.0100 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Beryllium | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Cadmium | 0.000997 | 0.00100 | 0.00100 | 0 | 99.7 | 70 | 130 | | | |
| Calcium | 0.0995 | 0.300 | 0.100 | 0 | 99.5 | 70 | 130 | | | |
| Chromium | 0.00543 | 0.00500 | 0.00500 | 0 | 109 | 70 | 130 | | | |
| Cobalt | 0.00545 | 0.00500 | 0.00500 | 0 | 109 | 70 | 130 | | | |
| Lead | 0.00117 | 0.00100 | 0.00100 | 0 | 117 | 70 | 130 | | | |
| Lithium | 0.0114 | 0.0100 | 0.0100 | 0 | 114 | 70 | 130 | | | |
| Molybdenum | 0.00512 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00539 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Thallium | 0.00105 | 0.00150 | 0.00100 | 0 | 105 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160223A**

The QC data in batch 73669 applies to the following samples: 1602130-01A, 1602130-02A, 1602130-03A, 1602130-04A, 1602130-05A, 1602130-06A, 1602130-07A, 1602130-08A, 1602130-09A

| Sample ID | **MB-73669** | Batch ID: | **73669** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 12:20:00 PM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0132 | 0.0300 | | | | | | | | |

| Sample ID | **LCS-73669** | Batch ID: | **73669** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 12:22:00 PM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.206 | 0.0300 | 0.200 | 0 | 103 | 80 | 120 | | | |

| Sample ID | **LCSD-73669** | Batch ID: | **73669** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 12:24:00 PM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.208 | 0.0300 | 0.200 | 0 | 104 | 80 | 120 | 0.620 | 15 | |

| Sample ID | **1602141-03A MS** | Batch ID: | **73669** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 2:21:00 PM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 2.19 | 0.300 | 0.200 | 1.95 | 119 | 80 | 120 | | | |

| Sample ID | **1602141-03A MSD** | Batch ID: | **73669** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 2:23:00 PM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 2.28 | 0.300 | 0.200 | 1.95 | 162 | 80 | 120 | 3.77 | 15 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160223A**

The QC data in batch 73688 applies to the following samples: 1602130-10A, 1602130-11A, 1602130-12A, 1602130-13A, 1602130-14A, 1602130-15A

| Sample ID | **MB-73688** | Batch ID: | **73688** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 1:09:00 PM** | Prep Date: | **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

| Sample ID | **LCS-73688** | Batch ID: | **73688** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 1:11:00 PM** | Prep Date: | **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.211 | 0.0300 | 0.200 | 0 | 105 | 80 | 120 | | | |

| Sample ID | **LCSD-73688** | Batch ID: | **73688** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 1:13:00 PM** | Prep Date: | **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.212 | 0.0300 | 0.200 | 0 | 106 | 80 | 120 | 0.669 | 15 | |

| Sample ID | **1602130-10A SD** | Batch ID: | **73688** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 1:21:00 PM** | Prep Date: | **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0852 | 0.150 | 0 | 0.0695 | | | | 20.3 | 10 | R |

| Sample ID | **1602130-10A PDS** | Batch ID: | **73688** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 1:33:00 PM** | Prep Date: | **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.263 | 0.0300 | 0.200 | 0.0695 | 97.0 | 80 | 120 | | | |

| Sample ID | **1602130-10A MS** | Batch ID: | **73688** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 1:35:00 PM** | Prep Date: | **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.277 | 0.0300 | 0.200 | 0.0695 | 104 | 80 | 120 | | | |

| Sample ID | **1602130-10A MSD** | Batch ID: | **73688** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **ICP-MS4_160223A** | Analysis Date: | **2/23/2016 1:37:00 PM** | Prep Date: | **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.285 | 0.0300 | 0.200 | 0.0695 | 108 | 80 | 120 | 2.95 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160223A**

| Sample ID **1602130-10A SD** | Batch ID: **73688** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 1:56:00 PM** | Prep Date: **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 141 | 15.0 | 0 | 140 | | | | 0.669 | 10 | |

| Sample ID **1602130-10A PDS** | Batch ID: **73688** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 2:13:00 PM** | Prep Date: **2/16/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 182 | 3.00 | 50.0 | 140 | 84.8 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160223A**

| Sample ID **ICV-160223** | Batch ID: **R84297** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 12:05:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.100 | 0.0300 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Calcium | 2.31 | 0.300 | 2.50 | 0 | 92.5 | 90 | 110 | | | |

| Sample ID **LCVL-160223** | Batch ID: **R84297** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 12:13:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0221 | 0.0300 | 0.0200 | 0 | 110 | 70 | 130 | | | |
| Calcium | 0.0987 | 0.300 | 0.100 | 0 | 98.7 | 70 | 130 | | | |

| Sample ID **CCV1-160223** | Batch ID: **R84297** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 12:54:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.197 | 0.0300 | 0.200 | 0 | 98.6 | 90 | 110 | | | |

| Sample ID **LCVL1-160223** | Batch ID: **R84297** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 1:00:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0219 | 0.0300 | 0.0200 | 0 | 109 | 70 | 130 | | | |

| Sample ID **CCV2-160223** | Batch ID: **R84297** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 1:43:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.201 | 0.0300 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Calcium | 4.88 | 0.300 | 5.00 | 0 | 97.6 | 90 | 110 | | | |

| Sample ID **LCVL2-160223** | Batch ID: **R84297** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 1:49:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0217 | 0.0300 | 0.0200 | 0 | 109 | 70 | 130 | | | |
| Calcium | 0.108 | 0.300 | 0.100 | 0 | 108 | 70 | 130 | | | |

| Sample ID **CCV3-160223** | Batch ID: **R84297** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 2:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.203 | 0.0300 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160223A**

| Sample ID **CCV3-160223** | Batch ID: **R84297** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 2:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.87 | 0.300 | 5.00 | 0 | 97.4 | 90 | 110 | | | |

| Sample ID **LCVL3-160223** | Batch ID: **R84297** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160223A** | Analysis Date: **2/23/2016 2:36:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0205 | 0.0300 | 0.0200 | 0 | 103 | 70 | 130 | | | |
| Calcium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_160215A**

The QC data in batch 73678 applies to the following samples: 1602130-11D, 1602130-12D, 1602130-13D, 1602130-14D, 1602130-15D

Sample ID **MB-73678** Batch ID: **73678** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_160215A** Analysis Date: **2/15/2016 11:18:21 AM** Prep Date: **2/15/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-73678** Batch ID: **73678** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_160215A** Analysis Date: **2/15/2016 11:32:57 AM** Prep Date: **2/15/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.75 | 1.00 | 10.00 | 0 | 97.5 | 90 | 110 | | | |
| Fluoride | 3.93 | 0.400 | 4.000 | 0 | 98.2 | 90 | 110 | | | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

Sample ID **LCSD-73678** Batch ID: **73678** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_160215A** Analysis Date: **2/15/2016 11:47:34 AM** Prep Date: **2/15/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.81 | 1.00 | 10.00 | 0 | 98.1 | 90 | 110 | 0.640 | 20 | |
| Fluoride | 4.02 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | 2.36 | 20 | |
| Sulfate | 31.7 | 3.00 | 30.00 | 0 | 106 | 90 | 110 | 0.479 | 20 | |

Sample ID **1602130-15DMS** Batch ID: **73678** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_160215A** Analysis Date: **2/15/2016 2:48:43 PM** Prep Date: **2/15/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 264 | 10.0 | 200.0 | 59.65 | 102 | 90 | 110 | | | |
| Fluoride | 207 | 4.00 | 200.0 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 230 | 30.0 | 200.0 | 12.57 | 109 | 90 | 110 | | | |

Sample ID **1602130-15DMSD** Batch ID: **73678** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_160215A** Analysis Date: **2/15/2016 3:03:20 PM** Prep Date: **2/15/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 266 | 10.0 | 200.0 | 59.65 | 103 | 90 | 110 | 1.03 | 20 | |
| Fluoride | 210 | 4.00 | 200.0 | 0 | 105 | 90 | 110 | 1.72 | 20 | |
| Sulfate | 234 | 30.0 | 200.0 | 12.57 | 111 | 90 | 110 | 1.58 | 20 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_160215A**

| Sample ID **ICV-160215** | Batch ID: **R84186** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_160215A** | Analysis Date: **2/15/2016 10:35:09 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.2 | 1.00 | 25.00 | 0 | 96.9 | 90 | 110 | | | |
| Fluoride | 9.81 | 0.400 | 10.00 | 0 | 98.1 | 90 | 110 | | | |
| Sulfate | 77.3 | 3.00 | 75.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **CCV1-160215** | Batch ID: **R84186** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_160215A** | Analysis Date: **2/15/2016 3:29:21 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.69 | 1.00 | 10.00 | 0 | 96.9 | 90 | 110 | | | |
| Fluoride | 4.10 | 0.400 | 4.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 31.3 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC3_160215A**

The QC data in batch 73677 applies to the following samples: 1602130-01D, 1602130-02D, 1602130-03D, 1602130-04D, 1602130-05D, 1602130-06D, 1602130-07D, 1602130-08D, 1602130-09D, 1602130-10D

| Sample ID | **MB-73677** | Batch ID: | **73677** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC3_160215A** | Analysis Date: | **2/15/2016 10:40:29 AM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-73677** | Batch ID: | **73677** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC3_160215A** | Analysis Date: | **2/15/2016 11:04:00 AM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.66 | 1.00 | 10.00 | 0 | 96.6 | 90 | 110 | | | |
| Fluoride | 4.40 | 0.400 | 4.000 | 0 | 110 | 90 | 110 | | | |
| Sulfate | 32.1 | 3.00 | 30.00 | 0 | 107 | 90 | 110 | | | |

| Sample ID | **LCSD-73677** | Batch ID: | **73677** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC3_160215A** | Analysis Date: | **2/15/2016 11:24:41 AM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.64 | 1.00 | 10.00 | 0 | 96.4 | 90 | 110 | 0.192 | 20 | |
| Fluoride | 4.30 | 0.400 | 4.000 | 0 | 107 | 90 | 110 | 2.29 | 20 | |
| Sulfate | 32.1 | 3.00 | 30.00 | 0 | 107 | 90 | 110 | 0.143 | 20 | |

| Sample ID | **1602130-01DMS** | Batch ID: | **73677** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC3_160215A** | Analysis Date: | **2/15/2016 5:17:44 PM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2410 | 100 | 2000 | 437.7 | 98.4 | 90 | 110 | | | |
| Fluoride | 1980 | 40.0 | 2000 | 0 | 98.9 | 90 | 110 | | | |
| Sulfate | 2160 | 300 | 2000 | 0 | 108 | 90 | 110 | | | |

| Sample ID | **1602130-01DMSD** | Batch ID: | **73677** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC3_160215A** | Analysis Date: | **2/16/2016 12:53:06 PM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2390 | 100 | 2000 | 437.7 | 97.8 | 90 | 110 | 0.464 | 20 | |
| Fluoride | 1980 | 40.0 | 2000 | 0 | 98.8 | 90 | 110 | 0.121 | 20 | |
| Sulfate | 2130 | 300 | 2000 | 0 | 106 | 90 | 110 | 1.36 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC3_160215A**

| Sample ID **ICV-160215** | Batch ID: **R84202** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC3_160215A** | Analysis Date: **2/15/2016 9:38:16 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.4 | 1.00 | 25.00 | 0 | 97.6 | 90 | 110 | | | |
| Fluoride | 10.3 | 0.400 | 10.00 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 76.9 | 3.00 | 75.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID **CCV1-160215** | Batch ID: **R84202** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC3_160215A** | Analysis Date: **2/15/2016 3:57:30 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.73 | 1.00 | 10.00 | 0 | 97.3 | 90 | 110 | | | |
| Fluoride | 4.23 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV2-160215** | Batch ID: **R84202** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC3_160215A** | Analysis Date: **2/16/2016 11:49:20 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.66 | 1.00 | 10.00 | 0 | 96.6 | 90 | 110 | | | |
| Fluoride | 4.15 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 31.0 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **CCV3-160215** | Batch ID: **R84202** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC3_160215A** | Analysis Date: **2/16/2016 2:02:16 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.53 | 1.00 | 10.00 | 0 | 95.3 | 90 | 110 | | | |
| Fluoride | 4.23 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 30.8 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160212A**

The QC data in batch 73662 applies to the following samples: 1602130-01D, 1602130-02D, 1602130-03D, 1602130-04D, 1602130-05D, 1602130-06D, 1602130-07D, 1602130-08D, 1602130-09D, 1602130-10D, 1602130-11D, 1602130-12D, 1602130-13D, 1602130-14D, 1602130-15D

| Sample ID | **1602130-06D-DUP** | Batch ID: | **73662** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.4℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **TITRATOR_160212A** | Analysis Date: | **2/12/2016 3:52:00 PM** | Prep Date: | **2/12/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.90 | 0 | 0 | 6.890 | | | | 0.145 | 5 | |

| Sample ID | **1602130-15D-DUP** | Batch ID: | **73662** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.8℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **TITRATOR_160212A** | Analysis Date: | **2/12/2016 4:25:00 PM** | Prep Date: | **2/12/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.76 | 0 | 0 | 6.760 | | | | 0 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160212A**

| Sample ID | **ICV-160212** | Batch ID: | **R84145** | TestNo: | **M4500-H+ B** | Units: | **pH Units@22.4℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_160212A** | Analysis Date: | **2/12/2016 3:31:00 PM** | Prep Date: | **2/12/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.98 | 0 | 10.00 | 0 | 99.8 | 99 | 101 | | | |

| Sample ID | **CCV1-160212** | Batch ID: | **R84145** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.9℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160212A** | Analysis Date: | **2/12/2016 3:53:00 PM** | Prep Date: | **2/12/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.02 | 0 | 7.000 | 0 | 100 | 97.1 | 102.9 | | | |

| Sample ID | **CCV2-160212** | Batch ID: | **R84145** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.8℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160212A** | Analysis Date: | **2/12/2016 4:26:00 PM** | Prep Date: | **2/12/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.02 | 0 | 7.000 | 0 | 100 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_160212C**

The QC data in batch 73653 applies to the following samples: 1602130-01D, 1602130-02D, 1602130-03D, 1602130-04D, 1602130-05D, 1602130-06D, 1602130-07D, 1602130-08D, 1602130-09D, 1602130-10D, 1602130-11D

| Sample ID | **MB-73653** | Batch ID: | **73653** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_160212C** | Analysis Date: | **2/15/2016 8:39:00 AM** | Prep Date: | **2/12/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-73653** | Batch ID: | **73653** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_160212C** | Analysis Date: | **2/15/2016 8:39:00 AM** | Prep Date: | **2/12/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 764 | 10.0 | 745.6 | 0 | 102 | 90 | 113 | | | |

| Sample ID | **1602109-05D-DUP** | Batch ID: | **73653** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_160212C** | Analysis Date: | **2/15/2016 8:39:00 AM** | Prep Date: | **2/12/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 2490 | 50.0 | 0 | 2565 | | | | 3.17 | 5 | |

| Sample ID | **1602130-03D-DUP** | Batch ID: | **73653** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_160212C** | Analysis Date: | **2/15/2016 8:39:00 AM** | Prep Date: | **2/12/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 5120 | 50.0 | 0 | 5100 | | | | 0.294 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1602130
**Project:** Oak Grove CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_160215A**

The QC data in batch 73670 applies to the following samples: 1602130-12D, 1602130-13D, 1602130-14D, 1602130-15D

| Sample ID | **MB-73670** | Batch ID: | **73670** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_160215A** | Analysis Date: | **2/16/2016 8:40:00 AM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-73670** | Batch ID: | **73670** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_160215A** | Analysis Date: | **2/16/2016 8:40:00 AM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 724 | 10.0 | 745.6 | 0 | 97.1 | 90 | 113 | | | |

| Sample ID | **1602122-01D-DUP** | Batch ID: | **73670** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_160215A** | Analysis Date: | **2/16/2016 8:40:00 AM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 3550 | 50.0 | 0 | 3650 | | | | 2.78 | 5 | |

| Sample ID | **1602144-03D-DUP** | Batch ID: | **73670** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_160215A** | Analysis Date: | **2/16/2016 8:40:00 AM** | Prep Date: | **2/15/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 4680 | 50.0 | 0 | 4515 | | | | 3.59 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

March 15, 2016

Mr. John DuPont
DHL Analytical
2300 Double Creek Drive
Round Rock, Texas 78664

Re: Routine Analysis
Work Order: 391437

Dear Mr. DuPont:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on February 16, 2016. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4707.

Sincerely,

Anna C Day

Anna Day
Project Manager

Purchase Order: 14243
Enclosures

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 − (843) 556−8171 − www.gel.com

# Certificate of Analysis Report
for

DHLA002 DHL Analytical

Client SDG: 391437 GEL Work Order: 391437

**The Qualifiers in this report are defined as follows:**

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a Tracer compound

** Analyte is a surrogate compound

U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Anna Day.

Reviewed by Anna C Day

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-11
Sample ID: 391437001
Matrix: Water
Collect Date: 10-FEB-16 09:25
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 2.64 | +/-1.17 | 1.62 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1302 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.39 | +/-0.413 | 0.401 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0720 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 86.4 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-12
Sample ID: 391437002
Matrix: Water
Collect Date: 10-FEB-16 10:00
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.460 | +/-0.867 | 1.53 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1302 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.771 | +/-0.367 | 0.462 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0720 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 90.8 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-08
Sample ID: 391437003
Matrix: Water
Collect Date: 10-FEB-16 11:25
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 3.55 | +/-1.31 | 1.78 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1302 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.77 | +/-0.444 | 0.320 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0720 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 91.2 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-1
Sample ID: 391437004
Matrix: Water
Collect Date: 10-FEB-16 12:00
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 1.42 | +/-0.901 | 1.35 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1302 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | U | 0.318 | +/-0.258 | 0.396 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0720 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 95.1 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-5
Sample ID: 391437005
Matrix: Water
Collect Date: 10-FEB-16 13:05
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 1.50 | +/-0.886 | 1.30 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1302 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.99 | +/-0.463 | 0.382 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0720 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 95.8 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-2
Sample ID: 391437006
Matrix: Water
Collect Date: 10-FEB-16 13:50
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 1.81 | +/-0.999 | 1.46 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1302 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.669 | +/-0.303 | 0.373 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0720 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 90 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-3
Sample ID: 391437007
Matrix: Water
Collect Date: 10-FEB-16 14:50
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 3.37 | +/-1.17 | 1.35 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1433 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.04 | +/-0.381 | 0.420 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0750 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 91 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-6
Sample ID: 391437008
Matrix: Water
Collect Date: 10-FEB-16 16:15
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.416 | +/-0.966 | 1.71 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1302 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.801 | +/-0.346 | 0.397 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0750 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 97.7 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: FGD-4
Sample ID: 391437009
Matrix: Water
Collect Date: 10-FEB-16 16:50
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.992 | +/-0.722 | 1.11 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1302 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | U | 0.115 | +/-0.186 | 0.332 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0750 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 98.1 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: MW-08
Sample ID: 391437010
Matrix: Water
Collect Date: 10-FEB-16 17:55
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.450 | +/-1.29 | 2.28 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1305 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 1.01 | +/-0.363 | 0.397 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0750 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 88.3 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: MW-07
Sample ID: 391437011
Matrix: Water
Collect Date: 11-FEB-16 07:45
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 1.07 | +/-1.27 | 2.14 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1305 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.633 | +/-0.327 | 0.426 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0750 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 95.6 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | MW-09 | Project: | DHLA00112 |
| Sample ID: | 391437012 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 11-FEB-16 08:30 | | |
| Receive Date: | 16-FEB-16 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 1.04 | +/-0.903 | 1.46 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1305 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.820 | +/-0.328 | 0.379 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0750 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 97.1 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

| | |
|---|---|
| Company : | DHL Analytical |
| Address : | 2300 Double Creek Drive |
| | Round Rock, Texas 78664 |
| Contact: | Mr. John DuPont |
| Project: | Routine Analysis |

| | | | |
|---|---|---|---|
| Client Sample ID: | AL-10 | Project: | DHLA00112 |
| Sample ID: | 391437013 | Client ID: | DHLA002 |
| Matrix: | Water | | |
| Collect Date: | 11-FEB-16 09:05 | | |
| Receive Date: | 16-FEB-16 | | |
| Collector: | Client | | |

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 1.19 | +/-0.791 | 1.18 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1305 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.979 | +/-0.390 | 0.427 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0820 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 93.2 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: MW-02
Sample ID: 391437014
Matrix: Water
Collect Date: 11-FEB-16 09:35
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | | 1.61 | +/-0.998 | 1.50 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1305 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | U | 0.275 | +/-0.275 | 0.445 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0820 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 89 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Report Date: March 15, 2016

Company : DHL Analytical
Address : 2300 Double Creek Drive

Round Rock, Texas 78664
Contact: Mr. John DuPont
Project: Routine Analysis

Client Sample ID: MW-05
Sample ID: 391437015
Matrix: Water
Collect Date: 11-FEB-16 10:45
Receive Date: 16-FEB-16
Collector: Client

Project: DHLA00112
Client ID: DHLA002

| Parameter | Qualifier | Result | Uncertainty | MDC | RL | Units | DF | Analyst | Date | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rad Gas Flow Proportional Counting | | | | | | | | | | | | |
| GFPC, Ra228, Liquid "As Received" | | | | | | | | | | | | |
| Radium-228 | U | 0.397 | +/-0.885 | 1.57 | 3.00 | pCi/L | | AXM6 | 03/11/16 | 1306 | 1547123 | 1 |
| Rad Radium-226 | | | | | | | | | | | | |
| Lucas Cell, Ra226, liquid "As Received" | | | | | | | | | | | | |
| Radium-226 | | 0.883 | +/-0.391 | 0.476 | 1.00 | pCi/L | | CXP3 | 03/15/16 | 0820 | 1545935 | 2 |

The following Analytical Methods were performed:

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EPA 904.0/SW846 9320 Modified | |
| 2 | EPA 903.1 Modified | |

| Surrogate/Tracer Recovery | Test | Result | Nominal | Recovery% | Acceptable Limits |
|---|---|---|---|---|---|
| Barium-133 Tracer | GFPC, Ra228, Liquid "As Received" | | | 93.4 | (15%-125%) |

**Notes:**
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

## QC Summary

**Report Date: March 15, 2016**



**DHL Analytical**
**2300 Double Creek Drive**
**Round Rock, Texas**

**Contact:** **Mr. John DuPont**

**Workorder:** **391437**

| Parmname | NOM | Sample | Qual | QC | Units | RPD% | REC% | Range | Anlst | Date Time |
|---|---|---|---|---|---|---|---|---|---|---|
| **Rad Gas Flow** | | | | | | | | | | |
| Batch 1547123 | | | | | | | | | | |
| QC1203495270 391437008 DUP | | | | | | | | | | |
| Radium-228 | U | 0.416 | U | 1.16 | pCi/L | N/A | | N/A | AXM6 | 03/11/16 13:05 |
| | Uncertainty | +/-0.966 | | +/-0.838 | | | | | | |
| QC1203495271 LCS | | | | | | | | | | |
| Radium-228 | 47.1 | | | 46.4 | pCi/L | | 98.5 | (75%-125%) | | 03/11/16 13:15 |
| | Uncertainty | | | +/-3.20 | | | | | | |
| QC1203495269 MB | | | | | | | | | | |
| Radium-228 | | | U | 0.924 | pCi/L | | | | | 03/11/16 13:05 |
| | Uncertainty | | | +/-0.864 | | | | | | |
| **Rad Ra-226** | | | | | | | | | | |
| Batch 1545935 | | | | | | | | | | |
| QC1203492177 391476001 DUP | | | | | | | | | | |
| Radium-226 | | 0.545 | | 0.974 | pCi/L | 56.5 | | (0% - 100%) | CXP3 | 03/15/16 08:55 |
| | Uncertainty | +/-0.346 | | +/-0.405 | | | | | | |
| QC1203492179 LCS | | | | | | | | | | |
| Radium-226 | 24.4 | | | 21.1 | pCi/L | | 86.3 | (75%-125%) | | 03/15/16 08:55 |
| | Uncertainty | | | +/-1.54 | | | | | | |
| QC1203492176 MB | | | | | | | | | | |
| Radium-226 | | | U | 0.271 | pCi/L | | | | | 03/15/16 08:20 |
| | Uncertainty | | | +/-0.250 | | | | | | |
| QC1203492178 391476001 MS | | | | | | | | | | |
| Radium-226 | 122 | 0.545 | | 114 | pCi/L | | 92.6 | (75%-125%) | | 03/15/16 08:55 |
| | Uncertainty | +/-0.346 | | +/-8.07 | | | | | | |

**Notes:**

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

| | |
|---|---|
| ** | Analyte is a Tracer compound |
| < | Result is less than value reported |
| > | Result is greater than value reported |
| BD | Results are either below the MDC or tracer recovery is low |
| FA | Failed analysis. |
| H | Analytical holding time was exceeded |
| J | Value is estimated |
| K | Analyte present. Reported value may be biased high. Actual value is expected to be lower. |
| L | Analyte present. Reported value may be biased low. Actual value is expected to be higher. |
| M | M if above MDC and less than LLD |
| M | REMP Result > MDC/CL and < RDL |
| N/A | RPD or %Recovery limits do not apply. |

## QC Summary

**Workorder:** **391437**



| Parmname | NOM | Sample | Qual | QC | Units | RPD% | REC% | Range | Anlst | Date | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | |
|---|---|
| N1 | See case narrative |
| ND | Analyte concentration is not detected above the detection limit |
| NJ | Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier |
| Q | One or more quality control criteria have not been met. Refer to the applicable narrative or DER. |
| R | Sample results are rejected |
| U | Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD. |
| UI | Gamma Spectroscopy--Uncertain identification |
| UJ | Gamma Spectroscopy--Uncertain identification |
| UL | Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias. |
| X | Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier |
| Y | Other specific qualifiers were required to properly define the results. Consult case narrative. |
| ^ | RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry. |
| h | Preparation or preservation holding time was exceeded |

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

**There are no "Data Exception Reports" associated with this analytical report.**

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

391437

# CHAIN-OF-CUSTODY RECORD



Work Order: 1602130

**Subcontractor:**

GEL Laboratories
PO Box 30712
Charleston, SC 29417

TEL: (843) 556-8171
FAX:
Acct #:

**11-Feb-16**

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E903.1 | E904.0 | | | | |
| FGD-11 | Aqueous | -01B | 02/10/16 09:25 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-11 | Aqueous | -01C | 02/10/16 09:25 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-12 | Aqueous | -02B | 02/10/16 10:00 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-12 | Aqueous | -02C | 02/10/16 10:00 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-08 | Aqueous | -03B | 02/10/16 11:25 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-08 | Aqueous | -03C | 02/10/16 11:25 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-1 | Aqueous | -04B | 02/10/16 12:00 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-1 | Aqueous | -04C | 02/10/16 12:00 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-5 | Aqueous | -05B | 02/10/16 01:05 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-5 | Aqueous | -05C | 02/10/16 01:05 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-2 | Aqueous | -06B | 02/10/16 01:50 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-2 | Aqueous | -06C | 02/10/16 01:50 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-3 | Aqueous | -07B | 02/10/16 02:50 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-3 | Aqueous | -07C | 02/10/16 02:50 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-6 | Aqueous | -08B | 02/10/16 04:15 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-6 | Aqueous | -08C | 02/10/16 04:15 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-4 | Aqueous | -09B | 02/10/16 04:50 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-4 | Aqueous | -09C | 02/10/16 04:50 PM | 500HDPEHNO3 | 1 | | | | | |

General Comments:

Please analyze these samples with a Standard Turnaround Time.
Call John DuPont if you have questions.
Quality Control Package Needed: Standard / _____
EMAIL report to both cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | [signature] | 2/11/16 1730 | **Received by:** | Fed ex | 2/11/16 1730 |
| **Relinquished by:** | | | **Received by:** | [signature] | 2/16/16 8:40 |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1602130

**Subcontractor:**

GEL Laboratories
PO Box 30712
Charleston, SC 29417

TEL: (843) 556-8171
FAX:
Acct #:

**11-Feb-16**

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E903.1 | E904.0 | | | | |
| MW-08 | Aqueous | -10B | 02/10/16 05:55 PM | 500HDPEHNO3 | | 1 | | | | |
| MW-08 | Aqueous | -10C | 02/10/16 05:55 PM | 500HDPEHNO3 | 1 | | | | | |
| MW-07 | Aqueous | -11B | 02/11/16 07:45 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-07 | Aqueous | -11C | 02/11/16 07:45 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-09 | Aqueous | -12B | 02/11/16 08:30 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-09 | Aqueous | -12C | 02/11/16 08:30 AM | 500HDPEHNO3 | 1 | | | | | |
| AL-10 | Aqueous | -13B | 02/11/16 09:05 AM | 500HDPEHNO3 | | 1 | | | | |
| AL-10 | Aqueous | -13C | 02/11/16 09:05 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-02 | Aqueous | -14B | 02/11/16 09:35 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-02 | Aqueous | -14C | 02/11/16 09:35 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-05 | Aqueous | -15B | 02/11/16 10:45 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-05 | Aqueous | -15C | 02/11/16 10:45 AM | 500HDPEHNO3 | 1 | | | | | |

General Comments:

Please analyze these samples with a Standard Turnaround Time.
Call John DuPont if you have questions.
Quality Control Package Needed: Standard / _____
EMAIL report to both cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | [signature] | 2/11/16 1730 | **Received by:** | Fed ex | 2/11/16 1730 |
| **Relinquished by:** | | | **Received by:** | [signature] mark | 2/16/16 8:40 |

GEL Laboratories LLC

# SAMPLE RECEIPT & REVIEW FORM

| | | | |
|---|---|---|---|
| **Client:** DHLA | | **SDG/AR/COC/Work Order:** 391437 | |
| **Received By:** Shanta mack | | **Date Received:** 2/16/16 8:40 | |
| **Suspected Hazard Information** | **Yes** | **No** | *If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation. |
| COC/Samples marked as radioactive? | | — | Maximum Net Counts Observed* (Observed Counts - Area Background Counts): Background |
| Classified Radioactive II or III by RSO? | | — | If yes, Were swipes taken of sample containers < action levels? |
| COC/Samples marked containing PCBs? | | — | |
| Package, COC, and/or Samples marked as beryllium or asbestos containing? | | — | If yes, samples are to be segregated as Safety Controlled Samples, and opened by the GEL Safety Group. |
| Shipped as a DOT Hazardous? | | — | Hazard Class Shipped: UN#: |
| Samples identified as Foreign Soil? | | — | |

| | Sample Receipt Criteria | Yes | NA | No | Comments/Qualifiers (Required for Non-Conforming Items) |
|---|---|---|---|---|---|
| 1 | Shipping containers received intact and sealed? | ✓ | | | Circle Applicable: Seals broken Damaged container Leaking container Other (describe) |
| 2 | Samples requiring cold preservation within (0 ≤ 6 deg. C)?* | | ✓ | | Preservation Method: Ice bags Blue ice Dry ice None Other (describe)<br>*all temperatures are recorded in Celsius 14 C |
| 2a | Daily check performed and passed on IR temperature gun? | ✓ | | | Temperature Device Serial #:<br>Secondary Temperature Device Serial # (If Applicable): ES03207585 |
| 3 | Chain of custody documents included with shipment? | ✓ | | | |
| 4 | Sample containers intact and sealed? | ✓ | | | Circle Applicable: Seals broken Damaged container Leaking container Other (describe) |
| 5 | Samples requiring chemical preservation at proper pH? | ✓ | | | Sample ID's, containers affected and observed pH:<br>If Preservation added, Lot#: |
| 6 | Do Low Level Perchlorate samples have headspace as required? | | ✓ | | Sample ID's and containers affected: |
| 7 | VOA vials contain acid preservation? | | ✓ | | (If unknown, select No) |
| 8 | VOA vials free of headspace (defined as < 6mm bubble)? | | ✓ | | Sample ID's and containers affected: |
| 9 | Are Encore containers present? | | | ✓ | (If yes, immediately deliver to Volatiles laboratory) |
| 10 | Samples received within holding time? | ✓ | | | ID's and tests affected: |
| 11 | Sample ID's on COC match ID's on bottles? | ✓ | | | Sample ID's and containers affected: |
| 12 | Date & time on COC match date & time on bottles? | ✓ | | | Sample ID's affected: |
| 13 | Number of containers received match number indicated on COC? | ✓ | | | Sample ID's affected: |
| 14 | Are sample containers identifiable as GEL provided? | | | ✓ | |
| 15 | COC form is properly signed in relinquished/received sections? | ✓ | | | |
| 16 | Carrier and tracking number. | | | | Circle Applicable:<br>FedEx Air FedEx Ground UPS Field Services Courier Other<br>7756 3067 8989 |

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials AOV Date 2/16/16 Page 1 of 1 GL-CHL-SR-001 Rev 2

**List of current GEL Certifications as of 15 March 2016**

| State | Certification |
|---|---|
| Alaska | UST−0110 |
| Arkansas | 88−0651 |
| CLIA | 42D0904046 |
| California | 2940 |
| Colorado | SC00012 |
| Connecticut | PH−0169 |
| Delaware | SC00012 |
| DoD ELAP/ ISO17025 A2LA | 2567.01 |
| Florida NELAP | E87156 |
| Foreign Soils Permit | P330−15−00283, P330−15−00253 |
| Georgia | SC00012 |
| Georgia SDWA | 967 |
| Hawaii | SC00012 |
| Idaho Chemistry | SC00012 |
| Idaho Radiochemistry | SC00012 |
| Illinois NELAP | 200029 |
| Indiana | C−SC−01 |
| Kansas NELAP | E−10332 |
| Kentucky SDWA | 90129 |
| Kentucky Wastewater | 90129 |
| Louisiana NELAP | 03046 (AI33904) |
| Louisiana SDWA | LA160006 |
| Maryland | 270 |
| Massachusetts | M−SC012 |
| Michigan | 9976 |
| Mississippi | SC00012 |
| Nebraska | NE−OS−26−13 |
| Nevada | SC000122016−1 |
| New Hampshire NELAP | 205415 |
| New Jersey NELAP | SC002 |
| New Mexico | SC00012 |
| New York NELAP | 11501 |
| North Carolina | 233 |
| North Carolina SDWA | 45709 |
| North Dakota | R−158 |
| Oklahoma | 9904 |
| Pennsylvania NELAP | 68−00485 |
| S.Carolina Radchem | 10120002 |
| South Carolina Chemistry | 10120001 |
| Tennessee | TN 02934 |
| Texas NELAP | T104704235−16−11 |
| Utah NELAP | SC000122016−20 |
| Vermont | VT87156 |
| Virginia NELAP | 460202 |
| Washington | C780 |
| West Virginia | 997404 |

May 26, 2016

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1604175

RE: Luminant - Oak Grove

Dear Will Vienne:

DHL Analytical, Inc. received 17 sample(s) on 4/18/2016 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-16-16

# Table of Contents

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 70848

# CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 4-15-16 PAGE 1 OF 2
PO #: 5164-D DHL WORK ORDER #: 1604175
PROJECT LOCATION OR NAME: LUMINANT - OAK GROVE
CLENT PROJECT #: 5164-D COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ ___ ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS ___ ❑ | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | SEE ATTACHED

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ NaOH | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-2 | 01 | 4-14-16 | 0815 | W | P | 4 | | | | | | X | |
| FGD-3 | 02 | | 0905 | W | P | 4 | | | | | | X | |
| FGD-6 | 03 | | 1000 | W | P | 4 | | | | | | X | |
| FGD-4 | 04 | | 1050 | W | P | 4 | | | | | | X | |
| FGD-5 | 05 | | 1140 | W | P | 4 | | | | | | X | |
| FGD-1 | 06 | | 1235 | W | P | 4 | | | | | | X | |
| FGD-8 | 07 | | 1450 | W | P | 4 | | | | | | X | |
| FGD-12 | 08 | | 1540 | W | P | 4 | | | | | | X | |
| FGD-11 | 09 | ↓ | 1630 | W | P | 4 | | | | | | X | |
| MW07 | 10 | 4-15-16 | 0750 | W | P | 4 | | | | | | X | |
| AL-10 | 11 | | 0915 | W | P | 4 | | | | | | X | |
| MW02 | 12 | | 1020 | W | P | 4 | | | | | | X | |
| MW09 | 13 | | 1120 | W | P | 4 | | | | | | X | |
| MWD8 | 14 | | 1225 | W | P | 4 | | | | | | X | |
| DUP-1 | 15 | ↓ | 1225 | W | P | 4 | | | | | | X | |

RELINQUISHED BY: (Signature) DATE/TIME 4/18/16 10:00 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

APPENDIX F-Revision 1 November 21, 2002 ❑ DHL DISPOSAL @ $5.00 each ❑ Return

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 0.4 THERM #: 78
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ☒ NOT USED
CARRIER: ❑ LONE STAR ❑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
☒ HAND DELIVERED

DHL ANALYTICAL
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E-Mail: login@dhlanalytical.com

# CHAIN-OF-CUSTODY

№ 70849

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 4-15-16 PAGE 2 OF 2
PO #: 5164-D DHL WORK ORDER #: 1604175
PROJECT LOCATION OR NAME: LUMINANT - OAK GROVE
CLENT PROJECT #: 5164-D COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ 8270 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ ____ ☐ | RCRA ☐ TX11 ☐ ____ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ____ ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | SEE ATTACHED

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EB-1 | 16 | 4-15-16 | 0825 | W | P | 4 | | | | | | X | |
| MW05 | 17 | 4-15-16 | 1340 | W | P | 4 | | | | | | X | |

RELINQUISHED BY: (Signature) DATE/TIME 4/18/16 10:00 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

☐ DHL DISPOSAL @ $5.00 each ☐ Return

**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 0.9 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☐ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☒ HAND DELIVERED

John Dupont

| | |
|---|---|
| From: | Sara Taube [Sara.Taube@pbwllc.com] |
| Sent: | Wednesday, July 22, 2015 12:05 PM |
| To: | John Dupont |
| Subject: | CCR Appendix III and IV |
| Follow Up Flag: | Follow up |
| Flag Status: | Completed |

Hi John,

Here are the Appendix III and Appendix IV constituents that we will need to have analyzed under the CCR Rule.

Appendix III
Boron
Calcium
Chloride
Fluoride
pH
sulfate
TDS

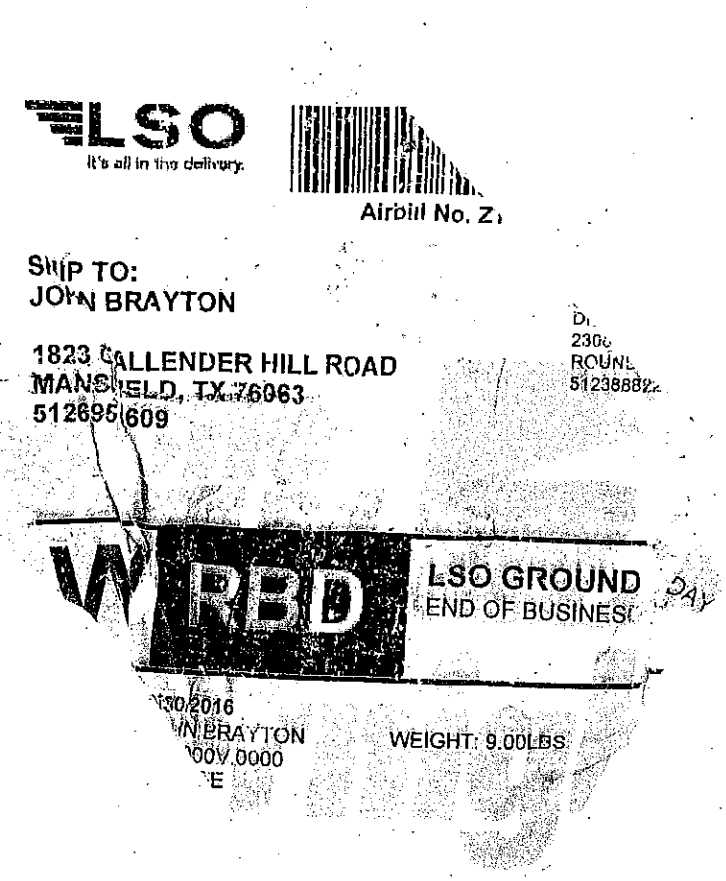
Appendix IV
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228

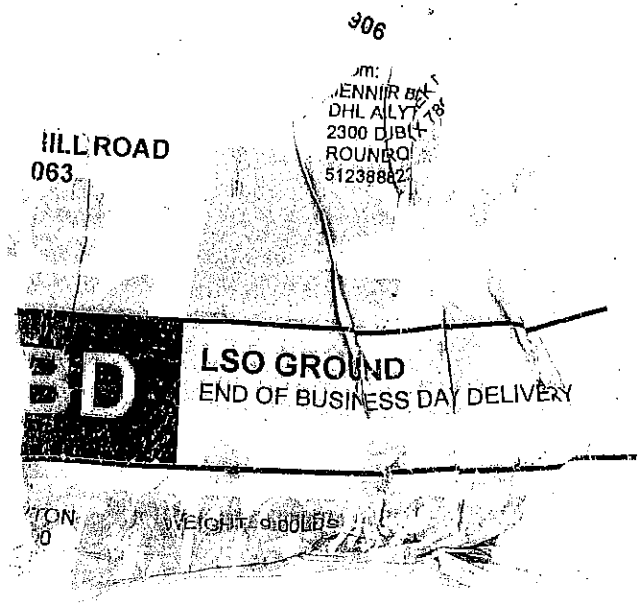
We are looking to have approximately 74 wells sampled 8 times over the course of the next two years. Please let me know if there is any more information you might need.

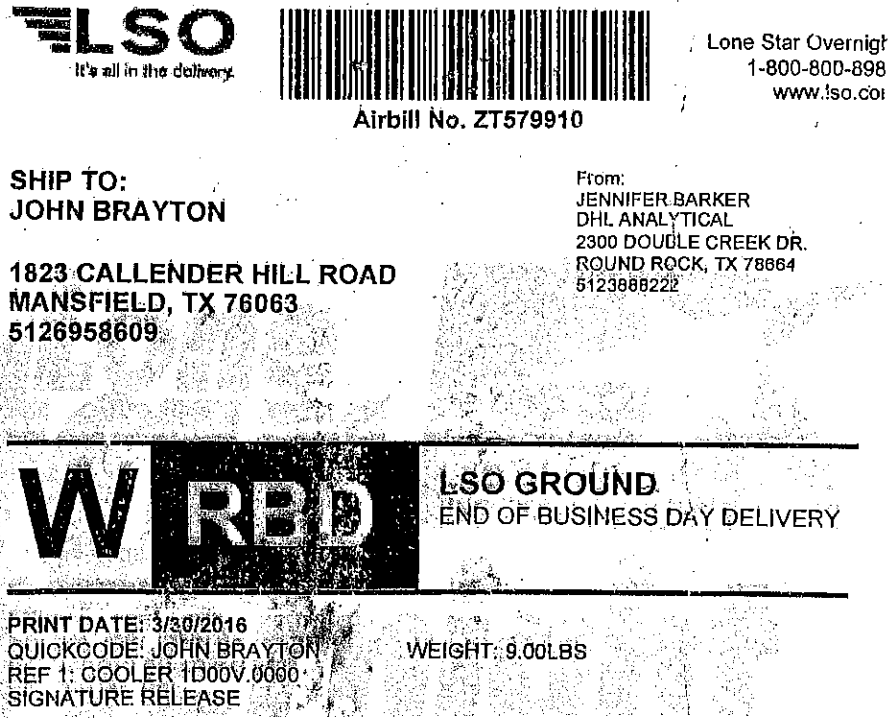
Cheers,

Sara

10/26/2015


LSO
It's all in the delivery.
Airbill No. Z
SHIP TO:
JOHN BRAYTON
1823 CALLENDER HILL ROAD
MANSFIELD, TX 76063
5126958609
WRBD
LSO GROUND
END OF BUSINES
WEIGHT: 9.00LBS


LSO GROUND
END OF BUSINESS DAY DELIVERY


LSO
It's all in the delivery.
Airbill No. ZT579910
Lone Star Overnigt
1-800-800-898
www.lso.co
SHIP TO:
JOHN BRAYTON
1823 CALLENDER HILL ROAD
MANSFIELD, TX 76063
5126958609
From:
JENNIFER BARKER
DHL ANALYTICAL
2300 DOUBLE CREEK DR.
ROUND ROCK, TX 78664
5123888222
WRBD
LSO GROUND
END OF BUSINESS DAY DELIVERY
PRINT DATE: 3/30/2016
QUICKCODE: JOHN BRAYTON
REF 1: COOLER 1D00V.0000
SIGNATURE RELEASE
WEIGHT: 9.00LBS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Pastor, Behling & Wheeler | Date Received: 4/18/2016

Work Order Number 1604175 | Received by JT

Checklist completed by: Signature 4/18/2016 Date | Reviewed by Initials 4/18/2016 Date

Carrier name Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 0.9 °C 10.6°C / 0.4°C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? NO | | Checked by |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *26-May-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1604175

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis

## LOG IN

The samples were received and log-in performed on 4/18/16. A total of 17 sample was received. The sample arrived in good condition and was properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 4/28/16 (batch 74670) matrix spike and matrix spike duplicate recoveries were above control limits for Boron. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

For Metals analysis performed on 4/26/16 (batch 74701) the RPD for the serial dilution was above control limits for Boron. This is flagged accordingly. The PDS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *26-May-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1604175

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1604175-01 | FGD-2 | | 04/14/16 08:15 AM | 4/18/2016 |
| 1604175-02 | FGD-3 | | 04/14/16 09:05 AM | 4/18/2016 |
| 1604175-03 | FGD-6 | | 04/14/16 10:00 AM | 4/18/2016 |
| 1604175-04 | FGD-4 | | 04/14/16 10:50 AM | 4/18/2016 |
| 1604175-05 | FGD-5 | | 04/14/16 11:40 AM | 4/18/2016 |
| 1604175-06 | FGD-1 | | 04/14/16 12:35 PM | 4/18/2016 |
| 1604175-07 | FGD-8 | | 04/14/16 02:50 PM | 4/18/2016 |
| 1604175-08 | FGD-12 | | 04/14/16 03:40 PM | 4/18/2016 |
| 1604175-09 | FGD-11 | | 04/14/16 04:30 PM | 4/18/2016 |
| 1604175-10 | MW-07 | | 04/15/16 07:50 AM | 4/18/2016 |
| 1604175-11 | AL-10 | | 04/15/16 09:15 AM | 4/18/2016 |
| 1604175-12 | MW-02 | | 04/15/16 10:20 AM | 4/18/2016 |
| 1604175-13 | MW-09 | | 04/15/16 11:20 AM | 4/18/2016 |
| 1604175-14 | MW-08 | | 04/15/16 12:25 PM | 4/18/2016 |
| 1604175-15 | DUP-1 | | 04/15/16 12:25 PM | 4/18/2016 |
| 1604175-16 | EB-1 | | 04/15/16 08:25 AM | 4/18/2016 |
| 1604175-17 | MW-05 | | 04/15/16 01:40 PM | 4/18/2016 |

**Lab Order:** 1604175
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1604175-01A | FGD-2 | 04/14/16 08:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-2 | 04/14/16 08:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-2 | 04/14/16 08:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-2 | 04/14/16 08:15 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-01D | FGD-2 | 04/14/16 08:15 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-2 | 04/14/16 08:15 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-2 | 04/14/16 08:15 AM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | FGD-2 | 04/14/16 08:15 AM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-02A | FGD-3 | 04/14/16 09:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-3 | 04/14/16 09:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-3 | 04/14/16 09:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-3 | 04/14/16 09:05 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-02D | FGD-3 | 04/14/16 09:05 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-3 | 04/14/16 09:05 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-3 | 04/14/16 09:05 AM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | FGD-3 | 04/14/16 09:05 AM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-03A | FGD-6 | 04/14/16 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-6 | 04/14/16 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-6 | 04/14/16 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-6 | 04/14/16 10:00 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-03D | FGD-6 | 04/14/16 10:00 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-6 | 04/14/16 10:00 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-6 | 04/14/16 10:00 AM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | FGD-6 | 04/14/16 10:00 AM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-04A | FGD-4 | 04/14/16 10:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-4 | 04/14/16 10:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-4 | 04/14/16 10:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-4 | 04/14/16 10:50 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |

**Lab Order:** 1604175
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1604175-04D | FGD-4 | 04/14/16 10:50 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-4 | 04/14/16 10:50 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-4 | 04/14/16 10:50 AM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | FGD-4 | 04/14/16 10:50 AM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-05A | FGD-5 | 04/14/16 11:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-5 | 04/14/16 11:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-5 | 04/14/16 11:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/19/16 09:29 AM | 74670 |
| | FGD-5 | 04/14/16 11:40 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-05D | FGD-5 | 04/14/16 11:40 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-5 | 04/14/16 11:40 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-5 | 04/14/16 11:40 AM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | FGD-5 | 04/14/16 11:40 AM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-06A | FGD-1 | 04/14/16 12:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | FGD-1 | 04/14/16 12:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | FGD-1 | 04/14/16 12:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | FGD-1 | 04/14/16 12:35 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-06D | FGD-1 | 04/14/16 12:35 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-1 | 04/14/16 12:35 PM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | FGD-1 | 04/14/16 12:35 PM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-07A | FGD-8 | 04/14/16 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | FGD-8 | 04/14/16 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | FGD-8 | 04/14/16 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | FGD-8 | 04/14/16 02:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-07D | FGD-8 | 04/14/16 02:50 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-8 | 04/14/16 02:50 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-8 | 04/14/16 02:50 PM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | FGD-8 | 04/14/16 02:50 PM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-08A | FGD-12 | 04/14/16 03:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |

**Lab Order:** 1604175
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1604175-08A | FGD-12 | 04/14/16 03:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | FGD-12 | 04/14/16 03:40 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-08D | FGD-12 | 04/14/16 03:40 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-12 | 04/14/16 03:40 PM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | FGD-12 | 04/14/16 03:40 PM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-09A | FGD-11 | 04/14/16 04:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | FGD-11 | 04/14/16 04:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | FGD-11 | 04/14/16 04:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | FGD-11 | 04/14/16 04:30 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-09D | FGD-11 | 04/14/16 04:30 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-11 | 04/14/16 04:30 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | FGD-11 | 04/14/16 04:30 PM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | FGD-11 | 04/14/16 04:30 PM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-10A | MW-07 | 04/15/16 07:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-07 | 04/15/16 07:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-07 | 04/15/16 07:50 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-10D | MW-07 | 04/15/16 07:50 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:20 AM | 74764 |
| | MW-07 | 04/15/16 07:50 AM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | MW-07 | 04/15/16 07:50 AM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-11A | AL-10 | 04/15/16 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | AL-10 | 04/15/16 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | AL-10 | 04/15/16 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | AL-10 | 04/15/16 09:15 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-11D | AL-10 | 04/15/16 09:15 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | AL-10 | 04/15/16 09:15 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | AL-10 | 04/15/16 09:15 AM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | AL-10 | 04/15/16 09:15 AM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-12A | MW-02 | 04/15/16 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |

**Lab Order:** 1604175
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1604175-12A | MW-02 | 04/15/16 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-02 | 04/15/16 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-02 | 04/15/16 10:20 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-12D | MW-02 | 04/15/16 10:20 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | MW-02 | 04/15/16 10:20 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | MW-02 | 04/15/16 10:20 AM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | MW-02 | 04/15/16 10:20 AM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-13A | MW-09 | 04/15/16 11:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-09 | 04/15/16 11:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-09 | 04/15/16 11:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-09 | 04/15/16 11:20 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-13D | MW-09 | 04/15/16 11:20 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | MW-09 | 04/15/16 11:20 AM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | MW-09 | 04/15/16 11:20 AM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | MW-09 | 04/15/16 11:20 AM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-14A | MW-08 | 04/15/16 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-08 | 04/15/16 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-08 | 04/15/16 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-08 | 04/15/16 12:25 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-14D | MW-08 | 04/15/16 12:25 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | MW-08 | 04/15/16 12:25 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | MW-08 | 04/15/16 12:25 PM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | MW-08 | 04/15/16 12:25 PM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-15A | DUP-1 | 04/15/16 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | DUP-1 | 04/15/16 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | DUP-1 | 04/15/16 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | DUP-1 | 04/15/16 12:25 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-15D | DUP-1 | 04/15/16 12:25 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |

**Lab Order:** 1604175
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1604175-15D | DUP-1 | 04/15/16 12:25 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | DUP-1 | 04/15/16 12:25 PM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | DUP-1 | 04/15/16 12:25 PM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-16A | EB-1 | 04/15/16 08:25 AM | Equip Blank | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | EB-1 | 04/15/16 08:25 AM | Equip Blank | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | EB-1 | 04/15/16 08:25 AM | Equip Blank | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-16D | EB-1 | 04/15/16 08:25 AM | Equip Blank | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | EB-1 | 04/15/16 08:25 AM | Equip Blank | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | EB-1 | 04/15/16 08:25 AM | Equip Blank | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |
| 1604175-17A | MW-05 | 04/15/16 01:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-05 | 04/15/16 01:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 04/20/16 11:01 AM | 74701 |
| | MW-05 | 04/15/16 01:40 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 04/19/16 11:59 AM | 74678 |
| 1604175-17D | MW-05 | 04/15/16 01:40 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | MW-05 | 04/15/16 01:40 PM | Aqueous | E300 | Anion Preparation | 04/25/16 09:05 AM | 74762 |
| | MW-05 | 04/15/16 01:40 PM | Aqueous | M4500-H+ B | pH Preparation | 04/20/16 08:28 AM | 74689 |
| | MW-05 | 04/15/16 01:40 PM | Aqueous | M2540C | TDS Preparation | 04/20/16 12:18 PM | 74704 |

**Lab Order:** 1604175
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1604175-01A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 11:37 AM | CETAC2_HG_160421A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 1 | 04/25/16 04:33 PM | ICP-MS4_160425E |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 10 | 04/27/16 02:06 PM | ICP-MS4_160427A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 1 | 04/28/16 12:51 PM | ICP-MS4_160428B |
| 1604175-01D | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 74764 | 1 | 04/25/16 10:51 AM | IC4_160425A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 74764 | 10 | 04/25/16 02:28 PM | IC4_160425A |
| | FGD-2 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:32 AM | TITRATOR_160420A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-02A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 11:49 AM | CETAC2_HG_160421A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 10 | 04/27/16 02:08 PM | ICP-MS4_160427A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 1 | 04/28/16 12:53 PM | ICP-MS4_160428B |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 1 | 04/25/16 04:35 PM | ICP-MS4_160425E |
| 1604175-02D | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 74764 | 1 | 04/25/16 11:06 AM | IC4_160425A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 74764 | 10 | 04/25/16 02:43 PM | IC4_160425A |
| | FGD-3 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:34 AM | TITRATOR_160420A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-03A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 11:51 AM | CETAC2_HG_160421A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 1 | 04/25/16 04:37 PM | ICP-MS4_160425E |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 10 | 04/27/16 02:14 PM | ICP-MS4_160427A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 1 | 04/28/16 12:55 PM | ICP-MS4_160428B |
| 1604175-03D | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 74764 | 1 | 04/25/16 11:21 AM | IC4_160425A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 74764 | 10 | 04/25/16 02:58 PM | IC4_160425A |
| | FGD-6 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:37 AM | TITRATOR_160420A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-04A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 11:53 AM | CETAC2_HG_160421A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 10 | 04/27/16 02:17 PM | ICP-MS4_160427A |

**Lab Order:** 1604175
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1604175-04A | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 1 | 04/28/16 12:57 PM | ICP-MS4_160428B |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 1 | 04/25/16 04:39 PM | ICP-MS4_160425E |
| 1604175-04D | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 74764 | 1 | 04/25/16 11:36 AM | IC4_160425A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 74764 | 10 | 04/25/16 03:13 PM | IC4_160425A |
| | FGD-4 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:38 AM | TITRATOR_160420A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-05A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 11:55 AM | CETAC2_HG_160421A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 10 | 04/27/16 02:19 PM | ICP-MS4_160427A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 1 | 04/28/16 12:59 PM | ICP-MS4_160428B |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74670 | 1 | 04/25/16 04:41 PM | ICP-MS4_160425E |
| 1604175-05D | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 74764 | 1 | 04/25/16 11:51 AM | IC4_160425A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 74764 | 100 | 04/25/16 03:28 PM | IC4_160425A |
| | FGD-5 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:39 AM | TITRATOR_160420A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-06A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 11:58 AM | CETAC2_HG_160421A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 02:41 PM | ICP-MS4_160426B |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 10 | 04/26/16 04:12 PM | ICP-MS4_160426B |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:01 PM | ICP-MS4_160425E |
| 1604175-06D | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 74764 | 1 | 04/25/16 12:06 PM | IC4_160425A |
| | FGD-1 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:42 AM | TITRATOR_160420A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-07A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:00 PM | CETAC2_HG_160421A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 50 | 04/26/16 04:16 PM | ICP-MS4_160426B |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:07 PM | ICP-MS4_160425E |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 02:47 PM | ICP-MS4_160426B |
| 1604175-07D | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 74764 | 1 | 04/25/16 12:21 PM | IC4_160425A |

**Lab Order:** 1604175
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1604175-07D | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 74764 | 100 | 04/25/16 03:43 PM | IC4_160425A |
| | FGD-8 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:45 AM | TITRATOR_160420A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-08A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:02 PM | CETAC2_HG_160421A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:09 PM | ICP-MS4_160425E |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 02:49 PM | ICP-MS4_160426B |
| 1604175-08D | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 74764 | 1 | 04/25/16 12:36 PM | IC4_160425A |
| | FGD-12 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:48 AM | TITRATOR_160420A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-09A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:04 PM | CETAC2_HG_160421A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 02:51 PM | ICP-MS4_160426B |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 10 | 04/26/16 04:18 PM | ICP-MS4_160426B |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:11 PM | ICP-MS4_160425E |
| 1604175-09D | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 74764 | 1 | 04/25/16 12:51 PM | IC4_160425A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 74764 | 100 | 04/25/16 04:13 PM | IC4_160425A |
| | FGD-11 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:51 AM | TITRATOR_160420A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-10A | MW-07 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:11 PM | CETAC2_HG_160421A |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 02:53 PM | ICP-MS4_160426B |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:13 PM | ICP-MS4_160425E |
| 1604175-10D | MW-07 | Aqueous | E300 | Anions by IC method - Water | 74764 | 1 | 04/25/16 01:06 PM | IC4_160425A |
| | MW-07 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:55 AM | TITRATOR_160420A |
| | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-11A | AL-10 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:14 PM | CETAC2_HG_160421A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:15 PM | ICP-MS4_160425E |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 02:55 PM | ICP-MS4_160426B |

**Lab Order:** 1604175
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1604175-11A | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 10 | 04/26/16 04:20 PM | ICP-MS4_160426B |
| 1604175-11D | AL-10 | Aqueous | E300 | Anions by IC method - Water | 74762 | 1 | 04/25/16 12:06 PM | IC2_160425A |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 74762 | 10 | 04/25/16 02:42 PM | IC2_160425A |
| | AL-10 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 09:58 AM | TITRATOR_160420A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-12A | MW-02 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:16 PM | CETAC2_HG_160421A |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:17 PM | ICP-MS4_160425E |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 02:57 PM | ICP-MS4_160426B |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 10 | 04/26/16 04:22 PM | ICP-MS4_160426B |
| 1604175-12D | MW-02 | Aqueous | E300 | Anions by IC method - Water | 74762 | 1 | 04/25/16 12:21 PM | IC2_160425A |
| | MW-02 | Aqueous | E300 | Anions by IC method - Water | 74762 | 10 | 04/25/16 02:56 PM | IC2_160425A |
| | MW-02 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 10:01 AM | TITRATOR_160420A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-13A | MW-09 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:18 PM | CETAC2_HG_160421A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:19 PM | ICP-MS4_160425E |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 02:59 PM | ICP-MS4_160426B |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 10 | 04/26/16 04:24 PM | ICP-MS4_160426B |
| 1604175-13D | MW-09 | Aqueous | E300 | Anions by IC method - Water | 74762 | 1 | 04/25/16 12:36 PM | IC2_160425A |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 74762 | 10 | 04/25/16 03:11 PM | IC2_160425A |
| | MW-09 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 10:04 AM | TITRATOR_160420A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-14A | MW-08 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:20 PM | CETAC2_HG_160421A |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:21 PM | ICP-MS4_160425E |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 03:01 PM | ICP-MS4_160426B |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 10 | 04/26/16 04:26 PM | ICP-MS4_160426B |
| 1604175-14D | MW-08 | Aqueous | E300 | Anions by IC method - Water | 74762 | 1 | 04/25/16 12:50 PM | IC2_160425A |

**Lab Order:** 1604175
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1604175-14D | MW-08 | Aqueous | E300 | Anions by IC method - Water | 74762 | 100 | 04/25/16 03:25 PM | IC2_160425A |
| | MW-08 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 10:07 AM | TITRATOR_160420A |
| | MW-08 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-15A | DUP-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:23 PM | CETAC2_HG_160421A |
| | DUP-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:37 PM | ICP-MS4_160425E |
| | DUP-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 03:25 PM | ICP-MS4_160426B |
| | DUP-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 10 | 04/26/16 04:28 PM | ICP-MS4_160426B |
| 1604175-15D | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 74762 | 1 | 04/25/16 01:05 PM | IC2_160425A |
| | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 74762 | 100 | 04/25/16 04:09 PM | IC2_160425A |
| | DUP-1 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 10:09 AM | TITRATOR_160420A |
| | DUP-1 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-16A | EB-1 | Equip Blank | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:25 PM | CETAC2_HG_160421A |
| | EB-1 | Equip Blank | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:39 PM | ICP-MS4_160425E |
| | EB-1 | Equip Blank | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 03:27 PM | ICP-MS4_160426B |
| 1604175-16D | EB-1 | Equip Blank | E300 | Anions by IC method - Water | 74762 | 1 | 04/25/16 01:56 PM | IC2_160425A |
| | EB-1 | Equip Blank | M4500-H+ B | pH | 74689 | 1 | 04/20/16 10:12 AM | TITRATOR_160420A |
| | EB-1 | Equip Blank | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |
| 1604175-17A | MW-05 | Aqueous | SW7470A | Mercury Total: Aqueous | 74678 | 1 | 04/21/16 12:27 PM | CETAC2_HG_160421A |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/25/16 05:41 PM | ICP-MS4_160425E |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 74701 | 1 | 04/26/16 03:29 PM | ICP-MS4_160426B |
| 1604175-17D | MW-05 | Aqueous | E300 | Anions by IC method - Water | 74762 | 1 | 04/25/16 02:10 PM | IC2_160425A |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 74762 | 10 | 04/25/16 04:53 PM | IC2_160425A |
| | MW-05 | Aqueous | M4500-H+ B | pH | 74689 | 1 | 04/20/16 10:15 AM | TITRATOR_160420A |
| | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 74704 | 1 | 04/21/16 08:40 AM | WC_160420A |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-01 |
| **Project No:** | 5164-D | **Collection Date:** | 04/14/16 08:15 AM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 11:37 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 04:33 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:33 PM |
| Barium | 0.129 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 04:33 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:33 PM |
| Boron | 0.136 | 0.0100 | 0.0300 | | mg/L | 1 | 04/28/16 12:51 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:33 PM |
| Calcium | 53.8 | 1.00 | 3.00 | | mg/L | 10 | 04/27/16 02:06 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:33 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 04:33 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:33 PM |
| Lithium | 0.0196 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 04:33 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:33 PM |
| Selenium | 0.0166 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:33 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 04:33 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 285 | 3.00 | 10.0 | | mg/L | 10 | 04/25/16 02:28 PM |
| Fluoride | 0.192 | 0.100 | 0.400 | J | mg/L | 1 | 04/25/16 10:51 AM |
| Sulfate | 103 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 10:51 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.00 | 0 | 0 | | pH Units@18.9℃ | 1 | 04/20/16 09:32 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 924 | 10.0 | 10.0 | | mg/L | 1 | 04/21/16 08:40 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-02 |
| **Project No:** | 5164-D | **Collection Date:** | 04/14/16 09:05 AM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 11:49 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 04:35 PM |
| Arsenic | 0.00218 | 0.00200 | 0.00500 | J | mg/L | 1 | 04/25/16 04:35 PM |
| Barium | 0.0371 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 04:35 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:35 PM |
| Boron | 0.231 | 0.0100 | 0.0300 | | mg/L | 1 | 04/28/16 12:53 PM |
| Cadmium | 0.00212 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:35 PM |
| Calcium | 98.1 | 1.00 | 3.00 | | mg/L | 10 | 04/27/16 02:08 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:35 PM |
| Cobalt | 0.0326 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 04:35 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:35 PM |
| Lithium | 0.119 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 04:35 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:35 PM |
| Selenium | 0.0640 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:35 PM |
| Thallium | 0.00137 | 0.000500 | 0.00150 | J | mg/L | 1 | 04/25/16 04:35 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 314 | 3.00 | 10.0 | | mg/L | 10 | 04/25/16 02:43 PM |
| Fluoride | 0.690 | 0.100 | 0.400 | | mg/L | 1 | 04/25/16 11:06 AM |
| Sulfate | 396 | 10.0 | 30.0 | | mg/L | 10 | 04/25/16 02:43 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.61 | 0 | 0 | | pH Units@18.1℃ | 1 | 04/20/16 09:34 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1980 | 50.0 | 50.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-03 |
| **Project No:** | 5164-D | **Collection Date:** | 04/14/16 10:00 AM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 11:51 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 04:37 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:37 PM |
| Barium | 0.122 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 04:37 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:37 PM |
| Boron | 0.0936 | 0.0100 | 0.0300 | | mg/L | 1 | 04/28/16 12:55 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:37 PM |
| Calcium | 36.4 | 1.00 | 3.00 | | mg/L | 10 | 04/27/16 02:14 PM |
| Chromium | 0.0568 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:37 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 04:37 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:37 PM |
| Lithium | 0.0110 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 04:37 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:37 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:37 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 04:37 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 259 | 3.00 | 10.0 | | mg/L | 10 | 04/25/16 02:58 PM |
| Fluoride | 0.442 | 0.100 | 0.400 | | mg/L | 1 | 04/25/16 11:21 AM |
| Sulfate | 57.9 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 11:21 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.02 | 0 | 0 | | pH Units@18.4℃ | 1 | 04/20/16 09:37 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1140 | 50.0 | 50.0 | | mg/L | 1 | 04/21/16 08:40 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-04 |
| **Project No:** | 5164-D | **Collection Date:** | 04/14/16 10:50 AM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | 0.000232 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 11:53 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 04:39 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:39 PM |
| Barium | 0.120 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 04:39 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:39 PM |
| Boron | 0.0726 | 0.0100 | 0.0300 | | mg/L | 1 | 04/28/16 12:57 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:39 PM |
| Calcium | 50.3 | 1.00 | 3.00 | | mg/L | 10 | 04/27/16 02:17 PM |
| Chromium | 0.00208 | 0.00200 | 0.00500 | J | mg/L | 1 | 04/25/16 04:39 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 04:39 PM |
| Lead | 0.0271 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:39 PM |
| Lithium | 0.0357 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 04:39 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:39 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:39 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 04:39 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 182 | 3.00 | 10.0 | | mg/L | 10 | 04/25/16 03:13 PM |
| Fluoride | 0.323 | 0.100 | 0.400 | J | mg/L | 1 | 04/25/16 11:36 AM |
| Sulfate | 55.4 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 11:36 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.83 | 0 | 0 | | pH Units@18.5℃ | 1 | 04/20/16 09:38 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 726 | 10.0 | 10.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-05 |
| **Project No:** | 5164-D | **Collection Date:** | 04/14/16 11:40 AM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 11:55 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 04:41 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:41 PM |
| Barium | 0.224 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 04:41 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:41 PM |
| Boron | 0.107 | 0.0100 | 0.0300 | | mg/L | 1 | 04/28/16 12:59 PM |
| Cadmium | 0.000392 | 0.000300 | 0.00100 | J | mg/L | 1 | 04/25/16 04:41 PM |
| Calcium | 101 | 1.00 | 3.00 | | mg/L | 10 | 04/27/16 02:19 PM |
| Chromium | 0.00477 | 0.00200 | 0.00500 | J | mg/L | 1 | 04/25/16 04:41 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 04:41 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 04:41 PM |
| Lithium | 0.164 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 04:41 PM |
| Molybdenum | 0.0183 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:41 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 04:41 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 04:41 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 359 | 30.0 | 100 | | mg/L | 100 | 04/25/16 03:28 PM |
| Fluoride | 0.491 | 0.100 | 0.400 | | mg/L | 1 | 04/25/16 11:51 AM |
| Sulfate | 50.8 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 11:51 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.66 | 0 | 0 | | pH Units@18.6℃ | 1 | 04/20/16 09:39 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1510 | 50.0 | 50.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-06 |
| **Project No:** | 5164-D | **Collection Date:** | 04/14/16 12:35 PM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 11:58 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:01 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:01 PM |
| Barium | 0.0296 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:01 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:01 PM |
| Boron | 0.0867 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 02:41 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:01 PM |
| Calcium | 12.2 | 0.100 | 0.300 | | mg/L | 1 | 04/25/16 05:01 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:01 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 05:01 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:01 PM |
| Lithium | 0.0338 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 05:01 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:01 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:01 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:01 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 38.6 | 0.300 | 1.00 | | mg/L | 1 | 04/25/16 12:06 PM |
| Fluoride | 0.229 | 0.100 | 0.400 | J | mg/L | 1 | 04/25/16 12:06 PM |
| Sulfate | 35.7 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 12:06 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.60 | 0 | 0 | | pH Units@19.4℃ | 1 | 04/20/16 09:42 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 77.0 | 10.0 | 10.0 | | mg/L | 1 | 04/21/16 08:40 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-07 |
| **Project No:** | 5164-D | **Collection Date:** | 04/14/16 02:50 PM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:00 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:07 PM |
| Arsenic | 0.0146 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:07 PM |
| Barium | 0.965 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:07 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:07 PM |
| Boron | 0.0805 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 02:47 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:07 PM |
| Calcium | 323 | 5.00 | 15.0 | | mg/L | 50 | 04/26/16 04:16 PM |
| Chromium | 0.00202 | 0.00200 | 0.00500 | J | mg/L | 1 | 04/25/16 05:07 PM |
| Cobalt | 0.00876 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 05:07 PM |
| Lead | 0.00160 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:07 PM |
| Lithium | 0.0160 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 05:07 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:07 PM |
| Selenium | 0.00211 | 0.00200 | 0.00500 | J | mg/L | 1 | 04/25/16 05:07 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:07 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 1920 | 30.0 | 100 | | mg/L | 100 | 04/25/16 03:43 PM |
| Fluoride | 0.218 | 0.100 | 0.400 | J | mg/L | 1 | 04/25/16 12:21 PM |
| Sulfate | 68.0 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 12:21 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.24 | 0 | 0 | | pH Units@19.4℃ | 1 | 04/20/16 09:45 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 6210 | 50.0 | 50.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-08 |
| **Project No:** | 5164-D | **Collection Date:** | 04/14/16 03:40 PM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:02 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:09 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:09 PM |
| Barium | 0.104 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:09 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:09 PM |
| Boron | 0.0753 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 02:49 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:09 PM |
| Calcium | 14.7 | 0.100 | 0.300 | | mg/L | 1 | 04/25/16 05:09 PM |
| Chromium | 0.00425 | 0.00200 | 0.00500 | J | mg/L | 1 | 04/25/16 05:09 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 05:09 PM |
| Lead | 0.00371 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:09 PM |
| Lithium | 0.0255 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 05:09 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:09 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:09 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:09 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 25.4 | 0.300 | 1.00 | | mg/L | 1 | 04/25/16 12:36 PM |
| Fluoride | 0.109 | 0.100 | 0.400 | J | mg/L | 1 | 04/25/16 12:36 PM |
| Sulfate | 15.8 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 12:36 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.74 | 0 | 0 | | pH Units@19℃ | 1 | 04/20/16 09:48 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 163 | 10.0 | 10.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-09 |
| **Project No:** | 5164-D | **Collection Date:** | 04/14/16 04:30 PM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:04 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:11 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:11 PM |
| Barium | 0.260 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:11 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:11 PM |
| Boron | 0.0963 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 02:51 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:11 PM |
| Calcium | 72.5 | 1.00 | 3.00 | | mg/L | 10 | 04/26/16 04:18 PM |
| Chromium | 0.00222 | 0.00200 | 0.00500 | J | mg/L | 1 | 04/25/16 05:11 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 05:11 PM |
| Lead | 0.00120 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:11 PM |
| Lithium | 0.0110 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 05:11 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:11 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:11 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:11 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 393 | 30.0 | 100 | | mg/L | 100 | 04/25/16 04:13 PM |
| Fluoride | 0.671 | 0.100 | 0.400 | | mg/L | 1 | 04/25/16 12:51 PM |
| Sulfate | 32.9 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 12:51 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.93 | 0 | 0 | | pH Units@19.4℃ | 1 | 04/20/16 09:51 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1120 | 50.0 | 50.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-07 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-10 |
| **Project No:** | 5164-D | **Collection Date:** | 04/15/16 07:50 AM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:11 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:13 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:13 PM |
| Barium | 0.0405 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:13 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:13 PM |
| Boron | 0.0567 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 02:53 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:13 PM |
| Calcium | 10.0 | 0.100 | 0.300 | | mg/L | 1 | 04/25/16 05:13 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:13 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 05:13 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:13 PM |
| Lithium | 0.0152 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 05:13 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:13 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:13 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:13 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 20.9 | 0.300 | 1.00 | | mg/L | 1 | 04/25/16 01:06 PM |
| Fluoride | 0.187 | 0.100 | 0.400 | J | mg/L | 1 | 04/25/16 01:06 PM |
| Sulfate | 16.0 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 01:06 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.86 | 0 | 0 | | pH Units@19.7℃ | 1 | 04/20/16 09:55 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 341 | 10.0 | 10.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | AL-10 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-11 |
| **Project No:** | 5164-D | **Collection Date:** | 04/15/16 09:15 AM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:14 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:15 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:15 PM |
| Barium | 0.180 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:15 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:15 PM |
| Boron | 0.0573 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 02:55 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:15 PM |
| Calcium | 44.8 | 1.00 | 3.00 | | mg/L | 10 | 04/26/16 04:20 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:15 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 05:15 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:15 PM |
| Lithium | 0.00971 | 0.00500 | 0.0100 | J | mg/L | 1 | 04/25/16 05:15 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:15 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:15 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:15 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 86.0 | 3.00 | 10.0 | | mg/L | 10 | 04/25/16 02:42 PM |
| Fluoride | 0.133 | 0.100 | 0.400 | J | mg/L | 1 | 04/25/16 12:06 PM |
| Sulfate | 23.6 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 12:06 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.29 | 0 | 0 | | pH Units@19.5℃ | 1 | 04/20/16 09:58 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 549 | 10.0 | 10.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-02 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-12 |
| **Project No:** | 5164-D | **Collection Date:** | 04/15/16 10:20 AM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:16 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:17 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:17 PM |
| Barium | 0.164 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:17 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:17 PM |
| Boron | 0.0597 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 02:57 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:17 PM |
| Calcium | 39.6 | 1.00 | 3.00 | | mg/L | 10 | 04/26/16 04:22 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:17 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 05:17 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:17 PM |
| Lithium | 0.00868 | 0.00500 | 0.0100 | J | mg/L | 1 | 04/25/16 05:17 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:17 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:17 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:17 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 68.0 | 3.00 | 10.0 | | mg/L | 10 | 04/25/16 02:56 PM |
| Fluoride | 0.102 | 0.100 | 0.400 | J | mg/L | 1 | 04/25/16 12:21 PM |
| Sulfate | 18.1 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 12:21 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.45 | 0 | 0 | | pH Units@19.8℃ | 1 | 04/20/16 10:01 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 440 | 10.0 | 10.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-09 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-13 |
| **Project No:** | 5164-D | **Collection Date:** | 04/15/16 11:20 AM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:18 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:19 PM |
| Arsenic | 0.00201 | 0.00200 | 0.00500 | J | mg/L | 1 | 04/25/16 05:19 PM |
| Barium | 0.104 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:19 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:19 PM |
| Boron | 0.0734 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 02:59 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:19 PM |
| Calcium | 42.2 | 1.00 | 3.00 | | mg/L | 10 | 04/26/16 04:24 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:19 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 05:19 PM |
| Lead | 0.000400 | 0.000300 | 0.00100 | J | mg/L | 1 | 04/25/16 05:19 PM |
| Lithium | 0.0550 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 05:19 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:19 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:19 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:19 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 151 | 3.00 | 10.0 | | mg/L | 10 | 04/25/16 03:11 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 04/25/16 12:36 PM |
| Sulfate | 80.9 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 12:36 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.22 | 0 | 0 | | pH Units@19.9℃ | 1 | 04/20/16 10:04 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 568 | 10.0 | 10.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-08 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-14 |
| **Project No:** | 5164-D | **Collection Date:** | 04/15/16 12:25 PM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | 0.000837 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:20 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:21 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:21 PM |
| Barium | 0.112 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:21 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:21 PM |
| Boron | 0.0726 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 03:01 PM |
| Cadmium | 0.000403 | 0.000300 | 0.00100 | J | mg/L | 1 | 04/25/16 05:21 PM |
| Calcium | 133 | 1.00 | 3.00 | | mg/L | 10 | 04/26/16 04:26 PM |
| Chromium | 0.328 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:21 PM |
| Cobalt | 0.00375 | 0.00300 | 0.00500 | J | mg/L | 1 | 04/25/16 05:21 PM |
| Lead | 0.00134 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:21 PM |
| Lithium | 0.0932 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 05:21 PM |
| Molybdenum | 0.0360 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:21 PM |
| Selenium | 0.0318 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:21 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:21 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 566 | 30.0 | 100 | | mg/L | 100 | 04/25/16 03:25 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 04/25/16 12:50 PM |
| Sulfate | 139 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 12:50 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.48 | 0 | 0 | | pH Units@19.9℃ | 1 | 04/20/16 10:07 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1680 | 50.0 | 50.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | DUP-1 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-15 |
| **Project No:** | 5164-D | **Collection Date:** | 04/15/16 12:25 PM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | 0.000562 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:23 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:37 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:37 PM |
| Barium | 0.121 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:37 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:37 PM |
| Boron | 0.0770 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 03:25 PM |
| Cadmium | 0.000377 | 0.000300 | 0.00100 | J | mg/L | 1 | 04/25/16 05:37 PM |
| Calcium | 133 | 1.00 | 3.00 | | mg/L | 10 | 04/26/16 04:28 PM |
| Chromium | 0.365 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:37 PM |
| Cobalt | 0.00479 | 0.00300 | 0.00500 | J | mg/L | 1 | 04/25/16 05:37 PM |
| Lead | 0.00151 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:37 PM |
| Lithium | 0.0908 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 05:37 PM |
| Molybdenum | 0.0305 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:37 PM |
| Selenium | 0.0299 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:37 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:37 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 569 | 30.0 | 100 | | mg/L | 100 | 04/25/16 04:09 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 04/25/16 01:05 PM |
| Sulfate | 140 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 01:05 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.45 | 0 | 0 | | pH Units@19.9℃ | 1 | 04/20/16 10:09 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1730 | 50.0 | 50.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | EB-1 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-16 |
| **Project No:** | 5164-D | **Collection Date:** | 04/15/16 08:25 AM |
| **Lab Order:** | 1604175 | **Matrix:** | EQUIP BLANK |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:25 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:39 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:39 PM |
| Barium | 0.0694 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:39 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:39 PM |
| Boron | 0.0379 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 03:27 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:39 PM |
| Calcium | 3.07 | 0.100 | 0.300 | | mg/L | 1 | 04/25/16 05:39 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:39 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 04/25/16 05:39 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:39 PM |
| Lithium | <0.00500 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 05:39 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:39 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:39 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:39 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 8.24 | 0.300 | 1.00 | | mg/L | 1 | 04/25/16 01:56 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 04/25/16 01:56 PM |
| Sulfate | 1.92 | 1.00 | 3.00 | J | mg/L | 1 | 04/25/16 01:56 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.24 | 0 | 0 | | pH Units@20.1℃ | 1 | 04/20/16 10:12 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 47.0 | 10.0 | 10.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-May-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-05 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1604175-17 |
| **Project No:** | 5164-D | **Collection Date:** | 04/15/16 01:40 PM |
| **Lab Order:** | 1604175 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 04/21/16 12:27 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 04/25/16 05:41 PM |
| Arsenic | 0.0103 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:41 PM |
| Barium | 0.0686 | 0.00300 | 0.0100 | | mg/L | 1 | 04/25/16 05:41 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:41 PM |
| Boron | 0.0458 | 0.0100 | 0.0300 | | mg/L | 1 | 04/26/16 03:29 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 04/25/16 05:41 PM |
| Calcium | 14.3 | 0.100 | 0.300 | | mg/L | 1 | 04/25/16 05:41 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:41 PM |
| Cobalt | 0.00419 | 0.00300 | 0.00500 | J | mg/L | 1 | 04/25/16 05:41 PM |
| Lead | 0.000420 | 0.000300 | 0.00100 | J | mg/L | 1 | 04/25/16 05:41 PM |
| Lithium | 0.0421 | 0.00500 | 0.0100 | | mg/L | 1 | 04/25/16 05:41 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:41 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 04/25/16 05:41 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 04/25/16 05:41 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 55.4 | 3.00 | 10.0 | | mg/L | 10 | 04/25/16 04:53 PM |
| Fluoride | 0.284 | 0.100 | 0.400 | J | mg/L | 1 | 04/25/16 02:10 PM |
| Sulfate | 10.7 | 1.00 | 3.00 | | mg/L | 1 | 04/25/16 02:10 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.75 | 0 | 0 | | pH Units@20.3℃ | 1 | 04/20/16 10:15 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 288 | 10.0 | 10.0 | | mg/L | 1 | 04/21/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160421A**

The QC data in batch 74678 applies to the following samples: 1604175-01A, 1604175-02A, 1604175-03A, 1604175-04A, 1604175-05A, 1604175-06A, 1604175-07A, 1604175-08A, 1604175-09A, 1604175-10A, 1604175-11A, 1604175-12A, 1604175-13A, 1604175-14A, 1604175-15A, 1604175-16A, 1604175-17A

| Sample ID | **MB-74678** | Batch ID: | **74678** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 11:28:44 AM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-74678** | Batch ID: | **74678** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 11:31:00 AM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00209 | 0.000200 | 0.00200 | 0 | 104 | 85 | 115 | | | |

| Sample ID | **LCSD-74678** | Batch ID: | **74678** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 11:33:16 AM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00204 | 0.000200 | 0.00200 | 0 | 102 | 85 | 115 | 2.42 | 15 | |

| Sample ID | **1604175-01A SD** | Batch ID: | **74678** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 11:40:04 AM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1604175-01A PDS** | Batch ID: | **74678** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 11:42:20 AM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00234 | 0.000200 | 0.00250 | 0 | 93.6 | 85 | 115 | | | |

| Sample ID | **1604175-01A MS** | Batch ID: | **74678** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 11:44:35 AM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00192 | 0.000200 | 0.00200 | 0 | 96.0 | 80 | 120 | | | |

| Sample ID | **1604175-01A MSD** | Batch ID: | **74678** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 11:46:51 AM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00190 | 0.000200 | 0.00200 | 0 | 95.0 | 80 | 120 | 1.05 | 15 | |

| **Qualifiers:** | | | | | |
|---|---|---|---|---|---|
| | B | Analyte detected in the associated Method Blank | DF | Dilution Factor | |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit | |
| | ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits | |
| | RL | Reporting Limit | S | Spike Recovery outside control limits | |
| | J | Analyte detected between SDL and RL | N | Parameter not NELAC certified | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160421A**

| Sample ID | **ICV-160421** | Batch ID: | **R85352** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 10:03:42 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00383 | 0.000200 | 0.00400 | 0 | 95.8 | 90 | 110 | | | |

| Sample ID | **CCV2-160421** | Batch ID: | **R85352** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 11:19:18 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00202 | 0.000200 | 0.00200 | 0 | 101 | 90 | 110 | | | |

| Sample ID | **CCV3-160421** | Batch ID: | **R85352** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 12:07:17 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00202 | 0.000200 | 0.00200 | 0 | 101 | 90 | 110 | | | |

| Sample ID | **CCV4-160421** | Batch ID: | **R85352** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160421A** | Analysis Date: | **4/21/2016 12:34:36 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00204 | 0.000200 | 0.00200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160425E**

The QC data in batch 74670 applies to the following samples: 1604175-01A, 1604175-02A, 1604175-03A, 1604175-04A, 1604175-05A

Sample ID **MB-74670** Batch ID: **74670** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_160425E** Analysis Date: **4/25/2016 3:19:00 PM** Prep Date: **4/19/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-74670** Batch ID: **74670** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_160425E** Analysis Date: **4/25/2016 3:21:00 PM** Prep Date: **4/19/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Barium | 0.196 | 0.0100 | 0.200 | 0 | 98.2 | 80 | 120 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cadmium | 0.195 | 0.00100 | 0.200 | 0 | 97.6 | 80 | 120 | | | |
| Calcium | 5.06 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | | | |
| Chromium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Cobalt | 0.207 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 80 | 120 | | | |
| Lithium | 0.207 | 0.0100 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 80 | 120 | | | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

Sample ID **LCSD-74670** Batch ID: **74670** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_160425E** Analysis Date: **4/25/2016 3:23:00 PM** Prep Date: **4/19/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.194 | 0.00250 | 0.200 | 0 | 96.9 | 80 | 120 | 1.62 | 15 | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.450 | 15 | |
| Barium | 0.195 | 0.0100 | 0.200 | 0 | 97.4 | 80 | 120 | 0.857 | 15 | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.190 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160425E**

| Sample ID **LCSD-74670** | Batch ID: **74670** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 3:23:00 PM** | Prep Date: **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.194 | 0.00100 | 0.200 | 0 | 96.8 | 80 | 120 | 0.887 | 15 | |
| Calcium | 4.96 | 0.300 | 5.00 | 0 | 99.2 | 80 | 120 | 2.12 | 15 | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 1.47 | 15 | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.625 | 15 | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.7 | 80 | 120 | 0.798 | 15 | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 1.14 | 15 | |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.5 | 80 | 120 | 1.08 | 15 | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.192 | 15 | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | 0.275 | 15 | |

| Sample ID **1604166-37B SD** | Batch ID: **74670** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 3:29:00 PM** | Prep Date: **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | 0.0231 | 0.0250 | 0 | 0.0234 | | | | 1.23 | 10 | |
| Barium | 0.0412 | 0.0500 | 0 | 0.0447 | | | | 8.03 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0.000432 | | | | 0 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0.00569 | | | | 0 | 10 | |
| Lead | 0.00485 | 0.00500 | 0 | 0.00446 | | | | 8.36 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.00715 | | | | 0 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0.00224 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1604166-37B PDS** | Batch ID: **74670** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 3:49:00 PM** | Prep Date: **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.192 | 0.00250 | 0.200 | 0 | 96.0 | 80 | 120 | | | |
| Arsenic | 0.216 | 0.00500 | 0.200 | 0.0234 | 96.1 | 80 | 120 | | | |
| Barium | 0.231 | 0.0100 | 0.200 | 0.0447 | 93.1 | 80 | 120 | | | |
| Beryllium | 0.190 | 0.00100 | 0.200 | 0 | 95.2 | 80 | 120 | | | |
| Cadmium | 0.183 | 0.00100 | 0.200 | 0.000432 | 91.5 | 80 | 120 | | | |
| Chromium | 0.195 | 0.00500 | 0.200 | 0 | 97.5 | 80 | 120 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0.00569 | 99.2 | 80 | 120 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0.00446 | 94.9 | 80 | 120 | | | |
| Lithium | 0.197 | 0.0100 | 0.200 | 0.00715 | 94.9 | 80 | 120 | | | |
| Molybdenum | 0.191 | 0.00500 | 0.200 | 0.00224 | 94.5 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160425E**

| Sample ID **1604166-37B PDS** | Batch ID: **74670** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 3:49:00 PM** | Prep Date: **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Selenium | 0.191 | 0.00500 | 0.200 | 0 | 95.7 | 80 | 120 | | | |
| Thallium | 0.189 | 0.00150 | 0.200 | 0 | 94.3 | 80 | 120 | | | |

| Sample ID **1604166-37B MS** | Batch ID: **74670** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 3:51:00 PM** | Prep Date: **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 98.8 | 80 | 120 | | | |
| Arsenic | 0.227 | 0.00500 | 0.200 | 0.0234 | 102 | 80 | 120 | | | |
| Barium | 0.244 | 0.0100 | 0.200 | 0.0447 | 99.9 | 80 | 120 | | | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Cadmium | 0.193 | 0.00100 | 0.200 | 0.000432 | 96.5 | 80 | 120 | | | |
| Calcium | 36.7 | 0.300 | 5.00 | 31.7 | 99.6 | 80 | 120 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.5 | 80 | 120 | | | |
| Cobalt | 0.212 | 0.00500 | 0.200 | 0.00569 | 103 | 80 | 120 | | | |
| Lead | 0.202 | 0.00100 | 0.200 | 0.00446 | 99.0 | 80 | 120 | | | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0.00715 | 99.0 | 80 | 120 | | | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0.00224 | 100 | 80 | 120 | | | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 99.8 | 80 | 120 | | | |

| Sample ID **1604166-37B MSD** | Batch ID: **74670** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 3:53:00 PM** | Prep Date: **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.195 | 0.00250 | 0.200 | 0 | 97.5 | 80 | 120 | 1.42 | 15 | |
| Arsenic | 0.224 | 0.00500 | 0.200 | 0.0234 | 101 | 80 | 120 | 0.943 | 15 | |
| Barium | 0.238 | 0.0100 | 0.200 | 0.0447 | 96.7 | 80 | 120 | 2.64 | 15 | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.3 | 80 | 120 | 0.004 | 15 | |
| Cadmium | 0.189 | 0.00100 | 0.200 | 0.000432 | 94.4 | 80 | 120 | 2.20 | 15 | |
| Calcium | 36.2 | 0.300 | 5.00 | 31.7 | 90.8 | 80 | 120 | 1.21 | 15 | |
| Chromium | 0.197 | 0.00500 | 0.200 | 0 | 98.3 | 80 | 120 | 1.20 | 15 | |
| Cobalt | 0.208 | 0.00500 | 0.200 | 0.00569 | 101 | 80 | 120 | 1.97 | 15 | |
| Lead | 0.199 | 0.00100 | 0.200 | 0.00446 | 97.4 | 80 | 120 | 1.59 | 15 | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0.00715 | 100 | 80 | 120 | 1.44 | 15 | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0.00224 | 99.1 | 80 | 120 | 1.31 | 15 | |
| Selenium | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 80 | 120 | 2.75 | 15 | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 80 | 120 | 0.331 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS4_160425E**

The QC data in batch 74701 applies to the following samples: 1604175-06A, 1604175-07A, 1604175-08A, 1604175-09A, 1604175-10A, 1604175-11A, 1604175-12A, 1604175-13A, 1604175-14A, 1604175-15A, 1604175-16A, 1604175-17A

Sample ID **MB-74701** Batch ID: **74701** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_160425E** Analysis Date: **4/25/2016 4:53:00 PM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-74701** Batch ID: **74701** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_160425E** Analysis Date: **4/25/2016 4:55:00 PM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.192 | 0.00250 | 0.200 | 0 | 96.0 | 80 | 120 | | | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 80 | 120 | | | |
| Barium | 0.192 | 0.0100 | 0.200 | 0 | 96.2 | 80 | 120 | | | |
| Beryllium | 0.194 | 0.00100 | 0.200 | 0 | 96.8 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0 | 95.9 | 80 | 120 | | | |
| Calcium | 4.96 | 0.300 | 5.00 | 0 | 99.3 | 80 | 120 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 97.2 | 80 | 120 | | | |
| Lithium | 0.200 | 0.0100 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.5 | 80 | 120 | | | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

Sample ID **LCSD-74701** Batch ID: **74701** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_160425E** Analysis Date: **4/25/2016 4:57:00 PM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.191 | 0.00250 | 0.200 | 0 | 95.7 | 80 | 120 | 0.336 | 15 | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 80 | 120 | 0.174 | 15 | |
| Barium | 0.193 | 0.0100 | 0.200 | 0 | 96.6 | 80 | 120 | 0.428 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160425E**

| Sample ID **LCSD-74701** | Batch ID: **74701** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 4:57:00 PM** | Prep Date: **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.194 | 0.00100 | 0.200 | 0 | 97.1 | 80 | 120 | 0.348 | 15 | |
| Cadmium | 0.191 | 0.00100 | 0.200 | 0 | 95.7 | 80 | 120 | 0.255 | 15 | |
| Calcium | 5.00 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | 0.703 | 15 | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.5 | 80 | 120 | 0.074 | 15 | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.396 | 15 | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.6 | 80 | 120 | 0.632 | 15 | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.7 | 80 | 120 | 0.122 | 15 | |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.3 | 80 | 120 | 0.216 | 15 | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 80 | 120 | 1.70 | 15 | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.7 | 80 | 120 | 2.28 | 15 | |

| Sample ID **1604175-06A SD** | Batch ID: **74701** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 5:03:00 PM** | Prep Date: **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0307 | 0.0500 | 0 | 0.0296 | | | | 3.61 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Calcium | 12.4 | 1.50 | 0 | 12.2 | | | | 2.05 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.0346 | 0.0500 | 0 | 0.0338 | | | | 2.17 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1604175-06A PDS** | Batch ID: **74701** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 5:23:00 PM** | Prep Date: **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.185 | 0.00250 | 0.200 | 0 | 92.3 | 80 | 120 | | | |
| Arsenic | 0.196 | 0.00500 | 0.200 | 0 | 98.1 | 80 | 120 | | | |
| Barium | 0.221 | 0.0100 | 0.200 | 0.0296 | 95.9 | 80 | 120 | | | |
| Beryllium | 0.191 | 0.00100 | 0.200 | 0 | 95.3 | 80 | 120 | | | |
| Cadmium | 0.186 | 0.00100 | 0.200 | 0 | 92.8 | 80 | 120 | | | |
| Calcium | 16.2 | 0.300 | 5.00 | 12.2 | 80.6 | 80 | 120 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 80 | 120 | | | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160425E**

| Sample ID **1604175-06A PDS** | Batch ID: **74701** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 5:23:00 PM** | Prep Date: **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.190 | 0.00100 | 0.200 | 0 | 95.1 | 80 | 120 | | | |
| Lithium | 0.222 | 0.0100 | 0.200 | 0.0338 | 93.9 | 80 | 120 | | | |
| Molybdenum | 0.188 | 0.00500 | 0.200 | 0 | 94.1 | 80 | 120 | | | |
| Selenium | 0.194 | 0.00500 | 0.200 | 0 | 96.9 | 80 | 120 | | | |
| Thallium | 0.188 | 0.00150 | 0.200 | 0 | 93.9 | 80 | 120 | | | |

| Sample ID **1604175-06A MS** | Batch ID: **74701** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 5:25:00 PM** | Prep Date: **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.195 | 0.00250 | 0.200 | 0 | 97.6 | 80 | 120 | | | |
| Arsenic | 0.198 | 0.00500 | 0.200 | 0 | 99.2 | 80 | 120 | | | |
| Barium | 0.225 | 0.0100 | 0.200 | 0.0296 | 97.9 | 80 | 120 | | | |
| Beryllium | 0.192 | 0.00100 | 0.200 | 0 | 95.8 | 80 | 120 | | | |
| Cadmium | 0.189 | 0.00100 | 0.200 | 0 | 94.6 | 80 | 120 | | | |
| Calcium | 17.4 | 0.300 | 5.00 | 12.2 | 103 | 80 | 120 | | | |
| Chromium | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 80 | 120 | | | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Lead | 0.191 | 0.00100 | 0.200 | 0 | 95.3 | 80 | 120 | | | |
| Lithium | 0.233 | 0.0100 | 0.200 | 0.0338 | 99.4 | 80 | 120 | | | |
| Molybdenum | 0.194 | 0.00500 | 0.200 | 0 | 96.9 | 80 | 120 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Thallium | 0.195 | 0.00150 | 0.200 | 0 | 97.7 | 80 | 120 | | | |

| Sample ID **1604175-06A MSD** | Batch ID: **74701** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 5:27:00 PM** | Prep Date: **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.193 | 0.00250 | 0.200 | 0 | 96.7 | 80 | 120 | 0.908 | 15 | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 80 | 120 | 0.156 | 15 | |
| Barium | 0.224 | 0.0100 | 0.200 | 0.0296 | 97.0 | 80 | 120 | 0.795 | 15 | |
| Beryllium | 0.193 | 0.00100 | 0.200 | 0 | 96.4 | 80 | 120 | 0.619 | 15 | |
| Cadmium | 0.188 | 0.00100 | 0.200 | 0 | 94.2 | 80 | 120 | 0.490 | 15 | |
| Calcium | 17.2 | 0.300 | 5.00 | 12.2 | 99.6 | 80 | 120 | 1.07 | 15 | |
| Chromium | 0.197 | 0.00500 | 0.200 | 0 | 98.5 | 80 | 120 | 0.077 | 15 | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.370 | 15 | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.6 | 80 | 120 | 1.35 | 15 | |
| Lithium | 0.228 | 0.0100 | 0.200 | 0.0338 | 97.0 | 80 | 120 | 2.04 | 15 | |
| Molybdenum | 0.194 | 0.00500 | 0.200 | 0 | 97.0 | 80 | 120 | 0.101 | 15 | |
| Selenium | 0.195 | 0.00500 | 0.200 | 0 | 97.5 | 80 | 120 | 0.921 | 15 | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.3 | 80 | 120 | 0.680 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160425E**

| Sample ID **ICV-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 10:36:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.0974 | 0.00250 | 0.100 | 0 | 97.4 | 90 | 110 | | | |
| Arsenic | 0.0993 | 0.00500 | 0.100 | 0 | 99.3 | 90 | 110 | | | |
| Barium | 0.0970 | 0.0100 | 0.100 | 0 | 97.0 | 90 | 110 | | | |
| Beryllium | 0.0975 | 0.00100 | 0.100 | 0 | 97.5 | 90 | 110 | | | |
| Cadmium | 0.0958 | 0.00100 | 0.100 | 0 | 95.8 | 90 | 110 | | | |
| Calcium | 2.37 | 0.300 | 2.50 | 0 | 94.9 | 90 | 110 | | | |
| Chromium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.103 | 0.00500 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.0984 | 0.00100 | 0.100 | 0 | 98.4 | 90 | 110 | | | |
| Lithium | 0.0953 | 0.0100 | 0.100 | 0 | 95.3 | 90 | 110 | | | |
| Molybdenum | 0.0957 | 0.00500 | 0.100 | 0 | 95.7 | 90 | 110 | | | |
| Selenium | 0.100 | 0.00500 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Thallium | 0.0974 | 0.00150 | 0.100 | 0 | 97.4 | 90 | 110 | | | |

| Sample ID **LCVL-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 10:47:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00179 | 0.00250 | 0.00200 | 0 | 89.7 | 70 | 130 | | | |
| Arsenic | 0.00484 | 0.00500 | 0.00500 | 0 | 96.7 | 70 | 130 | | | |
| Barium | 0.00471 | 0.0100 | 0.00500 | 0 | 94.2 | 70 | 130 | | | |
| Beryllium | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 70 | 130 | | | |
| Cadmium | 0.000927 | 0.00100 | 0.00100 | 0 | 92.7 | 70 | 130 | | | |
| Calcium | 0.0899 | 0.300 | 0.100 | 0 | 89.9 | 70 | 130 | | | |
| Chromium | 0.00492 | 0.00500 | 0.00500 | 0 | 98.4 | 70 | 130 | | | |
| Cobalt | 0.00497 | 0.00500 | 0.00500 | 0 | 99.3 | 70 | 130 | | | |
| Lead | 0.000956 | 0.00100 | 0.00100 | 0 | 95.6 | 70 | 130 | | | |
| Lithium | 0.0105 | 0.0100 | 0.0100 | 0 | 105 | 70 | 130 | | | |
| Molybdenum | 0.00456 | 0.00500 | 0.00500 | 0 | 91.2 | 70 | 130 | | | |
| Selenium | 0.00528 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Thallium | 0.000926 | 0.00150 | 0.00100 | 0 | 92.6 | 70 | 130 | | | |

| Sample ID **CCV6-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 2:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.196 | 0.00250 | 0.200 | 0 | 98.0 | 90 | 110 | | | |
| Arsenic | 0.196 | 0.00500 | 0.200 | 0 | 98.0 | 90 | 110 | | | |
| Barium | 0.192 | 0.0100 | 0.200 | 0 | 95.9 | 90 | 110 | | | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.6 | 90 | 110 | | | |
| Cadmium | 0.191 | 0.00100 | 0.200 | 0 | 95.7 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160425E**

| Sample ID **CCV6-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 2:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.94 | 0.300 | 5.00 | 0 | 98.8 | 90 | 110 | | | |
| Chromium | 0.195 | 0.00500 | 0.200 | 0 | 97.7 | 90 | 110 | | | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.3 | 90 | 110 | | | |
| Lithium | 0.196 | 0.0100 | 0.200 | 0 | 98.2 | 90 | 110 | | | |
| Molybdenum | 0.190 | 0.00500 | 0.200 | 0 | 94.9 | 90 | 110 | | | |
| Selenium | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID **LCVL6-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 3:13:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00181 | 0.00250 | 0.00200 | 0 | 90.7 | 70 | 130 | | | |
| Arsenic | 0.00487 | 0.00500 | 0.00500 | 0 | 97.3 | 70 | 130 | | | |
| Barium | 0.00459 | 0.0100 | 0.00500 | 0 | 91.7 | 70 | 130 | | | |
| Beryllium | 0.000957 | 0.00100 | 0.00100 | 0 | 95.7 | 70 | 130 | | | |
| Cadmium | 0.000910 | 0.00100 | 0.00100 | 0 | 91.0 | 70 | 130 | | | |
| Calcium | 0.0911 | 0.300 | 0.100 | 0 | 91.1 | 70 | 130 | | | |
| Chromium | 0.00492 | 0.00500 | 0.00500 | 0 | 98.4 | 70 | 130 | | | |
| Cobalt | 0.00491 | 0.00500 | 0.00500 | 0 | 98.2 | 70 | 130 | | | |
| Lead | 0.000917 | 0.00100 | 0.00100 | 0 | 91.7 | 70 | 130 | | | |
| Lithium | 0.0112 | 0.0100 | 0.0100 | 0 | 112 | 70 | 130 | | | |
| Molybdenum | 0.00462 | 0.00500 | 0.00500 | 0 | 92.5 | 70 | 130 | | | |
| Selenium | 0.00503 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Thallium | 0.000922 | 0.00150 | 0.00100 | 0 | 92.2 | 70 | 130 | | | |

| Sample ID **CCV7-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 4:07:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.196 | 0.00250 | 0.200 | 0 | 98.1 | 90 | 110 | | | |
| Arsenic | 0.198 | 0.00500 | 0.200 | 0 | 98.8 | 90 | 110 | | | |
| Barium | 0.192 | 0.0100 | 0.200 | 0 | 95.9 | 90 | 110 | | | |
| Beryllium | 0.194 | 0.00100 | 0.200 | 0 | 96.8 | 90 | 110 | | | |
| Cadmium | 0.190 | 0.00100 | 0.200 | 0 | 95.1 | 90 | 110 | | | |
| Calcium | 4.96 | 0.300 | 5.00 | 0 | 99.1 | 90 | 110 | | | |
| Chromium | 0.195 | 0.00500 | 0.200 | 0 | 97.7 | 90 | 110 | | | |
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 96.2 | 90 | 110 | | | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.4 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160425E**

| Sample ID **CCV7-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 4:07:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.192 | 0.00500 | 0.200 | 0 | 95.9 | 90 | 110 | | | |
| Selenium | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.5 | 90 | 110 | | | |

| Sample ID **LCVL7-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 4:14:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00183 | 0.00250 | 0.00200 | 0 | 91.6 | 70 | 130 | | | |
| Arsenic | 0.00499 | 0.00500 | 0.00500 | 0 | 99.8 | 70 | 130 | | | |
| Barium | 0.00463 | 0.0100 | 0.00500 | 0 | 92.5 | 70 | 130 | | | |
| Beryllium | 0.000961 | 0.00100 | 0.00100 | 0 | 96.1 | 70 | 130 | | | |
| Cadmium | 0.000895 | 0.00100 | 0.00100 | 0 | 89.5 | 70 | 130 | | | |
| Calcium | 0.0953 | 0.300 | 0.100 | 0 | 95.3 | 70 | 130 | | | |
| Chromium | 0.00496 | 0.00500 | 0.00500 | 0 | 99.2 | 70 | 130 | | | |
| Cobalt | 0.00501 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Lead | 0.000909 | 0.00100 | 0.00100 | 0 | 90.9 | 70 | 130 | | | |
| Lithium | 0.0111 | 0.0100 | 0.0100 | 0 | 111 | 70 | 130 | | | |
| Molybdenum | 0.00447 | 0.00500 | 0.00500 | 0 | 89.4 | 70 | 130 | | | |
| Selenium | 0.00540 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Thallium | 0.000932 | 0.00150 | 0.00100 | 0 | 93.2 | 70 | 130 | | | |

| Sample ID **CCV8-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 4:43:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.7 | 90 | 110 | | | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Barium | 0.194 | 0.0100 | 0.200 | 0 | 97.0 | 90 | 110 | | | |
| Beryllium | 0.194 | 0.00100 | 0.200 | 0 | 97.0 | 90 | 110 | | | |
| Cadmium | 0.191 | 0.00100 | 0.200 | 0 | 95.7 | 90 | 110 | | | |
| Calcium | 4.99 | 0.300 | 5.00 | 0 | 99.8 | 90 | 110 | | | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.190 | 0.00100 | 0.200 | 0 | 95.2 | 90 | 110 | | | |
| Lithium | 0.195 | 0.0100 | 0.200 | 0 | 97.3 | 90 | 110 | | | |
| Molybdenum | 0.192 | 0.00500 | 0.200 | 0 | 95.9 | 90 | 110 | | | |
| Selenium | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 98.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

| Sample ID **LCVL8-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 4:48:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00183 | 0.00250 | 0.00200 | 0 | 91.5 | 70 | 130 | | | |
| Arsenic | 0.00491 | 0.00500 | 0.00500 | 0 | 98.2 | 70 | 130 | | | |
| Barium | 0.00469 | 0.0100 | 0.00500 | 0 | 93.7 | 70 | 130 | | | |
| Beryllium | 0.000822 | 0.00100 | 0.00100 | 0 | 82.2 | 70 | 130 | | | |
| Cadmium | 0.000924 | 0.00100 | 0.00100 | 0 | 92.4 | 70 | 130 | | | |
| Calcium | 0.108 | 0.300 | 0.100 | 0 | 108 | 70 | 130 | | | |
| Chromium | 0.00489 | 0.00500 | 0.00500 | 0 | 97.9 | 70 | 130 | | | |
| Cobalt | 0.00503 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lead | 0.000901 | 0.00100 | 0.00100 | 0 | 90.1 | 70 | 130 | | | |
| Lithium | 0.0105 | 0.0100 | 0.0100 | 0 | 105 | 70 | 130 | | | |
| Molybdenum | 0.00468 | 0.00500 | 0.00500 | 0 | 93.6 | 70 | 130 | | | |
| Selenium | 0.00540 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Thallium | 0.000903 | 0.00150 | 0.00100 | 0 | 90.3 | 70 | 130 | | | |

| Sample ID **CCV9-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 5:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 98.8 | 90 | 110 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Barium | 0.193 | 0.0100 | 0.200 | 0 | 96.4 | 90 | 110 | | | |
| Beryllium | 0.189 | 0.00100 | 0.200 | 0 | 94.4 | 90 | 110 | | | |
| Cadmium | 0.190 | 0.00100 | 0.200 | 0 | 95.1 | 90 | 110 | | | |
| Calcium | 4.95 | 0.300 | 5.00 | 0 | 99.0 | 90 | 110 | | | |
| Chromium | 0.197 | 0.00500 | 0.200 | 0 | 98.7 | 90 | 110 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.4 | 90 | 110 | | | |
| Lithium | 0.194 | 0.0100 | 0.200 | 0 | 97.0 | 90 | 110 | | | |
| Molybdenum | 0.191 | 0.00500 | 0.200 | 0 | 95.6 | 90 | 110 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.6 | 90 | 110 | | | |

| Sample ID **LCVL9-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 5:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00196 | 0.00250 | 0.00200 | 0 | 98.1 | 70 | 130 | | | |
| Arsenic | 0.00488 | 0.00500 | 0.00500 | 0 | 97.7 | 70 | 130 | | | |
| Barium | 0.00475 | 0.0100 | 0.00500 | 0 | 95.0 | 70 | 130 | | | |
| Beryllium | 0.000866 | 0.00100 | 0.00100 | 0 | 86.6 | 70 | 130 | | | |
| Cadmium | 0.000953 | 0.00100 | 0.00100 | 0 | 95.3 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160425E**

| Sample ID **LCVL9-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 5:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.107 | 0.300 | 0.100 | 0 | 107 | 70 | 130 | | | |
| Chromium | 0.00495 | 0.00500 | 0.00500 | 0 | 99.0 | 70 | 130 | | | |
| Cobalt | 0.00500 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Lead | 0.000945 | 0.00100 | 0.00100 | 0 | 94.5 | 70 | 130 | | | |
| Lithium | 0.0109 | 0.0100 | 0.0100 | 0 | 109 | 70 | 130 | | | |
| Molybdenum | 0.00462 | 0.00500 | 0.00500 | 0 | 92.3 | 70 | 130 | | | |
| Selenium | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Thallium | 0.000949 | 0.00150 | 0.00100 | 0 | 94.9 | 70 | 130 | | | |

| Sample ID **CCV10-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 5:58:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.194 | 0.00250 | 0.200 | 0 | 97.0 | 90 | 110 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Barium | 0.189 | 0.0100 | 0.200 | 0 | 94.4 | 90 | 110 | | | |
| Beryllium | 0.192 | 0.00100 | 0.200 | 0 | 96.2 | 90 | 110 | | | |
| Cadmium | 0.186 | 0.00100 | 0.200 | 0 | 93.2 | 90 | 110 | | | |
| Calcium | 4.95 | 0.300 | 5.00 | 0 | 99.1 | 90 | 110 | | | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 95.8 | 90 | 110 | | | |
| Lithium | 0.194 | 0.0100 | 0.200 | 0 | 97.2 | 90 | 110 | | | |
| Molybdenum | 0.189 | 0.00500 | 0.200 | 0 | 94.4 | 90 | 110 | | | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.3 | 90 | 110 | | | |

| Sample ID **LCVL10-160425** | Batch ID: **R85434** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160425E** | Analysis Date: **4/25/2016 6:02:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00182 | 0.00250 | 0.00200 | 0 | 91.0 | 70 | 130 | | | |
| Arsenic | 0.00485 | 0.00500 | 0.00500 | 0 | 96.9 | 70 | 130 | | | |
| Barium | 0.00465 | 0.0100 | 0.00500 | 0 | 93.1 | 70 | 130 | | | |
| Beryllium | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Cadmium | 0.000948 | 0.00100 | 0.00100 | 0 | 94.8 | 70 | 130 | | | |
| Calcium | 0.105 | 0.300 | 0.100 | 0 | 105 | 70 | 130 | | | |
| Chromium | 0.00499 | 0.00500 | 0.00500 | 0 | 99.8 | 70 | 130 | | | |
| Cobalt | 0.00503 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lead | 0.000915 | 0.00100 | 0.00100 | 0 | 91.5 | 70 | 130 | | | |
| Lithium | 0.0111 | 0.0100 | 0.0100 | 0 | 111 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160425E**

Sample ID **LCVL10-160425** Batch ID: **R85434** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_160425E** Analysis Date: **4/25/2016 6:02:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.00448 | 0.00500 | 0.00500 | 0 | 89.6 | 70 | 130 | | | |
| Selenium | 0.00520 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Thallium | 0.000946 | 0.00150 | 0.00100 | 0 | 94.6 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160426B**

The QC data in batch 74701 applies to the following samples: 1604175-06A, 1604175-07A, 1604175-08A, 1604175-09A, 1604175-10A, 1604175-11A, 1604175-12A, 1604175-13A, 1604175-14A, 1604175-15A, 1604175-16A, 1604175-17A

Sample ID **MB-74701** Batch ID: **74701** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_160426B** Analysis Date: **4/26/2016 2:33:00 PM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

Sample ID **LCS-74701** Batch ID: **74701** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_160426B** Analysis Date: **4/26/2016 2:35:00 PM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.187 | 0.0300 | 0.200 | 0 | 93.3 | 80 | 120 | | | |

Sample ID **LCSD-74701** Batch ID: **74701** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_160426B** Analysis Date: **4/26/2016 2:37:00 PM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 80 | 120 | 7.96 | 15 | |

Sample ID **1604175-06A SD** Batch ID: **74701** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_160426B** Analysis Date: **4/26/2016 2:43:00 PM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.107 | 0.150 | 0 | 0.0867 | | | | 20.8 | 10 | R |

Sample ID **1604175-06A PDS** Batch ID: **74701** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_160426B** Analysis Date: **4/26/2016 3:03:00 PM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.292 | 0.0300 | 0.200 | 0.0867 | 103 | 80 | 120 | | | |

Sample ID **1604175-06A MS** Batch ID: **74701** TestNo: **SW6020A** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS4_160426B** Analysis Date: **4/26/2016 3:05:00 PM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.289 | 0.0300 | 0.200 | 0.0867 | 101 | 80 | 120 | | | |

Sample ID **1604175-06A MSD** Batch ID: **74701** TestNo: **SW6020A** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS4_160426B** Analysis Date: **4/26/2016 3:08:00 PM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.292 | 0.0300 | 0.200 | 0.0867 | 102 | 80 | 120 | 0.704 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160426B**

| Sample ID **ICV-160426** | Batch ID: **R85458** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160426B** | Analysis Date: **4/26/2016 11:36:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0978 | 0.0300 | 0.100 | 0 | 97.8 | 90 | 110 | | | |
| Calcium | 2.39 | 0.300 | 2.50 | 0 | 95.5 | 90 | 110 | | | |

| Sample ID **LCVL-160426** | Batch ID: **R85458** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160426B** | Analysis Date: **4/26/2016 11:45:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0198 | 0.0300 | 0.0200 | 0 | 99.0 | 70 | 130 | | | |
| Calcium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |

| Sample ID **CCV4-160426** | Batch ID: **R85458** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160426B** | Analysis Date: **4/26/2016 2:19:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL4-160426** | Batch ID: **R85458** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160426B** | Analysis Date: **4/26/2016 2:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0218 | 0.0300 | 0.0200 | 0 | 109 | 70 | 130 | | | |

| Sample ID **CCV5-160426** | Batch ID: **R85458** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160426B** | Analysis Date: **4/26/2016 3:14:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.200 | 0.0300 | 0.200 | 0 | 100 | 90 | 110 | | | |

| Sample ID **LCVL5-160426** | Batch ID: **R85458** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160426B** | Analysis Date: **4/26/2016 3:20:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0211 | 0.0300 | 0.0200 | 0 | 105 | 70 | 130 | | | |

| Sample ID **CCV6-160426** | Batch ID: **R85458** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160426B** | Analysis Date: **4/26/2016 3:49:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.207 | 0.0300 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Calcium | 4.99 | 0.300 | 5.00 | 0 | 99.9 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160426B**

| Sample ID **LCVL6-160426** | Batch ID: **R85458** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160426B** | Analysis Date: **4/26/2016 4:08:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0211 | 0.0300 | 0.0200 | 0 | 106 | 70 | 130 | | | |
| Calcium | 0.0978 | 0.300 | 0.100 | 0 | 97.8 | 70 | 130 | | | |

| Sample ID **CCV7-160426** | Batch ID: **R85458** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160426B** | Analysis Date: **4/26/2016 4:36:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.98 | 0.300 | 5.00 | 0 | 99.7 | 90 | 110 | | | |

| Sample ID **LCVL7-160426** | Batch ID: **R85458** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160426B** | Analysis Date: **4/26/2016 4:41:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0939 | 0.300 | 0.100 | 0 | 93.9 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160427A**

The QC data in batch 74670 applies to the following samples: 1604175-01A, 1604175-02A, 1604175-03A, 1604175-04A, 1604175-05A

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID **1604166-37B SD** | Batch ID: **74670** | TestNo: **SW6020A** | Units: **mg/L** | | | | |
| SampType: **SD** | Run ID: **ICP-MS4_160427A** | Analysis Date: **4/27/2016 2:12:00 PM** | Prep Date: **4/19/2016** | | | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 32.3 | 15.0 | 0 | 31.8 | | | | 1.55 | 10 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID **1604166-37B PDS** | Batch ID: **74670** | TestNo: **SW6020A** | Units: **mg/L** | | | | |
| SampType: **PDS** | Run ID: **ICP-MS4_160427A** | Analysis Date: **4/27/2016 2:21:00 PM** | Prep Date: **4/19/2016** | | | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 80.1 | 3.00 | 50.0 | 31.8 | 96.6 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160427A**

| Sample ID | **ICV-160427** | Batch ID: | **R85480** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **ICP-MS4_160427A** | Analysis Date: | **4/27/2016 1:41:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.51 | 0.300 | 2.50 | 0 | 100 | 90 | 110 | | | |

| Sample ID | **LCVL-160427** | Batch ID: | **R85480** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160427A** | Analysis Date: | **4/27/2016 1:55:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0931 | 0.300 | 0.100 | 0 | 93.1 | 70 | 130 | | | |

| Sample ID | **CCV1-160427** | Batch ID: | **R85480** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160427A** | Analysis Date: | **4/27/2016 2:23:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.89 | 0.300 | 5.00 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID | **LCVL1-160427** | Batch ID: | **R85480** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160427A** | Analysis Date: | **4/27/2016 2:28:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0945 | 0.300 | 0.100 | 0 | 94.5 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160428B**

The QC data in batch 74670 applies to the following samples: 1604175-01A, 1604175-02A, 1604175-03A, 1604175-04A, 1604175-05A

| Sample ID | **MB-74670** | Batch ID: | **74670** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_160428B** | Analysis Date: | **4/28/2016 12:38:00 PM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

| Sample ID | **LCS-74670** | Batch ID: | **74670** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_160428B** | Analysis Date: | **4/28/2016 12:41:00 PM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID | **LCSD-74670** | Batch ID: | **74670** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_160428B** | Analysis Date: | **4/28/2016 12:43:00 PM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.210 | 0.0300 | 0.200 | 0 | 105 | 80 | 120 | 3.72 | 15 | |

| Sample ID | **1604166-37B SD** | Batch ID: | **74670** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_160428B** | Analysis Date: | **4/28/2016 12:49:00 PM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.250 | 0.750 | 0 | 0.0590 | | | | 0 | 10 | |

| Sample ID | **1604166-37B PDS** | Batch ID: | **74670** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_160428B** | Analysis Date: | **4/28/2016 1:05:00 PM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 1.15 | 0.150 | 1.00 | 0.0590 | 109 | 80 | 120 | | | |

| Sample ID | **1604166-37B MS** | Batch ID: | **74670** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **ICP-MS4_160428B** | Analysis Date: | **4/28/2016 1:07:00 PM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.329 | 0.150 | 0.200 | 0.0590 | 135 | 80 | 120 | | | S |

| Sample ID | **1604166-37B MSD** | Batch ID: | **74670** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **ICP-MS4_160428B** | Analysis Date: | **4/28/2016 1:09:00 PM** | Prep Date: | **4/19/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.301 | 0.150 | 0.200 | 0.0590 | 121 | 80 | 120 | 8.63 | 15 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160428B**

| Sample ID **ICV-160428** | Batch ID: **R85511** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160428B** | Analysis Date: **4/28/2016 12:21:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.103 | 0.0300 | 0.100 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL-160428** | Batch ID: **R85511** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160428B** | Analysis Date: **4/28/2016 12:27:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0209 | 0.0300 | 0.0200 | 0 | 105 | 70 | 130 | | | |

| Sample ID **CCV1-160428** | Batch ID: **R85511** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160428B** | Analysis Date: **4/28/2016 1:19:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.197 | 0.0300 | 0.200 | 0 | 98.5 | 90 | 110 | | | |

| Sample ID **LCVL1-160428** | Batch ID: **R85511** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160428B** | Analysis Date: **4/28/2016 1:32:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0234 | 0.0300 | 0.0200 | 0 | 117 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_160425A**

The QC data in batch 74762 applies to the following samples: 1604175-11D, 1604175-12D, 1604175-13D, 1604175-14D, 1604175-15D, 1604175-16D, 1604175-17D

Sample ID **MB-74762** Batch ID: **74762** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_160425A** Analysis Date: **4/25/2016 9:40:38 AM** Prep Date: **4/25/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-74762** Batch ID: **74762** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_160425A** Analysis Date: **4/25/2016 9:55:14 AM** Prep Date: **4/25/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.29 | 1.00 | 10.00 | 0 | 92.9 | 90 | 110 | | | |
| Fluoride | 3.70 | 0.400 | 4.000 | 0 | 92.4 | 90 | 110 | | | |
| Sulfate | 29.9 | 3.00 | 30.00 | 0 | 99.7 | 90 | 110 | | | |

Sample ID **LCSD-74762** Batch ID: **74762** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_160425A** Analysis Date: **4/25/2016 10:09:51 AM** Prep Date: **4/25/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.21 | 1.00 | 10.00 | 0 | 92.1 | 90 | 110 | 0.829 | 20 | |
| Fluoride | 3.72 | 0.400 | 4.000 | 0 | 92.9 | 90 | 110 | 0.529 | 20 | |
| Sulfate | 29.8 | 3.00 | 30.00 | 0 | 99.2 | 90 | 110 | 0.490 | 20 | |

Sample ID **1604175-14DMS** Batch ID: **74762** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_160425A** Analysis Date: **4/25/2016 3:40:26 PM** Prep Date: **4/25/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2520 | 100 | 2000 | 565.9 | 97.9 | 90 | 110 | | | |
| Fluoride | 1950 | 40.0 | 2000 | 0 | 97.7 | 90 | 110 | | | |
| Sulfate | 2250 | 300 | 2000 | 145.5 | 105 | 90 | 110 | | | |

Sample ID **1604175-14DMSD** Batch ID: **74762** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_160425A** Analysis Date: **4/25/2016 3:55:03 PM** Prep Date: **4/25/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2530 | 100 | 2000 | 565.9 | 98.4 | 90 | 110 | 0.410 | 20 | |
| Fluoride | 1960 | 40.0 | 2000 | 0 | 97.9 | 90 | 110 | 0.189 | 20 | |
| Sulfate | 2270 | 300 | 2000 | 145.5 | 106 | 90 | 110 | 0.893 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_160425A**

| Sample ID **1604175-15DMS** | Batch ID: **74762** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_160425A** | Analysis Date: **4/25/2016 4:24:16 PM** | Prep Date: **4/25/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2540 | 100 | 2000 | 568.5 | 98.5 | 90 | 110 | | | |
| Fluoride | 1970 | 40.0 | 2000 | 0 | 98.3 | 90 | 110 | | | |
| Sulfate | 2270 | 300 | 2000 | 196.9 | 104 | 90 | 110 | | | |

| Sample ID **1604175-15DMSD** | Batch ID: **74762** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_160425A** | Analysis Date: **4/25/2016 4:38:52 PM** | Prep Date: **4/25/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2560 | 100 | 2000 | 568.5 | 99.5 | 90 | 110 | 0.832 | 20 | |
| Fluoride | 1980 | 40.0 | 2000 | 0 | 99.0 | 90 | 110 | 0.693 | 20 | |
| Sulfate | 2300 | 300 | 2000 | 196.9 | 105 | 90 | 110 | 1.32 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_160425A**

| Sample ID **ICV-160425** | Batch ID: **R85438** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_160425A** | Analysis Date: **4/25/2016 9:04:31 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 23.6 | 1.00 | 25.00 | 0 | 94.4 | 90 | 110 | | | |
| Fluoride | 9.59 | 0.400 | 10.00 | 0 | 95.9 | 90 | 110 | | | |
| Sulfate | 75.8 | 3.00 | 75.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **CCV1-160425** | Batch ID: **R85438** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_160425A** | Analysis Date: **4/25/2016 1:19:54 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.39 | 1.00 | 10.00 | 0 | 93.9 | 90 | 110 | | | |
| Fluoride | 3.81 | 0.400 | 4.000 | 0 | 95.2 | 90 | 110 | | | |
| Sulfate | 30.0 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV2-160425** | Batch ID: **R85438** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_160425A** | Analysis Date: **4/25/2016 5:08:05 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.26 | 1.00 | 10.00 | 0 | 92.6 | 90 | 110 | | | |
| Fluoride | 3.84 | 0.400 | 4.000 | 0 | 96.0 | 90 | 110 | | | |
| Sulfate | 30.0 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160425A**

The QC data in batch 74764 applies to the following samples: 1604175-01D, 1604175-02D, 1604175-03D, 1604175-04D, 1604175-05D, 1604175-06D, 1604175-07D, 1604175-08D, 1604175-09D, 1604175-10D

Sample ID **MB-74764** Batch ID: **74764** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_160425A** Analysis Date: **4/25/2016 10:01:12 AM** Prep Date: **4/25/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-74764** Batch ID: **74764** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_160425A** Analysis Date: **4/25/2016 10:16:12 AM** Prep Date: **4/25/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.56 | 1.00 | 10.00 | 0 | 95.6 | 90 | 110 | | | |
| Fluoride | 3.80 | 0.400 | 4.000 | 0 | 95.0 | 90 | 110 | | | |
| Sulfate | 28.4 | 3.00 | 30.00 | 0 | 94.6 | 90 | 110 | | | |

Sample ID **LCSD-74764** Batch ID: **74764** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_160425A** Analysis Date: **4/25/2016 10:31:12 AM** Prep Date: **4/25/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.58 | 1.00 | 10.00 | 0 | 95.8 | 90 | 110 | 0.181 | 20 | |
| Fluoride | 3.81 | 0.400 | 4.000 | 0 | 95.3 | 90 | 110 | 0.344 | 20 | |
| Sulfate | 28.8 | 3.00 | 30.00 | 0 | 96.0 | 90 | 110 | 1.39 | 20 | |

Sample ID **1604175-09DMS** Batch ID: **74764** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_160425A** Analysis Date: **4/25/2016 4:28:44 PM** Prep Date: **4/25/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2450 | 100 | 2000 | 393.1 | 103 | 90 | 110 | | | |
| Fluoride | 2020 | 40.0 | 2000 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 2040 | 300 | 2000 | 0 | 102 | 90 | 110 | | | |

Sample ID **1604175-09DMSD** Batch ID: **74764** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_160425A** Analysis Date: **4/25/2016 4:43:44 PM** Prep Date: **4/25/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2470 | 100 | 2000 | 393.1 | 104 | 90 | 110 | 0.690 | 20 | |
| Fluoride | 2040 | 40.0 | 2000 | 0 | 102 | 90 | 110 | 0.972 | 20 | |
| Sulfate | 2090 | 300 | 2000 | 0 | 104 | 90 | 110 | 2.12 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160425A**

| Sample ID **ICV-160425** | Batch ID: **R85439** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_160425A** | Analysis Date: **4/25/2016 9:19:38 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 23.7 | 1.00 | 25.00 | 0 | 94.8 | 90 | 110 | | | |
| Fluoride | 9.45 | 0.400 | 10.00 | 0 | 94.5 | 90 | 110 | | | |
| Sulfate | 71.2 | 3.00 | 75.00 | 0 | 94.9 | 90 | 110 | | | |

| Sample ID **CCV1-160425** | Batch ID: **R85439** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160425A** | Analysis Date: **4/25/2016 1:36:48 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.0 | 1.00 | 10.00 | 0 | 100 | 90 | 110 | | | |
| Fluoride | 3.97 | 0.400 | 4.000 | 0 | 99.3 | 90 | 110 | | | |
| Sulfate | 29.7 | 3.00 | 30.00 | 0 | 98.8 | 90 | 110 | | | |

| Sample ID **CCV2-160425** | Batch ID: **R85439** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160425A** | Analysis Date: **4/25/2016 5:13:44 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.39 | 1.00 | 10.00 | 0 | 93.9 | 90 | 110 | | | |
| Fluoride | 3.70 | 0.400 | 4.000 | 0 | 92.6 | 90 | 110 | | | |
| Sulfate | 28.0 | 3.00 | 30.00 | 0 | 93.3 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1604175

**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160420A**

The QC data in batch 74689 applies to the following samples: 1604175-01D, 1604175-02D, 1604175-03D, 1604175-04D, 1604175-05D, 1604175-06D, 1604175-07D, 1604175-08D, 1604175-09D, 1604175-10D, 1604175-11D, 1604175-12D, 1604175-13D, 1604175-14D, 1604175-15D, 1604175-16D, 1604175-17D

| Sample ID | **1604175-01D-DUP** | Batch ID: | **74689** | TestNo: | **M4500-H+ B** | Units: | **pH Units@17.6℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **TITRATOR_160420A** | Analysis Date: | **4/20/2016 9:33:00 AM** | Prep Date: | **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 0 | 7.000 | | | | 0.429 | 5 | |

| Sample ID | **1604176-01B-DUP** | Batch ID: | **74689** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.2℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **TITRATOR_160420A** | Analysis Date: | **4/20/2016 10:21:00 AM** | Prep Date: | **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.84 | 0 | 0 | 7.860 | | | | 0.255 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160420A**

| Sample ID | **ICV-160420** | Batch ID: | **R85330** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.8℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_160420A** | Analysis Date: | **4/20/2016 8:36:00 AM** | Prep Date: | **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 10.0 | 0 | 10.00 | 0 | 100 | 99 | 101 | | | |

| Sample ID | **CCV1-160420** | Batch ID: | **R85330** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160420A** | Analysis Date: | **4/20/2016 9:52:00 AM** | Prep Date: | **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.04 | 0 | 7.000 | 0 | 101 | 97.1 | 102.9 | | | |

| Sample ID | **CCV2-160420** | Batch ID: | **R85330** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.5℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160420A** | Analysis Date: | **4/20/2016 10:23:00 AM** | Prep Date: | **4/20/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.05 | 0 | 7.000 | 0 | 101 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1604175
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_160420A**

The QC data in batch 74704 applies to the following samples: 1604175-01D, 1604175-02D, 1604175-03D, 1604175-04D, 1604175-05D, 1604175-06D, 1604175-07D, 1604175-08D, 1604175-09D, 1604175-10D, 1604175-11D, 1604175-12D, 1604175-13D, 1604175-14D, 1604175-15D, 1604175-16D, 1604175-17D

Sample ID **MB-74704** Batch ID: **74704** TestNo: **M2540C** Units: **mg/L**
SampType: **MBLK** Run ID: **WC_160420A** Analysis Date: **4/21/2016 8:40:00 AM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

Sample ID **LCS-74704** Batch ID: **74704** TestNo: **M2540C** Units: **mg/L**
SampType: **LCS** Run ID: **WC_160420A** Analysis Date: **4/21/2016 8:40:00 AM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 754 | 10.0 | 745.6 | 0 | 101 | 90 | 113 | | | |

Sample ID **1604202-01A-DUP** Batch ID: **74704** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_160420A** Analysis Date: **4/21/2016 8:40:00 AM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 13100 | 200 | 0 | 12900 | | | | 1.54 | 5 | |

Sample ID **1604202-03A-DUP** Batch ID: **74704** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_160420A** Analysis Date: **4/21/2016 8:40:00 AM** Prep Date: **4/20/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 23100 | 200 | 0 | 22160 | | | | 4.07 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# Case Narrative

## Lab No: 20160374

This report contains the analytical results for the 17 sample(s) received under chain of custody by ESC Lab Sciences on 04/20/16 10:38:16. These samples are associated with your 1604175 project.

The analytical results included in this report meet all applicable quality control procedure requirements except as noted below:

The test results in this report meet all NELAC requirements unless noted below:

This report shall not be reproduced, except in full, without the written approval of ESC Lab Sciences.

All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client.

Results have been reviewed by the Director of Radiochemistry or their designees and is approved for release.

**Observations / Nonconformances**

The following QC parameters are outside method control limits:
Ra-226 MS % Rec & MSD RPD SDG R1076

Sample -07 Ra-228 was confirmed.


*OUTREACH LABORATORY, A Divsion of ESC Lab Sciences*
*Address: 311 North Aspen Avenue, Broken Arrow, OK, 74012 EMail: outreach@esclabsciences.com - Tel: (918) 251-2515*

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160374-01** | | | | | | | | |
| **Client ID** : **FGD-2** | | | | | | | | |
| **Date Sampled** : **04/14/16 08:15:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 0.198 +/- 1.19 | 2.22 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.198 +/- 0.149 | 0.196 | pCi/l | | 04/25/16 | 04/27/16 | AK |
| Radium-228 | EPA 904*/9320* | -0.394 +/- 1.04 | 2.03 | pCi/l | | 05/13/16 | 05/16/16 | AE |
| **Lab ID** : **20160374-02** | | | | | | | | |
| **Client ID** : **FGD-3** | | | | | | | | |
| **Date Sampled** : **04/14/16 09:05:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 0.639 +/- 1.00 | 1.63 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.096 +/- 0.172 | 0.276 | pCi/l | | 04/25/16 | 04/27/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.543 +/- 0.823 | 1.35 | pCi/l | | 05/13/16 | 05/16/16 | AE |
| **Lab ID** : **20160374-03** | | | | | | | | |
| **Client ID** : **FGD-6** | | | | | | | | |
| **Date Sampled** : **04/14/16 10:00:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 2.56 +/- 1.38 | 2.10 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.484 +/- 0.355 | 0.439 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.08 +/- 1.02 | 1.66 | pCi/l | | 05/13/16 | 05/20/16 | AE |
| **Lab ID** : **20160374-04** | | | | | | | | |
| **Client ID** : **FGD-4** | | | | | | | | |
| **Date Sampled** : **04/14/16 10:50:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 0.868 +/- 1.04 | 1.39 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.560 +/- 0.223 | 0.184 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.31 +/- 0.814 | 1.21 | pCi/l | | 05/13/16 | 05/20/16 | AE |

*NELAC Certified Parameter BDL = Below Detection Limit

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160374-05** | | | | | | | | |
| **Client ID** : **FGD-5** | | | | | | | | |
| **Date Sampled** : **04/14/16 11:40:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 2.00 +/- 1.32 | 1.68 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.951 +/- 0.430 | 0.439 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.05 +/- 0.895 | 1.24 | pCi/l | | 05/13/16 | 05/16/16 | AE |
| **Lab ID** : **20160374-06** | | | | | | | | |
| **Client ID** : **FDG-1** | | | | | | | | |
| **Date Sampled** : **04/14/16 12:35:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 0.354 +/- 1.10 | 1.72 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.024 +/- 0.256 | 0.439 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.330 +/- 0.844 | 1.28 | pCi/l | | 05/13/16 | 05/16/16 | AE |
| **Lab ID** : **20160374-07** | | | | | | | | |
| **Client ID** : **FGD-8** | | | | | | | | |
| **Date Sampled** : **04/14/16 14:50:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 9.31 +/- 1.10 | 2.54 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.973 +/- 0.275 | 0.304 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 8.34 +/- 0.822 | 2.24 | pCi/l | | 05/13/16 | 05/20/16 | AE |
| **Lab ID** : **20160374-08** | | | | | | | | |
| **Client ID** : **FGD-12** | | | | | | | | |
| **Date Sampled** : **04/14/16 15:40:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 2.02 +/- 1.11 | 1.27 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.560 +/- 0.330 | 0.329 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.46 +/- 0.777 | 0.944 | pCi/l | | 05/13/16 | 05/16/16 | AE |

*NELAC Certified Parameter BDL = Below Detection Limit

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160374-09** | | | | | | | | |
| **Client ID** : **FGD-11** | | | | | | | | |
| **Date Sampled** : **04/14/16 16:30:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 4.12 +/- 1.19 | 1.20 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.69 +/- 0.412 | 0.199 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.43 +/- 0.780 | 1.00 | pCi/l | | 05/13/16 | 05/16/16 | AE |
| **Lab ID** : **20160374-10** | | | | | | | | |
| **Client ID** : **MW-07** | | | | | | | | |
| **Date Sampled** : **04/15/16 07:50:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 0.863 +/- 1.30 | 1.78 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.214 +/- 0.234 | 0.344 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.650 +/- 1.07 | 1.43 | pCi/l | | 05/13/16 | 05/16/16 | AE |
| **Lab ID** : **20160374-11** | | | | | | | | |
| **Client ID** : **AL-10** | | | | | | | | |
| **Date Sampled** : **04/15/16 09:15:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 1.12 +/- 2.38 | 3.32 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.586 +/- 0.426 | 0.562 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.532 +/- 1.96 | 2.76 | pCi/l | | 05/13/16 | 05/20/16 | AE |
| **Lab ID** : **20160374-12** | | | | | | | | |
| **Client ID** : **MW-02** | | | | | | | | |
| **Date Sampled** : **04/15/16 10:20:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 0.555 +/- 1.45 | 2.46 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.555 +/- 0.503 | 0.716 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | -0.263 +/- 0.946 | 1.74 | pCi/l | | 05/13/16 | 05/16/16 | AE |

*NELAC Certified Parameter BDL = Below Detection Limit

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160374-13** | | | | | | | | |
| **Client ID** : **MW-09** | | | | | | | | |
| **Date Sampled** : **04/15/16 11:20:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 3.56 +/- 1.14 | 1.30 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.883 +/- 0.243 | 0.140 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.68 +/- 0.896 | 1.16 | pCi/l | | 05/13/16 | 05/16/16 | AE |
| **Lab ID** : **20160374-14** | | | | | | | | |
| **Client ID** : **MW-08** | | | | | | | | |
| **Date Sampled** : **04/15/16 12:25:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 3.57 +/- 1.29 | 1.90 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.537 +/- 0.191 | 0.197 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 3.03 +/- 1.10 | 1.70 | pCi/l | | 05/13/16 | 05/20/16 | AE |
| **Lab ID** : **20160374-15** | | | | | | | | |
| **Client ID** : **DUP-1** | | | | | | | | |
| **Date Sampled** : **04/15/16 12:25:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 3.05 +/- 1.130 | 1.39 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.973 +/- 0.269 | 0.157 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.07 +/- 0.861 | 1.23 | pCi/l | | 05/13/16 | 05/16/16 | AE |
| **Lab ID** : **20160374-16** | | | | | | | | |
| **Client ID** : **EB-1** | | | | | | | | |
| **Date Sampled** : **04/15/16 08:25:00** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 0.412 +/- 1.32 | 1.77 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.412 +/- 0.178 | 0.177 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | -0.322 +/- 1.14 | 1.59 | pCi/l | | 05/13/16 | 05/16/16 | AE |

*NELAC Certified Parameter BDL = Below Detection Limit

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : | **20160374-17** | | | | | | | |
| **Client ID** : | **MW-05** | | | | | | | |
| **Date Sampled** : | **04/15/16 13:40:00** | | | | | | | |
| **Matrix** : | **NPW** | | | | | | | |
| | **Radiochemical Analyses** | | | | | | | |
| Combined Radium | | 3.83 +/- 1.21 | 1.29 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.10 +/- 0.265 | 0.137 | pCi/l | | 04/27/16 | 04/29/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.73 +/- 0.947 | 1.15 | pCi/l | | 05/13/16 | 05/16/16 | AE |

# QC Report

| Parameter | Blank | LCS %REC | LCSD %REC | LCSD RPD | DUP RPD | RER, NAD or DER | MS %REC | MSD %REC | MSD RPD | Date |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.00 | 92.4 | | | NC | 0.695 | 97.7 | 71.4 | 30.9 | 05/03/16 |
| Radium-228 | -0.244 | 113.0 | | | NC | 0.871 | 126.0 | 130.0 | 2.7 | 05/16/16 |

**Lab Approval:**

*NELAC Certified Parameter BDL = Below Detection Limit

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1604175

**Subcontractor:**

ESC Laboratory
311 North Aspen
Broken Arrow, Oklahoma 74012

TEL: (918) 251-2515
FAX:
Acct #: DHLRRTX

**18-Apr-16**

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E904.0 | SM7500Ra-B M | | | | |
| FGD-2 | Aqueous | -01B | 04/14/16 08:15 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-2 | Aqueous | -01C | 04/14/16 08:15 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-3 | Aqueous | -02B | 04/14/16 09:05 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-3 | Aqueous | -02C | 04/14/16 09:05 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-6 | Aqueous | -03B | 04/14/16 10:00 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-6 | Aqueous | -03C | 04/14/16 10:00 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-4 | Aqueous | -04B | 04/14/16 10:50 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-4 | Aqueous | -04C | 04/14/16 10:50 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-5 | Aqueous | -05B | 04/14/16 11:40 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-5 | Aqueous | -05C | 04/14/16 11:40 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-1 | Aqueous | -06B | 04/14/16 12:35 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-1 | Aqueous | -06C | 04/14/16 12:35 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-8 | Aqueous | -07B | 04/14/16 02:50 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-8 | Aqueous | -07C | 04/14/16 02:50 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-12 | Aqueous | -08B | 04/14/16 03:40 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-12 | Aqueous | -08C | 04/14/16 03:40 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-11 | Aqueous | -09B | 04/14/16 04:30 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-11 | Aqueous | -09C | 04/14/16 04:30 PM | 500HDPEHNO3 | | 1 | | | | |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs DHLRRTX033116S.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| Relinquished by: | Jorge | 4/18/16 17:30 | Received by: | LoneStar | 4/18/16 17:30 |
| Relinquished by: | | | Received by: | | 4/20/16 10:38 |

20160374

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1604175

**Subcontractor:**

ESC Laboratory
311 North Aspen
Broken Arrow, Oklahoma 74012

TEL: (918) 251-2515
FAX:
Acct #: DHLRRTX

**18-Apr-16**

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E904.0 | SM7500Ra-B M | | | | |
| MW-07 | Aqueous | -10B | 04/15/16 07:50 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-07 | Aqueous | -10C | 04/15/16 07:50 AM | 500HDPEHNO3 | | 1 | | | | |
| AL-10 | Aqueous | -11B | 04/15/16 09:15 AM | 500HDPEHNO3 | 1 | | | | | |
| AL-10 | Aqueous | -11C | 04/15/16 09:15 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-02 | Aqueous | -12B | 04/15/16 10:20 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-02 | Aqueous | -12C | 04/15/16 10:20 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-09 | Aqueous | -13B | 04/15/16 11:20 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-09 | Aqueous | -13C | 04/15/16 11:20 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-08 | Aqueous | -14B | 04/15/16 12:25 PM | 500HDPEHNO3 | 1 | | | | | |
| MW-08 | Aqueous | -14C | 04/15/16 12:25 PM | 500HDPEHNO3 | | 1 | | | | |
| DUP-1 | Aqueous | -15B | 04/15/16 12:25 PM | 500HDPEHNO3 | 1 | | | | | |
| DUP-1 | Aqueous | -15C | 04/15/16 12:25 PM | 500HDPEHNO3 | | 1 | | | | |
| EB-1 | Equip Blank | -16B | 04/15/16 08:25 AM | 500HDPEHNO3 | 1 | | | | | |
| EB-1 | Equip Blank | -16C | 04/15/16 08:25 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-05 | Aqueous | -17B | 04/15/16 01:40 PM | 500HDPEHNO3 | 1 | | | | | |
| MW-05 | Aqueous | -17C | 04/15/16 01:40 PM | 500HDPEHNO3 | | 1 | | | | |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs DHLRRTX033116S.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

L830741

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | J Hoover | 4/18/16 17:30 | **Received by:** | LoneStar | 4/18/16 17:30 |
| **Relinquished by:** | | | **Received by:** | | 4/20/16 1038 |

20160374

# SAMPLE LOGIN

**Date Received:** *04/20/16 10:38:16* **Lab Number:** **20160374** **Due:** **05/18/16**

| Sample Number | Client Sample ID | Matrix | Date Sampled | Container Type | Container Size | Preservation | Preserved Upon Receipt | Custody Seal | Seal Intact |
|---|---|---|---|---|---|---|---|---|---|
| **20160374-01 B** | FGD-2 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20160374-01 A** | FGD-2 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-02 A** | FGD-3 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20160374-02 B** | FGD-3 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-03 A** | FGD-6 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20160374-03 B** | FGD-6 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-04 B** | FGD-4 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20160374-04 A** | FGD-4 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-05 A** | FGD-5 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20160374-05 B** | FGD-5 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-06 A** | FDG-1 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20160374-06 B** | FDG-1 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-07 A** | FGD-8 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20160374-07 B** | FGD-8 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **20160374-08 A** | FGD-12 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| **20160374-08 B** | FGD-12 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-09 B** | FGD-11 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| **20160374-09 A** | FGD-11 | NPW | 04/14/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-10 A** | MW-07 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| **20160374-10 B** | MW-07 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-11 A** | AL-10 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| **20160374-11 B** | AL-10 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-12 A** | MW-02 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| **20160374-12 B** | MW-02 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-13 A** | MW-09 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| **20160374-13 B** | MW-09 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-14 B** | MW-08 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| **20160374-14 A** | MW-08 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-15 A** | DUP-1 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| **20160374-15 B** | DUP-1 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160374-16 A** | EB-1 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| **20160374-16 B** | EB-1 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Radium-226<br>Radium-228 | | | SM 7500 Ra B M*<br>EPA 904*/9320* | | | | | | |
| **20160374-17 B** | MW-05 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160374-17 A** | MW-05 | NPW | 04/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226<br>Radium-228 | | | SM 7500 Ra B M*<br>EPA 904*/9320* | | | | | | |

**CONTAINER INSPECTION**

**# Coolers** 2 **Custody Seals Broken** ND **Temperature:** C **Ice** **Radiation Survey:** <300 cpm

**SAMPLE INSPECTION**

**Sample Seal Broken** No **Chain of Custody Record** ✔ **Labels in Tact** ☑ + **Radiation Survey Complete** ☐

**Anomalies** sample -10, "mw-07", customer has two labels, a hand written 04/20/16 JD labd w.th sample dat. "04/14/16" and a printed label (which matches coc) with "04/15/16" JD

**Inspected By:** _____ **DATE** 4/20/16

**QA or Designee Review:** Raymond Vaughn **DATE** 04/20/16

**Sample Custodian Review:** _____ **DATE** _____

**Project Notes:**

August 03, 2016

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1606193

RE: Oak Grove

Dear Will Vienne:

DHL Analytical, Inc. received 17 sample(s) on 6/17/2016 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-16-16

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 71585

# CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 6-16-16 PAGE 1 OF 2
PO #: 5164-D DHL WORK ORDER #: 1606193
PROJECT LOCATION OR NAME: OAKGROVE-
CLENT PROJECT #: 5164-D COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT
P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl, $HNO_3$, $H_2SO_4$ ❑ NaOH ❑, ICE, UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ (METHOD 8021); TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑; GRO (METHOD 8015) ❑ DRO (METHOD 8105) ❑; VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑; SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑; 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑; 8270 O-P PEST ❑ 8082 PCB ❑ 608 PCB ❑; 8321 HERB ❑ T PHOS; AMMONIA ❑; METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑; RCRA ❑ TX11 ❑ ____ ❑; PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑; CHLORIDE ❑ ANIONS ❑; TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑; TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑; RCI ❑ FLASHPOINT ❑ DGAS ❑; TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑; SEE ATTACHED

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-3 | 01 | 6-14-16 | 1100 | W | P | 4 | | | | X | | |
| FGD-4 | 02 | | 1155 | W | P | 4 | | | | X | | |
| FGD-6 | 03 | | 1255 | W | P | 4 | | | | X | | |
| FGD-2 | 04 | | 1350 | W | P | 4 | | | | X | | |
| FGD-8 | 05 | | 1500 | W | P | 4 | | | | X | | |
| FGD-1 | 06 | 6-15-16 | 1555 | W | P | 4 | | | | X | | |
| FGD-11 | 07 | | 1005 | W | P | 4 | | | | X | | |
| FGD-12 | 08 | | 1105 | W | P | 4 | | | | X | | |
| FGD-5 | 09 | | 1200 | W | P | 4 | | | | X | | |
| MW-07 | 10 | | 1320 | W | P | 4 | | | | X | | |
| MW-05 | 11 | | 1415 | W | P | 4 | | | | X | | |
| MW-09 | 12 | | 1605 | W | P | 4 | | | | X | | |
| BL-10 | 13 | 6-16-16 | 0835 | W | P | 4 | | | | X | | |
| MW-02 | 14 | | 1040 | W | P | 4 | | | | X | | |
| MW-08 | 15 | | 1250 | W | P | 4 | | | | X | | |

RELINQUISHED BY: (Signature) DATE/TIME 6-16-16 1730 RECEIVED BY: (Signature) FedEx
RELINQUISHED BY: (Signature) FedEx DATE/TIME 6/17/16 10:00 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☑
OTHER ❑ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 5.3, 5.1.5.1 THERM #: -78
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ☒ NOT USED
CARRIER: ❑ LONE STAR ☒ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED


❑ DHL DISPOSAL @ $5.00 each ❑ Return

DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 71586

# CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 6-16-16 PAGE 2 OF 2
PO #: 5164-D DHL WORK ORDER #: 1606193
PROJECT LOCATION OR NAME: OAK GROVE
CLENT PROJECT #: 5164-D COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL P=PAINT
W=WATER SL=SLUDGE
A=AIR O=OTHER
L=LIQUID SO=SOLID
SE=SEDIMENT

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ ___ ☐ | RCRA ☐ TX11 ☐ ___ | PH ☐ HEX. CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ___ ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | SEE ATTACHED

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | SEE ATTACHED | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DUP-1 | 16 | 6-16-16 | 1250 | W | P | 4 | | | | X | | X | |
| EB-1 | 17 | 1 | 1330 | W | P | 4 | | | | X | | X | |

OP 6/17/16

RELINQUISHED BY: (Signature) DATE/TIME 6-16-16 1730 RECEIVED BY: (Signature) FedEx
RELINQUISHED BY: (Signature) FedEx DATE/TIME 6/17/16 10:20 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

APPENDIX F Revision 1 November 21, 2022

☐ DHL DISPOSAL @ $5.00 each ☐ Return



**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ ___

**LABORATORY USE ONLY:**
RECEIVING TEMP: 5.3 5.1 THERM #: 76
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

John Dupont

From: Sara Taube [Sara.Taube@pbwllc.com]
Sent: Wednesday, July 22, 2015 12:06 PM
To: John Dupont
Subject: CCR Appendix III and IV
Follow Up Flag: Follow up
Flag Status: Completed

Hi John,

Here are the Appendix III and Appendix IV constituents that we will need to have analyzed under the CCR Rule.

Appendix III
Boron
Calcium
Chloride
Fluoride
pH
sulfate
TDS

Appendix IV
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluorids
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228

We are looking to have approximately 74 wells sampled 8 times over the course of the next two years. Please let me know if there is any more information you might need.

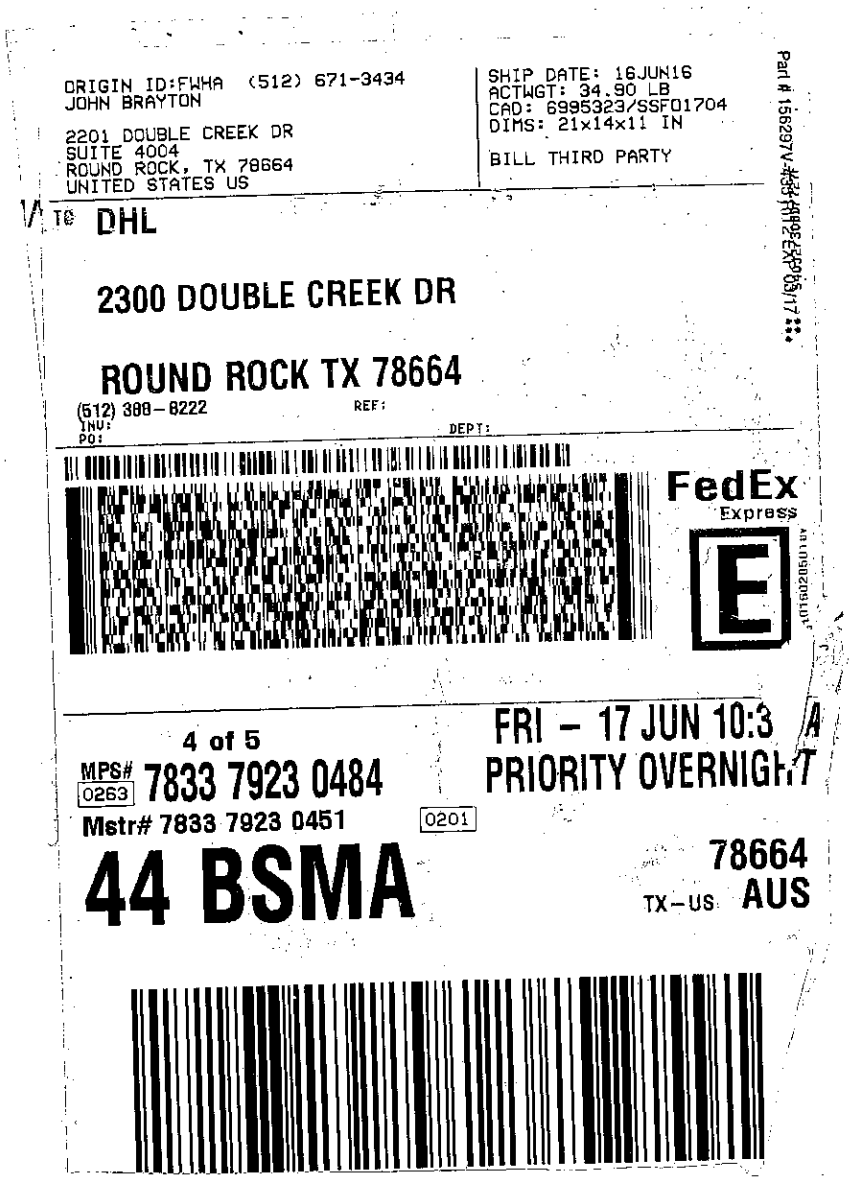
Cheers,

Sara

10/26/2015

ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON
2201 DOUBLE CREEK DR
SUITE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DATE: 16JUN16
ACTWGT: 52.90 LB
CAD: 6995323/SSFO1704
DIMS: 23x16x14 IN
BILL THIRD PARTY
TO DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
INV:
PO:
REF:
DEPT:
FedEx Express
2 of 5
MPS# 0263 7833 7923 0462
Mstr# 7833 7923 0451
0201
FRI - 17 JUN 10:30A
PRIORITY OVERNIGHT
44 BSMA
78664
TX-US AUS

ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON
2201 DOUBLE CREEK DR
SUITE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DATE: 16JUN16
ACTWGT: 62.80 LB
CAD: 6995323/SSFO1704
DIMS: 25x14x13 IN
BILL THIRD PARTY
TO DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
INV:
PO:
REF:
DEPT:
FedEx Express
1 of 5
TRK# 0201 7833 7923 0451
FRI - 17 JUN 10:30A
PRIORITY OVERNIGHT
78664
TX-US AUS
RT 512
FZ
10:30


ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON
2201 DOUBLE CREEK DR
SUITE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DATE: 16JUN16
ACTWGT: 34.90 LB
CAD: 6995323/SSF01704
DIMS: 21x14x11 IN
BILL THIRD PARTY
TO DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
REF:
INV:
PO:
DEPT:
FedEx
Express
4 of 5
MPS# 0263 7833 7923 0484
Mstr# 7833 7923 0451
0201
FRI - 17 JUN 10:3
PRIORITY OVERNIGHT
44 BSMA
78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Pastor, Behling & Wheeler** Date Received: **6/17/2016**

Work Order Number **1606193** Received by **JT**

Checklist completed by: _____ 6/17/2016 (Signature / Date) Reviewed by _____ 6/17/2016 (Initials / Date)

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 5.3 °C 5.1 5.1 |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? NO | | Checked by |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *03-Aug-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Oak Grove
**Lab Order:** 1606193

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904/9320 and SM 7500 Ra B M. Analyzed at ESC Lab Sciences.

## LOG IN

The samples were received and log-in performed on 6/17/16. A total of 17 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 6/29/16 the RPD for the serial dilution was above control limits for Boron. This is flagged accordingly in the QC summary report. The PDS was within control limits for this analyte. No further corrective actions were taken.

## TDS ANALYSIS

For TDS analysis performed on 6/21/16 (batch 75770) the sample and sample duplicate (1606193-05 & 1606193-05 DUP) had the RPD above control limits. This was due to the sample being silty. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *03-Aug-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Oak Grove
**Lab Order:** 1606193

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1606193-01 | FGD-3 | | 06/14/16 11:00 AM | 6/17/2016 |
| 1606193-02 | FGD-4 | | 06/14/16 11:55 AM | 6/17/2016 |
| 1606193-03 | FGD-6 | | 06/14/16 12:55 PM | 6/17/2016 |
| 1606193-04 | FGD-2 | | 06/14/16 01:50 PM | 6/17/2016 |
| 1606193-05 | FGD-8 | | 06/14/16 03:00 PM | 6/17/2016 |
| 1606193-06 | FGD-1 | | 06/15/16 03:55 PM | 6/17/2016 |
| 1606193-07 | FGD-11 | | 06/15/16 10:05 AM | 6/17/2016 |
| 1606193-08 | FGD-12 | | 06/15/16 11:05 AM | 6/17/2016 |
| 1606193-09 | FGD-5 | | 06/15/16 12:00 PM | 6/17/2016 |
| 1606193-10 | MW-07 | | 06/15/16 01:20 PM | 6/17/2016 |
| 1606193-11 | MW-05 | | 06/15/16 02:15 PM | 6/17/2016 |
| 1606193-12 | MW-09 | | 06/15/16 04:05 PM | 6/17/2016 |
| 1606193-13 | AL-10 | | 06/16/16 08:35 AM | 6/17/2016 |
| 1606193-14 | MW-02 | | 06/16/16 10:40 AM | 6/17/2016 |
| 1606193-15 | MW-08 | | 06/16/16 12:50 PM | 6/17/2016 |
| 1606193-16 | DUP-1 | | 06/16/16 12:50 PM | 6/17/2016 |
| 1606193-17 | EB-1 | | 06/16/16 01:30 PM | 6/17/2016 |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1606193-01A | FGD-3 | 06/14/16 11:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-3 | 06/14/16 11:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-3 | 06/14/16 11:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-3 | 06/14/16 11:00 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/21/16 09:19 AM | 75769 |
| 1606193-01D | FGD-3 | 06/14/16 11:00 AM | Aqueous | E300 | Anion Preparation | 06/23/16 08:57 AM | 75822 |
| | FGD-3 | 06/14/16 11:00 AM | Aqueous | E300 | Anion Preparation | 06/23/16 08:57 AM | 75822 |
| | FGD-3 | 06/14/16 11:00 AM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | FGD-3 | 06/14/16 11:00 AM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-02A | FGD-4 | 06/14/16 11:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-4 | 06/14/16 11:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-4 | 06/14/16 11:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-4 | 06/14/16 11:55 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/21/16 09:19 AM | 75769 |
| 1606193-02D | FGD-4 | 06/14/16 11:55 AM | Aqueous | E300 | Anion Preparation | 06/23/16 08:57 AM | 75822 |
| | FGD-4 | 06/14/16 11:55 AM | Aqueous | E300 | Anion Preparation | 06/23/16 08:57 AM | 75822 |
| | FGD-4 | 06/14/16 11:55 AM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | FGD-4 | 06/14/16 11:55 AM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-03A | FGD-6 | 06/14/16 12:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-6 | 06/14/16 12:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-6 | 06/14/16 12:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-6 | 06/14/16 12:55 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/21/16 09:19 AM | 75769 |
| 1606193-03D | FGD-6 | 06/14/16 12:55 PM | Aqueous | E300 | Anion Preparation | 06/23/16 08:57 AM | 75822 |
| | FGD-6 | 06/14/16 12:55 PM | Aqueous | E300 | Anion Preparation | 06/23/16 08:57 AM | 75822 |
| | FGD-6 | 06/14/16 12:55 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | FGD-6 | 06/14/16 12:55 PM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-04A | FGD-2 | 06/14/16 01:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-2 | 06/14/16 01:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-2 | 06/14/16 01:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-2 | 06/14/16 01:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/21/16 09:19 AM | 75769 |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1606193-04D | FGD-2 | 06/14/16 01:50 PM | Aqueous | E300 | Anion Preparation | 06/23/16 08:57 AM | 75822 |
| | FGD-2 | 06/14/16 01:50 PM | Aqueous | E300 | Anion Preparation | 06/23/16 08:57 AM | 75822 |
| | FGD-2 | 06/14/16 01:50 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | FGD-2 | 06/14/16 01:50 PM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-05A | FGD-8 | 06/14/16 03:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-8 | 06/14/16 03:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-8 | 06/14/16 03:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-8 | 06/14/16 03:00 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/21/16 09:19 AM | 75769 |
| 1606193-05D | FGD-8 | 06/14/16 03:00 PM | Aqueous | E300 | Anion Preparation | 06/23/16 08:57 AM | 75822 |
| | FGD-8 | 06/14/16 03:00 PM | Aqueous | E300 | Anion Preparation | 06/23/16 08:57 AM | 75822 |
| | FGD-8 | 06/14/16 03:00 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | FGD-8 | 06/14/16 03:00 PM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-06A | FGD-1 | 06/15/16 03:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-1 | 06/15/16 03:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-1 | 06/15/16 03:55 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-1 | 06/15/16 03:55 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/21/16 09:19 AM | 75769 |
| 1606193-06D | FGD-1 | 06/15/16 03:55 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | FGD-1 | 06/15/16 03:55 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | FGD-1 | 06/15/16 03:55 PM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-07A | FGD-11 | 06/15/16 10:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-11 | 06/15/16 10:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-11 | 06/15/16 10:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-11 | 06/15/16 10:05 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-07D | FGD-11 | 06/15/16 10:05 AM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | FGD-11 | 06/15/16 10:05 AM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | FGD-11 | 06/15/16 10:05 AM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | FGD-11 | 06/15/16 10:05 AM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-08A | FGD-12 | 06/15/16 11:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1606193-08A | FGD-12 | 06/15/16 11:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-12 | 06/15/16 11:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-12 | 06/15/16 11:05 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-08D | FGD-12 | 06/15/16 11:05 AM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | FGD-12 | 06/15/16 11:05 AM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | FGD-12 | 06/15/16 11:05 AM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-09A | FGD-5 | 06/15/16 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-5 | 06/15/16 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-5 | 06/15/16 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-5 | 06/15/16 12:00 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-09D | FGD-5 | 06/15/16 12:00 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | FGD-5 | 06/15/16 12:00 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | FGD-5 | 06/15/16 12:00 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | FGD-5 | 06/15/16 12:00 PM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-10A | MW-07 | 06/15/16 01:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-07 | 06/15/16 01:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-07 | 06/15/16 01:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-07 | 06/15/16 01:20 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-10D | MW-07 | 06/15/16 01:20 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | MW-07 | 06/15/16 01:20 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | MW-07 | 06/15/16 01:20 PM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-11A | MW-05 | 06/15/16 02:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-05 | 06/15/16 02:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-05 | 06/15/16 02:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-05 | 06/15/16 02:15 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-11D | MW-05 | 06/15/16 02:15 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | MW-05 | 06/15/16 02:15 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | MW-05 | 06/15/16 02:15 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1606193-11D | MW-05 | 06/15/16 02:15 PM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-12A | MW-09 | 06/15/16 04:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-09 | 06/15/16 04:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-09 | 06/15/16 04:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-09 | 06/15/16 04:05 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-12D | MW-09 | 06/15/16 04:05 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | MW-09 | 06/15/16 04:05 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | MW-09 | 06/15/16 04:05 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | MW-09 | 06/15/16 04:05 PM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-13A | AL-10 | 06/16/16 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | AL-10 | 06/16/16 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | AL-10 | 06/16/16 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | AL-10 | 06/16/16 08:35 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-13D | AL-10 | 06/16/16 08:35 AM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | AL-10 | 06/16/16 08:35 AM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | AL-10 | 06/16/16 08:35 AM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | AL-10 | 06/16/16 08:35 AM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-14A | MW-02 | 06/16/16 10:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-02 | 06/16/16 10:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-02 | 06/16/16 10:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-02 | 06/16/16 10:40 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-14D | MW-02 | 06/16/16 10:40 AM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | MW-02 | 06/16/16 10:40 AM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | MW-02 | 06/16/16 10:40 AM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 12:32 PM | 75719 |
| | MW-02 | 06/16/16 10:40 AM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-15A | MW-08 | 06/16/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-08 | 06/16/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | MW-08 | 06/16/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1606193-15A | MW-08 | 06/16/16 12:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-15D | MW-08 | 06/16/16 12:50 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | MW-08 | 06/16/16 12:50 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | MW-08 | 06/16/16 12:50 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 02:34 PM | 75721 |
| | MW-08 | 06/16/16 12:50 PM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-16A | DUP-1 | 06/16/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | DUP-1 | 06/16/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | DUP-1 | 06/16/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | DUP-1 | 06/16/16 12:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-16D | DUP-1 | 06/16/16 12:50 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | DUP-1 | 06/16/16 12:50 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | DUP-1 | 06/16/16 12:50 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 02:34 PM | 75721 |
| | DUP-1 | 06/16/16 12:50 PM | Aqueous | M2540C | TDS Preparation | 06/21/16 09:45 AM | 75770 |
| 1606193-17A | EB-1 | 06/16/16 01:30 PM | Equip Blank | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | EB-1 | 06/16/16 01:30 PM | Equip Blank | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | EB-1 | 06/16/16 01:30 PM | Equip Blank | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | EB-1 | 06/16/16 01:30 PM | Equip Blank | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606193-17D | EB-1 | 06/16/16 01:30 PM | Equip Blank | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | EB-1 | 06/16/16 01:30 PM | Equip Blank | M4500-H+ B | pH Preparation | 06/17/16 02:34 PM | 75721 |
| | EB-1 | 06/16/16 01:30 PM | Equip Blank | M2540C | TDS Preparation | 06/22/16 01:19 PM | 75802 |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1606193-01A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 75769 | 1 | 06/23/16 01:25 PM | CETAC2_HG_160623A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:05 PM | ICP-MS4_160628C |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:09 PM | ICP-MS4_160629A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 05:44 PM | ICP-MS4_160629E |
| 1606193-01D | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 75822 | 1 | 06/23/16 10:26 AM | IC2_160623A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 75822 | 10 | 06/23/16 12:50 PM | IC2_160623A |
| | FGD-3 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:11 PM | TITRATOR_160617A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-02A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 75769 | 1 | 06/23/16 01:28 PM | CETAC2_HG_160623A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 05:46 PM | ICP-MS4_160629E |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:07 PM | ICP-MS4_160628C |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:11 PM | ICP-MS4_160629A |
| 1606193-02D | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 75822 | 1 | 06/23/16 10:40 AM | IC2_160623A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 75822 | 10 | 06/23/16 01:46 PM | IC2_160623A |
| | FGD-4 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:13 PM | TITRATOR_160617A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-03A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 75769 | 1 | 06/23/16 01:30 PM | CETAC2_HG_160623A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 05:48 PM | ICP-MS4_160629E |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:09 PM | ICP-MS4_160628C |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:13 PM | ICP-MS4_160629A |
| 1606193-03D | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 75822 | 1 | 06/23/16 10:55 AM | IC2_160623A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 75822 | 10 | 06/23/16 02:01 PM | IC2_160623A |
| | FGD-6 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:14 PM | TITRATOR_160617A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-04A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 75769 | 1 | 06/23/16 01:32 PM | CETAC2_HG_160623A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:11 PM | ICP-MS4_160628C |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1606193-04A | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:15 PM | ICP-MS4_160629A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 05:50 PM | ICP-MS4_160629E |
| 1606193-04D | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 75822 | 1 | 06/23/16 11:09 AM | IC2_160623A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 75822 | 10 | 06/23/16 02:16 PM | IC2_160623A |
| | FGD-2 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:18 PM | TITRATOR_160617A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-05A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 75769 | 1 | 06/23/16 01:34 PM | CETAC2_HG_160623A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 05:52 PM | ICP-MS4_160629E |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:13 PM | ICP-MS4_160628C |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 50 | 06/29/16 12:17 PM | ICP-MS4_160629A |
| 1606193-05D | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 75822 | 1 | 06/23/16 11:24 AM | IC2_160623A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 75822 | 100 | 06/23/16 02:30 PM | IC2_160623A |
| | FGD-8 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:22 PM | TITRATOR_160617A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-06A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 75769 | 1 | 06/23/16 01:37 PM | CETAC2_HG_160623A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:15 PM | ICP-MS4_160628C |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 5 | 06/29/16 12:19 PM | ICP-MS4_160629A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 05:54 PM | ICP-MS4_160629E |
| 1606193-06D | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 11:05 AM | IC4_160623A |
| | FGD-1 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:25 PM | TITRATOR_160617A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-07A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:09 AM | CETAC2_HG_160628A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 05:56 PM | ICP-MS4_160629E |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:21 PM | ICP-MS4_160629A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:17 PM | ICP-MS4_160628C |
| 1606193-07D | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 75825 | 10 | 06/23/16 03:15 PM | IC4_160623A |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1606193-07D | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 11:20 AM | IC4_160623A |
| | FGD-11 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:28 PM | TITRATOR_160617A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-08A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:21 AM | CETAC2_HG_160628A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 5 | 06/29/16 12:23 PM | ICP-MS4_160629A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 05:58 PM | ICP-MS4_160629E |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:19 PM | ICP-MS4_160628C |
| 1606193-08D | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 11:35 AM | IC4_160623A |
| | FGD-12 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:31 PM | TITRATOR_160617A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-09A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:23 AM | CETAC2_HG_160628A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:25 PM | ICP-MS4_160629A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:21 PM | ICP-MS4_160628C |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 06:00 PM | ICP-MS4_160629E |
| 1606193-09D | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 75825 | 10 | 06/23/16 03:30 PM | IC4_160623A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 11:50 AM | IC4_160623A |
| | FGD-5 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:34 PM | TITRATOR_160617A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-10A | MW-07 | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:25 AM | CETAC2_HG_160628A |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 05:38 PM | ICP-MS4_160629E |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:01 PM | ICP-MS4_160628C |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 5 | 06/29/16 12:05 PM | ICP-MS4_160629A |
| 1606193-10D | MW-07 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 12:05 PM | IC4_160623A |
| | MW-07 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:37 PM | TITRATOR_160617A |
| | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-11A | MW-05 | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:28 AM | CETAC2_HG_160628A |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1606193-11A | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:39 PM | ICP-MS4_160628C |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 5 | 06/29/16 12:46 PM | ICP-MS4_160629A |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 06:25 PM | ICP-MS4_160629E |
| 1606193-11D | MW-05 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 12:20 PM | IC4_160623A |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 75825 | 10 | 06/23/16 04:37 PM | IC4_160623A |
| | MW-05 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:40 PM | TITRATOR_160617A |
| | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-12A | MW-09 | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:30 AM | CETAC2_HG_160628A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:41 PM | ICP-MS4_160628C |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:48 PM | ICP-MS4_160629A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 06:27 PM | ICP-MS4_160629E |
| 1606193-12D | MW-09 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 12:35 PM | IC4_160623A |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 75825 | 10 | 06/23/16 04:52 PM | IC4_160623A |
| | MW-09 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:42 PM | TITRATOR_160617A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-13A | AL-10 | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:32 AM | CETAC2_HG_160628A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:43 PM | ICP-MS4_160628C |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:50 PM | ICP-MS4_160629A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 06:29 PM | ICP-MS4_160629E |
| 1606193-13D | AL-10 | Aqueous | E300 | Anions by IC method - Water | 75825 | 10 | 06/23/16 05:07 PM | IC4_160623A |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 12:50 PM | IC4_160623A |
| | AL-10 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:56 PM | TITRATOR_160617A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-14A | MW-02 | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:34 AM | CETAC2_HG_160628A |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:45 PM | ICP-MS4_160628C |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:52 PM | ICP-MS4_160629A |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1606193-14A | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 06:31 PM | ICP-MS4_160629E |
| 1606193-14D | MW-02 | Aqueous | E300 | Anions by IC method - Water | 75825 | 10 | 06/23/16 06:37 PM | IC4_160623A |
| | MW-02 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 01:05 PM | IC4_160623A |
| | MW-02 | Aqueous | M4500-H+ B | pH | 75719 | 1 | 06/17/16 01:58 PM | TITRATOR_160617A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-15A | MW-08 | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:37 AM | CETAC2_HG_160628A |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:47 PM | ICP-MS4_160628C |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:54 PM | ICP-MS4_160629A |
| | MW-08 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 06:33 PM | ICP-MS4_160629E |
| 1606193-15D | MW-08 | Aqueous | E300 | Anions by IC method - Water | 75825 | 100 | 06/23/16 07:22 PM | IC4_160623A |
| | MW-08 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 01:20 PM | IC4_160623A |
| | MW-08 | Aqueous | M4500-H+ B | pH | 75721 | 1 | 06/17/16 02:51 PM | TITRATOR_160617B |
| | MW-08 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-16A | DUP-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:39 AM | CETAC2_HG_160628A |
| | DUP-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:49 PM | ICP-MS4_160628C |
| | DUP-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 10 | 06/29/16 12:56 PM | ICP-MS4_160629A |
| | DUP-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 06:35 PM | ICP-MS4_160629E |
| 1606193-16D | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 75825 | 100 | 06/23/16 08:07 PM | IC4_160623A |
| | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 02:45 PM | IC4_160623A |
| | DUP-1 | Aqueous | M4500-H+ B | pH | 75721 | 1 | 06/17/16 02:54 PM | TITRATOR_160617B |
| | DUP-1 | Aqueous | M2540C | Total Dissolved Solids | 75770 | 1 | 06/22/16 08:36 AM | WC_160621C |
| 1606193-17A | EB-1 | Equip Blank | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:46 AM | CETAC2_HG_160628A |
| | EB-1 | Equip Blank | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:51 PM | ICP-MS4_160628C |
| | EB-1 | Equip Blank | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 12:58 PM | ICP-MS4_160629A |
| | EB-1 | Equip Blank | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/29/16 06:37 PM | ICP-MS4_160629E |
| 1606193-17D | EB-1 | Equip Blank | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 02:30 PM | IC4_160623A |

**Lab Order:** 1606193
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1606193-17D | EB-1 | Equip Blank | M4500-H+ B | pH | 75721 | 1 | 06/17/16 02:57 PM | TITRATOR_160617B |
| | EB-1 | Equip Blank | M2540C | Total Dissolved Solids | 75802 | 1 | 06/23/16 08:49 AM | WC_160622D |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-3 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-01 |
| **Project No:** | 5164-D | **Collection Date:** | 06/14/16 11:00 AM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **KL** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/23/16 01:25 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:05 PM |
| Arsenic | 0.00205 | 0.00200 | 0.00500 | J | mg/L | 1 | 06/28/16 05:05 PM |
| Barium | 0.0392 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:05 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:05 PM |
| Boron | 0.207 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 05:44 PM |
| Cadmium | 0.00156 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:05 PM |
| Calcium | 80.1 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:09 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:05 PM |
| Cobalt | 0.0261 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:05 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:05 PM |
| Lithium | 0.107 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:05 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:05 PM |
| Selenium | 0.0447 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:05 PM |
| Thallium | 0.00126 | 0.000500 | 0.00150 | J | mg/L | 1 | 06/28/16 05:05 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 267 | 3.00 | 10.0 | | mg/L | 10 | 06/23/16 12:50 PM |
| Fluoride | 0.173 | 0.100 | 0.400 | J | mg/L | 1 | 06/23/16 10:26 AM |
| Sulfate | 338 | 10.0 | 30.0 | | mg/L | 10 | 06/23/16 12:50 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.60 | 0 | 0 | | pH Units@16.1℃ | 1 | 06/17/16 01:11 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1440 | 50.0 | 50.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-4 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-02 |
| **Project No:** | 5164-D | **Collection Date:** | 06/14/16 11:55 AM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **KL** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/23/16 01:28 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:07 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:07 PM |
| Barium | 0.128 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:07 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:07 PM |
| Boron | 0.0728 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 05:46 PM |
| Cadmium | 0.000561 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/28/16 05:07 PM |
| Calcium | 47.5 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:11 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:07 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:07 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:07 PM |
| Lithium | 0.0477 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:07 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:07 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:07 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:07 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 210 | 3.00 | 10.0 | | mg/L | 10 | 06/23/16 01:46 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/23/16 10:40 AM |
| Sulfate | 37.9 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 10:40 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.66 | 0 | 0 | | pH Units@17℃ | 1 | 06/17/16 01:13 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 689 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-6 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-03 |
| **Project No:** | 5164-D | **Collection Date:** | 06/14/16 12:55 PM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **KL** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/23/16 01:30 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:09 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:09 PM |
| Barium | 0.160 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:09 PM |
| Beryllium | 0.000309 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/28/16 05:09 PM |
| Boron | 0.0955 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 05:48 PM |
| Cadmium | 0.000404 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/28/16 05:09 PM |
| Calcium | 33.9 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:13 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:09 PM |
| Cobalt | 0.00657 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:09 PM |
| Lead | 0.00132 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:09 PM |
| Lithium | 0.00920 | 0.00500 | 0.0100 | J | mg/L | 1 | 06/28/16 05:09 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:09 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:09 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:09 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 237 | 3.00 | 10.0 | | mg/L | 10 | 06/23/16 02:01 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/23/16 10:55 AM |
| Sulfate | 49.8 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 10:55 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.95 | 0 | 0 | | pH Units@16.8℃ | 1 | 06/17/16 01:14 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 813 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-2 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-04 |
| **Project No:** | 5164-D | **Collection Date:** | 06/14/16 01:50 PM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **KL** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/23/16 01:32 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:11 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:11 PM |
| Barium | 0.0910 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:11 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:11 PM |
| Boron | 0.0729 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 05:50 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:11 PM |
| Calcium | 26.8 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:15 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:11 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:11 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:11 PM |
| Lithium | 0.0243 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:11 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:11 PM |
| Selenium | 0.0189 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:11 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:11 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 138 | 3.00 | 10.0 | | mg/L | 10 | 06/23/16 02:16 PM |
| Fluoride | 0.122 | 0.100 | 0.400 | J | mg/L | 1 | 06/23/16 11:09 AM |
| Sulfate | 62.2 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 11:09 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.89 | 0 | 0 | | pH Units@17.3℃ | 1 | 06/17/16 01:18 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 564 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-8 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-05 |
| **Project No:** | 5164-D | **Collection Date:** | 06/14/16 03:00 PM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **KL** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/23/16 01:34 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:13 PM |
| Arsenic | 0.00639 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:13 PM |
| Barium | 0.792 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:13 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:13 PM |
| Boron | 0.0869 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 05:52 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:13 PM |
| Calcium | 336 | 5.00 | 15.0 | | mg/L | 50 | 06/29/16 12:17 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:13 PM |
| Cobalt | 0.0158 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:13 PM |
| Lead | 0.00137 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:13 PM |
| Lithium | 0.0150 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:13 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:13 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:13 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:13 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 2070 | 30.0 | 100 | | mg/L | 100 | 06/23/16 02:30 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/23/16 11:24 AM |
| Sulfate | 476 | 100 | 300 | | mg/L | 100 | 06/23/16 02:30 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.15 | 0 | 0 | | pH Units@17.3℃ | 1 | 06/17/16 01:22 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 6130 | 50.0 | 50.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-1 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-06 |
| **Project No:** | 5164-D | **Collection Date:** | 06/15/16 03:55 PM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **KL** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/23/16 01:37 PM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:15 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:15 PM |
| Barium | 0.0276 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:15 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:15 PM |
| Boron | 0.0660 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 05:54 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:15 PM |
| Calcium | 12.0 | 0.500 | 1.50 | | mg/L | 5 | 06/29/16 12:19 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:15 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:15 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:15 PM |
| Lithium | 0.0321 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:15 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:15 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:15 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:15 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 39.0 | 0.300 | 1.00 | | mg/L | 1 | 06/23/16 11:05 AM |
| Fluoride | 0.302 | 0.100 | 0.400 | J | mg/L | 1 | 06/23/16 11:05 AM |
| Sulfate | 41.2 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 11:05 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.48 | 0 | 0 | | pH Units@17.8℃ | 1 | 06/17/16 01:25 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 258 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-11 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-07 |
| **Project No:** | 5164-D | **Collection Date:** | 06/15/16 10:05 AM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/28/16 10:09 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:17 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:17 PM |
| Barium | 0.216 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:17 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:17 PM |
| Boron | 0.0979 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 05:56 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:17 PM |
| Calcium | 55.1 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:21 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:17 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:17 PM |
| Lead | 0.000407 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/28/16 05:17 PM |
| Lithium | 0.0126 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:17 PM |
| Molybdenum | 0.00238 | 0.00200 | 0.00500 | J | mg/L | 1 | 06/28/16 05:17 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:17 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:17 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 356 | 3.00 | 10.0 | | mg/L | 10 | 06/23/16 03:15 PM |
| Fluoride | 0.331 | 0.100 | 0.400 | J | mg/L | 1 | 06/23/16 11:20 AM |
| Sulfate | 32.4 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 11:20 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.82 | 0 | 0 | | pH Units@17.9℃ | 1 | 06/17/16 01:28 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 900 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-12 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-08 |
| **Project No:** | 5164-D | **Collection Date:** | 06/15/16 11:05 AM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | 0.000134 | 0.0000800 | 0.000200 | J | mg/L | 1 | 06/28/16 10:21 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:19 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:19 PM |
| Barium | 0.107 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:19 PM |
| Beryllium | 0.000390 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/28/16 05:19 PM |
| Boron | 0.0711 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 05:58 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:19 PM |
| Calcium | 11.2 | 0.500 | 1.50 | | mg/L | 5 | 06/29/16 12:23 PM |
| Chromium | 0.00269 | 0.00200 | 0.00500 | J | mg/L | 1 | 06/28/16 05:19 PM |
| Cobalt | 0.00323 | 0.00300 | 0.00500 | J | mg/L | 1 | 06/28/16 05:19 PM |
| Lead | 0.00513 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:19 PM |
| Lithium | 0.0192 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:19 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:19 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:19 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:19 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 19.5 | 0.300 | 1.00 | | mg/L | 1 | 06/23/16 11:35 AM |
| Fluoride | 0.101 | 0.100 | 0.400 | J | mg/L | 1 | 06/23/16 11:35 AM |
| Sulfate | 13.4 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 11:35 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.67 | 0 | 0 | | pH Units@18.7℃ | 1 | 06/17/16 01:31 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 253 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-5 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-09 |
| **Project No:** | 5164-D | **Collection Date:** | 06/15/16 12:00 PM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/28/16 10:23 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:21 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:21 PM |
| Barium | 0.174 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:21 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:21 PM |
| Boron | 0.110 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 06:00 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:21 PM |
| Calcium | 88.9 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:25 PM |
| Chromium | 0.00599 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:21 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:21 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:21 PM |
| Lithium | 0.162 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:21 PM |
| Molybdenum | 0.0144 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:21 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:21 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:21 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 368 | 3.00 | 10.0 | | mg/L | 10 | 06/23/16 03:30 PM |
| Fluoride | 0.284 | 0.100 | 0.400 | J | mg/L | 1 | 06/23/16 11:50 AM |
| Sulfate | 55.1 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 11:50 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.26 | 0 | 0 | | pH Units@18.4℃ | 1 | 06/17/16 01:34 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 735 | 50.0 | 50.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-07 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-10 |
| **Project No:** | 5164-D | **Collection Date:** | 06/15/16 01:20 PM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/28/16 10:25 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:01 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:01 PM |
| Barium | 0.0467 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:01 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:01 PM |
| Boron | 0.0639 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 05:38 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:01 PM |
| Calcium | 10.5 | 0.500 | 1.50 | | mg/L | 5 | 06/29/16 12:05 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:01 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:01 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:01 PM |
| Lithium | 0.0151 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:01 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:01 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:01 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:01 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 22.9 | 0.300 | 1.00 | | mg/L | 1 | 06/23/16 12:05 PM |
| Fluoride | 0.226 | 0.100 | 0.400 | J | mg/L | 1 | 06/23/16 12:05 PM |
| Sulfate | 23.2 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 12:05 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.85 | 0 | 0 | | pH Units@18.9℃ | 1 | 06/17/16 01:37 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 294 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-05 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-11 |
| **Project No:** | 5164-D | **Collection Date:** | 06/15/16 02:15 PM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/28/16 10:28 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:39 PM |
| Arsenic | 0.0207 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:39 PM |
| Barium | 0.127 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:39 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:39 PM |
| Boron | 0.0580 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 06:25 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:39 PM |
| Calcium | 14.2 | 0.500 | 1.50 | | mg/L | 5 | 06/29/16 12:46 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:39 PM |
| Cobalt | 0.00373 | 0.00300 | 0.00500 | J | mg/L | 1 | 06/28/16 05:39 PM |
| Lead | 0.00146 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:39 PM |
| Lithium | 0.0433 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:39 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:39 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:39 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:39 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 60.4 | 3.00 | 10.0 | | mg/L | 10 | 06/23/16 04:37 PM |
| Fluoride | 0.306 | 0.100 | 0.400 | J | mg/L | 1 | 06/23/16 12:20 PM |
| Sulfate | 11.8 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 12:20 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.69 | 0 | 0 | | pH Units@19.8℃ | 1 | 06/17/16 01:40 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 269 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-09 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-12 |
| **Project No:** | 5164-D | **Collection Date:** | 06/15/16 04:05 PM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/28/16 10:30 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:41 PM |
| Arsenic | 0.00524 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:41 PM |
| Barium | 0.144 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:41 PM |
| Beryllium | 0.000435 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/28/16 05:41 PM |
| Boron | 0.0778 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 06:27 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:41 PM |
| Calcium | 43.1 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:48 PM |
| Chromium | 0.00587 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:41 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:41 PM |
| Lead | 0.00200 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:41 PM |
| Lithium | 0.0634 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:41 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:41 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:41 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:41 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 174 | 3.00 | 10.0 | | mg/L | 10 | 06/23/16 04:52 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/23/16 12:35 PM |
| Sulfate | 98.7 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 12:35 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.25 | 0 | 0 | | pH Units@19.8℃ | 1 | 06/17/16 01:42 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 574 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | AL-10 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-13 |
| **Project No:** | 5164-D | **Collection Date:** | 06/16/16 08:35 AM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/28/16 10:32 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:43 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:43 PM |
| Barium | 0.103 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:43 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:43 PM |
| Boron | 0.0915 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 06:29 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:43 PM |
| Calcium | 34.7 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:50 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:43 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:43 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:43 PM |
| Lithium | 0.00591 | 0.00500 | 0.0100 | J | mg/L | 1 | 06/28/16 05:43 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:43 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:43 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:43 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 66.7 | 3.00 | 10.0 | | mg/L | 10 | 06/23/16 05:07 PM |
| Fluoride | 0.155 | 0.100 | 0.400 | J | mg/L | 1 | 06/23/16 12:50 PM |
| Sulfate | 23.5 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 12:50 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.18 | 0 | 0 | | pH Units@17.7℃ | 1 | 06/17/16 01:56 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 436 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-02 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-14 |
| **Project No:** | 5164-D | **Collection Date:** | 06/16/16 10:40 AM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/28/16 10:34 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:45 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:45 PM |
| Barium | 0.117 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:45 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:45 PM |
| Boron | 0.106 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 06:31 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:45 PM |
| Calcium | 26.5 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:52 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:45 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:45 PM |
| Lead | 0.000790 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/28/16 05:45 PM |
| Lithium | 0.0684 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:45 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:45 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:45 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:45 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 87.8 | 3.00 | 10.0 | | mg/L | 10 | 06/23/16 06:37 PM |
| Fluoride | 0.161 | 0.100 | 0.400 | J | mg/L | 1 | 06/23/16 01:05 PM |
| Sulfate | 34.8 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 01:05 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.82 | 0 | 0 | | pH Units@20.1℃ | 1 | 06/17/16 01:58 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 343 | 10.0 | 10.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-08 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-15 |
| **Project No:** | 5164-D | **Collection Date:** | 06/16/16 12:50 PM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | 0.000173 | 0.0000800 | 0.000200 | J | mg/L | 1 | 06/28/16 10:37 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:47 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:47 PM |
| Barium | 0.229 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:47 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:47 PM |
| Boron | 0.0677 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 06:33 PM |
| Cadmium | 0.000457 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/28/16 05:47 PM |
| Calcium | 76.6 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:54 PM |
| Chromium | 0.0105 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:47 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:47 PM |
| Lead | 0.00216 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:47 PM |
| Lithium | 0.0492 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:47 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:47 PM |
| Selenium | 0.0154 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:47 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:47 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 520 | 30.0 | 100 | | mg/L | 100 | 06/23/16 07:22 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/23/16 01:20 PM |
| Sulfate | 83.6 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 01:20 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.70 | 0 | 0 | | pH Units@17.7℃ | 1 | 06/17/16 02:51 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1090 | 50.0 | 50.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | DUP-1 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-16 |
| **Project No:** | 5164-D | **Collection Date:** | 06/16/16 12:50 PM |
| **Lab Order:** | 1606193 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | 0.000191 | 0.0000800 | 0.000200 | J | mg/L | 1 | 06/28/16 10:39 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:49 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:49 PM |
| Barium | 0.222 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:49 PM |
| Beryllium | 0.000329 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/28/16 05:49 PM |
| Boron | 0.0697 | 0.0100 | 0.0300 | | mg/L | 1 | 06/29/16 06:35 PM |
| Cadmium | 0.000351 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/28/16 05:49 PM |
| Calcium | 76.0 | 1.00 | 3.00 | | mg/L | 10 | 06/29/16 12:56 PM |
| Chromium | 0.0114 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:49 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:49 PM |
| Lead | 0.00210 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:49 PM |
| Lithium | 0.0507 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:49 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:49 PM |
| Selenium | 0.0149 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:49 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:49 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 500 | 30.0 | 100 | | mg/L | 100 | 06/23/16 08:07 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/23/16 02:45 PM |
| Sulfate | 70.0 | 1.00 | 3.00 | | mg/L | 1 | 06/23/16 02:45 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.79 | 0 | 0 | | pH Units@16.7℃ | 1 | 06/17/16 02:54 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1080 | 50.0 | 50.0 | | mg/L | 1 | 06/22/16 08:36 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *03-Aug-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | EB-1 |
| **Project:** | Oak Grove | **Lab ID:** | 1606193-17 |
| **Project No:** | 5164-D | **Collection Date:** | 06/16/16 01:30 PM |
| **Lab Order:** | 1606193 | **Matrix:** | EQUIP BLANK |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/28/16 10:46 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:51 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:51 PM |
| Barium | 0.0191 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:51 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:51 PM |
| Boron | 0.0274 | 0.0100 | 0.0300 | J | mg/L | 1 | 06/29/16 06:37 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:51 PM |
| Calcium | 1.03 | 0.100 | 0.300 | | mg/L | 1 | 06/28/16 05:51 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:51 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/28/16 05:51 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:51 PM |
| Lithium | <0.00500 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:51 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:51 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:51 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/28/16 05:51 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 4.47 | 0.300 | 1.00 | | mg/L | 1 | 06/23/16 02:30 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/23/16 02:30 PM |
| Sulfate | 2.34 | 1.00 | 3.00 | J | mg/L | 1 | 06/23/16 02:30 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.16 | 0 | 0 | | pH Units@18℃ | 1 | 06/17/16 02:57 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 43.0 | 10.0 | 10.0 | | mg/L | 1 | 06/23/16 08:49 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160623A**

The QC data in batch 75769 applies to the following samples: 1606193-01A, 1606193-02A, 1606193-03A, 1606193-04A, 1606193-05A, 1606193-06A

| Sample ID | **MB-75769** | Batch ID: | **75769** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 12:33:39 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-75769** | Batch ID: | **75769** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 12:35:55 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00196 | 0.000200 | 0.00200 | 0 | 98.0 | 85 | 115 | | | |

| Sample ID | **LCSD-75769** | Batch ID: | **75769** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 12:38:11 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00201 | 0.000200 | 0.00200 | 0 | 101 | 85 | 115 | 2.52 | 15 | |

| Sample ID | **1606160-06A SD** | Batch ID: | **75769** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 12:42:44 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1606160-06A PDS** | Batch ID: | **75769** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 12:44:59 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00243 | 0.000200 | 0.00250 | 0 | 97.2 | 85 | 115 | | | |

| Sample ID | **1606160-06A MS** | Batch ID: | **75769** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 12:47:15 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00206 | 0.000200 | 0.00200 | 0 | 103 | 80 | 120 | | | |

| Sample ID | **1606160-06A MSD** | Batch ID: | **75769** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 12:49:30 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00205 | 0.000200 | 0.00200 | 0 | 103 | 80 | 120 | 0.487 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160623A**

| Sample ID | **ICV-160623** | Batch ID: | **R86503** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 10:03:19 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00399 | 0.000200 | 0.00400 | 0 | 99.8 | 90 | 110 | | | |

| Sample ID | **CCV4-160623** | Batch ID: | **R86503** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 12:24:10 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00197 | 0.000200 | 0.00200 | 0 | 98.5 | 90 | 110 | | | |

| Sample ID | **CCV5-160623** | Batch ID: | **R86503** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 1:12:12 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00198 | 0.000200 | 0.00200 | 0 | 99.0 | 90 | 110 | | | |

| Sample ID | **CCV6-160623** | Batch ID: | **R86503** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160623A** | Analysis Date: | **6/23/2016 1:39:31 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00198 | 0.000200 | 0.00200 | 0 | 99.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160628A**

The QC data in batch 75845 applies to the following samples: 1606193-07A, 1606193-08A, 1606193-09A, 1606193-10A, 1606193-11A, 1606193-12A, 1606193-13A, 1606193-14A, 1606193-15A, 1606193-16A, 1606193-17A

| Sample ID | **MB-75845** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:03:09 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-75845** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:05:25 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00205 | 0.000200 | 0.00200 | 0 | 103 | 85 | 115 | | | |

| Sample ID | **LCSD-75845** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:07:41 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00202 | 0.000200 | 0.00200 | 0 | 101 | 85 | 115 | 1.47 | 15 | |

| Sample ID | **1606193-07A SD** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:12:14 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1606193-07A PDS** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:14:29 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00238 | 0.000200 | 0.00250 | 0 | 95.2 | 85 | 115 | | | |

| Sample ID | **1606193-07A MS** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:16:45 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 80 | 120 | | | |

| Sample ID | **1606193-07A MSD** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:19:00 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00208 | 0.000200 | 0.00200 | 0 | 104 | 80 | 120 | 4.42 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160628A**

| Sample ID **ICV-160628** | Batch ID: **R86598** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_160628A** | Analysis Date: **6/28/2016 9:58:36 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00396 | 0.000200 | 0.00400 | 0 | 99.0 | 90 | 110 | | | |

| Sample ID **CCV1-160628** | Batch ID: **R86598** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_160628A** | Analysis Date: **6/28/2016 10:41:42 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 90 | 110 | | | |

| Sample ID **CCV2-160628** | Batch ID: **R86598** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_160628A** | Analysis Date: **6/28/2016 11:06:44 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00200 | 0.000200 | 0.00200 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

The QC data in batch 75757 applies to the following samples: 1606193-01A, 1606193-02A, 1606193-03A, 1606193-04A, 1606193-05A, 1606193-06A, 1606193-07A, 1606193-08A, 1606193-09A, 1606193-10A, 1606193-11A, 1606193-12A, 1606193-13A, 1606193-14A, 1606193-15A, 1606193-16A, 1606193-17A

Sample ID **MB-75757** Batch ID: **75757** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_160628C** Analysis Date: **6/28/2016 4:52:00 PM** Prep Date: **6/21/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-75757** Batch ID: **75757** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_160628C** Analysis Date: **6/28/2016 4:54:00 PM** Prep Date: **6/21/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Barium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Beryllium | 0.209 | 0.00100 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Calcium | 4.95 | 0.300 | 5.00 | 0 | 99.0 | 80 | 120 | | | |
| Chromium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Cobalt | 0.211 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Thallium | 0.208 | 0.00150 | 0.200 | 0 | 104 | 80 | 120 | | | |

Sample ID **LCSD-75757** Batch ID: **75757** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_160628C** Analysis Date: **6/28/2016 4:57:00 PM** Prep Date: **6/21/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | 0.683 | 15 | |
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 1.01 | 15 | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.3 | 80 | 120 | 1.64 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

| Sample ID **LCSD-75757** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 4:57:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.207 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | 1.12 | 15 | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 99.9 | 80 | 120 | 1.87 | 15 | |
| Calcium | 4.84 | 0.300 | 5.00 | 0 | 96.9 | 80 | 120 | 2.17 | 15 | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 2.11 | 15 | |
| Cobalt | 0.210 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | 0.406 | 15 | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | 0.154 | 15 | |
| Lithium | 0.210 | 0.0100 | 0.200 | 0 | 105 | 80 | 120 | 2.16 | 15 | |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 80 | 120 | 1.20 | 15 | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 2.08 | 15 | |
| Thallium | 0.208 | 0.00150 | 0.200 | 0 | 104 | 80 | 120 | 0.049 | 15 | |

| Sample ID **1606193-10A SD** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:03:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0460 | 0.0500 | 0 | 0.0467 | | | | 1.35 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.0151 | | | | 0 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1606193-10A PDS** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:23:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.189 | 0.00250 | 0.200 | 0 | 94.3 | 80 | 120 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Barium | 0.243 | 0.0100 | 0.200 | 0.0467 | 98.0 | 80 | 120 | | | |
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Cadmium | 0.194 | 0.00100 | 0.200 | 0 | 97.1 | 80 | 120 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Lead | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Lithium | 0.215 | 0.0100 | 0.200 | 0.0151 | 100 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

| Sample ID **1606193-10A PDS** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:23:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 80 | 120 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID **1606193-10A MS** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:25:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.211 | 0.00250 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Barium | 0.253 | 0.0100 | 0.200 | 0.0467 | 103 | 80 | 120 | | | |
| Beryllium | 0.208 | 0.00100 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Calcium | 16.0 | 0.300 | 5.00 | 11.0 | 101 | 80 | 120 | | | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.207 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lithium | 0.224 | 0.0100 | 0.200 | 0.0151 | 104 | 80 | 120 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 80 | 120 | | | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Thallium | 0.207 | 0.00150 | 0.200 | 0 | 103 | 80 | 120 | | | |

| Sample ID **1606193-10A MSD** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:27:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | 3.97 | 15 | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 1.35 | 15 | |
| Barium | 0.246 | 0.0100 | 0.200 | 0.0467 | 99.9 | 80 | 120 | 2.64 | 15 | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 2.97 | 15 | |
| Cadmium | 0.197 | 0.00100 | 0.200 | 0 | 98.4 | 80 | 120 | 1.87 | 15 | |
| Calcium | 15.9 | 0.300 | 5.00 | 11.0 | 99.2 | 80 | 120 | 0.672 | 15 | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 80 | 120 | 1.53 | 15 | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.697 | 15 | |
| Lead | 0.203 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.667 | 15 | |
| Lithium | 0.218 | 0.0100 | 0.200 | 0.0151 | 101 | 80 | 120 | 2.68 | 15 | |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.5 | 80 | 120 | 1.93 | 15 | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 1.60 | 15 | |
| Thallium | 0.204 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | 1.11 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

| Sample ID **ICV-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 11:22:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.104 | 0.00250 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Arsenic | 0.100 | 0.00500 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Barium | 0.100 | 0.0100 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.0989 | 0.00100 | 0.100 | 0 | 98.9 | 90 | 110 | | | |
| Cadmium | 0.100 | 0.00100 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Calcium | 2.43 | 0.300 | 2.50 | 0 | 97.1 | 90 | 110 | | | |
| Chromium | 0.106 | 0.00500 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.103 | 0.00100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.0977 | 0.0100 | 0.100 | 0 | 97.7 | 90 | 110 | | | |
| Molybdenum | 0.0983 | 0.00500 | 0.100 | 0 | 98.3 | 90 | 110 | | | |
| Selenium | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.102 | 0.00150 | 0.100 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 11:33:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00196 | 0.00250 | 0.00200 | 0 | 98.2 | 70 | 130 | | | |
| Arsenic | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Barium | 0.00488 | 0.0100 | 0.00500 | 0 | 97.6 | 70 | 130 | | | |
| Beryllium | 0.000760 | 0.00100 | 0.00100 | 0 | 76.0 | 70 | 130 | | | |
| Cadmium | 0.000973 | 0.00100 | 0.00100 | 0 | 97.3 | 70 | 130 | | | |
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |
| Chromium | 0.00519 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Cobalt | 0.00525 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Lead | 0.00105 | 0.00100 | 0.00100 | 0 | 105 | 70 | 130 | | | |
| Lithium | 0.0109 | 0.0100 | 0.0100 | 0 | 109 | 70 | 130 | | | |
| Molybdenum | 0.00489 | 0.00500 | 0.00500 | 0 | 97.8 | 70 | 130 | | | |
| Selenium | 0.00549 | 0.00500 | 0.00500 | 0 | 110 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

| Sample ID **CCV7-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 4:35:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.207 | 0.00100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

| Sample ID **CCV7-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 4:35:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.92 | 0.300 | 5.00 | 0 | 98.3 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.203 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.200 | 0.0100 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.205 | 0.00150 | 0.200 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL7-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 4:41:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00201 | 0.00250 | 0.00200 | 0 | 100 | 70 | 130 | | | |
| Arsenic | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Barium | 0.00514 | 0.0100 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Beryllium | 0.000958 | 0.00100 | 0.00100 | 0 | 95.8 | 70 | 130 | | | |
| Cadmium | 0.00106 | 0.00100 | 0.00100 | 0 | 106 | 70 | 130 | | | |
| Calcium | 0.0991 | 0.300 | 0.100 | 0 | 99.1 | 70 | 130 | | | |
| Chromium | 0.00530 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Cobalt | 0.00535 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Lead | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.0110 | 0.0100 | 0.0100 | 0 | 110 | 70 | 130 | | | |
| Molybdenum | 0.00499 | 0.00500 | 0.00500 | 0 | 99.8 | 70 | 130 | | | |
| Selenium | 0.00556 | 0.00500 | 0.00500 | 0 | 111 | 70 | 130 | | | |
| Thallium | 0.00104 | 0.00150 | 0.00100 | 0 | 104 | 70 | 130 | | | |

| Sample ID **CCV8-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Calcium | 4.89 | 0.300 | 5.00 | 0 | 97.9 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.209 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.201 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

| Sample ID **CCV8-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.4 | 90 | 110 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL8-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00232 | 0.00250 | 0.00200 | 0 | 116 | 70 | 130 | | | |
| Arsenic | 0.00530 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Barium | 0.00521 | 0.0100 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Beryllium | 0.00112 | 0.00100 | 0.00100 | 0 | 112 | 70 | 130 | | | |
| Cadmium | 0.000991 | 0.00100 | 0.00100 | 0 | 99.1 | 70 | 130 | | | |
| Calcium | 0.106 | 0.300 | 0.100 | 0 | 106 | 70 | 130 | | | |
| Chromium | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Cobalt | 0.00531 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Lead | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Lithium | 0.0102 | 0.0100 | 0.0100 | 0 | 102 | 70 | 130 | | | |
| Molybdenum | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00519 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Thallium | 0.00108 | 0.00150 | 0.00100 | 0 | 108 | 70 | 130 | | | |

| Sample ID **CCV9-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:55:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.5 | 90 | 110 | | | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Calcium | 5.33 | 0.300 | 5.00 | 0 | 107 | 90 | 110 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cobalt | 0.209 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.189 | 0.0100 | 0.200 | 0 | 94.6 | 90 | 110 | | | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Selenium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.207 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

Sample ID **LCVL9-160628** Batch ID: **R86596** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_160628C** Analysis Date: **6/28/2016 5:59:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00215 | 0.00250 | 0.00200 | 0 | 107 | 70 | 130 | | | |
| Arsenic | 0.00528 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Barium | 0.00519 | 0.0100 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Beryllium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Cadmium | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Calcium | 0.106 | 0.300 | 0.100 | 0 | 106 | 70 | 130 | | | |
| Chromium | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Cobalt | 0.00533 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Lead | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Lithium | 0.00884 | 0.0100 | 0.0100 | 0 | 88.4 | 70 | 130 | | | |
| Molybdenum | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Selenium | 0.00540 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Thallium | 0.00106 | 0.00150 | 0.00100 | 0 | 106 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160629A**

The QC data in batch 75757 applies to the following samples: 1606193-01A, 1606193-02A, 1606193-03A, 1606193-04A, 1606193-05A, 1606193-06A, 1606193-07A, 1606193-08A, 1606193-09A, 1606193-10A, 1606193-11A, 1606193-12A, 1606193-13A, 1606193-14A, 1606193-15A, 1606193-16A, 1606193-17A

| Sample ID | **1606193-10A SD** | Batch ID: | **75757** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 12:07:00 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 10.4 | 7.50 | 0 | 10.5 | | | | 0.592 | 10 | |

| Sample ID | **1606193-10A PDS** | Batch ID: | **75757** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 12:27:00 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 33.0 | 1.50 | 25.0 | 10.5 | 90.1 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160629A**

| Sample ID | **ICV-160629** | Batch ID: | **R86633** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 11:25:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.28 | 0.300 | 2.50 | 0 | 91.2 | 90 | 110 | | | |

| Sample ID | **LCVL-160629** | Batch ID: | **R86633** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 11:36:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0990 | 0.300 | 0.100 | 0 | 99.0 | 70 | 130 | | | |

| Sample ID | **CCV1-160629** | Batch ID: | **R86633** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 12:29:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.68 | 0.300 | 5.00 | 0 | 93.5 | 90 | 110 | | | |

| Sample ID | **LCVL1-160629** | Batch ID: | **R86633** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 12:33:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |

| Sample ID | **CCV2-160629** | Batch ID: | **R86633** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 1:02:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.70 | 0.300 | 5.00 | 0 | 94.1 | 90 | 110 | | | |

| Sample ID | **LCVL2-160629** | Batch ID: | **R86633** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 1:16:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0939 | 0.300 | 0.100 | 0 | 93.9 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160629E**

The QC data in batch 75757 applies to the following samples: 1606193-01A, 1606193-02A, 1606193-03A, 1606193-04A, 1606193-05A, 1606193-06A, 1606193-07A, 1606193-08A, 1606193-09A, 1606193-10A, 1606193-11A, 1606193-12A, 1606193-13A, 1606193-14A, 1606193-15A, 1606193-16A, 1606193-17A

Sample ID **MB-75757** Batch ID: **75757** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_160629E** Analysis Date: **6/29/2016 5:30:00 PM** Prep Date: **6/21/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

Sample ID **LCS-75757** Batch ID: **75757** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_160629E** Analysis Date: **6/29/2016 5:32:00 PM** Prep Date: **6/21/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.196 | 0.0300 | 0.200 | 0 | 98.0 | 80 | 120 | | | |

Sample ID **LCSD-75757** Batch ID: **75757** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_160629E** Analysis Date: **6/29/2016 5:34:00 PM** Prep Date: **6/21/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.194 | 0.0300 | 0.200 | 0 | 96.8 | 80 | 120 | 1.17 | 15 | |

Sample ID **1606193-10A SD** Batch ID: **75757** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_160629E** Analysis Date: **6/29/2016 5:40:00 PM** Prep Date: **6/21/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0800 | 0.150 | 0 | 0.0639 | | | | 22.4 | 10 | R |

Sample ID **1606193-10A PDS** Batch ID: **75757** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_160629E** Analysis Date: **6/29/2016 5:42:00 PM** Prep Date: **6/21/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.263 | 0.0300 | 0.200 | 0.0639 | 99.5 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160629E**

| Sample ID | **ICV2-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 5:12:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.105 | 0.0300 | 0.100 | 0 | 105 | 90 | 110 | | | |

| Sample ID | **ILCVL2-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 5:19:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0248 | 0.0300 | 0.0200 | 0 | 124 | 70 | 130 | | | |

| Sample ID | **CCV7-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 6:11:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.204 | 0.0300 | 0.200 | 0 | 102 | 90 | 110 | | | |

| Sample ID | **LCVL7-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 6:21:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0236 | 0.0300 | 0.0200 | 0 | 118 | 70 | 130 | | | |

| Sample ID | **CCV8-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 6:49:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.207 | 0.0300 | 0.200 | 0 | 104 | 90 | 110 | | | |

| Sample ID | **LCVL8-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 6:59:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0231 | 0.0300 | 0.0200 | 0 | 116 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_160623A**

The QC data in batch 75822 applies to the following samples: 1606193-01D, 1606193-02D, 1606193-03D, 1606193-04D, 1606193-05D

| Sample ID | **MB-75822** | Batch ID: | **75822** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC2_160623A** | Analysis Date: | **6/23/2016 9:34:11 AM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-75822** | Batch ID: | **75822** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC2_160623A** | Analysis Date: | **6/23/2016 9:48:47 AM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.79 | 1.00 | 10.00 | 0 | 97.9 | 90 | 110 | | | |
| Fluoride | 3.73 | 0.400 | 4.000 | 0 | 93.3 | 90 | 110 | | | |
| Sulfate | 29.7 | 3.00 | 30.00 | 0 | 98.9 | 90 | 110 | | | |

| Sample ID | **LCSD-75822** | Batch ID: | **75822** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC2_160623A** | Analysis Date: | **6/23/2016 10:03:24 AM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.67 | 1.00 | 10.00 | 0 | 96.7 | 90 | 110 | 1.20 | 20 | |
| Fluoride | 3.79 | 0.400 | 4.000 | 0 | 94.8 | 90 | 110 | 1.55 | 20 | |
| Sulfate | 29.7 | 3.00 | 30.00 | 0 | 99.1 | 90 | 110 | 0.169 | 20 | |

| Sample ID | **1606193-05DMS** | Batch ID: | **75822** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_160623A** | Analysis Date: | **6/23/2016 3:01:17 PM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3870 | 100 | 2000 | 2071 | 89.8 | 90 | 110 | | | |
| Fluoride | 1960 | 40.0 | 2000 | 0 | 98.0 | 90 | 110 | | | |
| Sulfate | 2550 | 300 | 2000 | 476.5 | 104 | 90 | 110 | | | |

| Sample ID | **1606193-05DMSD** | Batch ID: | **75822** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_160623A** | Analysis Date: | **6/23/2016 3:15:53 PM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3900 | 100 | 2000 | 2071 | 91.4 | 90 | 110 | 0.859 | 20 | |
| Fluoride | 2000 | 40.0 | 2000 | 0 | 99.9 | 90 | 110 | 1.99 | 20 | |
| Sulfate | 2600 | 300 | 2000 | 476.5 | 106 | 90 | 110 | 1.87 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_160623A**

| Sample ID **ICV-160623** | Batch ID: **R86510** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_160623A** | Analysis Date: **6/23/2016 8:57:03 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 23.6 | 1.00 | 25.00 | 0 | 94.5 | 90 | 110 | | | |
| Fluoride | 9.31 | 0.400 | 10.00 | 0 | 93.1 | 90 | 110 | | | |
| Sulfate | 73.4 | 3.00 | 75.00 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID **CCV1-160623** | Batch ID: **R86510** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_160623A** | Analysis Date: **6/23/2016 1:05:33 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.63 | 1.00 | 10.00 | 0 | 96.3 | 90 | 110 | | | |
| Fluoride | 3.89 | 0.400 | 4.000 | 0 | 97.1 | 90 | 110 | | | |
| Sulfate | 29.8 | 3.00 | 30.00 | 0 | 99.3 | 90 | 110 | | | |

| Sample ID **CCV2-160623** | Batch ID: **R86510** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_160623A** | Analysis Date: **6/23/2016 3:30:30 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.64 | 1.00 | 10.00 | 0 | 96.4 | 90 | 110 | | | |
| Fluoride | 3.95 | 0.400 | 4.000 | 0 | 98.8 | 90 | 110 | | | |
| Sulfate | 29.9 | 3.00 | 30.00 | 0 | 99.7 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160623A**

The QC data in batch 75825 applies to the following samples: 1606193-06D, 1606193-07D, 1606193-08D, 1606193-09D, 1606193-10D, 1606193-11D, 1606193-12D, 1606193-13D, 1606193-14D, 1606193-15D, 1606193-16D, 1606193-17D

| Sample ID | **MB-75825** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 10:10:50 AM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-75825** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 10:25:50 AM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Fluoride | 3.86 | 0.400 | 4.000 | 0 | 96.5 | 90 | 110 | | | |
| Sulfate | 31.3 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID | **LCSD-75825** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 10:40:50 AM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | 0.306 | 20 | |
| Fluoride | 3.92 | 0.400 | 4.000 | 0 | 98.0 | 90 | 110 | 1.64 | 20 | |
| Sulfate | 31.5 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | 0.423 | 20 | |

| Sample ID | **1606193-14DMS** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 6:52:41 PM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 298 | 10.0 | 200.0 | 87.82 | 105 | 90 | 110 | | | |
| Fluoride | 204 | 4.00 | 200.0 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 248 | 30.0 | 200.0 | 35.85 | 106 | 90 | 110 | | | |

| Sample ID | **1606193-14DMSD** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 7:07:41 PM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 297 | 10.0 | 200.0 | 87.82 | 105 | 90 | 110 | 0.387 | 20 | |
| Fluoride | 203 | 4.00 | 200.0 | 0 | 102 | 90 | 110 | 0.202 | 20 | |
| Sulfate | 248 | 30.0 | 200.0 | 35.85 | 106 | 90 | 110 | 0.092 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160623A**

| Sample ID **1606193-15DMS** | Batch ID: **75825** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 7:37:41 PM** | Prep Date: **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2610 | 100 | 2000 | 519.7 | 105 | 90 | 110 | | | |
| Fluoride | 2030 | 40.0 | 2000 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 2220 | 300 | 2000 | 103.0 | 106 | 90 | 110 | | | |

| Sample ID **1606193-15DMSD** | Batch ID: **75825** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 7:52:41 PM** | Prep Date: **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2620 | 100 | 2000 | 519.7 | 105 | 90 | 110 | 0.193 | 20 | |
| Fluoride | 2040 | 40.0 | 2000 | 0 | 102 | 90 | 110 | 0.279 | 20 | |
| Sulfate | 2220 | 300 | 2000 | 103.0 | 106 | 90 | 110 | 0.305 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160623A**

| Sample ID **ICV-160623** | Batch ID: **R86527** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 9:30:34 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.7 | 1.00 | 25.00 | 0 | 103 | 90 | 110 | | | |
| Fluoride | 9.88 | 0.400 | 10.00 | 0 | 98.8 | 90 | 110 | | | |
| Sulfate | 78.7 | 3.00 | 75.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV1-160623** | Batch ID: **R86527** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 1:50:32 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.99 | 0.400 | 4.000 | 0 | 99.7 | 90 | 110 | | | |
| Sulfate | 31.5 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV2-160623** | Batch ID: **R86527** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 6:07:41 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 4.03 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 31.7 | 3.00 | 30.00 | 0 | 106 | 90 | 110 | | | |

| Sample ID **CCV3-160623** | Batch ID: **R86527** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 8:37:41 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 4.02 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 31.8 | 3.00 | 30.00 | 0 | 106 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160617A**

The QC data in batch 75719 applies to the following samples: 1606193-01D, 1606193-02D, 1606193-03D, 1606193-04D, 1606193-05D, 1606193-06D, 1606193-07D, 1606193-08D, 1606193-09D, 1606193-10D, 1606193-11D, 1606193-12D, 1606193-13D, 1606193-14D

Sample ID **1606168-01D-DUP** Batch ID: **75719** TestNo: **M4500-H+ B** Units: **pH Units@18.1℃**
SampType: **DUP** Run ID: **TITRATOR_160617A** Analysis Date: **6/17/2016 1:00:00 PM** Prep Date: **6/17/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.26 | 0 | 0 | 6.290 | | | | 0.478 | 5 | |

Sample ID **1606193-04D-DUP** Batch ID: **75719** TestNo: **M4500-H+ B** Units: **pH Units@17.3℃**
SampType: **DUP** Run ID: **TITRATOR_160617A** Analysis Date: **6/17/2016 1:20:00 PM** Prep Date: **6/17/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.95 | 0 | 0 | 6.890 | | | | 0.867 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160617A**

| Sample ID | **ICV-160617** | Batch ID: | **R86391** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.9℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_160617A** | Analysis Date: | **6/17/2016 12:36:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.97 | 0 | 10.00 | 0 | 99.7 | 99 | 101 | | | |

| Sample ID | **CCV1-160617** | Batch ID: | **R86391** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.2℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160617A** | Analysis Date: | **6/17/2016 1:15:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.01 | 0 | 7.000 | 0 | 100 | 97.1 | 102.9 | | | |

| Sample ID | **CCV2-160617** | Batch ID: | **R86391** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.2℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160617A** | Analysis Date: | **6/17/2016 1:44:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.00 | 0 | 7.000 | 0 | 100 | 97.1 | 102.9 | | | |

| Sample ID | **CCV3-160617** | Batch ID: | **R86391** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.6℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160617A** | Analysis Date: | **6/17/2016 1:59:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.01 | 0 | 7.000 | 0 | 100 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160617B**

The QC data in batch 75721 applies to the following samples: 1606193-15D, 1606193-16D, 1606193-17D

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID | **1606193-15D-DUP** | Batch ID: | **75721** | TestNo: | **M4500-H+ B** | Units: | **pH Units@17.9℃** |
| SampType: | **DUP** | Run ID: | **TITRATOR_160617B** | Analysis Date: | **6/17/2016 2:52:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.79 | 0 | 0 | 6.700 | | | | 1.33 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160617B**

| Sample ID | **ICV-160617** | Batch ID: | **R86395** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.9℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_160617B** | Analysis Date: | **6/17/2016 12:36:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.97 | 0 | 10.00 | 0 | 99.7 | 99 | 101 | | | |

| Sample ID | **CCV3-160617** | Batch ID: | **R86395** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.6℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160617B** | Analysis Date: | **6/17/2016 1:59:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.01 | 0 | 7.000 | 0 | 100 | 97.1 | 102.9 | | | |

| Sample ID | **CCV4-160617** | Batch ID: | **R86395** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.9℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160617B** | Analysis Date: | **6/17/2016 3:00:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.01 | 0 | 7.000 | 0 | 100 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_160621C**

The QC data in batch 75770 applies to the following samples: 1606193-01D, 1606193-02D, 1606193-03D, 1606193-04D, 1606193-05D, 1606193-06D, 1606193-07D, 1606193-08D, 1606193-09D, 1606193-10D, 1606193-11D, 1606193-12D, 1606193-13D, 1606193-14D, 1606193-15D, 1606193-16D

| Sample ID | **MB-75770** | Batch ID: | **75770** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_160621C** | Analysis Date: | **6/22/2016 8:36:00 AM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-75770** | Batch ID: | **75770** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_160621C** | Analysis Date: | **6/22/2016 8:36:00 AM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 770 | 10.0 | 745.6 | 0 | 103 | 90 | 113 | | | |

| Sample ID | **1606168-02D-DUP** | Batch ID: | **75770** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_160621C** | Analysis Date: | **6/22/2016 8:36:00 AM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1800 | 50.0 | 0 | 1725 | | | | 4.26 | 5 | |

| Sample ID | **1606193-05D-DUP** | Batch ID: | **75770** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_160621C** | Analysis Date: | **6/22/2016 8:36:00 AM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 3920 | 50.0 | 0 | 6135 | | | | 44.1 | 5 | R |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606193
**Project:** Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_160622D**

The QC data in batch 75802 applies to the following samples: 1606193-17D

| Sample ID | **MB-75802** | Batch ID: | **75802** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_160622D** | Analysis Date: | **6/23/2016 8:49:00 AM** | Prep Date: | **6/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-75802** | Batch ID: | **75802** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_160622D** | Analysis Date: | **6/23/2016 8:49:00 AM** | Prep Date: | **6/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 773 | 10.0 | 745.6 | 0 | 104 | 90 | 113 | | | |

| Sample ID | **1606194-01B-DUP** | Batch ID: | **75802** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_160622D** | Analysis Date: | **6/23/2016 8:49:00 AM** | Prep Date: | **6/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 6810 | 50.0 | 0 | 7110 | | | | 4.31 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# Case Narrative

## Lab No: 20160589

This report contains the analytical results for the 17 sample(s) received under chain of custody by ESC Lab Sciences on 6/21/2016 1:05:08 PM. These samples are associated with your 1606193 project.

The analytical results included in this report meet all applicable quality control procedure requirements except as noted below:

The test results in this report meet all NELAC requirements unless noted below:

This report shall not be reproduced, except in full, without the written approval of ESC Lab Sciences.

All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client.

Results have been reviewed by the Director of Radiochemistry or their designees and is approved for release.

**Observations / Nonconformances**


*OUTREACH LABORATORY, A Divsion of ESC Lab Sciences*
*Address: 311 North Aspen Avenue, Broken Arrow, OK, 74012 EMail: outreach@esclabsciences.com - Tel: (918) 251-2515*

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160589-01** | | | | | | | | |
| **Client ID** : **FGD-3** | | | | | | | | |
| **Date Sampled** : **6/14/2016 11:00:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 2.31 +/- 0.783 | 1.35 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.754 +/- 0.205 | 0.125 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.56 +/- 0.578 | 1.22 | pCi/l | | 07/19/16 | 07/29/16 | JR |
| **Lab ID** : **20160589-02** | | | | | | | | |
| **Client ID** : **FGD-4** | | | | | | | | |
| **Date Sampled** : **6/14/2016 11:55:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 1.35 +/- 0.964 | 1.13 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.437 +/- 0.172 | 0.151 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.909 +/- 0.792 | 0.975 | pCi/l | | 07/19/16 | 07/25/16 | JR |
| **Lab ID** : **20160589-03** | | | | | | | | |
| **Client ID** : **FGD-6** | | | | | | | | |
| **Date Sampled** : **6/14/2016 12:55:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 3.47 +/- 1.40 | 1.55 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.31 +/- 0.395 | 0.273 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.16 +/- 1.00 | 1.28 | pCi/l | | 07/19/16 | 07/25/16 | JR |
| **Lab ID** : **20160589-04** | | | | | | | | |
| **Client ID** : **FGD-2** | | | | | | | | |
| **Date Sampled** : **6/14/2016 1:50:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 1.94 +/- 1.01 | 1.25 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.275 +/- 0.126 | 0.096 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.66 +/- 0.885 | 1.15 | pCi/l | | 07/19/16 | 07/25/16 | JR |

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160589-05** | | | | | | | | |
| **Client ID** : **FGD-8** | | | | | | | | |
| **Date Sampled** : **6/14/2016 3:00:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 4.23 +/- 1.33 | 2.48 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.93 +/- 0.700 | 0.611 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.30 +/- 0.628 | 1.87 | pCi/l | | 07/19/16 | 07/29/16 | JR |
| **Lab ID** : **20160589-06** | | | | | | | | |
| **Client ID** : **FGD-1** | | | | | | | | |
| **Date Sampled** : **6/15/2016 3:55:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.70 +/- 0.878 | 1.31 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.039 +/- 0.153 | 0.258 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.66 +/- 0.725 | 1.05 | pCi/l | | 07/19/16 | 07/25/16 | JR |
| **Lab ID** : **20160589-07** | | | | | | | | |
| **Client ID** : **FGD-11** | | | | | | | | |
| **Date Sampled** : **6/15/2016 10:05:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 4.40 +/- 1.18 | 1.13 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 2.34 +/- 0.574 | 0.377 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.06 +/- 0.605 | 0.750 | pCi/l | | 07/19/16 | 07/25/16 | JR |
| **Lab ID** : **20160589-08** | | | | | | | | |
| **Client ID** : **FGD-12** | | | | | | | | |
| **Date Sampled** : **6/15/2016 11:05:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 4.07 +/- 1.30 | 1.33 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 2.01 +/- 0.634 | 0.515 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.06 +/- 0.662 | 0.817 | pCi/l | | 07/19/16 | 07/25/16 | JR |

*NELAC Certified Parameter BDL = Below Detection Limit

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160589-09** | | | | | | | | |
| **Client ID** : **FGD-5** | | | | | | | | |
| **Date Sampled** : **6/15/2016 12:00:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 1.68 +/- 1.19 | 1.49 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.429 +/- 0.250 | 0.308 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.25 +/- 0.944 | 1.18 | pCi/l | | 07/19/16 | 07/25/16 | JR |
| **Lab ID** : **20160589-10** | | | | | | | | |
| **Client ID** : **MW-07** | | | | | | | | |
| **Date Sampled** : **6/15/2016 1:20:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 0.284 +/- 0.704 | 0.889 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.245 +/- 0.141 | 0.167 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.039 +/- 0.563 | 0.722 | pCi/l | | 07/19/16 | 07/25/16 | JR |
| **Lab ID** : **20160589-11** | | | | | | | | |
| **Client ID** : **MW-05** | | | | | | | | |
| **Date Sampled** : **6/15/2016 2:15:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 1.76 +/- 0.984 | 1.19 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.679 +/- 0.208 | 0.203 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.08 +/- 0.776 | 0.985 | pCi/l | | 07/20/16 | 07/26/16 | JR |
| **Lab ID** : **20160589-12** | | | | | | | | |
| **Client ID** : **MW-09** | | | | | | | | |
| **Date Sampled** : **6/15/2016 4:05:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 3.17 +/- 1.90 | 2.32 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.794 +/- 0.312 | 0.314 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.38 +/- 1.59 | 2.01 | pCi/l | | 07/20/16 | 07/26/16 | JR |

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160589-13** | | | | | | | | |
| **Client ID** : **AL-10** | | | | | | | | |
| **Date Sampled** : **6/16/2016 8:35:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 0.527 +/- 0.830 | 0.955 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.527 +/- 0.238 | 0.195 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | -0.150 +/- 0.592 | 0.760 | pCi/l | | 07/20/16 | 07/26/16 | JR |
| **Lab ID** : **20160589-14** | | | | | | | | |
| **Client ID** : **MW-02** | | | | | | | | |
| **Date Sampled** : **6/16/2016 10:40:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 4.39 +/- 1.15 | 1.66 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.11 +/- 0.322 | 0.299 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 3.28 +/- 0.827 | 1.36 | pCi/l | | 07/20/16 | 07/26/16 | JR |
| **Lab ID** : **20160589-15** | | | | | | | | |
| **Client ID** : **MW-08** | | | | | | | | |
| **Date Sampled** : **6/16/2016 12:50:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.88 +/- 1.24 | 1.25 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.15 +/- 0.365 | 0.202 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.73 +/- 0.870 | 1.05 | pCi/l | | 07/20/16 | 07/26/16 | JR |
| **Lab ID** : **20160589-16** | | | | | | | | |
| **Client ID** : **DUP-1** | | | | | | | | |
| **Date Sampled** : **6/16/2016 12:50:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 0.866 +/- 1.34 | 1.65 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.793 +/- 0.308 | 0.282 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.073 +/- 1.03 | 1.37 | pCi/l | | 07/20/16 | 07/26/16 | JR |

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : | **20160589-17** | | | | | | | |
| **Client ID** : | **EB-1** | | | | | | | |
| **Date Sampled** : | **6/16/2016 1:30:00 PM** | | | | | | | |
| **Matrix** : | **NPW** | | | | | | | |
| | **Radiochemical Analyses** | | | | | | | |
| Combined Radium | | 0.204 +/- 0.877 | 1.17 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.204 +/- 0.149 | 0.187 | pCi/l | | 06/29/16 | 07/01/16 | AK |
| Radium-228 | EPA 904*/9320* | -0.064 +/- 0.728 | 0.983 | pCi/l | | 07/20/16 | 07/26/16 | JR |

# QC Report

| Parameter | Blank | LCS %REC | LCSD %REC | LCSD RPD | DUP RPD | RER, NAD or DER | MS %REC | MSD %REC | MSD RPD | Batch ID |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.008 | 100.0 | | | 36.7 | 0.745 | 92.3 | 87.7 | 4.8 | R1105 |
| Radium-228 | -.196 | 105.0 | | | NC | 0.533 | 94.1 | 96.6 | 2.6 | R3833 |
| Radium-228 | 0.163 | 88.3 | | | NC | 0.469 | 96.2 | 99.8 | 3.6 | R3832 |

**Lab Approval:**

*NELAC Certified Parameter BDL = Below Detection Limit





*OUTREACH LABORATORY, A Divsion of ESC Lab Sciences*
*Address: 311 North Aspen Avenue, Broken Arrow, OK, 74012 EMail: outreach@esclabsciences.com - Tel: (918) 251-2515*

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1606193

**Subcontractor:**

ESC Laboratory
311 North Aspen
Broken Arrow, Oklahoma 74012

TEL: (918) 251-2515
FAX:
Acct #: DHLRRTX

**17-Jun-16**

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E904.0 | SM7500Ra-B M | | | | |
| FGD-3 | Aqueous | -01B | 06/14/16 11:00 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-3 | Aqueous | -01C | 06/14/16 11:00 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-4 | Aqueous | -02B | 06/14/16 11:55 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-4 | Aqueous | -02C | 06/14/16 11:55 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-6 | Aqueous | -03B | 06/14/16 12:55 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-6 | Aqueous | -03C | 06/14/16 12:55 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-2 | Aqueous | -04B | 06/14/16 01:50 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-2 | Aqueous | -04C | 06/14/16 01:50 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-8 | Aqueous | -05B | 06/14/16 03:00 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-8 | Aqueous | -05C | 06/14/16 03:00 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-1 | Aqueous | -06B | 06/15/16 03:55 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-1 | Aqueous | -06C | 06/15/16 03:55 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-11 | Aqueous | -07B | 06/15/16 10:05 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-11 | Aqueous | -07C | 06/15/16 10:05 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-12 | Aqueous | -08B | 06/15/16 11:05 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-12 | Aqueous | -08C | 06/15/16 11:05 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-5 | Aqueous | -09B | 06/15/16 12:00 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-5 | Aqueous | -09C | 06/15/16 12:00 PM | 500HDPEHNO3 | | 1 | | | | |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs DHLRRTX033116S.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

LR483016
1606589

| | Date/Time | | Date/Time |
|---|---|---|---|
| **Relinquished by:** | 6/17/16 1730 | **Received by:** | 6/17/16 1730 |
| **Relinquished by:** | | **Received by:** | |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1606193

**Subcontractor:**

ESC Laboratory
311 North Aspen
Broken Arrow, Oklahoma 74012

TEL: (918) 251-2515
FAX:
Acct #: DHLRRTX

**17-Jun-16**

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E904.0 | SM7500Ra-B M | | | | |
| MW-07 | Aqueous | -10B | 06/15/16 01:20 PM | 500HDPEHNO3 | 1 | | | | | |
| MW-07 | Aqueous | -10C | 06/15/16 01:20 PM | 500HDPEHNO3 | | 1 | | | | |
| MW-05 | Aqueous | -11B | 06/15/16 02:15 PM | 500HDPEHNO3 | 1 | | | | | |
| MW-05 | Aqueous | -11C | 06/15/16 02:15 PM | 500HDPEHNO3 | | 1 | | | | |
| MW-09 | Aqueous | -12B | 06/15/16 04:05 PM | 500HDPEHNO3 | 1 | | | | | |
| MW-09 | Aqueous | -12C | 06/15/16 04:05 PM | 500HDPEHNO3 | | 1 | | | | |
| AL-10 | Aqueous | -13B | 06/16/16 08:35 AM | 500HDPEHNO3 | 1 | | | | | |
| AL-10 | Aqueous | -13C | 06/16/16 08:35 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-02 | Aqueous | -14B | 06/16/16 10:40 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-02 | Aqueous | -14C | 06/16/16 10:40 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-08 | Aqueous | -15B | 06/16/16 12:50 PM | 500HDPEHNO3 | 1 | | | | | |
| MW-08 | Aqueous | -15C | 06/16/16 12:50 PM | 500HDPEHNO3 | | 1 | | | | |
| DUP-1 | Aqueous | -16B | 06/16/16 12:50 PM | 500HDPEHNO3 | 1 | | | | | |
| DUP-1 | Aqueous | -16C | 06/16/16 12:50 PM | 500HDPEHNO3 | | 1 | | | | |
| EB-1 | Equip Blank | -17B | 06/16/16 01:30 PM | 500HDPEHNO3 | 1 | | | | | |
| EB-1 | Equip Blank | -17C | 06/16/16 01:30 PM | 500HDPEHNO3 | | 1 | | | | |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs DHLRRTX033116S.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

LB43076
20160589

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | | 6/17/16 1730 | **Received by:** | Lonestar | 6/17/16 1730 |
| **Relinquished by:** | | | **Received by:** | | |

# SAMPLE LOGIN

**Date Received:** *6/21/2016 1:05:08* **Lab Number:** 20160589 **Due:** 7/19/2016

| Sample Number | Client Sample ID | Matrix | Date Sampled | Container Type | Container Size | Preservation | Preserved Upon Receipt | Custody Seal | Seal Intact |
|---|---|---|---|---|---|---|---|---|---|
| **20160589-01 B** | FGD-3 | NPW | 06/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-01 A** | FGD-3 | NPW | 06/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-02 A** | FGD-4 | NPW | 06/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-02 B** | FGD-4 | NPW | 06/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-03 A** | FGD-6 | NPW | 06/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-03 B** | FGD-6 | NPW | 06/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-04 B** | FGD-2 | NPW | 06/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-04 A** | FGD-2 | NPW | 06/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-05 A** | FGD-8 | NPW | 06/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-05 B** | FGD-8 | NPW | 06/14/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-06 A** | FGD-1 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-06 B** | FGD-1 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-07 A** | FGD-11 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-07 B** | FGD-11 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **20160589-08 A** | FGD-12 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-08 B** | FGD-12 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-09 B** | FGD-5 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-09 A** | FGD-5 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-10 A** | MW-07 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-10 B** | MW-07 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-11 A** | MW-05 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-11 B** | MW-05 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-12 A** | MW-09 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-12 B** | MW-09 | NPW | 06/15/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-13 A** | AL-10 | NPW | 06/16/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-13 B** | AL-10 | NPW | 06/16/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-14 B** | MW-02 | NPW | 06/16/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-14 A** | MW-02 | NPW | 06/16/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-15 A** | MW-08 | NPW | 06/16/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-15 B** | MW-08 | NPW | 06/16/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-16 A** | DUP-1 | NPW | 06/16/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-16 B** | DUP-1 | NPW | 06/16/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160589-17 B** | EB-1 | NPW | 06/16/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| **20160589-17 A** | EB-1 | NPW | 06/16/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |

**CONTAINER INSPECTION**

**# Coolers** 1 **Custody Seals Broken** 0 ☐ **Temperature:** NA **C** **Ice** **Radiation Survey:** <300 cpm

**SAMPLE INSPECTION**

**Sample Seal Broken** 0 **Chain of Custody Record** ☐ ✓ **Labels in Tact** ☐ ✓ **Radiation Survey Complete** ☐ NA

**Anomalies**

**Inspected By:** _____ **DATE** 6/21/16

**QA or Designee Review:** _____ **DATE** _____

**Sample Custodian Review:** _____ **DATE** 6/21/16

**Project Notes:**

July 01, 2016

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1606194

RE: Luminant - Oak Grove

Dear Will Vienne:

DHL Analytical, Inc. received 1 sample(s) on 6/17/2016 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-16-16

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# № 71510 CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 6-16-16 PAGE 1 OF 1
PO #: 5164-D DHL WORK ORDER #: 1606194
PROJECT LOCATION OR NAME: LUMINANT - OAK GROVE
CLENT PROJECT #: 5164-D COLLECTOR:

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL P=PAINT
W=WATER SL=SLUDGE
A=AIR O=OTHER
L=LIQUID SO=SOLID
SE=SEDIMENT

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX1,1 ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS ❑ | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | SEE ATTACHED WITH IT PROTOCOL

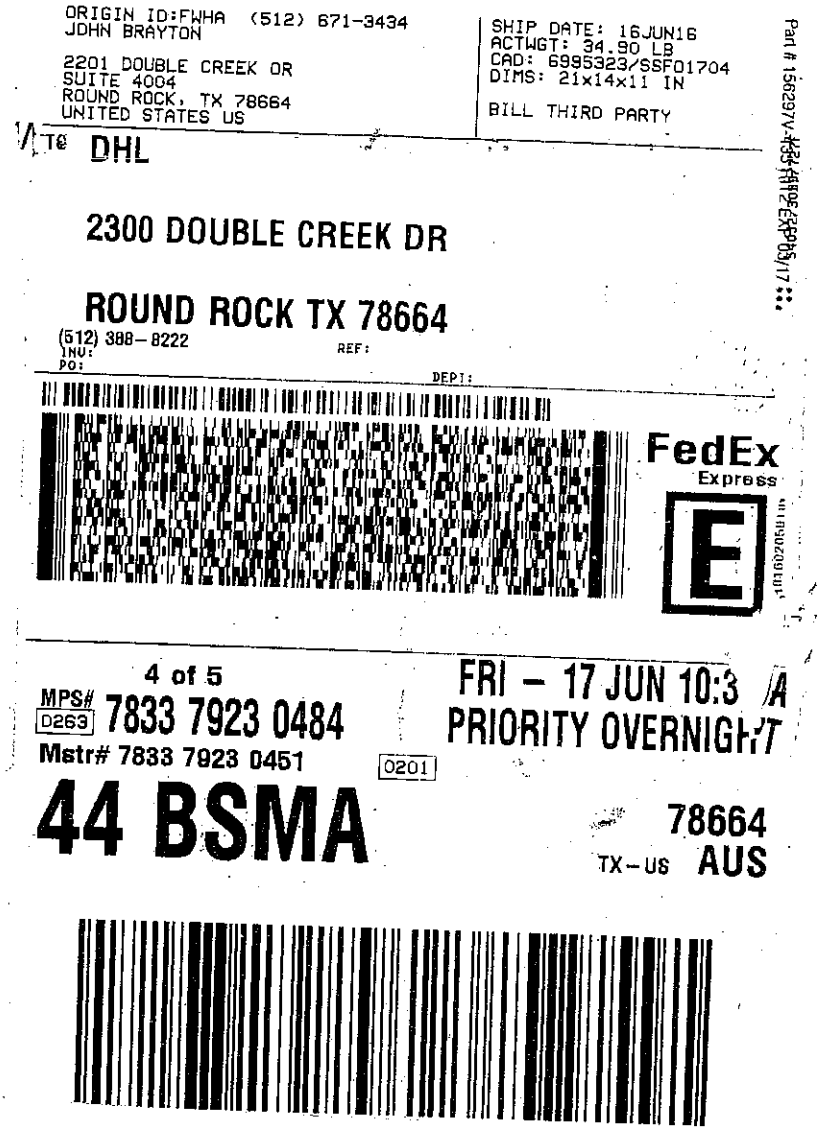
| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-A-POND | 01 | 6-16-16 | 1315 | W | P | 2 | | | | X | | X | |

RELINQUISHED BY: (Signature) DATE/TIME 6-16-16 1730 RECEIVED BY: (Signature) FedEx
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)
FedEx 6/17/16 10:20
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

APPENDIX F-Revision 1 November 2, 2012 ❑ DHL DISPOSAL @ $5.00 each ❑ Return

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑

**LABORATORY USE ONLY:**
RECEIVING TEMP: 5.1 THERM #: 78
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ☒ NOT USED
CARRIER: ❑ LONE STAR ☒ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED


ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON
2201 DOUBLE CREEK DR
SUITE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DATE: 16JUN16
ACTWGT: 34.90 LB
CAD: 6995323/SSFO1704
DIMS: 21x14x11 IN
BILL THIRD PARTY
TO DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
INV:
PO:
REF:
DEPT:
FedEx
Express
4 of 5
MPS# 7833 7923 0484
Mstr# 7833 7923 0451
FRI - 17 JUN 10:3
PRIORITY OVERNIGHT
44 BSMA
78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Pastor, Behling & Wheeler** Date Received: **6/17/2016**

Work Order Number **1606194** Received by **JT**

Checklist completed by: Signature 6/17/2016 Date Reviewed by Initials 6/17/2016 Date

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 5.1 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? NO | | Checked by |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

Page 1 of 1

**DHL Analytical, Inc.** **Date:** *01-Jul-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1606194

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Total and Dissolved Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis

## LOG IN

The samples were received and log-in performed on 6/17/2016. A total of 1 sample was received and analyzed. The sample arrived in good condition and was properly packaged.

## METALS ANALYSIS

For Metals Analysis, the recovery of Boron for the Matrix Spike and matrix Spike Duplicate (1606193-10 MS/MSD) was above the method control limits. These are flagged accordingly in the QC Summary Report. This analyte was within method control limits in the associated LCS. No further corrective action was taken.

For Metals Analysis, the RPD of Boron for the Serial Dilution (1606193-10 SD) was above the method control limit. This is flagged accordingly in the QC Summary Report. This analyte was within method control limits in the associated Post Digestion Spike. No further corrective action was taken.

## DHL Analytical, Inc.

**Date:** *01-Jul-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1606194

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1606194-01 | FGD-A-POND | | 06/16/16 01:15 PM | 6/17/2016 |

**Lab Order:** 1606194
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1606194-01A | FGD-A-POND | 06/16/16 01:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-A-POND | 06/16/16 01:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-A-POND | 06/16/16 01:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/16 04:30 AM | 75757 |
| | FGD-A-POND | 06/16/16 01:15 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| | FGD-A-POND | 06/16/16 01:15 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 06/24/16 09:39 AM | 75845 |
| 1606194-01B | FGD-A-POND | 06/16/16 01:15 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | FGD-A-POND | 06/16/16 01:15 PM | Aqueous | E300 | Anion Preparation | 06/23/16 09:33 AM | 75825 |
| | FGD-A-POND | 06/16/16 01:15 PM | Aqueous | M4500-H+ B | pH Preparation | 06/17/16 02:34 PM | 75721 |
| | FGD-A-POND | 06/16/16 01:15 PM | Aqueous | M2540C | TDS Preparation | 06/22/16 01:19 PM | 75802 |

**Lab Order:** 1606194
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1606194-01A | FGD-A-POND | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 11:28 AM | CETAC2_HG_160628A |
| | FGD-A-POND | Aqueous | SW7470A | Mercury Total: Aqueous | 75845 | 1 | 06/28/16 10:48 AM | CETAC2_HG_160628A |
| | FGD-A-POND | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 100 | 06/29/16 06:39 PM | ICP-MS4_160629E |
| | FGD-A-POND | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 100 | 06/29/16 01:00 PM | ICP-MS4_160629A |
| | FGD-A-POND | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 75757 | 1 | 06/28/16 05:53 PM | ICP-MS4_160628C |
| 1606194-01B | FGD-A-POND | Aqueous | E300 | Anions by IC method - Water | 75825 | 100 | 06/23/16 05:22 PM | IC4_160623A |
| | FGD-A-POND | Aqueous | E300 | Anions by IC method - Water | 75825 | 1 | 06/23/16 03:00 PM | IC4_160623A |
| | FGD-A-POND | Aqueous | M4500-H+ B | pH | 75721 | 1 | 06/17/16 02:58 PM | TITRATOR_160617B |
| | FGD-A-POND | Aqueous | M2540C | Total Dissolved Solids | 75802 | 1 | 06/23/16 08:49 AM | WC_160622D |

# DHL Analytical, Inc.

**Date:** *01-Jul-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-A-POND |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1606194-01 |
| **Project No:** | 5164-D | **Collection Date:** | 06/16/16 01:15 PM |
| **Lab Order:** | 1606194 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | 0.00188 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/28/16 11:28 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | 0.00297 | 0.000800 | 0.00250 | | mg/L | 1 | 06/28/16 05:53 PM |
| Arsenic | 0.00438 | 0.00200 | 0.00500 | J | mg/L | 1 | 06/28/16 05:53 PM |
| Barium | 0.144 | 0.00300 | 0.0100 | | mg/L | 1 | 06/28/16 05:53 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:53 PM |
| Boron | 88.7 | 1.00 | 3.00 | | mg/L | 100 | 06/29/16 06:39 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:53 PM |
| Calcium | 581 | 10.0 | 30.0 | | mg/L | 100 | 06/29/16 01:00 PM |
| Chromium | 0.0160 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:53 PM |
| Cobalt | 0.00458 | 0.00300 | 0.00500 | J | mg/L | 1 | 06/28/16 05:53 PM |
| Lead | 0.00210 | 0.000300 | 0.00100 | | mg/L | 1 | 06/28/16 05:53 PM |
| Lithium | 0.156 | 0.00500 | 0.0100 | | mg/L | 1 | 06/28/16 05:53 PM |
| Molybdenum | 0.276 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:53 PM |
| Selenium | 1.10 | 0.00200 | 0.00500 | | mg/L | 1 | 06/28/16 05:53 PM |
| Thallium | 0.00128 | 0.000500 | 0.00150 | J | mg/L | 1 | 06/28/16 05:53 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 1190 | 30.0 | 100 | | mg/L | 100 | 06/23/16 05:22 PM |
| Fluoride | 7.29 | 0.100 | 0.400 | | mg/L | 1 | 06/23/16 03:00 PM |
| Sulfate | 3390 | 100 | 300 | | mg/L | 100 | 06/23/16 05:22 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.69 | 0 | 0 | | pH Units@16.3°C | 1 | 06/17/16 02:58 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 7110 | 50.0 | 50.0 | | mg/L | 1 | 06/23/16 08:49 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160628A**

The QC data in batch 75845 applies to the following samples: 1606194-01A

| Sample ID | **MB-75845** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:03:09 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-75845** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:05:25 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00205 | 0.000200 | 0.00200 | 0 | 103 | 85 | 115 | | | |

| Sample ID | **LCSD-75845** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:07:41 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00202 | 0.000200 | 0.00200 | 0 | 101 | 85 | 115 | 1.47 | 15 | |

| Sample ID | **1606193-07A SD** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:12:14 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1606193-07A PDS** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:14:29 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00238 | 0.000200 | 0.00250 | 0 | 95.2 | 85 | 115 | | | |

| Sample ID | **1606193-07A MS** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:16:45 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 80 | 120 | | | |

| Sample ID | **1606193-07A MSD** | Batch ID: | **75845** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_160628A** | Analysis Date: | **6/28/2016 10:19:00 AM** | Prep Date: | **6/24/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00208 | 0.000200 | 0.00200 | 0 | 104 | 80 | 120 | 4.42 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160628A**

| Sample ID **ICV-160628** | Batch ID: **R86598** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_160628A** | Analysis Date: **6/28/2016 9:58:36 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00396 | 0.000200 | 0.00400 | 0 | 99.0 | 90 | 110 | | | |

| Sample ID **CCV1-160628** | Batch ID: **R86598** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_160628A** | Analysis Date: **6/28/2016 10:41:42 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 90 | 110 | | | |

| Sample ID **CCV2-160628** | Batch ID: **R86598** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_160628A** | Analysis Date: **6/28/2016 11:06:44 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00200 | 0.000200 | 0.00200 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV3-160628** | Batch ID: **R86598** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_160628A** | Analysis Date: **6/28/2016 11:33:05 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00201 | 0.000200 | 0.00200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

The QC data in batch 75757 applies to the following samples: 1606194-01A

| Sample ID | **MB-75757** | Batch ID: | **75757** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_160628C** | Analysis Date: | **6/28/2016 4:52:00 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

| Sample ID | **LCS-75757** | Batch ID: | **75757** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_160628C** | Analysis Date: | **6/28/2016 4:54:00 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Barium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Beryllium | 0.209 | 0.00100 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Calcium | 4.95 | 0.300 | 5.00 | 0 | 99.0 | 80 | 120 | | | |
| Chromium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Cobalt | 0.211 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Thallium | 0.208 | 0.00150 | 0.200 | 0 | 104 | 80 | 120 | | | |

| Sample ID | **LCSD-75757** | Batch ID: | **75757** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_160628C** | Analysis Date: | **6/28/2016 4:57:00 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | 0.683 | 15 | |
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 1.01 | 15 | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.3 | 80 | 120 | 1.64 | 15 | |
| Beryllium | 0.207 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | 1.12 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

| Sample ID **LCSD-75757** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 4:57:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 99.9 | 80 | 120 | 1.87 | 15 | |
| Calcium | 4.84 | 0.300 | 5.00 | 0 | 96.9 | 80 | 120 | 2.17 | 15 | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 2.11 | 15 | |
| Cobalt | 0.210 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | 0.406 | 15 | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | 0.154 | 15 | |
| Lithium | 0.210 | 0.0100 | 0.200 | 0 | 105 | 80 | 120 | 2.16 | 15 | |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 80 | 120 | 1.20 | 15 | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 2.08 | 15 | |
| Thallium | 0.208 | 0.00150 | 0.200 | 0 | 104 | 80 | 120 | 0.049 | 15 | |

| Sample ID **1606193-10A SD** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:03:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0460 | 0.0500 | 0 | 0.0467 | | | | 1.35 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.0151 | | | | 0 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1606193-10A PDS** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:23:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.189 | 0.00250 | 0.200 | 0 | 94.3 | 80 | 120 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Barium | 0.243 | 0.0100 | 0.200 | 0.0467 | 98.0 | 80 | 120 | | | |
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Cadmium | 0.194 | 0.00100 | 0.200 | 0 | 97.1 | 80 | 120 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Lead | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Lithium | 0.215 | 0.0100 | 0.200 | 0.0151 | 100 | 80 | 120 | | | |
| Molybdenum | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

| Sample ID **1606193-10A PDS** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:23:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID **1606193-10A MS** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:25:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.211 | 0.00250 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Barium | 0.253 | 0.0100 | 0.200 | 0.0467 | 103 | 80 | 120 | | | |
| Beryllium | 0.208 | 0.00100 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Calcium | 16.0 | 0.300 | 5.00 | 11.0 | 101 | 80 | 120 | | | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.207 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lithium | 0.224 | 0.0100 | 0.200 | 0.0151 | 104 | 80 | 120 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 80 | 120 | | | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Thallium | 0.207 | 0.00150 | 0.200 | 0 | 103 | 80 | 120 | | | |

| Sample ID **1606193-10A MSD** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:27:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | 3.97 | 15 | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 1.35 | 15 | |
| Barium | 0.246 | 0.0100 | 0.200 | 0.0467 | 99.9 | 80 | 120 | 2.64 | 15 | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 2.97 | 15 | |
| Cadmium | 0.197 | 0.00100 | 0.200 | 0 | 98.4 | 80 | 120 | 1.87 | 15 | |
| Calcium | 15.9 | 0.300 | 5.00 | 11.0 | 99.2 | 80 | 120 | 0.672 | 15 | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 80 | 120 | 1.53 | 15 | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.697 | 15 | |
| Lead | 0.203 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.667 | 15 | |
| Lithium | 0.218 | 0.0100 | 0.200 | 0.0151 | 101 | 80 | 120 | 2.68 | 15 | |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.5 | 80 | 120 | 1.93 | 15 | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 1.60 | 15 | |
| Thallium | 0.204 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | 1.11 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

| Sample ID **ICV-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 11:22:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.104 | 0.00250 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Arsenic | 0.100 | 0.00500 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Barium | 0.100 | 0.0100 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.0989 | 0.00100 | 0.100 | 0 | 98.9 | 90 | 110 | | | |
| Cadmium | 0.100 | 0.00100 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Calcium | 2.43 | 0.300 | 2.50 | 0 | 97.1 | 90 | 110 | | | |
| Chromium | 0.106 | 0.00500 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.103 | 0.00100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.0977 | 0.0100 | 0.100 | 0 | 97.7 | 90 | 110 | | | |
| Molybdenum | 0.0983 | 0.00500 | 0.100 | 0 | 98.3 | 90 | 110 | | | |
| Selenium | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.102 | 0.00150 | 0.100 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 11:33:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00196 | 0.00250 | 0.00200 | 0 | 98.2 | 70 | 130 | | | |
| Arsenic | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Barium | 0.00488 | 0.0100 | 0.00500 | 0 | 97.6 | 70 | 130 | | | |
| Beryllium | 0.000760 | 0.00100 | 0.00100 | 0 | 76.0 | 70 | 130 | | | |
| Cadmium | 0.000973 | 0.00100 | 0.00100 | 0 | 97.3 | 70 | 130 | | | |
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |
| Chromium | 0.00519 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Cobalt | 0.00525 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Lead | 0.00105 | 0.00100 | 0.00100 | 0 | 105 | 70 | 130 | | | |
| Lithium | 0.0109 | 0.0100 | 0.0100 | 0 | 109 | 70 | 130 | | | |
| Molybdenum | 0.00489 | 0.00500 | 0.00500 | 0 | 97.8 | 70 | 130 | | | |
| Selenium | 0.00549 | 0.00500 | 0.00500 | 0 | 110 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

| Sample ID **CCV7-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 4:35:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.207 | 0.00100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

| Sample ID **CCV7-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 4:35:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.92 | 0.300 | 5.00 | 0 | 98.3 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.203 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.200 | 0.0100 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.205 | 0.00150 | 0.200 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL7-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 4:41:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00201 | 0.00250 | 0.00200 | 0 | 100 | 70 | 130 | | | |
| Arsenic | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Barium | 0.00514 | 0.0100 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Beryllium | 0.000958 | 0.00100 | 0.00100 | 0 | 95.8 | 70 | 130 | | | |
| Cadmium | 0.00106 | 0.00100 | 0.00100 | 0 | 106 | 70 | 130 | | | |
| Calcium | 0.0991 | 0.300 | 0.100 | 0 | 99.1 | 70 | 130 | | | |
| Chromium | 0.00530 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Cobalt | 0.00535 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Lead | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.0110 | 0.0100 | 0.0100 | 0 | 110 | 70 | 130 | | | |
| Molybdenum | 0.00499 | 0.00500 | 0.00500 | 0 | 99.8 | 70 | 130 | | | |
| Selenium | 0.00556 | 0.00500 | 0.00500 | 0 | 111 | 70 | 130 | | | |
| Thallium | 0.00104 | 0.00150 | 0.00100 | 0 | 104 | 70 | 130 | | | |

| Sample ID **CCV8-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Calcium | 4.89 | 0.300 | 5.00 | 0 | 97.9 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.209 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.201 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

| Sample ID **CCV8-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.4 | 90 | 110 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL8-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00232 | 0.00250 | 0.00200 | 0 | 116 | 70 | 130 | | | |
| Arsenic | 0.00530 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Barium | 0.00521 | 0.0100 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Beryllium | 0.00112 | 0.00100 | 0.00100 | 0 | 112 | 70 | 130 | | | |
| Cadmium | 0.000991 | 0.00100 | 0.00100 | 0 | 99.1 | 70 | 130 | | | |
| Calcium | 0.106 | 0.300 | 0.100 | 0 | 106 | 70 | 130 | | | |
| Chromium | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Cobalt | 0.00531 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Lead | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Lithium | 0.0102 | 0.0100 | 0.0100 | 0 | 102 | 70 | 130 | | | |
| Molybdenum | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00519 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Thallium | 0.00108 | 0.00150 | 0.00100 | 0 | 108 | 70 | 130 | | | |

| Sample ID **CCV9-160628** | Batch ID: **R86596** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160628C** | Analysis Date: **6/28/2016 5:55:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.5 | 90 | 110 | | | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Calcium | 5.33 | 0.300 | 5.00 | 0 | 107 | 90 | 110 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cobalt | 0.209 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.189 | 0.0100 | 0.200 | 0 | 94.6 | 90 | 110 | | | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Selenium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.207 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160628C**

Sample ID **LCVL9-160628** Batch ID: **R86596** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_160628C** Analysis Date: **6/28/2016 5:59:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00215 | 0.00250 | 0.00200 | 0 | 107 | 70 | 130 | | | |
| Arsenic | 0.00528 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Barium | 0.00519 | 0.0100 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Beryllium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Cadmium | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Calcium | 0.106 | 0.300 | 0.100 | 0 | 106 | 70 | 130 | | | |
| Chromium | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Cobalt | 0.00533 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Lead | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Lithium | 0.00884 | 0.0100 | 0.0100 | 0 | 88.4 | 70 | 130 | | | |
| Molybdenum | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Selenium | 0.00540 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Thallium | 0.00106 | 0.00150 | 0.00100 | 0 | 106 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160629A**

The QC data in batch 75757 applies to the following samples: 1606194-01A

| Sample ID **1606193-10A SD** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160629A** | Analysis Date: **6/29/2016 12:07:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 10.4 | 7.50 | 0 | 10.5 | | | | 0.592 | 10 | |

| Sample ID **1606193-10A PDS** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160629A** | Analysis Date: **6/29/2016 12:27:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 33.0 | 1.50 | 25.0 | 10.5 | 90.1 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160629A**

| Sample ID | **ICV-160629** | Batch ID: | **R86633** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 11:25:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.28 | 0.300 | 2.50 | 0 | 91.2 | 90 | 110 | | | |

| Sample ID | **LCVL-160629** | Batch ID: | **R86633** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 11:36:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0990 | 0.300 | 0.100 | 0 | 99.0 | 70 | 130 | | | |

| Sample ID | **CCV1-160629** | Batch ID: | **R86633** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 12:29:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.68 | 0.300 | 5.00 | 0 | 93.5 | 90 | 110 | | | |

| Sample ID | **LCVL1-160629** | Batch ID: | **R86633** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629A** | Analysis Date: | **6/29/2016 12:33:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160629E**

The QC data in batch 75757 applies to the following samples: 1606194-01A

| Sample ID | **MB-75757** | Batch ID: | **75757** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 5:30:00 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

| Sample ID | **LCS-75757** | Batch ID: | **75757** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 5:32:00 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.196 | 0.0300 | 0.200 | 0 | 98.0 | 80 | 120 | | | |

| Sample ID | **LCSD-75757** | Batch ID: | **75757** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 5:34:00 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.194 | 0.0300 | 0.200 | 0 | 96.8 | 80 | 120 | 1.17 | 15 | |

| Sample ID | **1606193-10A SD** | Batch ID: | **75757** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 5:40:00 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0800 | 0.150 | 0 | 0.0639 | | | | 22.4 | 10 | R |

| Sample ID | **1606193-10A PDS** | Batch ID: | **75757** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 5:42:00 PM** | Prep Date: | **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.263 | 0.0300 | 0.200 | 0.0639 | 99.5 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160629E**

| Sample ID | **ICV2-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 5:12:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.105 | 0.0300 | 0.100 | 0 | 105 | 90 | 110 | | | |

| Sample ID | **ILCVL2-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 5:19:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0248 | 0.0300 | 0.0200 | 0 | 124 | 70 | 130 | | | |

| Sample ID | **CCV7-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 6:11:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.204 | 0.0300 | 0.200 | 0 | 102 | 90 | 110 | | | |

| Sample ID | **LCVL7-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 6:21:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0236 | 0.0300 | 0.0200 | 0 | 118 | 70 | 130 | | | |

| Sample ID | **CCV8-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 6:49:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.207 | 0.0300 | 0.200 | 0 | 104 | 90 | 110 | | | |

| Sample ID | **LCVL8-160629** | Batch ID: | **R86640** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_160629E** | Analysis Date: | **6/29/2016 6:59:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0231 | 0.0300 | 0.0200 | 0 | 116 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160630A**

The QC data in batch 75757 applies to the following samples: 1606194-01A

| Sample ID **1606193-10A MS** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_160630A** | Analysis Date: **6/30/2016 12:28:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.327 | 0.150 | 0.200 | 0 | 163 | 80 | 120 | | | S |

| Sample ID **1606193-10A MSD** | Batch ID: **75757** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_160630A** | Analysis Date: **6/30/2016 12:30:00 PM** | Prep Date: **6/21/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.294 | 0.150 | 0.200 | 0 | 147 | 80 | 120 | 10.6 | 15 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160630A**

| Sample ID **ICV-160630** | Batch ID: **R86654** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160630A** | Analysis Date: **6/30/2016 11:20:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.104 | 0.0300 | 0.100 | 0 | 104 | 90 | 110 | | | |

| Sample ID **LCVL-160630** | Batch ID: **R86654** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160630A** | Analysis Date: **6/30/2016 11:39:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0249 | 0.0300 | 0.0200 | 0 | 125 | 70 | 130 | | | |

| Sample ID **CCV1-160630** | Batch ID: **R86654** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160630A** | Analysis Date: **6/30/2016 12:36:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.209 | 0.0300 | 0.200 | 0 | 104 | 90 | 110 | | | |

| Sample ID **LCVL1-160630** | Batch ID: **R86654** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160630A** | Analysis Date: **6/30/2016 12:42:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0236 | 0.0300 | 0.0200 | 0 | 118 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160623A**

The QC data in batch 75825 applies to the following samples: 1606194-01B

| Sample ID | **MB-75825** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 10:10:50 AM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-75825** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 10:25:50 AM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Fluoride | 3.86 | 0.400 | 4.000 | 0 | 96.5 | 90 | 110 | | | |
| Sulfate | 31.3 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID | **LCSD-75825** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 10:40:50 AM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | 0.306 | 20 | |
| Fluoride | 3.92 | 0.400 | 4.000 | 0 | 98.0 | 90 | 110 | 1.64 | 20 | |
| Sulfate | 31.5 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | 0.423 | 20 | |

| Sample ID | **1606193-14DMS** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 6:52:41 PM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 298 | 10.0 | 200.0 | 87.82 | 105 | 90 | 110 | | | |
| Fluoride | 204 | 4.00 | 200.0 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 248 | 30.0 | 200.0 | 35.85 | 106 | 90 | 110 | | | |

| Sample ID | **1606193-14DMSD** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 7:07:41 PM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 297 | 10.0 | 200.0 | 87.82 | 105 | 90 | 110 | 0.387 | 20 | |
| Fluoride | 203 | 4.00 | 200.0 | 0 | 102 | 90 | 110 | 0.202 | 20 | |
| Sulfate | 248 | 30.0 | 200.0 | 35.85 | 106 | 90 | 110 | 0.092 | 20 | |

| Sample ID | **1606193-15DMS** | Batch ID: | **75825** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_160623A** | Analysis Date: | **6/23/2016 7:37:41 PM** | Prep Date: | **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160623A**

| Sample ID **1606193-15DMS** | Batch ID: **75825** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 7:37:41 PM** | Prep Date: **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2610 | 100 | 2000 | 519.7 | 105 | 90 | 110 | | | |
| Fluoride | 2030 | 40.0 | 2000 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 2220 | 300 | 2000 | 103.0 | 106 | 90 | 110 | | | |

| Sample ID **1606193-15DMSD** | Batch ID: **75825** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 7:52:41 PM** | Prep Date: **6/23/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2620 | 100 | 2000 | 519.7 | 105 | 90 | 110 | 0.193 | 20 | |
| Fluoride | 2040 | 40.0 | 2000 | 0 | 102 | 90 | 110 | 0.279 | 20 | |
| Sulfate | 2220 | 300 | 2000 | 103.0 | 106 | 90 | 110 | 0.305 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160623A**

| Sample ID **ICV-160623** | Batch ID: **R86527** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 9:30:34 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.7 | 1.00 | 25.00 | 0 | 103 | 90 | 110 | | | |
| Fluoride | 9.88 | 0.400 | 10.00 | 0 | 98.8 | 90 | 110 | | | |
| Sulfate | 78.7 | 3.00 | 75.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV1-160623** | Batch ID: **R86527** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 1:50:32 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.99 | 0.400 | 4.000 | 0 | 99.7 | 90 | 110 | | | |
| Sulfate | 31.5 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV2-160623** | Batch ID: **R86527** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 6:07:41 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 4.03 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 31.7 | 3.00 | 30.00 | 0 | 106 | 90 | 110 | | | |

| Sample ID **CCV3-160623** | Batch ID: **R86527** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160623A** | Analysis Date: **6/23/2016 8:37:41 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 4.02 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 31.8 | 3.00 | 30.00 | 0 | 106 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160617B**

The QC data in batch 75721 applies to the following samples: 1606194-01B

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **1606193-15D-DUP** | Batch ID: **75721** | TestNo: **M4500-H+ B** | Units: **pH Units@17.9°C** |
| SampType: **DUP** | Run ID: **TITRATOR_160617B** | Analysis Date: **6/17/2016 2:52:00 PM** | Prep Date: **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.79 | 0 | 0 | 6.700 | | | | 1.33 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160617B**

| Sample ID | **ICV-160617** | Batch ID: | **R86395** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.9°C** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_160617B** | Analysis Date: | **6/17/2016 12:36:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.97 | 0 | 10.00 | 0 | 99.7 | 99 | 101 | | | |

| Sample ID | **CCV3-160617** | Batch ID: | **R86395** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.6°C** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160617B** | Analysis Date: | **6/17/2016 1:59:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.01 | 0 | 7.000 | 0 | 100 | 97.1 | 102.9 | | | |

| Sample ID | **CCV4-160617** | Batch ID: | **R86395** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.9°C** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160617B** | Analysis Date: | **6/17/2016 3:00:00 PM** | Prep Date: | **6/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.01 | 0 | 7.000 | 0 | 100 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1606194
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_160622D**

The QC data in batch 75802 applies to the following samples: 1606194-01B

| Sample ID | **MB-75802** | Batch ID: | **75802** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_160622D** | Analysis Date: | **6/23/2016 8:49:00 AM** | Prep Date: | **6/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-75802** | Batch ID: | **75802** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_160622D** | Analysis Date: | **6/23/2016 8:49:00 AM** | Prep Date: | **6/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 773 | 10.0 | 745.6 | 0 | 104 | 90 | 113 | | | |

| Sample ID | **1606194-01B-DUP** | Batch ID: | **75802** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_160622D** | Analysis Date: | **6/23/2016 8:49:00 AM** | Prep Date: | **6/22/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 6810 | 50.0 | 0 | 7110 | | | | 4.31 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

September 26, 2016

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1608276

RE: Luminant - Oak Grove

Dear Will Vienne:

DHL Analytical, Inc. received 16 sample(s) on 8/27/2016 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-16-16

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 72318

# CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 8-26-16 PAGE 1 OF 2
PO #: 5164-D DHL WORK ORDER #: 1608276
PROJECT LOCATION OR NAME: LUMINANT - OAK GROVE
CLENT PROJECT #: 5164-D COLLECTOR: J. BEAUTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl, $HNO_3$, $H_2SO_4$ ❑ NaOH ❑, ICE, UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ 8270 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ ____ ❑ | RCRA ❑ TX11 ❑ ____ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS ____ ❑ | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | SEE ATTACHED

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | SEE ATTACHED | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-2 | 01 | 8-24-16 | 1020 | W | P | 4 | | X | | X | X | X | |
| FGD-3 | 02 | | 1115 | W | P | 4 | | X | | X | X | X | |
| FGD-4 | 03 | | 1200 | W | P | 4 | | X | | X | X | X | |
| FGD-6 | 04 | | 1250 | W | P | 4 | | X | | X | X | X | |
| FGD-5 | 05 | | 1340 | W | P | 4 | | X | | X | X | X | |
| FGD-1 | 06 | | 1430 | W | P | 4 | | X | | X | X | X | |
| MW-07 | 07 | | 1520 | W | P | 4 | | X | | X | X | X | |
| MW-05 | 08 | | 1620 | W | P | 4 | | X | | X | X | X | |
| DUP-01 | 09 | | 1620 | W | P | 4 | | X | | X | X | X | |
| EB-1 | 10 | | 1640 | W | P | 4 | | X | | X | X | X | |
| FGD-8 | 11 | | 1735 | W | P | 4 | | X | | X | X | X | |
| AL-10 | 12 | 8-25-16 | 0850 | W | P | 4 | | X | | X | X | X | |
| MW-02 | 13 | | 1000 | W | P | 4 | | X | | X | X | X | |
| MW-09 | 14 | | 1105 | W | P | 4 | | X | | X | X | X | |
| FGD-11 | 15 | | 1205 | W | P | 4 | | X | | X | X | X | |

| | DATE/TIME | | |
|---|---|---|---|
| RELINQUISHED BY: (Signature) | 8-26-16 | 1730 | RECEIVED BY: (Signature) |
| RELINQUISHED BY: (Signature) | 8/27/16 | 1000 | RECEIVED BY: (Signature) |
| RELINQUISHED BY: (Signature) | DATE/TIME | | RECEIVED BY: (Signature) |

❑ DHL DISPOSAL @ $5.00 each ❑ Return

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑ ____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 1.8, 4.0, 3.5 THERM #: 28
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ❑ NOT USED
CARRIER: ❑ LONE STAR ❑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED

DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 72319

# CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 8-26-16 PAGE 2 OF 2
PO #: 5164-D DHL WORK ORDER #: 1608276
PROJECT LOCATION OR NAME: LUMINANT - OAK GROVE
CLENT PROJECT #: 5164-D COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL P=PAINT
W=WATER SL=SLUDGE
A=AIR O=OTHER
L=LIQUID SO=SOLID
SE=SEDIMENT

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ 8082 PCB ❑ 8270 PCB ❑ | 8270 O-P PEST ❑ 8081 PEST ❑ 8082 PCB ❑ T PHOS, AMMONIA ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS ❑ | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | SEE ATTACHED

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-12 | 14 | 8-25-16 | 1305 | W | P | 4 | | X | | X | X | X | |

RELINQUISHED BY: (Signature) DATE/TIME 8-26-16 RECEIVED BY: (Signature) 1730
RELINQUISHED BY: (Signature) DATE/TIME 8/27/16 RECEIVED BY: (Signature) 1000
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

❑ DHL DISPOSAL @ $5.00 each ❑ Return

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 1.5, 1.0, 3.5 THERM #: 28
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ☒ NOT USED
CARRIER: ❑ LONE STAR ☒ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED

John Dupont

| | |
|---|---|
| From: | Sara Taube [Sara.Taube@pbwllc.com] |
| Sent: | Wednesday, July 22, 2015 12:05 PM |
| To: | John Dupont |
| Subject: | CCR Appendix III and IV |
| Follow Up Flag: | Follow up |
| Flag Status: | Completed |

Hi John,

Here are the Appendix III and Appendix IV constituents that we will need to have analyzed under the CCR Rule.

Appendix III
Boron
Calcium
Chloride
Fluoride
pH
sulfate
TDS

Appendix IV
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228

We are looking to have approximately 74 wells sampled 8 times over the course of the next two years. Please let me know if there is any more information you might need.

Cheers,

Sara

10/26/2015

ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON

2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 26AUG16
ACTWGT: 56.00 LB
CAD: 6991003/SSFO1704
DIMS: 24x14x14 IN

BILL THIRD PARTY

TO DHL

2300 DOUBLE CREEK DR

ROUND ROCK TX 78664

(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx Express

1 of 3

TRK# 0201 7839 3247 1021

## MASTER ##

SATURDAY 12:00P
PRIORITY OVERNIGHT

XO BSMA

78664
TX-US AUS

ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON

2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 26AUG16
ACTWGT: 55.50 LB
CAD: 6991003/SSFO1704
DIMS: 24x14x14 IN

BILL THIRD PARTY

Part # 156297V-496 RIT2 APV EXP 08/17

TO DHL

2300 DOUBLE CREEK DR

ROUND ROCK TX 78664

(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx Express

2 of 3

MPS# 0263 7839 3247 1032

Mstr# 7839 3247 1021 0201

SATURDAY 12:00P
PRIORITY OVERNIGHT

XO BSMA

78664
TX-US AUS

MPS# 0263 7839 3247 1043

SATURDAY 12:00
PRIORITY OVERNIGH

XO BSMA

78664
TX-US
AUS

5169367 27Aug 00:46 MEMH 5121/6323/0560

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Pastor, Behling & Wheeler

Date Received: 8/27/2016

Work Order Number 1608276

Received by JB

Checklist completed by: _____ 8/29/2016
Signature | Date

Reviewed by _____ 8/29/2016
Initials | Date

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 1.8 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? _____ | | Checked by _____ |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? _____ | | Checked by _____ |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *26-Sep-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1608276

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904/9320 and SM 7500 Ra B M. Analyzed at ESC Lab Sciences.

## LOG IN

The samples were received and log-in performed on 8/22/16. A total of 16 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 9/6/16 and 9/9/16 (batches 77018 & 77092) the RPDs for the serial dilutions were above control limits for Boron. These are flagged accordingly in the QC summary report. The PDSs were within control limits for this analyte. No further corrective actions were taken.

For Metals analysis performed on 9/8/16 (batch 77092) the PDS recovery was slightly below control limits for Calcium. This is flagged accordingly. The serial dilution was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *26-Sep-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1608276

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1608276-01 | FGD-2 | | 08/24/16 10:20 AM | 8/27/2016 |
| 1608276-02 | FGD-3 | | 08/24/16 11:15 AM | 8/27/2016 |
| 1608276-03 | FGD-4 | | 08/24/16 12:00 PM | 8/27/2016 |
| 1608276-04 | FGD-6 | | 08/24/16 12:50 PM | 8/27/2016 |
| 1608276-05 | FGD-5 | | 08/24/16 01:40 PM | 8/27/2016 |
| 1608276-06 | FGD-1 | | 08/24/16 02:30 PM | 8/27/2016 |
| 1608276-07 | MW-07 | | 08/24/16 03:20 PM | 8/27/2016 |
| 1608276-08 | MW-05 | | 08/24/16 04:20 PM | 8/27/2016 |
| 1608276-09 | DUP-01 | | 08/24/16 04:20 PM | 8/27/2016 |
| 1608276-10 | EB-1 | | 08/24/16 04:40 PM | 8/27/2016 |
| 1608276-11 | FGD-8 | | 08/24/16 05:35 PM | 8/27/2016 |
| 1608276-12 | AL-10 | | 08/25/16 08:50 AM | 8/27/2016 |
| 1608276-13 | MW-02 | | 08/25/16 10:00 AM | 8/27/2016 |
| 1608276-14 | MW-09 | | 08/25/16 11:05 AM | 8/27/2016 |
| 1608276-15 | FGD-11 | | 08/25/16 12:05 PM | 8/27/2016 |
| 1608276-16 | FGD-12 | | 08/25/16 01:05 PM | 8/27/2016 |

**Lab Order:** 1608276
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1608276-01A | FGD-2 | 08/24/16 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-2 | 08/24/16 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-2 | 08/24/16 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-2 | 08/24/16 10:20 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-01D | FGD-2 | 08/24/16 10:20 AM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-2 | 08/24/16 10:20 AM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-2 | 08/24/16 10:20 AM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | FGD-2 | 08/24/16 10:20 AM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-02A | FGD-3 | 08/24/16 11:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-3 | 08/24/16 11:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-3 | 08/24/16 11:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-3 | 08/24/16 11:15 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-02D | FGD-3 | 08/24/16 11:15 AM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-3 | 08/24/16 11:15 AM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-3 | 08/24/16 11:15 AM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | FGD-3 | 08/24/16 11:15 AM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-03A | FGD-4 | 08/24/16 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-4 | 08/24/16 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-4 | 08/24/16 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-4 | 08/24/16 12:00 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-03D | FGD-4 | 08/24/16 12:00 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-4 | 08/24/16 12:00 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-4 | 08/24/16 12:00 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | FGD-4 | 08/24/16 12:00 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-04A | FGD-6 | 08/24/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-6 | 08/24/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-6 | 08/24/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-6 | 08/24/16 12:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |

**Lab Order:** 1608276
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1608276-04D | FGD-6 | 08/24/16 12:50 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-6 | 08/24/16 12:50 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-6 | 08/24/16 12:50 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | FGD-6 | 08/24/16 12:50 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-05A | FGD-5 | 08/24/16 01:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-5 | 08/24/16 01:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-5 | 08/24/16 01:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-5 | 08/24/16 01:40 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-05D | FGD-5 | 08/24/16 01:40 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-5 | 08/24/16 01:40 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-5 | 08/24/16 01:40 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | FGD-5 | 08/24/16 01:40 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-06A | FGD-1 | 08/24/16 02:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-1 | 08/24/16 02:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-1 | 08/24/16 02:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-1 | 08/24/16 02:30 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-06D | FGD-1 | 08/24/16 02:30 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | FGD-1 | 08/24/16 02:30 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | FGD-1 | 08/24/16 02:30 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-07A | MW-07 | 08/24/16 03:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | MW-07 | 08/24/16 03:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | MW-07 | 08/24/16 03:20 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-07D | MW-07 | 08/24/16 03:20 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | MW-07 | 08/24/16 03:20 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | MW-07 | 08/24/16 03:20 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-08A | MW-05 | 08/24/16 04:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | MW-05 | 08/24/16 04:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | MW-05 | 08/24/16 04:20 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |

**Lab Order:** 1608276
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1608276-08D | MW-05 | 08/24/16 04:20 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | MW-05 | 08/24/16 04:20 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | MW-05 | 08/24/16 04:20 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | MW-05 | 08/24/16 04:20 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-09A | DUP-01 | 08/24/16 04:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | DUP-01 | 08/24/16 04:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | DUP-01 | 08/24/16 04:20 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-09D | DUP-01 | 08/24/16 04:20 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | DUP-01 | 08/24/16 04:20 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | DUP-01 | 08/24/16 04:20 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | DUP-01 | 08/24/16 04:20 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-10A | EB-1 | 08/24/16 04:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | EB-1 | 08/24/16 04:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | EB-1 | 08/24/16 04:40 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-10D | EB-1 | 08/24/16 04:40 PM | Aqueous | E300 | Anion Preparation | 08/29/16 10:44 AM | 77006 |
| | EB-1 | 08/24/16 04:40 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | EB-1 | 08/24/16 04:40 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-11A | FGD-8 | 08/24/16 05:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | FGD-8 | 08/24/16 05:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | FGD-8 | 08/24/16 05:35 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-11D | FGD-8 | 08/24/16 05:35 PM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | FGD-8 | 08/24/16 05:35 PM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | FGD-8 | 08/24/16 05:35 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | FGD-8 | 08/24/16 05:35 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-12A | AL-10 | 08/25/16 08:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | AL-10 | 08/25/16 08:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | AL-10 | 08/25/16 08:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | AL-10 | 08/25/16 08:50 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |

**Lab Order:** 1608276
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1608276-12D | AL-10 | 08/25/16 08:50 AM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | AL-10 | 08/25/16 08:50 AM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | AL-10 | 08/25/16 08:50 AM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | AL-10 | 08/25/16 08:50 AM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-13A | MW-02 | 08/25/16 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | MW-02 | 08/25/16 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | MW-02 | 08/25/16 10:00 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-13D | MW-02 | 08/25/16 10:00 AM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | MW-02 | 08/25/16 10:00 AM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 08:49 AM | 77040 |
| | MW-02 | 08/25/16 10:00 AM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-14A | MW-09 | 08/25/16 11:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | MW-09 | 08/25/16 11:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | MW-09 | 08/25/16 11:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | MW-09 | 08/25/16 11:05 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-14D | MW-09 | 08/25/16 11:05 AM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | MW-09 | 08/25/16 11:05 AM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | MW-09 | 08/25/16 11:05 AM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 01:16 PM | 77050 |
| | MW-09 | 08/25/16 11:05 AM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-15A | FGD-11 | 08/25/16 12:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | FGD-11 | 08/25/16 12:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | FGD-11 | 08/25/16 12:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | FGD-11 | 08/25/16 12:05 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608276-15D | FGD-11 | 08/25/16 12:05 PM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | FGD-11 | 08/25/16 12:05 PM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | FGD-11 | 08/25/16 12:05 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 01:16 PM | 77050 |
| | FGD-11 | 08/25/16 12:05 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |
| 1608276-16A | FGD-12 | 08/25/16 01:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | FGD-12 | 08/25/16 01:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |

**Lab Order:** 1608276
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1608276-16A | FGD-12 | 08/25/16 01:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/06/16 09:14 AM | 77092 |
| | FGD-12 | 08/25/16 01:05 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 09/02/16 10:32 AM | 77077 |
| 1608276-16D | FGD-12 | 08/25/16 01:05 PM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | FGD-12 | 08/25/16 01:05 PM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | FGD-12 | 08/25/16 01:05 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 01:16 PM | 77050 |
| | FGD-12 | 08/25/16 01:05 PM | Aqueous | M2540C | TDS Preparation | 08/31/16 03:45 PM | 77055 |

**Lab Order:** 1608276
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1608276-01A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:20 AM | CETAC2_HG_160831B |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 10 | 09/02/16 05:26 PM | ICP-MS3_160902A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/02/16 07:01 PM | ICP-MS3_160902A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/06/16 01:09 PM | ICP-MS4_160906B |
| 1608276-01D | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 77006 | 1 | 08/29/16 12:41 PM | IC4_160829A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 77006 | 10 | 08/29/16 06:04 PM | IC4_160829A |
| | FGD-2 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 10:25 AM | TITRATOR_160831A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-02A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:22 AM | CETAC2_HG_160831B |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 10 | 09/02/16 05:32 PM | ICP-MS3_160902A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/02/16 07:07 PM | ICP-MS3_160902A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/06/16 01:12 PM | ICP-MS4_160906B |
| 1608276-02D | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 77006 | 10 | 08/29/16 06:19 PM | IC4_160829A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 77006 | 1 | 08/29/16 12:56 PM | IC4_160829A |
| | FGD-3 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 11:06 AM | TITRATOR_160831A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-03A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:25 AM | CETAC2_HG_160831B |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 10 | 09/02/16 05:38 PM | ICP-MS3_160902A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/02/16 07:13 PM | ICP-MS3_160902A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/06/16 01:15 PM | ICP-MS4_160906B |
| 1608276-03D | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 77006 | 1 | 08/29/16 03:08 PM | IC4_160829A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 77006 | 10 | 08/29/16 06:34 PM | IC4_160829A |
| | FGD-4 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 11:07 AM | TITRATOR_160831A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-04A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:27 AM | CETAC2_HG_160831B |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 10 | 09/02/16 05:44 PM | ICP-MS3_160902A |

**Lab Order:** 1608276
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1608276-04A | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/02/16 08:32 PM | ICP-MS3_160902A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/06/16 01:18 PM | ICP-MS4_160906B |
| 1608276-04D | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 77006 | 1 | 08/29/16 03:23 PM | IC4_160829A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 77006 | 10 | 08/29/16 06:49 PM | IC4_160829A |
| | FGD-6 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 11:10 AM | TITRATOR_160831A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-05A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:29 AM | CETAC2_HG_160831B |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 10 | 09/02/16 05:50 PM | ICP-MS3_160902A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/02/16 08:38 PM | ICP-MS3_160902A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/06/16 01:21 PM | ICP-MS4_160906B |
| 1608276-05D | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 77006 | 1 | 08/29/16 03:38 PM | IC4_160829A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 77006 | 10 | 08/29/16 07:04 PM | IC4_160829A |
| | FGD-5 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 11:13 AM | TITRATOR_160831A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-06A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:31 AM | CETAC2_HG_160831B |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/06/16 03:11 PM | ICP-MS4_160906B |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/02/16 05:02 PM | ICP-MS3_160902A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 5 | 09/06/16 02:06 PM | ICP-MS4_160906B |
| 1608276-06D | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 77006 | 1 | 08/29/16 03:53 PM | IC4_160829A |
| | FGD-1 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 11:16 AM | TITRATOR_160831A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-07A | MW-07 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:43 AM | CETAC2_HG_160831B |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/08/16 06:58 PM | ICP-MS4_160908B |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/09/16 01:50 PM | ICP-MS4_160909A |
| 1608276-07D | MW-07 | Aqueous | E300 | Anions by IC method - Water | 77006 | 1 | 08/29/16 04:08 PM | IC4_160829A |
| | MW-07 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 11:17 AM | TITRATOR_160831A |

**Lab Order:** 1608276
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1608276-07D | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-08A | MW-05 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:45 AM | CETAC2_HG_160831B |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/08/16 07:04 PM | ICP-MS4_160908B |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/09/16 03:26 PM | ICP-MS4_160909B |
| 1608276-08D | MW-05 | Aqueous | E300 | Anions by IC method - Water | 77006 | 1 | 08/29/16 04:23 PM | IC4_160829A |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 77006 | 10 | 08/29/16 08:04 PM | IC4_160829A |
| | MW-05 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 11:20 AM | TITRATOR_160831A |
| | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-09A | DUP-01 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:47 AM | CETAC2_HG_160831B |
| | DUP-01 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/08/16 07:07 PM | ICP-MS4_160908B |
| | DUP-01 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/09/16 03:29 PM | ICP-MS4_160909B |
| 1608276-09D | DUP-01 | Aqueous | E300 | Anions by IC method - Water | 77006 | 1 | 08/29/16 04:38 PM | IC4_160829A |
| | DUP-01 | Aqueous | E300 | Anions by IC method - Water | 77006 | 10 | 08/29/16 08:19 PM | IC4_160829A |
| | DUP-01 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 11:22 AM | TITRATOR_160831A |
| | DUP-01 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-10A | EB-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:54 AM | CETAC2_HG_160831B |
| | EB-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/08/16 07:10 PM | ICP-MS4_160908B |
| | EB-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/09/16 03:32 PM | ICP-MS4_160909B |
| 1608276-10D | EB-1 | Aqueous | E300 | Anions by IC method - Water | 77006 | 1 | 08/29/16 04:53 PM | IC4_160829A |
| | EB-1 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 11:24 AM | TITRATOR_160831A |
| | EB-1 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-11A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:56 AM | CETAC2_HG_160831B |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/09/16 03:35 PM | ICP-MS4_160909B |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/08/16 07:13 PM | ICP-MS4_160908B |
| 1608276-11D | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 77028 | 1 | 08/30/16 11:25 AM | IC4_160830A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 77028 | 10 | 08/30/16 03:07 PM | IC4_160830A |

**Lab Order:** 1608276
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1608276-11D | FGD-8 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 11:26 AM | TITRATOR_160831A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-12A | AL-10 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 10:59 AM | CETAC2_HG_160831B |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/08/16 07:16 PM | ICP-MS4_160908B |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 10 | 09/09/16 02:05 PM | ICP-MS4_160909A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/09/16 03:38 PM | ICP-MS4_160909B |
| 1608276-12D | AL-10 | Aqueous | E300 | Anions by IC method - Water | 77028 | 1 | 08/30/16 11:40 AM | IC4_160830A |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 77028 | 100 | 08/30/16 03:52 PM | IC4_160830A |
| | AL-10 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 01:06 PM | TITRATOR_160831A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-13A | MW-02 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 11:01 AM | CETAC2_HG_160831B |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/09/16 03:41 PM | ICP-MS4_160909B |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/08/16 07:19 PM | ICP-MS4_160908B |
| 1608276-13D | MW-02 | Aqueous | E300 | Anions by IC method - Water | 77028 | 1 | 08/30/16 11:55 AM | IC4_160830A |
| | MW-02 | Aqueous | M4500-H+ B | pH | 77040 | 1 | 08/31/16 01:07 PM | TITRATOR_160831A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-14A | MW-09 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 11:03 AM | CETAC2_HG_160831B |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/08/16 07:22 PM | ICP-MS4_160908B |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 10 | 09/09/16 02:08 PM | ICP-MS4_160909A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/09/16 03:44 PM | ICP-MS4_160909B |
| 1608276-14D | MW-09 | Aqueous | E300 | Anions by IC method - Water | 77028 | 1 | 08/30/16 12:10 PM | IC4_160830A |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 77028 | 10 | 08/30/16 04:07 PM | IC4_160830A |
| | MW-09 | Aqueous | M4500-H+ B | pH | 77050 | 1 | 08/31/16 01:44 PM | TITRATOR_160831A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-15A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 11:06 AM | CETAC2_HG_160831B |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/09/16 03:47 PM | ICP-MS4_160909B |

**Lab Order:** 1608276
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1608276-15A | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/08/16 07:25 PM | ICP-MS4_160908B |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 50 | 09/09/16 02:11 PM | ICP-MS4_160909A |
| 1608276-15D | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 77028 | 1 | 08/30/16 12:25 PM | IC4_160830A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 77028 | 100 | 08/30/16 04:22 PM | IC4_160830A |
| | FGD-11 | Aqueous | M4500-H+ B | pH | 77050 | 1 | 08/31/16 01:49 PM | TITRATOR_160831A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |
| 1608276-16A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 77077 | 1 | 09/06/16 10:45 AM | CETAC2_HG_160906C |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/08/16 07:28 PM | ICP-MS4_160908B |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 10 | 09/09/16 02:14 PM | ICP-MS4_160909A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77092 | 1 | 09/09/16 03:50 PM | ICP-MS4_160909B |
| 1608276-16D | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 77028 | 1 | 08/30/16 12:40 PM | IC4_160830A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 77028 | 10 | 08/30/16 04:37 PM | IC4_160830A |
| | FGD-12 | Aqueous | M4500-H+ B | pH | 77050 | 1 | 08/31/16 01:51 PM | TITRATOR_160831A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 77055 | 1 | 09/01/16 08:46 AM | WC_160831A |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-01 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 10:20 AM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:20 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/02/16 07:01 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:01 PM |
| Barium | 0.144 | 0.00300 | 0.0100 | | mg/L | 1 | 09/02/16 07:01 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 07:01 PM |
| Boron | 0.219 | 0.0100 | 0.0300 | | mg/L | 1 | 09/06/16 01:09 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 07:01 PM |
| Calcium | 79.9 | 1.00 | 3.00 | | mg/L | 10 | 09/02/16 05:26 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:01 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/02/16 07:01 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 07:01 PM |
| Lithium | 0.0190 | 0.00500 | 0.0100 | | mg/L | 1 | 09/02/16 07:01 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:01 PM |
| Selenium | 0.0185 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:01 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/02/16 07:01 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 421 | 3.00 | 10.0 | | mg/L | 10 | 08/29/16 06:04 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 08/29/16 12:41 PM |
| Sulfate | 158 | 10.0 | 30.0 | | mg/L | 10 | 08/29/16 06:04 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.85 | 0 | 0 | | pH Units@16.3℃ | 1 | 08/31/16 10:25 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1060 | 50.0 | 50.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-02 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 11:15 AM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:22 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/02/16 07:07 PM |
| Arsenic | 0.00221 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/02/16 07:07 PM |
| Barium | 0.0387 | 0.00300 | 0.0100 | | mg/L | 1 | 09/02/16 07:07 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 07:07 PM |
| Boron | 0.112 | 0.0100 | 0.0300 | | mg/L | 1 | 09/06/16 01:12 PM |
| Cadmium | 0.00146 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 07:07 PM |
| Calcium | 90.4 | 1.00 | 3.00 | | mg/L | 10 | 09/02/16 05:32 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:07 PM |
| Cobalt | 0.0232 | 0.00300 | 0.00500 | | mg/L | 1 | 09/02/16 07:07 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 07:07 PM |
| Lithium | 0.0974 | 0.00500 | 0.0100 | | mg/L | 1 | 09/02/16 07:07 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:07 PM |
| Selenium | 0.0272 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:07 PM |
| Thallium | 0.00123 | 0.000500 | 0.00150 | J | mg/L | 1 | 09/02/16 07:07 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 279 | 3.00 | 10.0 | | mg/L | 10 | 08/29/16 06:19 PM |
| Fluoride | 0.463 | 0.100 | 0.400 | | mg/L | 1 | 08/29/16 12:56 PM |
| Sulfate | 357 | 10.0 | 30.0 | | mg/L | 10 | 08/29/16 06:19 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.83 | 0 | 0 | | pH Units@19.2℃ | 1 | 08/31/16 11:06 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1490 | 50.0 | 50.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-03 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 12:00 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:25 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/02/16 07:13 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:13 PM |
| Barium | 0.111 | 0.00300 | 0.0100 | | mg/L | 1 | 09/02/16 07:13 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 07:13 PM |
| Boron | 0.343 | 0.0100 | 0.0300 | | mg/L | 1 | 09/06/16 01:15 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 07:13 PM |
| Calcium | 52.5 | 1.00 | 3.00 | | mg/L | 10 | 09/02/16 05:38 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:13 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/02/16 07:13 PM |
| Lead | 0.000578 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/02/16 07:13 PM |
| Lithium | 0.0383 | 0.00500 | 0.0100 | | mg/L | 1 | 09/02/16 07:13 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:13 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 07:13 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/02/16 07:13 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 208 | 3.00 | 10.0 | | mg/L | 10 | 08/29/16 06:34 PM |
| Fluoride | 0.148 | 0.100 | 0.400 | J | mg/L | 1 | 08/29/16 03:08 PM |
| Sulfate | 53.3 | 1.00 | 3.00 | | mg/L | 1 | 08/29/16 03:08 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.97 | 0 | 0 | | pH Units@19.5℃ | 1 | 08/31/16 11:07 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 704 | 10.0 | 10.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-04 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 12:50 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:27 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/02/16 08:32 PM |
| Arsenic | 0.00725 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 08:32 PM |
| Barium | 0.127 | 0.00300 | 0.0100 | | mg/L | 1 | 09/02/16 08:32 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 08:32 PM |
| Boron | 0.0355 | 0.0100 | 0.0300 | | mg/L | 1 | 09/06/16 01:18 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 08:32 PM |
| Calcium | 35.6 | 1.00 | 3.00 | | mg/L | 10 | 09/02/16 05:44 PM |
| Chromium | 0.00334 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/02/16 08:32 PM |
| Cobalt | 0.00399 | 0.00300 | 0.00500 | J | mg/L | 1 | 09/02/16 08:32 PM |
| Lead | 0.000656 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/02/16 08:32 PM |
| Lithium | 0.00885 | 0.00500 | 0.0100 | J | mg/L | 1 | 09/02/16 08:32 PM |
| Molybdenum | 0.00244 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/02/16 08:32 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 08:32 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/02/16 08:32 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 285 | 3.00 | 10.0 | | mg/L | 10 | 08/29/16 06:49 PM |
| Fluoride | 0.147 | 0.100 | 0.400 | J | mg/L | 1 | 08/29/16 03:23 PM |
| Sulfate | 64.7 | 1.00 | 3.00 | | mg/L | 1 | 08/29/16 03:23 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.16 | 0 | 0 | | pH Units@19.9℃ | 1 | 08/31/16 11:10 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 750 | 50.0 | 50.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-05 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 01:40 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:29 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/02/16 08:38 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 08:38 PM |
| Barium | 0.173 | 0.00300 | 0.0100 | | mg/L | 1 | 09/02/16 08:38 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 08:38 PM |
| Boron | 0.0394 | 0.0100 | 0.0300 | | mg/L | 1 | 09/06/16 01:21 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 08:38 PM |
| Calcium | 102 | 1.00 | 3.00 | | mg/L | 10 | 09/02/16 05:50 PM |
| Chromium | 0.0189 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 08:38 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/02/16 08:38 PM |
| Lead | 0.000450 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/02/16 08:38 PM |
| Lithium | 0.145 | 0.00500 | 0.0100 | | mg/L | 1 | 09/02/16 08:38 PM |
| Molybdenum | 0.00814 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 08:38 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 08:38 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/02/16 08:38 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 372 | 3.00 | 10.0 | | mg/L | 10 | 08/29/16 07:04 PM |
| Fluoride | 0.168 | 0.100 | 0.400 | J | mg/L | 1 | 08/29/16 03:38 PM |
| Sulfate | 58.8 | 1.00 | 3.00 | | mg/L | 1 | 08/29/16 03:38 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.17 | 0 | 0 | | pH Units@19.7℃ | 1 | 08/31/16 11:13 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 770 | 50.0 | 50.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-06 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 02:30 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:31 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/02/16 05:02 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 05:02 PM |
| Barium | 0.0294 | 0.00300 | 0.0100 | | mg/L | 1 | 09/02/16 05:02 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 05:02 PM |
| Boron | 0.0601 | 0.0100 | 0.0300 | | mg/L | 1 | 09/06/16 03:11 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 05:02 PM |
| Calcium | 13.5 | 0.100 | 0.300 | | mg/L | 1 | 09/02/16 05:02 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 05:02 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/02/16 05:02 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 05:02 PM |
| Lithium | 0.0330 | 0.00500 | 0.0100 | | mg/L | 1 | 09/02/16 05:02 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 05:02 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 05:02 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/02/16 05:02 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 42.1 | 0.300 | 1.00 | | mg/L | 1 | 08/29/16 03:53 PM |
| Fluoride | 0.225 | 0.100 | 0.400 | J | mg/L | 1 | 08/29/16 03:53 PM |
| Sulfate | 46.6 | 1.00 | 3.00 | | mg/L | 1 | 08/29/16 03:53 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.68 | 0 | 0 | | pH Units@19.3℃ | 1 | 08/31/16 11:16 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 193 | 10.0 | 10.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-07 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-07 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 03:20 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:43 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/09/16 01:50 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 06:58 PM |
| Barium | 0.0438 | 0.00300 | 0.0100 | | mg/L | 1 | 09/08/16 06:58 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 06:58 PM |
| Boron | 0.0691 | 0.0100 | 0.0300 | | mg/L | 1 | 09/09/16 01:50 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 06:58 PM |
| Calcium | 9.58 | 0.100 | 0.300 | | mg/L | 1 | 09/08/16 06:58 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 06:58 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/08/16 06:58 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 06:58 PM |
| Lithium | 0.0124 | 0.00500 | 0.0100 | | mg/L | 1 | 09/08/16 06:58 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 06:58 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 06:58 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/08/16 06:58 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 20.4 | 0.300 | 1.00 | | mg/L | 1 | 08/29/16 04:08 PM |
| Fluoride | 0.159 | 0.100 | 0.400 | J | mg/L | 1 | 08/29/16 04:08 PM |
| Sulfate | 21.8 | 1.00 | 3.00 | | mg/L | 1 | 08/29/16 04:08 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.02 | 0 | 0 | | pH Units@19℃ | 1 | 08/31/16 11:17 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 290 | 10.0 | 10.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-05 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-08 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 04:20 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:45 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/09/16 03:26 PM |
| Arsenic | 0.00799 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:04 PM |
| Barium | 0.0624 | 0.00300 | 0.0100 | | mg/L | 1 | 09/08/16 07:04 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:04 PM |
| Boron | 0.0877 | 0.0100 | 0.0300 | | mg/L | 1 | 09/09/16 03:26 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:04 PM |
| Calcium | 13.1 | 0.100 | 0.300 | | mg/L | 1 | 09/08/16 07:04 PM |
| Chromium | 0.00233 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/08/16 07:04 PM |
| Cobalt | 0.00312 | 0.00300 | 0.00500 | J | mg/L | 1 | 09/08/16 07:04 PM |
| Lead | 0.00111 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:04 PM |
| Lithium | 0.0375 | 0.00500 | 0.0100 | | mg/L | 1 | 09/08/16 07:04 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:04 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:04 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/08/16 07:04 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 63.0 | 3.00 | 10.0 | | mg/L | 10 | 08/29/16 08:04 PM |
| Fluoride | 0.262 | 0.100 | 0.400 | J | mg/L | 1 | 08/29/16 04:23 PM |
| Sulfate | 11.8 | 1.00 | 3.00 | | mg/L | 1 | 08/29/16 04:23 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.84 | 0 | 0 | | pH Units@19.1℃ | 1 | 08/31/16 11:20 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 287 | 10.0 | 10.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | DUP-01 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-09 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 04:20 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:47 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/09/16 03:29 PM |
| Arsenic | 0.00872 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:07 PM |
| Barium | 0.0672 | 0.00300 | 0.0100 | | mg/L | 1 | 09/08/16 07:07 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:07 PM |
| Boron | 0.116 | 0.0100 | 0.0300 | | mg/L | 1 | 09/09/16 03:29 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:07 PM |
| Calcium | 13.5 | 0.100 | 0.300 | | mg/L | 1 | 09/08/16 07:07 PM |
| Chromium | 0.00277 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/08/16 07:07 PM |
| Cobalt | 0.00318 | 0.00300 | 0.00500 | J | mg/L | 1 | 09/08/16 07:07 PM |
| Lead | 0.00140 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:07 PM |
| Lithium | 0.0369 | 0.00500 | 0.0100 | | mg/L | 1 | 09/08/16 07:07 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:07 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:07 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/08/16 07:07 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 62.2 | 3.00 | 10.0 | | mg/L | 10 | 08/29/16 08:19 PM |
| Fluoride | 0.265 | 0.100 | 0.400 | J | mg/L | 1 | 08/29/16 04:38 PM |
| Sulfate | 11.7 | 1.00 | 3.00 | | mg/L | 1 | 08/29/16 04:38 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.82 | 0 | 0 | | pH Units@19.3℃ | 1 | 08/31/16 11:22 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 277 | 10.0 | 10.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | EB-1 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-10 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 04:40 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:54 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/09/16 03:32 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:10 PM |
| Barium | <0.00300 | 0.00300 | 0.0100 | | mg/L | 1 | 09/08/16 07:10 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:10 PM |
| Boron | 0.113 | 0.0100 | 0.0300 | | mg/L | 1 | 09/09/16 03:32 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:10 PM |
| Calcium | 5.55 | 0.100 | 0.300 | | mg/L | 1 | 09/08/16 07:10 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:10 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/08/16 07:10 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:10 PM |
| Lithium | <0.00500 | 0.00500 | 0.0100 | | mg/L | 1 | 09/08/16 07:10 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:10 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:10 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/08/16 07:10 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 11.6 | 0.300 | 1.00 | | mg/L | 1 | 08/29/16 04:53 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 08/29/16 04:53 PM |
| Sulfate | 24.8 | 1.00 | 3.00 | | mg/L | 1 | 08/29/16 04:53 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.23 | 0 | 0 | | pH Units@19.4℃ | 1 | 08/31/16 11:24 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | <10.0 | 10.0 | 10.0 | | mg/L | 1 | 09/01/16 08:46 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-11 |
| **Project No:** | 5164-D | **Collection Date:** | 08/24/16 05:35 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:56 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/09/16 03:35 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:13 PM |
| Barium | 0.102 | 0.00300 | 0.0100 | | mg/L | 1 | 09/08/16 07:13 PM |
| Beryllium | 0.000417 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/08/16 07:13 PM |
| Boron | 0.119 | 0.0100 | 0.0300 | | mg/L | 1 | 09/09/16 03:35 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:13 PM |
| Calcium | 21.1 | 0.100 | 0.300 | | mg/L | 1 | 09/08/16 07:13 PM |
| Chromium | 0.0107 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:13 PM |
| Cobalt | 0.0150 | 0.00300 | 0.00500 | | mg/L | 1 | 09/08/16 07:13 PM |
| Lead | 0.00381 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:13 PM |
| Lithium | 0.0265 | 0.00500 | 0.0100 | | mg/L | 1 | 09/08/16 07:13 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:13 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:13 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/08/16 07:13 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 107 | 3.00 | 10.0 | | mg/L | 10 | 08/30/16 03:07 PM |
| Fluoride | 0.186 | 0.100 | 0.400 | J | mg/L | 1 | 08/30/16 11:25 AM |
| Sulfate | 41.6 | 1.00 | 3.00 | | mg/L | 1 | 08/30/16 11:25 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.81 | 0 | 0 | | pH Units@20.1℃ | 1 | 08/31/16 11:26 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 400 | 10.0 | 10.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | AL-10 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-12 |
| **Project No:** | 5164-D | **Collection Date:** | 08/25/16 08:50 AM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 10:59 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/09/16 03:38 PM |
| Arsenic | 0.00364 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/08/16 07:16 PM |
| Barium | 0.306 | 0.00300 | 0.0100 | | mg/L | 1 | 09/08/16 07:16 PM |
| Beryllium | 0.000436 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/08/16 07:16 PM |
| Boron | 0.105 | 0.0100 | 0.0300 | | mg/L | 1 | 09/09/16 03:38 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:16 PM |
| Calcium | 87.5 | 1.00 | 3.00 | | mg/L | 10 | 09/09/16 02:05 PM |
| Chromium | 0.00842 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:16 PM |
| Cobalt | 0.00314 | 0.00300 | 0.00500 | J | mg/L | 1 | 09/08/16 07:16 PM |
| Lead | 0.00285 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:16 PM |
| Lithium | 0.0337 | 0.00500 | 0.0100 | | mg/L | 1 | 09/08/16 07:16 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:16 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:16 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/08/16 07:16 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 444 | 30.0 | 100 | | mg/L | 100 | 08/30/16 03:52 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 08/30/16 11:40 AM |
| Sulfate | 96.3 | 1.00 | 3.00 | | mg/L | 1 | 08/30/16 11:40 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.74 | 0 | 0 | | pH Units@17.4℃ | 1 | 08/31/16 01:06 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1120 | 50.0 | 50.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-02 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-13 |
| **Project No:** | 5164-D | **Collection Date:** | 08/25/16 10:00 AM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 11:01 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/09/16 03:41 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:19 PM |
| Barium | 0.0415 | 0.00300 | 0.0100 | | mg/L | 1 | 09/08/16 07:19 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:19 PM |
| Boron | 0.0492 | 0.0100 | 0.0300 | | mg/L | 1 | 09/09/16 03:41 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:19 PM |
| Calcium | 12.9 | 0.100 | 0.300 | | mg/L | 1 | 09/08/16 07:19 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:19 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/08/16 07:19 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:19 PM |
| Lithium | 0.0113 | 0.00500 | 0.0100 | | mg/L | 1 | 09/08/16 07:19 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:19 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:19 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/08/16 07:19 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 21.9 | 0.300 | 1.00 | | mg/L | 1 | 08/30/16 11:55 AM |
| Fluoride | 0.164 | 0.100 | 0.400 | J | mg/L | 1 | 08/30/16 11:55 AM |
| Sulfate | 22.4 | 1.00 | 3.00 | | mg/L | 1 | 08/30/16 11:55 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.16 | 0 | 0 | | pH Units@17.1℃ | 1 | 08/31/16 01:07 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 163 | 10.0 | 10.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-09 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-14 |
| **Project No:** | 5164-D | **Collection Date:** | 08/25/16 11:05 AM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 11:03 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/09/16 03:44 PM |
| Arsenic | 0.00411 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/08/16 07:22 PM |
| Barium | 0.133 | 0.00300 | 0.0100 | | mg/L | 1 | 09/08/16 07:22 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:22 PM |
| Boron | 0.0829 | 0.0100 | 0.0300 | | mg/L | 1 | 09/09/16 03:44 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:22 PM |
| Calcium | 45.6 | 1.00 | 3.00 | | mg/L | 10 | 09/09/16 02:08 PM |
| Chromium | 0.00673 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:22 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/08/16 07:22 PM |
| Lead | 0.00178 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:22 PM |
| Lithium | 0.0569 | 0.00500 | 0.0100 | | mg/L | 1 | 09/08/16 07:22 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:22 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:22 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/08/16 07:22 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 195 | 3.00 | 10.0 | | mg/L | 10 | 08/30/16 04:07 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 08/30/16 12:10 PM |
| Sulfate | 116 | 1.00 | 3.00 | | mg/L | 1 | 08/30/16 12:10 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.31 | 0 | 0 | | pH Units@17.7℃ | 1 | 08/31/16 01:44 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 715 | 10.0 | 10.0 | | mg/L | 1 | 09/01/16 08:46 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-15 |
| **Project No:** | 5164-D | **Collection Date:** | 08/25/16 12:05 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 11:06 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/09/16 03:47 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:25 PM |
| Barium | 0.439 | 0.00300 | 0.0100 | | mg/L | 1 | 09/08/16 07:25 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:25 PM |
| Boron | 0.103 | 0.0100 | 0.0300 | | mg/L | 1 | 09/09/16 03:47 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:25 PM |
| Calcium | 154 | 5.00 | 15.0 | | mg/L | 50 | 09/09/16 02:11 PM |
| Chromium | 0.00465 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/08/16 07:25 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/08/16 07:25 PM |
| Lead | 0.00179 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:25 PM |
| Lithium | 0.0110 | 0.00500 | 0.0100 | | mg/L | 1 | 09/08/16 07:25 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:25 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:25 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/08/16 07:25 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 759 | 30.0 | 100 | | mg/L | 100 | 08/30/16 04:22 PM |
| Fluoride | 0.128 | 0.100 | 0.400 | J | mg/L | 1 | 08/30/16 12:25 PM |
| Sulfate | 68.8 | 1.00 | 3.00 | | mg/L | 1 | 08/30/16 12:25 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.95 | 0 | 0 | | pH Units@18.1℃ | 1 | 08/31/16 01:49 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1960 | 50.0 | 50.0 | | mg/L | 1 | 09/01/16 08:46 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *26-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608276-16 |
| **Project No:** | 5164-D | **Collection Date:** | 08/25/16 01:05 PM |
| **Lab Order:** | 1608276 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 09/06/16 10:45 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 09/09/16 03:50 PM |
| Arsenic | 0.00451 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/08/16 07:28 PM |
| Barium | 0.262 | 0.00300 | 0.0100 | | mg/L | 1 | 09/08/16 07:28 PM |
| Beryllium | 0.000629 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/08/16 07:28 PM |
| Boron | 0.0858 | 0.0100 | 0.0300 | | mg/L | 1 | 09/09/16 03:50 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:28 PM |
| Calcium | 52.8 | 1.00 | 3.00 | | mg/L | 10 | 09/09/16 02:14 PM |
| Chromium | 0.0135 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:28 PM |
| Cobalt | 0.00412 | 0.00300 | 0.00500 | J | mg/L | 1 | 09/08/16 07:28 PM |
| Lead | 0.00842 | 0.000300 | 0.00100 | | mg/L | 1 | 09/08/16 07:28 PM |
| Lithium | 0.0204 | 0.00500 | 0.0100 | | mg/L | 1 | 09/08/16 07:28 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:28 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/08/16 07:28 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/08/16 07:28 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 296 | 3.00 | 10.0 | | mg/L | 10 | 08/30/16 04:37 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 08/30/16 12:40 PM |
| Sulfate | 33.8 | 1.00 | 3.00 | | mg/L | 1 | 08/30/16 12:40 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.91 | 0 | 0 | | pH Units@18℃ | 1 | 08/31/16 01:51 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 817 | 10.0 | 10.0 | | mg/L | 1 | 09/01/16 08:46 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160831B**

The QC data in batch 77030 applies to the following samples: 1608276-01A, 1608276-02A, 1608276-03A, 1608276-04A, 1608276-05A, 1608276-06A, 1608276-07A, 1608276-08A, 1608276-09A, 1608276-10A, 1608276-11A, 1608276-12A, 1608276-13A, 1608276-14A, 1608276-15A

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **MB-77030** | Batch ID: **77030** | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | | |
| SampType: **MBLK** | Run ID: **CETAC2_HG_160831B** | | Analysis Date: **8/31/2016 10:09:17 AM** | | | | Prep Date: **8/30/2016** | | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | <0.0000800 | 0.000200 | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **LCS-77030** | Batch ID: **77030** | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | | |
| SampType: **LCS** | Run ID: **CETAC2_HG_160831B** | | Analysis Date: **8/31/2016 10:13:49 AM** | | | | Prep Date: **8/30/2016** | | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | 0.00194 | 0.000200 | 0.00200 | 0 | 97.0 | 85 | 115 | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **LCSD-77030** | Batch ID: **77030** | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | | |
| SampType: **LCSD** | Run ID: **CETAC2_HG_160831B** | | Analysis Date: **8/31/2016 10:16:05 AM** | | | | Prep Date: **8/30/2016** | | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | 0.00195 | 0.000200 | 0.00200 | 0 | 97.5 | 85 | 115 | 0.514 | 15 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **1608276-06A SD** | Batch ID: **77030** | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | | |
| SampType: **SD** | Run ID: **CETAC2_HG_160831B** | | Analysis Date: **8/31/2016 10:34:12 AM** | | | | Prep Date: **8/30/2016** | | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **1608276-06A PDS** | Batch ID: **77030** | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | | |
| SampType: **PDS** | Run ID: **CETAC2_HG_160831B** | | Analysis Date: **8/31/2016 10:36:28 AM** | | | | Prep Date: **8/30/2016** | | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | 0.00235 | 0.000200 | 0.00250 | 0 | 94.0 | 85 | 115 | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **1608276-06A MS** | Batch ID: **77030** | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | | |
| SampType: **MS** | Run ID: **CETAC2_HG_160831B** | | Analysis Date: **8/31/2016 10:38:44 AM** | | | | Prep Date: **8/30/2016** | | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | 0.00197 | 0.000200 | 0.00200 | 0 | 98.5 | 80 | 120 | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **1608276-06A MSD** | Batch ID: **77030** | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | | |
| SampType: **MSD** | Run ID: **CETAC2_HG_160831B** | | Analysis Date: **8/31/2016 10:41:00 AM** | | | | Prep Date: **8/30/2016** | | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | 0.00201 | 0.000200 | 0.00200 | 0 | 101 | 80 | 120 | 2.01 | 15 | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160831B**

| Sample ID **ICV-160831** | Batch ID: **R87892** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_160831B** | Analysis Date: **8/31/2016 10:04:43 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00388 | 0.000200 | 0.00400 | 0 | 97.0 | 90 | 110 | | | |

| Sample ID **CCV1-160831** | Batch ID: **R87892** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_160831B** | Analysis Date: **8/31/2016 10:50:06 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00191 | 0.000200 | 0.00200 | 0 | 95.5 | 90 | 110 | | | |

| Sample ID **CCV2-160831** | Batch ID: **R87892** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_160831B** | Analysis Date: **8/31/2016 11:17:25 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00194 | 0.000200 | 0.00200 | 0 | 97.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160906C**

The QC data in batch 77077 applies to the following samples: 1608276-16A

| Sample ID | **MB-77077** | Batch ID: | **77077** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_160906C** | Analysis Date: | **9/6/2016 10:36:46 AM** | Prep Date: | **9/2/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-77077** | Batch ID: | **77077** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_160906C** | Analysis Date: | **9/6/2016 10:41:17 AM** | Prep Date: | **9/2/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00198 | 0.000200 | 0.00200 | 0 | 99.0 | 85 | 115 | | | |

| Sample ID | **LCSD-77077** | Batch ID: | **77077** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_160906C** | Analysis Date: | **9/6/2016 10:43:33 AM** | Prep Date: | **9/2/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00202 | 0.000200 | 0.00200 | 0 | 101 | 85 | 115 | 2.00 | 15 | |

| Sample ID | **1608276-16A SD** | Batch ID: | **77077** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_160906C** | Analysis Date: | **9/6/2016 10:48:05 AM** | Prep Date: | **9/2/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1608276-16A PDS** | Batch ID: | **77077** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_160906C** | Analysis Date: | **9/6/2016 10:50:21 AM** | Prep Date: | **9/2/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00236 | 0.000200 | 0.00250 | 0 | 94.4 | 85 | 115 | | | |

| Sample ID | **1608276-16A MS** | Batch ID: | **77077** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_160906C** | Analysis Date: | **9/6/2016 10:52:37 AM** | Prep Date: | **9/2/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 80 | 120 | | | |

| Sample ID | **1608276-16A MSD** | Batch ID: | **77077** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_160906C** | Analysis Date: | **9/6/2016 10:54:53 AM** | Prep Date: | **9/2/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00197 | 0.000200 | 0.00200 | 0 | 98.5 | 80 | 120 | 1.01 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160906C**

| Sample ID | **ICV-160906** | Batch ID: | **R87963** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_160906C** | Analysis Date: | **9/6/2016 10:11:48 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00390 | 0.000200 | 0.00400 | 0 | 97.5 | 90 | 110 | | | |

| Sample ID | **CCV1-160906** | Batch ID: | **R87963** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160906C** | Analysis Date: | **9/6/2016 11:01:43 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00193 | 0.000200 | 0.00200 | 0 | 96.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

The QC data in batch 77018 applies to the following samples: 1608276-01A, 1608276-02A, 1608276-03A, 1608276-04A, 1608276-05A, 1608276-06A

Sample ID **MB-77018** Batch ID: **77018** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 4:38:00 PM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-77018** Batch ID: **77018** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 4:44:00 PM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Barium | 0.189 | 0.0100 | 0.200 | 0 | 94.3 | 80 | 120 | | | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0 | 96.0 | 80 | 120 | | | |
| Calcium | 5.00 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | | | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 80 | 120 | | | |
| Cobalt | 0.197 | 0.00500 | 0.200 | 0 | 98.3 | 80 | 120 | | | |
| Lead | 0.189 | 0.00100 | 0.200 | 0 | 94.7 | 80 | 120 | | | |
| Lithium | 0.203 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Molybdenum | 0.188 | 0.00500 | 0.200 | 0 | 93.8 | 80 | 120 | | | |
| Selenium | 0.196 | 0.00500 | 0.200 | 0 | 97.8 | 80 | 120 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.5 | 80 | 120 | | | |

Sample ID **LCSD-77018** Batch ID: **77018** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 4:50:00 PM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.4 | 80 | 120 | 1.01 | 15 | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.987 | 15 | |
| Barium | 0.192 | 0.0100 | 0.200 | 0 | 96.0 | 80 | 120 | 1.73 | 15 | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 80 | 120 | 1.11 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

| Sample ID **LCSD-77018** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 4:50:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.196 | 0.00100 | 0.200 | 0 | 98.2 | 80 | 120 | 2.21 | 15 | |
| Calcium | 5.09 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | 1.74 | 15 | |
| Chromium | 0.195 | 0.00500 | 0.200 | 0 | 97.4 | 80 | 120 | 0.716 | 15 | |
| Cobalt | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 80 | 120 | 0.102 | 15 | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 95.9 | 80 | 120 | 1.26 | 15 | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | 0.396 | 15 | |
| Molybdenum | 0.192 | 0.00500 | 0.200 | 0 | 95.8 | 80 | 120 | 2.06 | 15 | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 2.47 | 15 | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | 1.74 | 15 | |

| Sample ID **1608276-06A SD** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 5:08:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0292 | 0.0500 | 0 | 0.0294 | | | | 0.683 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Calcium | 13.4 | 1.50 | 0 | 13.5 | | | | 0.260 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.0353 | 0.0500 | 0 | 0.0330 | | | | 6.50 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1608276-06A PDS** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:08:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.6 | 80 | 120 | | | |
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Barium | 0.223 | 0.0100 | 0.200 | 0.0294 | 96.9 | 80 | 120 | | | |
| Beryllium | 0.194 | 0.00100 | 0.200 | 0 | 97.2 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0 | 96.2 | 80 | 120 | | | |
| Calcium | 17.6 | 0.300 | 5.00 | 13.5 | 81.6 | 80 | 120 | | | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.194 | 0.00500 | 0.200 | 0 | 97.0 | 80 | 120 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 95.8 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

| Sample ID **1608276-06A PDS** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:08:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.216 | 0.0100 | 0.200 | 0.0330 | 91.4 | 80 | 120 | | | |
| Molybdenum | 0.188 | 0.00500 | 0.200 | 0 | 94.2 | 80 | 120 | | | |
| Selenium | 0.193 | 0.00500 | 0.200 | 0 | 96.6 | 80 | 120 | | | |
| Thallium | 0.204 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | | | |

| Sample ID **1608276-06A MS** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:14:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Barium | 0.220 | 0.0100 | 0.200 | 0.0294 | 95.4 | 80 | 120 | | | |
| Beryllium | 0.188 | 0.00100 | 0.200 | 0 | 94.2 | 80 | 120 | | | |
| Cadmium | 0.191 | 0.00100 | 0.200 | 0 | 95.3 | 80 | 120 | | | |
| Calcium | 18.3 | 0.300 | 5.00 | 13.5 | 96.8 | 80 | 120 | | | |
| Chromium | 0.190 | 0.00500 | 0.200 | 0 | 94.8 | 80 | 120 | | | |
| Cobalt | 0.189 | 0.00500 | 0.200 | 0 | 94.4 | 80 | 120 | | | |
| Lead | 0.187 | 0.00100 | 0.200 | 0 | 93.6 | 80 | 120 | | | |
| Lithium | 0.224 | 0.0100 | 0.200 | 0.0330 | 95.3 | 80 | 120 | | | |
| Molybdenum | 0.191 | 0.00500 | 0.200 | 0 | 95.6 | 80 | 120 | | | |
| Selenium | 0.192 | 0.00500 | 0.200 | 0 | 96.2 | 80 | 120 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.6 | 80 | 120 | | | |

| Sample ID **1608276-06A MSD** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:20:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.4 | 80 | 120 | 1.61 | 15 | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | 0.999 | 15 | |
| Barium | 0.218 | 0.0100 | 0.200 | 0.0294 | 94.3 | 80 | 120 | 1.00 | 15 | |
| Beryllium | 0.188 | 0.00100 | 0.200 | 0 | 94.0 | 80 | 120 | 0.266 | 15 | |
| Cadmium | 0.190 | 0.00100 | 0.200 | 0 | 95.0 | 80 | 120 | 0.368 | 15 | |
| Calcium | 18.3 | 0.300 | 5.00 | 13.5 | 96.4 | 80 | 120 | 0.109 | 15 | |
| Chromium | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 80 | 120 | 0.158 | 15 | |
| Cobalt | 0.190 | 0.00500 | 0.200 | 0 | 95.2 | 80 | 120 | 0.844 | 15 | |
| Lead | 0.188 | 0.00100 | 0.200 | 0 | 93.9 | 80 | 120 | 0.320 | 15 | |
| Lithium | 0.224 | 0.0100 | 0.200 | 0.0330 | 95.3 | 80 | 120 | 0 | 15 | |
| Molybdenum | 0.189 | 0.00500 | 0.200 | 0 | 94.7 | 80 | 120 | 0.894 | 15 | |
| Selenium | 0.194 | 0.00500 | 0.200 | 0 | 97.0 | 80 | 120 | 0.932 | 15 | |
| Thallium | 0.198 | 0.00150 | 0.200 | 0 | 99.2 | 80 | 120 | 0.352 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

| Sample ID **ICV1-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 12:27:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.103 | 0.00250 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.0984 | 0.0100 | 0.100 | 0 | 98.4 | 90 | 110 | | | |
| Beryllium | 0.103 | 0.00100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Cadmium | 0.0980 | 0.00100 | 0.100 | 0 | 98.0 | 90 | 110 | | | |
| Calcium | 2.50 | 0.300 | 2.50 | 0 | 100 | 90 | 110 | | | |
| Chromium | 0.106 | 0.00500 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Cobalt | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.0985 | 0.00100 | 0.100 | 0 | 98.5 | 90 | 110 | | | |
| Lithium | 0.105 | 0.0100 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Molybdenum | 0.0949 | 0.00500 | 0.100 | 0 | 94.9 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.0976 | 0.00150 | 0.100 | 0 | 97.6 | 90 | 110 | | | |

| Sample ID **ILCVL-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 12:39:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00207 | 0.00250 | 0.00200 | 0 | 104 | 70 | 130 | | | |
| Arsenic | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00500 | 0.0100 | 0.00500 | 0 | 99.9 | 70 | 130 | | | |
| Beryllium | 0.00110 | 0.00100 | 0.00100 | 0 | 110 | 70 | 130 | | | |
| Cadmium | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Calcium | 0.0938 | 0.300 | 0.100 | 0 | 93.8 | 70 | 130 | | | |
| Chromium | 0.00537 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Cobalt | 0.00521 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lead | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Lithium | 0.0103 | 0.0100 | 0.0100 | 0 | 103 | 70 | 130 | | | |
| Molybdenum | 0.00494 | 0.00500 | 0.00500 | 0 | 98.8 | 70 | 130 | | | |
| Selenium | 0.00516 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Thallium | 0.00109 | 0.00150 | 0.00100 | 0 | 109 | 70 | 130 | | | |

| Sample ID **CCV2-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 4:14:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.196 | 0.0100 | 0.200 | 0 | 97.8 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.196 | 0.00100 | 0.200 | 0 | 98.2 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

| Sample ID **CCV2-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 4:14:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.31 | 0.300 | 5.00 | 0 | 106 | 90 | 110 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 98.2 | 90 | 110 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Molybdenum | 0.194 | 0.00500 | 0.200 | 0 | 96.8 | 90 | 110 | | | |
| Selenium | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL2-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 4:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00228 | 0.00250 | 0.00200 | 0 | 114 | 70 | 130 | | | |
| Arsenic | 0.00545 | 0.00500 | 0.00500 | 0 | 109 | 70 | 130 | | | |
| Barium | 0.00498 | 0.0100 | 0.00500 | 0 | 99.6 | 70 | 130 | | | |
| Beryllium | 0.00112 | 0.00100 | 0.00100 | 0 | 112 | 70 | 130 | | | |
| Cadmium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Calcium | 0.0878 | 0.300 | 0.100 | 0 | 87.8 | 70 | 130 | | | |
| Chromium | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Cobalt | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Lead | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 70 | 130 | | | |
| Lithium | 0.00965 | 0.0100 | 0.0100 | 0 | 96.5 | 70 | 130 | | | |
| Molybdenum | 0.00496 | 0.00500 | 0.00500 | 0 | 99.2 | 70 | 130 | | | |
| Selenium | 0.00496 | 0.00500 | 0.00500 | 0 | 99.1 | 70 | 130 | | | |
| Thallium | 0.00117 | 0.00150 | 0.00100 | 0 | 117 | 70 | 130 | | | |

| Sample ID **CCV3-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:31:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.207 | 0.00250 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Arsenic | 0.212 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Barium | 0.197 | 0.0100 | 0.200 | 0 | 98.6 | 90 | 110 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 5.30 | 0.300 | 5.00 | 0 | 106 | 90 | 110 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Lithium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

Sample ID **CCV3-160902** Batch ID: **R87956** TestNo: **SW6020A** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 6:31:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.208 | 0.00150 | 0.200 | 0 | 104 | 90 | 110 | | | |

Sample ID **LCVL3-160902** Batch ID: **R87956** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 6:49:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00225 | 0.00250 | 0.00200 | 0 | 113 | 70 | 130 | | | |
| Arsenic | 0.00527 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Barium | 0.00501 | 0.0100 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Beryllium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Cadmium | 0.00105 | 0.00100 | 0.00100 | 0 | 105 | 70 | 130 | | | |
| Calcium | 0.0851 | 0.300 | 0.100 | 0 | 85.1 | 70 | 130 | | | |
| Chromium | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lead | 0.00105 | 0.00100 | 0.00100 | 0 | 105 | 70 | 130 | | | |
| Lithium | 0.00969 | 0.0100 | 0.0100 | 0 | 96.9 | 70 | 130 | | | |
| Molybdenum | 0.00491 | 0.00500 | 0.00500 | 0 | 98.2 | 70 | 130 | | | |
| Selenium | 0.00516 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Thallium | 0.00111 | 0.00150 | 0.00100 | 0 | 111 | 70 | 130 | | | |

Sample ID **CCV4-160902** Batch ID: **R87956** TestNo: **SW6020A** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 8:02:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 98.8 | 90 | 110 | | | |
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 99.1 | 90 | 110 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 98.0 | 90 | 110 | | | |
| Lithium | 0.212 | 0.0100 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 98.8 | 90 | 110 | | | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.208 | 0.00150 | 0.200 | 0 | 104 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

Sample ID **LCVL4-160902** Batch ID: **R87956** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 8:20:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00210 | 0.00250 | 0.00200 | 0 | 105 | 70 | 130 | | | |
| Arsenic | 0.00521 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Barium | 0.00504 | 0.0100 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Beryllium | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 70 | 130 | | | |
| Cadmium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Chromium | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00502 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Lead | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Molybdenum | 0.00487 | 0.00500 | 0.00500 | 0 | 97.4 | 70 | 130 | | | |
| Selenium | 0.00562 | 0.00500 | 0.00500 | 0 | 112 | 70 | 130 | | | |
| Thallium | 0.00103 | 0.00150 | 0.00100 | 0 | 103 | 70 | 130 | | | |

Sample ID **CCV5-160902** Batch ID: **R87956** TestNo: **SW6020A** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 9:32:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.210 | 0.00250 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Arsenic | 0.213 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Selenium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.211 | 0.00150 | 0.200 | 0 | 105 | 90 | 110 | | | |

Sample ID **LCVL5-160902** Batch ID: **R87956** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 9:50:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00205 | 0.00250 | 0.00200 | 0 | 102 | 70 | 130 | | | |
| Arsenic | 0.00532 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Barium | 0.00497 | 0.0100 | 0.00500 | 0 | 99.5 | 70 | 130 | | | |
| Beryllium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Cadmium | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 70 | 130 | | | |
| Chromium | 0.00505 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Cobalt | 0.00491 | 0.00500 | 0.00500 | 0 | 98.2 | 70 | 130 | | | |

**Qualifiers:**

| | |
|---|---|
| B | Analyte detected in the associated Method Blank |
| J | Analyte detected between MDL and RL |
| ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit |
| J | Analyte detected between SDL and RL |
| DF | Dilution Factor |
| MDL | Method Detection Limit |
| R | RPD outside accepted control limits |
| S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

Sample ID **LCVL5-160902** Batch ID: **R87956** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 9:50:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.000982 | 0.00100 | 0.00100 | 0 | 98.2 | 70 | 130 | | | |
| Lithium | 0.00953 | 0.0100 | 0.0100 | 0 | 95.3 | 70 | 130 | | | |
| Molybdenum | 0.00485 | 0.00500 | 0.00500 | 0 | 97.0 | 70 | 130 | | | |
| Selenium | 0.00514 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160906B**

The QC data in batch 77018 applies to the following samples: 1608276-01A, 1608276-02A, 1608276-03A, 1608276-04A, 1608276-05A, 1608276-06A

| Sample ID | **MB-77018** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 2:28:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

| Sample ID | **LCS-77018** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 2:31:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.189 | 0.0300 | 0.200 | 0 | 94.5 | 80 | 120 | | | |

| Sample ID | **LCSD-77018** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 2:34:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.188 | 0.0300 | 0.200 | 0 | 94.0 | 80 | 120 | 0.514 | 15 | |

| Sample ID | **1608276-06A SD** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 3:14:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0778 | 0.150 | 0 | 0.0602 | | | | 25.6 | 10 | R |

| Sample ID | **1608276-06A PDS** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 3:56:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.267 | 0.0300 | 0.200 | 0.0601 | 103 | 80 | 120 | | | |

| Sample ID | **1608276-06A MS** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 3:59:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.271 | 0.0300 | 0.200 | 0.0601 | 105 | 80 | 120 | | | |

| Sample ID | **1608276-06A MSD** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 4:02:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.269 | 0.0300 | 0.200 | 0.0601 | 104 | 80 | 120 | 0.591 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

| Sample ID **ICV-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 12:51:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0949 | 0.0300 | 0.100 | 0 | 94.9 | 90 | 110 | | | |

| Sample ID **LCVL-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 12:57:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0203 | 0.0300 | 0.0200 | 0 | 101 | 70 | 130 | | | |

| Sample ID **CCV1-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 1:24:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.199 | 0.0300 | 0.200 | 0 | 99.5 | 90 | 110 | | | |

| Sample ID **LCVL1-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 1:30:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0241 | 0.0300 | 0.0200 | 0 | 120 | 70 | 130 | | | |

| Sample ID **CCV2-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 2:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.201 | 0.0300 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL2-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 3:05:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0219 | 0.0300 | 0.0200 | 0 | 109 | 70 | 130 | | | |

| Sample ID **CCV3-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 4:11:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.207 | 0.0300 | 0.200 | 0 | 103 | 90 | 110 | | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160906B**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **LCVL3-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** | | |
| SampType: **LCVL** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 4:31:00 PM** | Prep Date: | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0240 | 0.0300 | 0.0200 | 0 | 120 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160908B**

The QC data in batch 77092 applies to the following samples: 1608276-07A, 1608276-08A, 1608276-09A, 1608276-10A, 1608276-11A, 1608276-12A, 1608276-13A, 1608276-14A, 1608276-15A, 1608276-16A

Sample ID **MB-77092** Batch ID: **77092** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_160908B** Analysis Date: **9/8/2016 4:41:00 PM** Prep Date: **9/6/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-77092** Batch ID: **77092** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_160908B** Analysis Date: **9/8/2016 4:44:00 PM** Prep Date: **9/6/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Arsenic | 0.198 | 0.00500 | 0.200 | 0 | 99.1 | 80 | 120 | | | |
| Barium | 0.192 | 0.0100 | 0.200 | 0 | 96.0 | 80 | 120 | | | |
| Beryllium | 0.190 | 0.00100 | 0.200 | 0 | 95.1 | 80 | 120 | | | |
| Cadmium | 0.197 | 0.00100 | 0.200 | 0 | 98.5 | 80 | 120 | | | |
| Calcium | 4.48 | 0.300 | 5.00 | 0 | 89.6 | 80 | 120 | | | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 97.2 | 80 | 120 | | | |
| Lithium | 0.197 | 0.0100 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Molybdenum | 0.194 | 0.00500 | 0.200 | 0 | 97.0 | 80 | 120 | | | |
| Selenium | 0.187 | 0.00500 | 0.200 | 0 | 93.5 | 80 | 120 | | | |
| Thallium | 0.191 | 0.00150 | 0.200 | 0 | 95.4 | 80 | 120 | | | |

Sample ID **LCSD-77092** Batch ID: **77092** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_160908B** Analysis Date: **9/8/2016 4:47:00 PM** Prep Date: **9/6/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | 1.06 | 15 | |
| Arsenic | 0.198 | 0.00500 | 0.200 | 0 | 99.1 | 80 | 120 | 0.031 | 15 | |
| Barium | 0.191 | 0.0100 | 0.200 | 0 | 95.6 | 80 | 120 | 0.456 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160908B**

| Sample ID **LCSD-77092** | Batch ID: **77092** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 4:47:00 PM** | Prep Date: **9/6/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.193 | 0.00100 | 0.200 | 0 | 96.7 | 80 | 120 | 1.69 | 15 | |
| Cadmium | 0.196 | 0.00100 | 0.200 | 0 | 97.9 | 80 | 120 | 0.575 | 15 | |
| Calcium | 4.49 | 0.300 | 5.00 | 0 | 89.7 | 80 | 120 | 0.140 | 15 | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.313 | 15 | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.702 | 15 | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.6 | 80 | 120 | 0.672 | 15 | |
| Lithium | 0.194 | 0.0100 | 0.200 | 0 | 97.0 | 80 | 120 | 1.47 | 15 | |
| Molybdenum | 0.192 | 0.00500 | 0.200 | 0 | 96.2 | 80 | 120 | 0.733 | 15 | |
| Selenium | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 80 | 120 | 1.64 | 15 | |
| Thallium | 0.189 | 0.00150 | 0.200 | 0 | 94.7 | 80 | 120 | 0.744 | 15 | |

| Sample ID **1608276-07A MS** | Batch ID: **77092** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 5:26:00 PM** | Prep Date: **9/6/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.207 | 0.00250 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 80 | 120 | | | |
| Barium | 0.236 | 0.0100 | 0.200 | 0.0438 | 96.1 | 80 | 120 | | | |
| Beryllium | 0.190 | 0.00100 | 0.200 | 0 | 94.9 | 80 | 120 | | | |
| Cadmium | 0.195 | 0.00100 | 0.200 | 0 | 97.6 | 80 | 120 | | | |
| Calcium | 13.9 | 0.300 | 5.00 | 9.58 | 85.6 | 80 | 120 | | | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 98.1 | 80 | 120 | | | |
| Cobalt | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Lead | 0.190 | 0.00100 | 0.200 | 0 | 95.1 | 80 | 120 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0.0124 | 97.7 | 80 | 120 | | | |
| Molybdenum | 0.193 | 0.00500 | 0.200 | 0 | 96.5 | 80 | 120 | | | |
| Selenium | 0.192 | 0.00500 | 0.200 | 0 | 96.1 | 80 | 120 | | | |
| Thallium | 0.187 | 0.00150 | 0.200 | 0 | 93.4 | 80 | 120 | | | |

| Sample ID **1608276-07A MSD** | Batch ID: **77092** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 5:29:00 PM** | Prep Date: **9/6/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | 0.936 | 15 | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | 0.232 | 15 | |
| Barium | 0.237 | 0.0100 | 0.200 | 0.0438 | 96.5 | 80 | 120 | 0.330 | 15 | |
| Beryllium | 0.188 | 0.00100 | 0.200 | 0 | 93.8 | 80 | 120 | 1.09 | 15 | |
| Cadmium | 0.194 | 0.00100 | 0.200 | 0 | 97.0 | 80 | 120 | 0.612 | 15 | |
| Calcium | 14.1 | 0.300 | 5.00 | 9.58 | 90.2 | 80 | 120 | 1.64 | 15 | |
| Chromium | 0.197 | 0.00500 | 0.200 | 0 | 98.5 | 80 | 120 | 0.429 | 15 | |
| Cobalt | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 80 | 120 | 0.561 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160908B**

| Sample ID **1608276-07A MSD** | Batch ID: **77092** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 5:29:00 PM** | Prep Date: **9/6/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.190 | 0.00100 | 0.200 | 0 | 94.9 | 80 | 120 | 0.288 | 15 | |
| Lithium | 0.198 | 0.0100 | 0.200 | 0.0124 | 92.8 | 80 | 120 | 4.85 | 15 | |
| Molybdenum | 0.193 | 0.00500 | 0.200 | 0 | 96.4 | 80 | 120 | 0.031 | 15 | |
| Selenium | 0.189 | 0.00500 | 0.200 | 0 | 94.7 | 80 | 120 | 1.41 | 15 | |
| Thallium | 0.185 | 0.00150 | 0.200 | 0 | 92.7 | 80 | 120 | 0.743 | 15 | |

| Sample ID **1608276-07A SD** | Batch ID: **77092** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 7:01:00 PM** | Prep Date: **9/6/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0434 | 0.0500 | 0 | 0.0438 | | | | 0.967 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Calcium | 9.68 | 1.50 | 0 | 9.58 | | | | 1.10 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.0124 | | | | 0 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1608276-07A PDS** | Batch ID: **77092** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 7:31:00 PM** | Prep Date: **9/6/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 80 | 120 | | | |
| Barium | 0.231 | 0.0100 | 0.200 | 0.0438 | 93.6 | 80 | 120 | | | |
| Beryllium | 0.182 | 0.00100 | 0.200 | 0 | 91.0 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0 | 96.0 | 80 | 120 | | | |
| Calcium | 13.3 | 0.300 | 5.00 | 9.58 | 73.8 | 80 | 120 | | | S |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.196 | 0.00500 | 0.200 | 0 | 98.1 | 80 | 120 | | | |
| Lead | 0.189 | 0.00100 | 0.200 | 0 | 94.6 | 80 | 120 | | | |
| Lithium | 0.187 | 0.0100 | 0.200 | 0.0124 | 87.2 | 80 | 120 | | | |
| Molybdenum | 0.185 | 0.00500 | 0.200 | 0 | 92.5 | 80 | 120 | | | |
| Selenium | 0.183 | 0.00500 | 0.200 | 0 | 91.6 | 80 | 120 | | | |
| Thallium | 0.184 | 0.00150 | 0.200 | 0 | 92.0 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160908B**

| Sample ID **ICV-160908** | Batch ID: **R88020** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 1:31:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.104 | 0.00250 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Arsenic | 0.100 | 0.00500 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Barium | 0.0974 | 0.0100 | 0.100 | 0 | 97.4 | 90 | 110 | | | |
| Beryllium | 0.0983 | 0.00100 | 0.100 | 0 | 98.3 | 90 | 110 | | | |
| Cadmium | 0.0980 | 0.00100 | 0.100 | 0 | 98.0 | 90 | 110 | | | |
| Calcium | 2.28 | 0.300 | 2.50 | 0 | 91.3 | 90 | 110 | | | |
| Chromium | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.0982 | 0.00100 | 0.100 | 0 | 98.2 | 90 | 110 | | | |
| Lithium | 0.0964 | 0.0100 | 0.100 | 0 | 96.4 | 90 | 110 | | | |
| Molybdenum | 0.0930 | 0.00500 | 0.100 | 0 | 93.0 | 90 | 110 | | | |
| Selenium | 0.0989 | 0.00500 | 0.100 | 0 | 98.9 | 90 | 110 | | | |
| Thallium | 0.0956 | 0.00150 | 0.100 | 0 | 95.6 | 90 | 110 | | | |

| Sample ID **LCVL-160908** | Batch ID: **R88020** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 1:37:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00197 | 0.00250 | 0.00200 | 0 | 98.6 | 70 | 130 | | | |
| Arsenic | 0.00509 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00493 | 0.0100 | 0.00500 | 0 | 98.6 | 70 | 130 | | | |
| Beryllium | 0.000866 | 0.00100 | 0.00100 | 0 | 86.6 | 70 | 130 | | | |
| Cadmium | 0.000951 | 0.00100 | 0.00100 | 0 | 95.1 | 70 | 130 | | | |
| Calcium | 0.0943 | 0.300 | 0.100 | 0 | 94.3 | 70 | 130 | | | |
| Chromium | 0.00509 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00528 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Lead | 0.000986 | 0.00100 | 0.00100 | 0 | 98.6 | 70 | 130 | | | |
| Lithium | 0.00952 | 0.0100 | 0.0100 | 0 | 95.2 | 70 | 130 | | | |
| Molybdenum | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00520 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Thallium | 0.000983 | 0.00150 | 0.00100 | 0 | 98.3 | 70 | 130 | | | |

| Sample ID **CCV2-160908** | Batch ID: **R88020** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 3:55:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.209 | 0.00250 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.197 | 0.0100 | 0.200 | 0 | 98.4 | 90 | 110 | | | |
| Beryllium | 0.196 | 0.00100 | 0.200 | 0 | 97.8 | 90 | 110 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160908B**

| Sample ID **CCV2-160908** | Batch ID: **R88020** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 3:55:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.62 | 0.300 | 5.00 | 0 | 92.3 | 90 | 110 | | | |
| Chromium | 0.207 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lithium | 0.198 | 0.0100 | 0.200 | 0 | 98.8 | 90 | 110 | | | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Selenium | 0.193 | 0.00500 | 0.200 | 0 | 96.6 | 90 | 110 | | | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 100 | 90 | 110 | | | |

| Sample ID **LCVL2-160908** | Batch ID: **R88020** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 4:35:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00197 | 0.00250 | 0.00200 | 0 | 98.2 | 70 | 130 | | | |
| Arsenic | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Barium | 0.00513 | 0.0100 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Beryllium | 0.000989 | 0.00100 | 0.00100 | 0 | 98.9 | 70 | 130 | | | |
| Cadmium | 0.000990 | 0.00100 | 0.00100 | 0 | 99.0 | 70 | 130 | | | |
| Calcium | 0.0886 | 0.300 | 0.100 | 0 | 88.6 | 70 | 130 | | | |
| Chromium | 0.00535 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Cobalt | 0.00534 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Lead | 0.000957 | 0.00100 | 0.00100 | 0 | 95.7 | 70 | 130 | | | |
| Lithium | 0.0102 | 0.0100 | 0.0100 | 0 | 102 | 70 | 130 | | | |
| Molybdenum | 0.00485 | 0.00500 | 0.00500 | 0 | 97.0 | 70 | 130 | | | |
| Selenium | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Thallium | 0.000996 | 0.00150 | 0.00100 | 0 | 99.6 | 70 | 130 | | | |

| Sample ID **CCV3-140402** | Batch ID: **R88020** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 5:32:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.216 | 0.00250 | 0.200 | 0 | 108 | 90 | 110 | | | |
| Arsenic | 0.209 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Beryllium | 0.196 | 0.00100 | 0.200 | 0 | 98.1 | 90 | 110 | | | |
| Cadmium | 0.208 | 0.00100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Calcium | 4.75 | 0.300 | 5.00 | 0 | 94.9 | 90 | 110 | | | |
| Chromium | 0.212 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Cobalt | 0.211 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.206 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160908B**

| Sample ID **CCV3-140402** | Batch ID: **R88020** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 5:32:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Selenium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL3-140402** | Batch ID: **R88020** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 5:38:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00234 | 0.00250 | 0.00200 | 0 | 117 | 70 | 130 | | | |
| Arsenic | 0.00529 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Barium | 0.00504 | 0.0100 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Beryllium | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Cadmium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Calcium | 0.0904 | 0.300 | 0.100 | 0 | 90.4 | 70 | 130 | | | |
| Chromium | 0.00530 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Cobalt | 0.00531 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Lead | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.00954 | 0.0100 | 0.0100 | 0 | 95.4 | 70 | 130 | | | |
| Molybdenum | 0.00497 | 0.00500 | 0.00500 | 0 | 99.3 | 70 | 130 | | | |
| Selenium | 0.00545 | 0.00500 | 0.00500 | 0 | 109 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

| Sample ID **CCV4-160908** | Batch ID: **R88020** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160908B** | Analysis Date: **9/8/2016 6:46:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.211 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Beryllium | 0.191 | 0.00100 | 0.200 | 0 | 95.5 | 90 | 110 | | | |
| Cadmium | 0.206 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Calcium | 4.63 | 0.300 | 5.00 | 0 | 92.6 | 90 | 110 | | | |
| Chromium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Cobalt | 0.209 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lithium | 0.189 | 0.0100 | 0.200 | 0 | 94.3 | 90 | 110 | | | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.5 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

Sample ID **LCVL4-160908** Batch ID: **R88020** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_160908B** Analysis Date: **9/8/2016 6:52:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00526 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Barium | 0.00498 | 0.0100 | 0.00500 | 0 | 99.6 | 70 | 130 | | | |
| Beryllium | 0.000988 | 0.00100 | 0.00100 | 0 | 98.8 | 70 | 130 | | | |
| Cadmium | 0.000987 | 0.00100 | 0.00100 | 0 | 98.7 | 70 | 130 | | | |
| Calcium | 0.0876 | 0.300 | 0.100 | 0 | 87.6 | 70 | 130 | | | |
| Chromium | 0.00516 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Cobalt | 0.00521 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lead | 0.000936 | 0.00100 | 0.00100 | 0 | 93.6 | 70 | 130 | | | |
| Lithium | 0.00993 | 0.0100 | 0.0100 | 0 | 99.3 | 70 | 130 | | | |
| Molybdenum | 0.00486 | 0.00500 | 0.00500 | 0 | 97.2 | 70 | 130 | | | |
| Selenium | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Thallium | 0.000971 | 0.00150 | 0.00100 | 0 | 97.1 | 70 | 130 | | | |

Sample ID **CCV5-160908** Batch ID: **R88020** TestNo: **SW6020A** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS4_160908B** Analysis Date: **9/8/2016 7:34:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.211 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Barium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.192 | 0.00100 | 0.200 | 0 | 96.1 | 90 | 110 | | | |
| Cadmium | 0.209 | 0.00100 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Calcium | 4.57 | 0.300 | 5.00 | 0 | 91.3 | 90 | 110 | | | |
| Chromium | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Cobalt | 0.209 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.190 | 0.0100 | 0.200 | 0 | 94.8 | 90 | 110 | | | |
| Molybdenum | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Selenium | 0.196 | 0.00500 | 0.200 | 0 | 97.8 | 90 | 110 | | | |
| Thallium | 0.198 | 0.00150 | 0.200 | 0 | 99.2 | 90 | 110 | | | |

Sample ID **LCVL5-160908** Batch ID: **R88020** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_160908B** Analysis Date: **9/8/2016 7:40:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00542 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Barium | 0.00492 | 0.0100 | 0.00500 | 0 | 98.5 | 70 | 130 | | | |
| Beryllium | 0.000973 | 0.00100 | 0.00100 | 0 | 97.3 | 70 | 130 | | | |
| Cadmium | 0.000983 | 0.00100 | 0.00100 | 0 | 98.3 | 70 | 130 | | | |
| Calcium | 0.0902 | 0.300 | 0.100 | 0 | 90.2 | 70 | 130 | | | |
| Chromium | 0.00538 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Cobalt | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160908B**

Sample ID **LCVL5-160908** Batch ID: **R88020** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_160908B** Analysis Date: **9/8/2016 7:40:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.000939 | 0.00100 | 0.00100 | 0 | 93.9 | 70 | 130 | | | |
| Lithium | 0.00876 | 0.0100 | 0.0100 | 0 | 87.6 | 70 | 130 | | | |
| Molybdenum | 0.00496 | 0.00500 | 0.00500 | 0 | 99.2 | 70 | 130 | | | |
| Selenium | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Thallium | 0.000989 | 0.00150 | 0.00100 | 0 | 98.9 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160909A**

The QC data in batch 77092 applies to the following samples: 1608276-07A, 1608276-08A, 1608276-09A, 1608276-10A, 1608276-11A, 1608276-12A, 1608276-13A, 1608276-14A, 1608276-15A, 1608276-16A

Sample ID **MB-77092** Batch ID: **77092** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_160909A** Analysis Date: **9/9/2016 1:38:00 PM** Prep Date: **9/6/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

Sample ID **LCS-77092** Batch ID: **77092** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_160909A** Analysis Date: **9/9/2016 1:41:00 PM** Prep Date: **9/6/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.183 | 0.0300 | 0.200 | 0 | 91.6 | 80 | 120 | | | |

Sample ID **LCSD-77092** Batch ID: **77092** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_160909A** Analysis Date: **9/9/2016 1:44:00 PM** Prep Date: **9/6/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.195 | 0.0300 | 0.200 | 0 | 97.6 | 80 | 120 | 6.39 | 15 | |

Sample ID **1608276-07A SD** Batch ID: **77092** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_160909A** Analysis Date: **9/9/2016 1:53:00 PM** Prep Date: **9/6/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Boron | 0.105 | 0.150 | 0 | 0.0690 | | | | 41.1 | 10 | R |

Sample ID **1608276-07A PDS** Batch ID: **77092** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_160909A** Analysis Date: **9/9/2016 2:17:00 PM** Prep Date: **9/6/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.186 | 0.00250 | 0.200 | 0 | 92.9 | 80 | 120 | | | |
| Boron | 0.242 | 0.0300 | 0.200 | 0.0691 | 86.5 | 80 | 120 | | | |

Sample ID **1608276-07A MS** Batch ID: **77092** TestNo: **SW6020A** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS4_160909A** Analysis Date: **9/9/2016 2:20:00 PM** Prep Date: **9/6/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.257 | 0.0300 | 0.200 | 0.0691 | 94.0 | 80 | 120 | | | |

Sample ID **1608276-07A MSD** Batch ID: **77092** TestNo: **SW6020A** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS4_160909A** Analysis Date: **9/9/2016 2:23:00 PM** Prep Date: **9/6/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.257 | 0.0300 | 0.200 | 0.0691 | 94.1 | 80 | 120 | 0.078 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160909A**

| Sample ID **ICV-160909** | Batch ID: **R88038** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160909A** | Analysis Date: **9/9/2016 1:23:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.105 | 0.00250 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Boron | 0.0999 | 0.0300 | 0.100 | 0 | 99.9 | 90 | 110 | | | |

| Sample ID **LCVL-160909** | Batch ID: **R88038** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160909A** | Analysis Date: **9/9/2016 1:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00210 | 0.00250 | 0.00200 | 0 | 105 | 70 | 130 | | | |
| Boron | 0.0209 | 0.0300 | 0.0200 | 0 | 104 | 70 | 130 | | | |

| Sample ID **CCV1-160909** | Batch ID: **R88038** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160909A** | Analysis Date: **9/9/2016 2:43:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.194 | 0.00250 | 0.200 | 0 | 96.9 | 90 | 110 | | | |
| Boron | 0.195 | 0.0300 | 0.200 | 0 | 97.4 | 90 | 110 | | | |

| Sample ID **LCVL1-160909** | Batch ID: **R88038** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160909A** | Analysis Date: **9/9/2016 3:00:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00210 | 0.00250 | 0.00200 | 0 | 105 | 70 | 130 | | | |
| Boron | 0.0244 | 0.0300 | 0.0200 | 0 | 122 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160909B**

| Sample ID **ICV-160909** | Batch ID: **R88044** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160909B** | Analysis Date: **9/9/2016 1:23:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.105 | 0.00250 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Boron | 0.0999 | 0.0300 | 0.100 | 0 | 99.9 | 90 | 110 | | | |

| Sample ID **LCVL-160909** | Batch ID: **R88044** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160909B** | Analysis Date: **9/9/2016 1:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00210 | 0.00250 | 0.00200 | 0 | 105 | 70 | 130 | | | |
| Boron | 0.0209 | 0.0300 | 0.0200 | 0 | 104 | 70 | 130 | | | |

| Sample ID **CCV1-160909** | Batch ID: **R88044** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160909B** | Analysis Date: **9/9/2016 2:43:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.194 | 0.00250 | 0.200 | 0 | 96.9 | 90 | 110 | | | |
| Boron | 0.195 | 0.0300 | 0.200 | 0 | 97.4 | 90 | 110 | | | |

| Sample ID **LCVL1-160909** | Batch ID: **R88044** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160909B** | Analysis Date: **9/9/2016 3:00:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00210 | 0.00250 | 0.00200 | 0 | 105 | 70 | 130 | | | |
| Boron | 0.0244 | 0.0300 | 0.0200 | 0 | 122 | 70 | 130 | | | |

| Sample ID **CCV2-160909** | Batch ID: **R88044** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160909B** | Analysis Date: **9/9/2016 3:53:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.195 | 0.00250 | 0.200 | 0 | 97.6 | 90 | 110 | | | |
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL2-160909** | Batch ID: **R88044** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160909B** | Analysis Date: **9/9/2016 3:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00208 | 0.00250 | 0.00200 | 0 | 104 | 70 | 130 | | | |
| Boron | 0.0250 | 0.0300 | 0.0200 | 0 | 125 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160829A**

The QC data in batch 77006 applies to the following samples: 1608276-01D, 1608276-02D, 1608276-03D, 1608276-04D, 1608276-05D, 1608276-06D, 1608276-07D, 1608276-08D, 1608276-09D, 1608276-10D

Sample ID **MB-77006** Batch ID: **77006** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_160829A** Analysis Date: **8/29/2016 11:32:48 AM** Prep Date: **8/29/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-77006** Batch ID: **77006** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_160829A** Analysis Date: **8/29/2016 11:47:48 AM** Prep Date: **8/29/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | | | |
| Fluoride | 3.83 | 0.400 | 4.000 | 0 | 95.9 | 90 | 110 | | | |
| Sulfate | 31.1 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | | | |

Sample ID **LCSD-77006** Batch ID: **77006** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_160829A** Analysis Date: **8/29/2016 12:02:48 PM** Prep Date: **8/29/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | 0.056 | 20 | |
| Fluoride | 3.78 | 0.400 | 4.000 | 0 | 94.5 | 90 | 110 | 1.44 | 20 | |
| Sulfate | 31.2 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | 0.208 | 20 | |

Sample ID **1608276-07DMS** Batch ID: **77006** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_160829A** Analysis Date: **8/29/2016 7:34:11 PM** Prep Date: **8/29/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 40.0 | 1.00 | 20.00 | 20.44 | 97.6 | 90 | 110 | | | |
| Fluoride | 20.0 | 0.400 | 20.00 | 0.1585 | 99.1 | 90 | 110 | | | |
| Sulfate | 43.0 | 3.00 | 20.00 | 21.84 | 106 | 90 | 110 | | | |

Sample ID **1608276-07DMSD** Batch ID: **77006** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_160829A** Analysis Date: **8/29/2016 7:49:11 PM** Prep Date: **8/29/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 40.1 | 1.00 | 20.00 | 20.44 | 98.2 | 90 | 110 | 0.299 | 20 | |
| Fluoride | 20.1 | 0.400 | 20.00 | 0.1585 | 99.6 | 90 | 110 | 0.539 | 20 | |
| Sulfate | 43.1 | 3.00 | 20.00 | 21.84 | 106 | 90 | 110 | 0.327 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160829A**

| Sample ID **ICV-160829** | Batch ID: **R87861** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_160829A** | Analysis Date: **8/29/2016 10:15:38 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 26.0 | 1.00 | 25.00 | 0 | 104 | 90 | 110 | | | |
| Fluoride | 9.38 | 0.400 | 10.00 | 0 | 93.8 | 90 | 110 | | | |
| Sulfate | 80.5 | 3.00 | 75.00 | 0 | 107 | 90 | 110 | | | |

| Sample ID **CCV1-160829** | Batch ID: **R87861** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160829A** | Analysis Date: **8/29/2016 5:23:12 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.87 | 0.400 | 4.000 | 0 | 96.6 | 90 | 110 | | | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV2-160829** | Batch ID: **R87861** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160829A** | Analysis Date: **8/29/2016 8:49:11 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.92 | 0.400 | 4.000 | 0 | 98.1 | 90 | 110 | | | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160830A**

The QC data in batch 77028 applies to the following samples: 1608276-11D, 1608276-12D, 1608276-13D, 1608276-14D, 1608276-15D, 1608276-16D

Sample ID **MB-77028** Batch ID: **77028** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_160830A** Analysis Date: **8/30/2016 10:36:06 AM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-77028** Batch ID: **77028** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_160830A** Analysis Date: **8/30/2016 10:51:06 AM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.4 | 1.00 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Fluoride | 3.82 | 0.400 | 4.000 | 0 | 95.4 | 90 | 110 | | | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

Sample ID **LCSD-77028** Batch ID: **77028** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_160830A** Analysis Date: **8/30/2016 11:06:06 AM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.4 | 1.00 | 10.00 | 0 | 104 | 90 | 110 | 0.161 | 20 | |
| Fluoride | 3.75 | 0.400 | 4.000 | 0 | 93.8 | 90 | 110 | 1.68 | 20 | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | 0.128 | 20 | |

Sample ID **1608276-11DMS** Batch ID: **77028** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_160830A** Analysis Date: **8/30/2016 3:22:20 PM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 309 | 10.0 | 200.0 | 106.8 | 101 | 90 | 110 | | | |
| Fluoride | 193 | 4.00 | 200.0 | 0 | 96.7 | 90 | 110 | | | |
| Sulfate | 256 | 30.0 | 200.0 | 40.70 | 108 | 90 | 110 | | | |

Sample ID **1608276-11DMSD** Batch ID: **77028** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_160830A** Analysis Date: **8/30/2016 3:37:20 PM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 310 | 10.0 | 200.0 | 106.8 | 102 | 90 | 110 | 0.409 | 20 | |
| Fluoride | 194 | 4.00 | 200.0 | 0 | 97.1 | 90 | 110 | 0.452 | 20 | |
| Sulfate | 258 | 30.0 | 200.0 | 40.70 | 108 | 90 | 110 | 0.558 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160830A**

| Sample ID **ICV-160830** | Batch ID: **R87889** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_160830A** | Analysis Date: **8/30/2016 9:57:10 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 26.5 | 1.00 | 25.00 | 0 | 106 | 90 | 110 | | | |
| Fluoride | 9.51 | 0.400 | 10.00 | 0 | 95.1 | 90 | 110 | | | |
| Sulfate | 81.9 | 3.00 | 75.00 | 0 | 109 | 90 | 110 | | | |

| Sample ID **CCV1-160830** | Batch ID: **R87889** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160830A** | Analysis Date: **8/30/2016 2:14:39 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.84 | 0.400 | 4.000 | 0 | 96.1 | 90 | 110 | | | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV2-160830** | Batch ID: **R87889** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160830A** | Analysis Date: **8/30/2016 5:22:20 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.85 | 0.400 | 4.000 | 0 | 96.2 | 90 | 110 | | | |
| Sulfate | 31.5 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160831A**

The QC data in batch 77040 applies to the following samples: 1608276-01D, 1608276-02D, 1608276-03D, 1608276-04D, 1608276-05D, 1608276-06D, 1608276-07D, 1608276-08D, 1608276-09D, 1608276-10D, 1608276-11D, 1608276-12D, 1608276-13D

Sample ID **1608241-01D-DUP** Batch ID: **77040** TestNo: **M4500-H+ B** Units: **pH Units@21.6℃**
SampType: **DUP** Run ID: **TITRATOR_160831A** Analysis Date: **8/31/2016 10:05:00 AM** Prep Date: **8/31/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.22 | 0 | 0 | 7.200 | | | | 0.277 | 5 | |

Sample ID **1608241-02D-DUP** Batch ID: **77040** TestNo: **M4500-H+ B** Units: **pH Units@21.5℃**
SampType: **DUP** Run ID: **TITRATOR_160831A** Analysis Date: **8/31/2016 10:10:00 AM** Prep Date: **8/31/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 7.31 | 0 | 0 | 7.260 | | | | 0.686 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160831A**

The QC data in batch 77050 applies to the following samples: 1608276-14D, 1608276-15D, 1608276-16D

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **1608276-14D-DUP** | Batch ID: **77050** | TestNo: **M4500-H+ B** | Units: **pH Units@18.2℃** |
| SampType: **DUP** | Run ID: **TITRATOR_160831A** | Analysis Date: **8/31/2016 1:47:00 PM** | Prep Date: **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.30 | 0 | 0 | 6.310 | | | | 0.159 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160831A**

| Sample ID | **ICV-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.9℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 8:53:00 AM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.94 | 0 | 10.00 | 0 | 99.4 | 99 | 101 | | | |

| Sample ID | **CCV1-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.1℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 10:26:00 AM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV2-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.1℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 10:59:00 AM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV3-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.4℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 11:28:00 AM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV4-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@22℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 1:08:00 PM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV5-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.6℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 2:02:00 PM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.98 | 0 | 7.000 | 0 | 99.7 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608276
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_160831A**

The QC data in batch 77055 applies to the following samples: 1608276-01D, 1608276-02D, 1608276-03D, 1608276-04D, 1608276-05D, 1608276-06D, 1608276-07D, 1608276-08D, 1608276-09D, 1608276-10D, 1608276-11D, 1608276-12D, 1608276-13D, 1608276-14D, 1608276-15D, 1608276-16D

Sample ID **MB-77055** Batch ID: **77055** TestNo: **M2540C** Units: **mg/L**
SampType: **MBLK** Run ID: **WC_160831A** Analysis Date: **9/1/2016 8:46:00 AM** Prep Date: **8/31/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

Sample ID **LCS-77055** Batch ID: **77055** TestNo: **M2540C** Units: **mg/L**
SampType: **LCS** Run ID: **WC_160831A** Analysis Date: **9/1/2016 8:46:00 AM** Prep Date: **8/31/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 748 | 10.0 | 745.6 | 0 | 100 | 90 | 113 | | | |

Sample ID **1608276-01D-DUP** Batch ID: **77055** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_160831A** Analysis Date: **9/1/2016 8:46:00 AM** Prep Date: **8/31/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1020 | 50.0 | 0 | 1065 | | | | 4.32 | 5 | |

Sample ID **1608276-12D-DUP** Batch ID: **77055** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_160831A** Analysis Date: **9/1/2016 8:46:00 AM** Prep Date: **8/31/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1170 | 50.0 | 0 | 1115 | | | | 4.39 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# Case Narrative

## Lab No: 20160843

This report contains the analytical results for the 16 sample(s) received under chain of custody by ESC Lab Sciences on 8/31/2016 10:45:00 AM. These samples are associated with your 1608276 project.

The analytical results included in this report meet all applicable quality control procedure requirements except as noted below:

The test results in this report meet all NELAC requirements unless noted below:

This report shall not be reproduced, except in full, without the written approval of ESC Lab Sciences.

All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client.

Results have been reviewed by the Director of Radiochemistry or their designees and is approved for release.

**Observations / Nonconformances**




*OUTREACH LABORATORY, A Divsion of ESC Lab Sciences*
*Address: 311 North Aspen Avenue, Broken Arrow, OK, 74012 EMail: outreach@esclabsciences.com - Tel: (918) 251-2515*

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160843-01** | | | | | | | | |
| **Client ID** : **FGD-2** | | | | | | | | |
| **Date Sampled** : **8/24/2016 10:20:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 3.24 +/- 1.44 | 0.803 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 2.47 +/- 0.611 | 0.299 | pCi/l | | 09/06/16 | 09/07/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.769 +/- 0.829 | 0.504 | pCi/l | | 09/16/16 | 09/21/16 | JR |
| **Lab ID** : **20160843-02** | | | | | | | | |
| **Client ID** : **FGD-3** | | | | | | | | |
| **Date Sampled** : **8/24/2016 11:15:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 3.01 +/- 1.39 | 0.884 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.416 +/- 0.184 | 0.203 | pCi/l | | 09/06/16 | 09/07/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.60 +/- 1.21 | 0.682 | pCi/l | | 09/16/16 | 09/21/16 | JR |
| **Lab ID** : **20160843-03** | | | | | | | | |
| **Client ID** : **FGD-4** | | | | | | | | |
| **Date Sampled** : **8/24/2016 12:00:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 0.810 +/- 0.927 | 0.654 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.185 +/- 0.145 | 0.199 | pCi/l | | 09/06/16 | 09/07/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.625 +/- 0.782 | 0.455 | pCi/l | | 09/16/16 | 09/21/16 | JR |
| **Lab ID** : **20160843-04** | | | | | | | | |
| **Client ID** : **FGD-6** | | | | | | | | |
| **Date Sampled** : **8/24/2016 12:50:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.36 +/- 1.21 | 0.893 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.465 +/- 0.174 | 0.130 | pCi/l | | 09/06/16 | 09/07/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.896 +/- 1.04 | 0.762 | pCi/l | | 09/16/16 | 09/21/16 | JR |

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160843-05** | | | | | | | | |
| **Client ID** : **FGD-5** | | | | | | | | |
| **Date Sampled** : **8/24/2016 1:40:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 0.660 +/- 1.33 | 0.868 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.398 +/- 0.193 | 0.224 | pCi/l | | 09/06/16 | 09/07/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.261 +/- 1.13 | 0.643 | pCi/l | | 09/16/16 | 09/21/16 | JR |
| **Lab ID** : **20160843-06** | | | | | | | | |
| **Client ID** : **FGD-1** | | | | | | | | |
| **Date Sampled** : **8/24/2016 2:30:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.43 +/- 1.10 | 0.684 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.188 +/- 0.110 | 0.102 | pCi/l | | 09/06/16 | 09/07/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.24 +/- 0.995 | 0.582 | pCi/l | | 09/16/16 | 09/21/16 | JR |
| **Lab ID** : **20160843-07** | | | | | | | | |
| **Client ID** : **MW-07** | | | | | | | | |
| **Date Sampled** : **8/24/2016 3:20:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.83 +/- 1.23 | 0.822 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.213 +/- 0.148 | 0.177 | pCi/l | | 09/06/16 | 09/07/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.61 +/- 1.08 | 0.644 | pCi/l | | 09/16/16 | 09/21/16 | JR |
| **Lab ID** : **20160843-08** | | | | | | | | |
| **Client ID** : **MW-05** | | | | | | | | |
| **Date Sampled** : **8/24/2016 4:20:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 3.37 +/- 2.12 | 1.24 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.562 +/- 0.182 | 0.113 | pCi/l | | 09/06/16 | 09/07/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.80 +/- 1.93 | 1.12 | pCi/l | | 09/16/16 | 09/21/16 | JR |

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160843-09** | | | | | | | | |
| **Client ID** : **DUP-01** | | | | | | | | |
| **Date Sampled** : **8/24/2016 4:20:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.35 +/- 1.10 | 0.685 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.601 +/- 0.218 | 0.168 | pCi/l | | 09/06/16 | 09/08/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.751 +/- 0.883 | 0.517 | pCi/l | | 09/16/16 | 09/21/16 | JR |
| **Lab ID** : **20160843-10** | | | | | | | | |
| **Client ID** : **EB-1** | | | | | | | | |
| **Date Sampled** : **8/24/2016 4:40:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 0.095 +/- 0.847 | 0.626 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.022 +/- 0.085 | 0.156 | pCi/l | | 09/06/16 | 09/08/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.073 +/- 0.762 | 0.470 | pCi/l | | 09/16/16 | 09/21/16 | JR |
| **Lab ID** : **20160843-11** | | | | | | | | |
| **Client ID** : **FGD-8** | | | | | | | | |
| **Date Sampled** : **8/24/2016 5:35:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.00 +/- 0.990 | 0.635 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.778 +/- 0.210 | 0.143 | pCi/l | | 09/06/16 | 09/08/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.223 +/- 0.780 | 0.491 | pCi/l | | 09/16/16 | 09/21/16 | JR |
| **Lab ID** : **20160843-12** | | | | | | | | |
| **Client ID** : **AL-10** | | | | | | | | |
| **Date Sampled** : **8/25/2016 8:50:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 3.45 +/- 1.40 | 0.732 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 2.34 +/- 0.339 | 0.116 | pCi/l | | 09/06/16 | 09/08/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.11 +/- 1.06 | 0.616 | pCi/l | | 09/16/16 | 09/21/16 | JR |


*OUTREACH LABORATORY, A Divsion of ESC Lab Sciences*
*Address: 311 North Aspen Avenue, Broken Arrow, OK, 74012 EMail: outreach@esclabsciences.com - Tel: (918) 251-2515*

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160843-13** | | | | | | | | |
| **Client ID** : **MW-02** | | | | | | | | |
| **Date Sampled** : **8/25/2016 10:00:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.10 +/- 1.02 | 0.688 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.182 +/- 0.133 | 0.166 | pCi/l | | 09/06/16 | 09/08/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.922 +/- 0.886 | 0.521 | pCi/l | | 09/16/16 | 09/21/16 | JR |
| **Lab ID** : **20160843-14** | | | | | | | | |
| **Client ID** : **MW-09** | | | | | | | | |
| **Date Sampled** : **8/25/2016 11:05:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 3.40 +/- 1.16 | 0.684 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.06 +/- 0.245 | 0.142 | pCi/l | | 09/06/16 | 09/08/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.34 +/- 0.914 | 0.542 | pCi/l | | 09/16/16 | 09/22/16 | JR |
| **Lab ID** : **20160843-15** | | | | | | | | |
| **Client ID** : **FGD-11** | | | | | | | | |
| **Date Sampled** : **8/25/2016 12:05:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 7.81 +/- 1.37 | 0.709 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 4.23 +/- 0.509 | 0.217 | pCi/l | | 09/06/16 | 09/08/16 | AK |
| Radium-228 | EPA 904*/9320* | 3.58 +/- 0.863 | 0.492 | pCi/l | | 09/16/16 | 09/22/16 | JR |
| **Lab ID** : **20160843-16** | | | | | | | | |
| **Client ID** : **FGD-12** | | | | | | | | |
| **Date Sampled** : **8/25/2016 1:05:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 3.43 +/- 1.04 | 0.599 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.59 +/- 0.312 | 0.164 | pCi/l | | 09/06/16 | 09/08/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.84 +/- 0.724 | 0.434 | pCi/l | | 09/16/16 | 09/22/16 | JR |

# QC Report

| Parameter | Blank | LCS %REC | LCSD %REC | LCSD RPD | DUP RPD | RER, NAD or DER | MS %REC | MSD %REC | MSD RPD | Batch ID |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.016 | 102.0 | | | 2.2 | 0.082 | 75.8 | 88.1 | 13.3 | R1130 |
| Radium-228 | 0.465 | 118.0 | | | 5.5 | 0.053 | 88.4 | 93.6 | 5.8 | R3856 |

**Lab Approval:**

Ron Eidson
Director of Radiochemistry

*NELAC Certified Parameter BDL = Below Detection Limit

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1608276

**Subcontractor:**

ESC Laboratory
311 North Aspen
Broken Arrow, Oklahoma 74012

TEL: (918) 251-2515
FAX:
Acct #: DHLRRTX

29-Aug-16

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E904.0 | SM7500Ra-B M | | | | |
| FGD-2 | Aqueous | -01B | 08/24/16 10:20 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-2 | Aqueous | -01C | 08/24/16 10:20 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-3 | Aqueous | -02B | 08/24/16 11:15 AM | 500HDPEHNO3 | 1 | | | | | |
| FGD-3 | Aqueous | -02C | 08/24/16 11:15 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-4 | Aqueous | -03B | 08/24/16 12:00 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-4 | Aqueous | -03C | 08/24/16 12:00 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-6 | Aqueous | -04B | 08/24/16 12:50 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-6 | Aqueous | -04C | 08/24/16 12:50 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-5 | Aqueous | -05B | 08/24/16 01:40 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-5 | Aqueous | -05C | 08/24/16 01:40 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-1 | Aqueous | -06B | 08/24/16 02:30 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-1 | Aqueous | -06C | 08/24/16 02:30 PM | 500HDPEHNO3 | | 1 | | | | |
| MW-07 | Aqueous | -07B | 08/24/16 03:20 PM | 500HDPEHNO3 | 1 | | | | | |
| MW-07 | Aqueous | -07C | 08/24/16 03:20 PM | 500HDPEHNO3 | | 1 | | | | |
| MW-05 | Aqueous | -08B | 08/24/16 04:20 PM | 500HDPEHNO3 | 1 | | | | | |
| MW-05 | Aqueous | -08C | 08/24/16 04:20 PM | 500HDPEHNO3 | | 1 | | | | |
| DUP-01 | Aqueous | -09B | 08/24/16 04:20 PM | 500HDPEHNO3 | 1 | | | | | |
| DUP-01 | Aqueous | -09C | 08/24/16 04:20 PM | 500HDPEHNO3 | | 1 | | | | |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs DHLRRTX033116S.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

2460843 L857240

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| Relinquished by: | J Burke | 8/29/16 1730 | Received by: | Loresta | 8/29/16 1730 |
| Relinquished by: | | | Received by: | Amber Taylor | 8/31/16 1045 |

CSL

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1608276

**Subcontractor:**

ESC Laboratory
311 North Aspen
Broken Arrow, Oklahoma 74012

TEL: (918) 251-2515
FAX:
Acct #: DHLRRTX

29-Aug-16

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E904.0 | SM7500Ra-B M | | | | |
| EB-1 | Aqueous | -10B | 08/24/16 04:40 PM | 500HDPEHNO3 | 1 | | | | | |
| EB-1 | Aqueous | -10C | 08/24/16 04:40 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-8 | Aqueous | -11B | 08/24/16 05:35 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-8 | Aqueous | -11C | 08/24/16 05:35 PM | 500HDPEHNO3 | | 1 | | | | |
| AL-10 | Aqueous | -12B | 08/25/16 08:50 AM | 500HDPEHNO3 | 1 | | | | | |
| AL-10 | Aqueous | -12C | 08/25/16 08:50 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-02 | Aqueous | -13B | 08/25/16 10:00 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-02 | Aqueous | -13C | 08/25/16 10:00 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-09 | Aqueous | -14B | 08/25/16 11:05 AM | 500HDPEHNO3 | 1 | | | | | |
| MW-09 | Aqueous | -14C | 08/25/16 11:05 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-11 | Aqueous | -15B | 08/25/16 12:05 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-11 | Aqueous | -15C | 08/25/16 12:05 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-12 | Aqueous | -16B | 08/25/16 01:05 PM | 500HDPEHNO3 | 1 | | | | | |
| FGD-12 | Aqueous | -16C | 08/25/16 01:05 PM | 500HDPEHNO3 | | 1 | | | | |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs DHLRRTX033116S.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

7060843

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| Relinquished by: | Barla | 8/29/16 1735 | Received by: | Loreste | 8/29/16 1735 |
| Relinquished by: | | | Received by: | Amber Taylor | 8/31/16 1045 |

CSL

# SAMPLE LOGIN

**Date Received:** *8/31/2016 10:45:0* **Lab Number:** 20160843 **Due:** 9/28/2016

| Sample Number | Client Sample ID | Matrix | Date Sampled | Container Type | Container Size | Preservation | Preserved Upon Receipt | Custody Seal | Seal Intact |
|---|---|---|---|---|---|---|---|---|---|
| **20160843-01 B** | FGD-2 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-01 A** | FGD-2 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-02 A** | FGD-3 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-02 B** | FGD-3 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-03 A** | FGD-4 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-03 B** | FGD-4 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-04 B** | FGD-6 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-04 A** | FGD-6 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-05 A** | FGD-5 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-05 B** | FGD-5 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-06 A** | FGD-1 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-06 B** | FGD-1 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-07 A** | MW-07 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-07 B** | MW-07 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **20160843-08 A** | MW-05 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-08 B** | MW-05 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-09 B** | DUP-01 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-09 A** | DUP-01 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-10 A** | EB-1 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-10 B** | EB-1 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-11 A** | FGD-8 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-11 B** | FGD-8 | NPW | 08/24/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-12 B** | AL-10 | NPW | 08/25/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-12 A** | AL-10 | NPW | 08/25/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-13 A** | MW-02 | NPW | 08/25/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| **20160843-13 B** | MW-02 | NPW | 08/25/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-14 A** | MW-09 | NPW | 08/25/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-14 B** | MW-09 | NPW | 08/25/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-15 A** | FGD-11 | NPW | 08/25/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-15 B** | FGD-11 | NPW | 08/25/16 | Plastic | 500 ml | HNO3, pH < 2 | | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20160843-16 B** | FGD-12 | NPW | 08/25/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20160843-16 A** | FGD-12 | NPW | 08/25/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |

| | |
|---|---|
| Radium-226 | SM 7500 Ra B M* |
| Radium-228 | EPA 904*/9320* |

**CONTAINER INSPECTION**

**# Coolers** 1 **Custody Seals Broken** N **Temperature:** Amb **Ice** **Radiation Survey:** <300 cpm

**SAMPLE INSPECTION**

**Sample Seal Broken** N **Chain of Custody Record** ✓ **Labels in Tact** ✓ **Radiation Survey Complete** N/A

**Anomalies**

**Inspected By:** Amber Taylor **DATE** 8/31/16

**QA or Designee Review:** [signature] **DATE** 8/31/16

**Sample Custodian Review:** Dustin Mauldin **DATE** 8/31/16

**Project Notes:**

September 08, 2016

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1608278

RE: Luminant - Oak Grove

Dear Will Vienne:

DHL Analytical, Inc. received 1 sample(s) on 8/27/2016 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-16-16

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 72316

# CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 8-26-16 PAGE 1 OF 1
PO #: 5164-D DHL WORK ORDER #: 1608278
PROJECT LOCATION OR NAME: LUMINANT - OAK GROVE
CLENT PROJECT #: 5164-D COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-A-POND | 01 | 8-25-16 | 1505 | W | P | 2 | | X | | X | X | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | See attached |

ANALYSES: BTEX ☐ MTBE ☐ (METHOD 8021) | GRO (METHOD 8015) ☐ DRO (METHOD 8105) ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ ____ ☐ | RCRA ☐ TX11 ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ____ ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐

| RELINQUISHED BY: (Signature) | DATE/TIME | RECEIVED BY: (Signature) |
|---|---|---|
| [signature] | 8-26-16 | 1730 [signature] |
| [signature] | 8/27/16 | 1200 [signature] |
| | | |

TURN AROUND TIME
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ ____

LABORATORY USE ONLY:
RECEIVING TEMP: 4.0 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☐ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

☐ DHL DISPOSAL @ $5.00 each ☐ Return

John Dupont

| | |
|---|---|
| From: | Sara Taube [Sara.Taube@pbwllc.com] |
| Sent: | Wednesday, July 22, 2015 12:06 PM |
| To: | John Dupont |
| Subject: | CCR Appendix III and IV |
| Follow Up Flag: | Follow up |
| Flag Status: | Completed |

Hi John,

Here are the Appendix III and Appendix IV constituents that we will need to have analyzed under the CCR Rule.

Appendix III
Boron
Calcium
Chloride
Fluoride
pH
sulfate
TDS

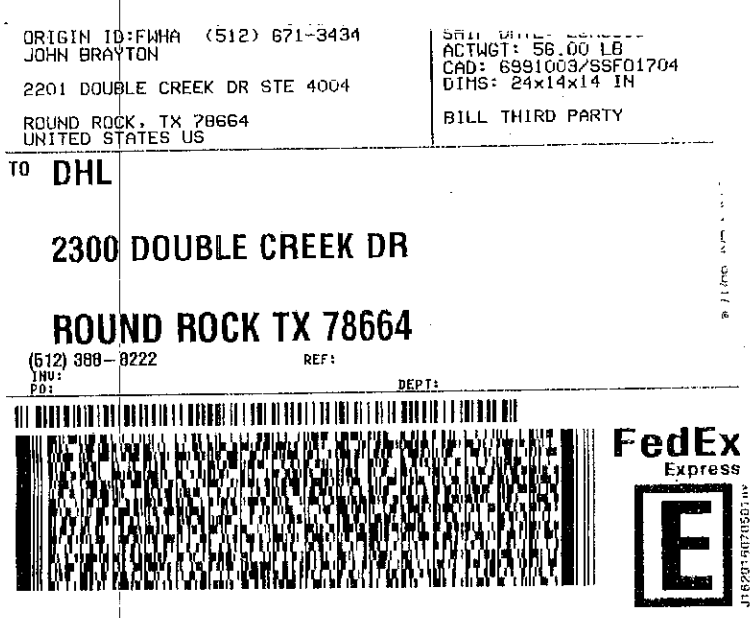
Appendix IV
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
~~Radium 226 and 228~~

We are looking to have approximately 74 wells sampled 8 times over the course of the next two years. Please let me know if there is any more information you might need.

Cheers,

Sara

10/26/2015



ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON

2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 26AUG16
ACTWGT: 56.00 LB
CAD: 6991003/SSF01704
DIMS: 24x14x14 IN

BILL THIRD PARTY

TO DHL

2300 DOUBLE CREEK DR

ROUND ROCK TX 78664

(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx Express

1 of 3

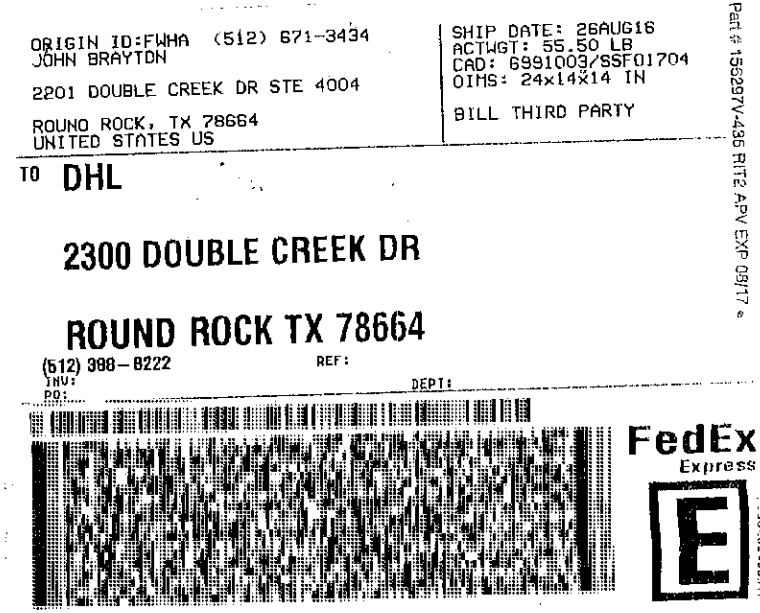
TRK# 0201 7839 3247 1021

## MASTER ##

SATURDAY 12:00P
PRIORITY OVERNIGHT

XO BSMA

78664
TX-US AUS



ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON

2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 26AUG16
ACTWGT: 55.50 LB
CAD: 6991003/SSF01704
DIMS: 24x14x14 IN

BILL THIRD PARTY

Part # 156297V435 RITE APV EXP 09/17

TO DHL

2300 DOUBLE CREEK DR

ROUND ROCK TX 78664

(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx Express

2 of 3

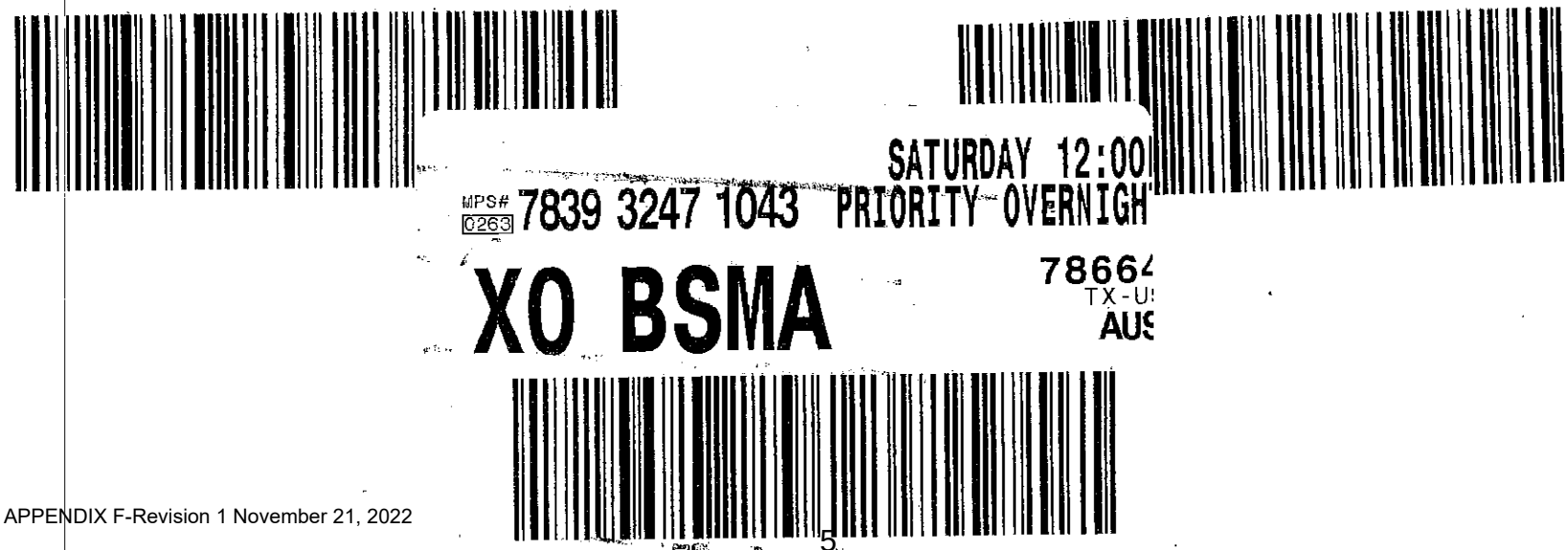
MPS# 0263 7839 3247 1032

Mstr# 7839 3247 1021 0201

SATURDAY 12:00P
PRIORITY OVERNIGHT

XO BSMA

78664
TX-US AUS



MPS# 0263 7839 3247 1043

SATURDAY 12:00
PRIORITY OVERNIGH

XO BSMA

78664
TX-US
AUS

5169367 27Aug 00:46 MEMH 5121/6323/0460

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Pastor, Behling & Wheeler | Date Received: 8/27/2016

Work Order Number 1608278 | Received by JB

Checklist completed by: Signature | 8/29/2016 Date | Reviewed by Initials | 8/29/2016 Date

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 4.0 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? NO | | Checked by |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *08-Sep-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1608278

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Total and Dissolved Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis

## LOG IN

The samples were received and log-in performed on 8/27/2016. A total of 1 sample was received and analyzed. The sample arrived in good condition and was properly packaged.

## METALS ANALYSIS

For Metals Analysis, the RPD of Boron for the Serial Dilution (1608278-06 SD) was above the method control limit. This is flagged accordingly in the QC Summary Report. This analyte was within method control limits in the associated Post Digestion Spike. No further corrective action was taken.

## DHL Analytical, Inc.

**Date:** *08-Sep-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove
**Lab Order:** 1608278

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1608278-01 | FGD-A-POND | | 08/25/16 03:05 PM | 8/27/2016 |

**Lab Order:** 1608278
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1608278-01A | FGD-A-POND | 08/25/16 03:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-A-POND | 08/25/16 03:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-A-POND | 08/25/16 03:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/30/16 08:16 AM | 77018 |
| | FGD-A-POND | 08/25/16 03:05 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 08/30/16 10:34 AM | 77030 |
| 1608278-01B | FGD-A-POND | 08/25/16 03:05 PM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | FGD-A-POND | 08/25/16 03:05 PM | Aqueous | E300 | Anion Preparation | 08/30/16 09:59 AM | 77028 |
| | FGD-A-POND | 08/25/16 03:05 PM | Aqueous | M4500-H+ B | pH Preparation | 08/31/16 01:16 PM | 77050 |
| | FGD-A-POND | 08/25/16 03:05 PM | Aqueous | M2540C | TDS Preparation | 08/30/16 03:36 PM | 77033 |

**Lab Order:** 1608278
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1608278-01A | FGD-A-POND | Aqueous | SW7470A | Mercury Total: Aqueous | 77030 | 1 | 08/31/16 11:08 AM | CETAC2_HG_160831B |
| | FGD-A-POND | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 500 | 09/06/16 02:50 PM | ICP-MS4_160906B |
| | FGD-A-POND | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 1 | 09/02/16 09:01 PM | ICP-MS3_160902A |
| | FGD-A-POND | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77018 | 100 | 09/02/16 05:56 PM | ICP-MS3_160902A |
| 1608278-01B | FGD-A-POND | Aqueous | E300 | Anions by IC method - Water | 77028 | 100 | 08/30/16 04:52 PM | IC4_160830A |
| | FGD-A-POND | Aqueous | E300 | Anions by IC method - Water | 77028 | 1 | 08/30/16 12:55 PM | IC4_160830A |
| | FGD-A-POND | Aqueous | M4500-H+ B | pH | 77050 | 1 | 08/31/16 01:53 PM | TITRATOR_160831A |
| | FGD-A-POND | Aqueous | M2540C | Total Dissolved Solids | 77033 | 1 | 08/31/16 08:40 AM | WC_160830B |

# DHL Analytical, Inc.

**Date:** *08-Sep-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-A-POND |
| **Project:** | Luminant - Oak Grove | **Lab ID:** | 1608278-01 |
| **Project No:** | 5164-D | **Collection Date:** | 08/25/16 03:05 PM |
| **Lab Order:** | 1608278 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | 0.000496 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/31/16 11:08 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | 0.00638 | 0.000800 | 0.00250 | | mg/L | 1 | 09/02/16 09:01 PM |
| Arsenic | 0.00561 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 09:01 PM |
| Barium | 0.208 | 0.00300 | 0.0100 | | mg/L | 1 | 09/02/16 09:01 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 09:01 PM |
| Boron | 115 | 5.00 | 15.0 | | mg/L | 500 | 09/06/16 02:50 PM |
| Cadmium | 0.000471 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/02/16 09:01 PM |
| Calcium | 629 | 50.0 | 150 | | mg/L | 500 | 09/06/16 02:50 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 09:01 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/02/16 09:01 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/02/16 09:01 PM |
| Lithium | 0.196 | 0.00500 | 0.0100 | | mg/L | 1 | 09/02/16 09:01 PM |
| Molybdenum | 0.495 | 0.00200 | 0.00500 | | mg/L | 1 | 09/02/16 09:01 PM |
| Selenium | 2.87 | 1.00 | 2.50 | | mg/L | 500 | 09/06/16 02:50 PM |
| Thallium | 0.00185 | 0.000500 | 0.00150 | | mg/L | 1 | 09/02/16 09:01 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 1960 | 30.0 | 100 | | mg/L | 100 | 08/30/16 04:52 PM |
| Fluoride | 16.3 | 10.0 | 40.0 | J | mg/L | 100 | 08/30/16 04:52 PM |
| Sulfate | 3670 | 100 | 300 | | mg/L | 100 | 08/30/16 04:52 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.80 | 0 | 0 | | pH Units@17.6°C | 1 | 08/31/16 01:53 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 10600 | 50.0 | 50.0 | | mg/L | 1 | 08/31/16 08:40 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160831B**

The QC data in batch 77030 applies to the following samples: 1608278-01A

| Sample ID | **MB-77030** | Batch ID: | **77030** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_160831B** | Analysis Date: | **8/31/2016 10:09:17 AM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-77030** | Batch ID: | **77030** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_160831B** | Analysis Date: | **8/31/2016 10:13:49 AM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00194 | 0.000200 | 0.00200 | 0 | 97.0 | 85 | 115 | | | |

| Sample ID | **LCSD-77030** | Batch ID: | **77030** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_160831B** | Analysis Date: | **8/31/2016 10:16:05 AM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00195 | 0.000200 | 0.00200 | 0 | 97.5 | 85 | 115 | 0.514 | 15 | |

| Sample ID | **1608276-06A SD** | Batch ID: | **77030** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_160831B** | Analysis Date: | **8/31/2016 10:34:12 AM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1608276-06A PDS** | Batch ID: | **77030** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_160831B** | Analysis Date: | **8/31/2016 10:36:28 AM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00235 | 0.000200 | 0.00250 | 0 | 94.0 | 85 | 115 | | | |

| Sample ID | **1608276-06A MS** | Batch ID: | **77030** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_160831B** | Analysis Date: | **8/31/2016 10:38:44 AM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00197 | 0.000200 | 0.00200 | 0 | 98.5 | 80 | 120 | | | |

| Sample ID | **1608276-06A MSD** | Batch ID: | **77030** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_160831B** | Analysis Date: | **8/31/2016 10:41:00 AM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00201 | 0.000200 | 0.00200 | 0 | 101 | 80 | 120 | 2.01 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_160831B**

| Sample ID | **ICV-160831** | Batch ID: | **R87892** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_160831B** | Analysis Date: | **8/31/2016 10:04:43 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00388 | 0.000200 | 0.00400 | 0 | 97.0 | 90 | 110 | | | |

| Sample ID | **CCV1-160831** | Batch ID: | **R87892** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160831B** | Analysis Date: | **8/31/2016 10:50:06 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00191 | 0.000200 | 0.00200 | 0 | 95.5 | 90 | 110 | | | |

| Sample ID | **CCV2-160831** | Batch ID: | **R87892** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_160831B** | Analysis Date: | **8/31/2016 11:17:25 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00194 | 0.000200 | 0.00200 | 0 | 97.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

The QC data in batch 77018 applies to the following samples: 1608278-01A

| Sample ID | **MB-77018** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS3_160902A** | Analysis Date: | **9/2/2016 4:38:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

| Sample ID | **LCS-77018** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS3_160902A** | Analysis Date: | **9/2/2016 4:44:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Barium | 0.189 | 0.0100 | 0.200 | 0 | 94.3 | 80 | 120 | | | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0 | 96.0 | 80 | 120 | | | |
| Calcium | 5.00 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | | | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 80 | 120 | | | |
| Cobalt | 0.197 | 0.00500 | 0.200 | 0 | 98.3 | 80 | 120 | | | |
| Lead | 0.189 | 0.00100 | 0.200 | 0 | 94.7 | 80 | 120 | | | |
| Lithium | 0.203 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Molybdenum | 0.188 | 0.00500 | 0.200 | 0 | 93.8 | 80 | 120 | | | |
| Selenium | 0.196 | 0.00500 | 0.200 | 0 | 97.8 | 80 | 120 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.5 | 80 | 120 | | | |

| Sample ID | **LCSD-77018** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS3_160902A** | Analysis Date: | **9/2/2016 4:50:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.4 | 80 | 120 | 1.01 | 15 | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.987 | 15 | |
| Barium | 0.192 | 0.0100 | 0.200 | 0 | 96.0 | 80 | 120 | 1.73 | 15 | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 80 | 120 | 1.11 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

| Sample ID **LCSD-77018** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 4:50:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.196 | 0.00100 | 0.200 | 0 | 98.2 | 80 | 120 | 2.21 | 15 | |
| Calcium | 5.09 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | 1.74 | 15 | |
| Chromium | 0.195 | 0.00500 | 0.200 | 0 | 97.4 | 80 | 120 | 0.716 | 15 | |
| Cobalt | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 80 | 120 | 0.102 | 15 | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 95.9 | 80 | 120 | 1.26 | 15 | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | 0.396 | 15 | |
| Molybdenum | 0.192 | 0.00500 | 0.200 | 0 | 95.8 | 80 | 120 | 2.06 | 15 | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 2.47 | 15 | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | 1.74 | 15 | |

| Sample ID **1608276-06A SD** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 5:08:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0292 | 0.0500 | 0 | 0.0294 | | | | 0.683 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Calcium | 13.4 | 1.50 | 0 | 13.5 | | | | 0.260 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.0353 | 0.0500 | 0 | 0.0330 | | | | 6.50 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1608276-06A PDS** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:08:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.6 | 80 | 120 | | | |
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Barium | 0.223 | 0.0100 | 0.200 | 0.0294 | 96.9 | 80 | 120 | | | |
| Beryllium | 0.194 | 0.00100 | 0.200 | 0 | 97.2 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0 | 96.2 | 80 | 120 | | | |
| Calcium | 17.6 | 0.300 | 5.00 | 13.5 | 81.6 | 80 | 120 | | | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.194 | 0.00500 | 0.200 | 0 | 97.0 | 80 | 120 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 95.8 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

| Sample ID **1608276-06A PDS** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:08:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.216 | 0.0100 | 0.200 | 0.0330 | 91.4 | 80 | 120 | | | |
| Molybdenum | 0.188 | 0.00500 | 0.200 | 0 | 94.2 | 80 | 120 | | | |
| Selenium | 0.193 | 0.00500 | 0.200 | 0 | 96.6 | 80 | 120 | | | |
| Thallium | 0.204 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | | | |

| Sample ID **1608276-06A MS** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:14:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Barium | 0.220 | 0.0100 | 0.200 | 0.0294 | 95.4 | 80 | 120 | | | |
| Beryllium | 0.188 | 0.00100 | 0.200 | 0 | 94.2 | 80 | 120 | | | |
| Cadmium | 0.191 | 0.00100 | 0.200 | 0 | 95.3 | 80 | 120 | | | |
| Calcium | 18.3 | 0.300 | 5.00 | 13.5 | 96.8 | 80 | 120 | | | |
| Chromium | 0.190 | 0.00500 | 0.200 | 0 | 94.8 | 80 | 120 | | | |
| Cobalt | 0.189 | 0.00500 | 0.200 | 0 | 94.4 | 80 | 120 | | | |
| Lead | 0.187 | 0.00100 | 0.200 | 0 | 93.6 | 80 | 120 | | | |
| Lithium | 0.224 | 0.0100 | 0.200 | 0.0330 | 95.3 | 80 | 120 | | | |
| Molybdenum | 0.191 | 0.00500 | 0.200 | 0 | 95.6 | 80 | 120 | | | |
| Selenium | 0.192 | 0.00500 | 0.200 | 0 | 96.2 | 80 | 120 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.6 | 80 | 120 | | | |

| Sample ID **1608276-06A MSD** | Batch ID: **77018** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:20:00 PM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.4 | 80 | 120 | 1.61 | 15 | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | 0.999 | 15 | |
| Barium | 0.218 | 0.0100 | 0.200 | 0.0294 | 94.3 | 80 | 120 | 1.00 | 15 | |
| Beryllium | 0.188 | 0.00100 | 0.200 | 0 | 94.0 | 80 | 120 | 0.266 | 15 | |
| Cadmium | 0.190 | 0.00100 | 0.200 | 0 | 95.0 | 80 | 120 | 0.368 | 15 | |
| Calcium | 18.3 | 0.300 | 5.00 | 13.5 | 96.4 | 80 | 120 | 0.109 | 15 | |
| Chromium | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 80 | 120 | 0.158 | 15 | |
| Cobalt | 0.190 | 0.00500 | 0.200 | 0 | 95.2 | 80 | 120 | 0.844 | 15 | |
| Lead | 0.188 | 0.00100 | 0.200 | 0 | 93.9 | 80 | 120 | 0.320 | 15 | |
| Lithium | 0.224 | 0.0100 | 0.200 | 0.0330 | 95.3 | 80 | 120 | 0 | 15 | |
| Molybdenum | 0.189 | 0.00500 | 0.200 | 0 | 94.7 | 80 | 120 | 0.894 | 15 | |
| Selenium | 0.194 | 0.00500 | 0.200 | 0 | 97.0 | 80 | 120 | 0.932 | 15 | |
| Thallium | 0.198 | 0.00150 | 0.200 | 0 | 99.2 | 80 | 120 | 0.352 | 15 | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

| Sample ID **ICV1-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 12:27:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.103 | 0.00250 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.0984 | 0.0100 | 0.100 | 0 | 98.4 | 90 | 110 | | | |
| Beryllium | 0.103 | 0.00100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Cadmium | 0.0980 | 0.00100 | 0.100 | 0 | 98.0 | 90 | 110 | | | |
| Calcium | 2.50 | 0.300 | 2.50 | 0 | 100 | 90 | 110 | | | |
| Chromium | 0.106 | 0.00500 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Cobalt | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.0985 | 0.00100 | 0.100 | 0 | 98.5 | 90 | 110 | | | |
| Lithium | 0.105 | 0.0100 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Molybdenum | 0.0949 | 0.00500 | 0.100 | 0 | 94.9 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.0976 | 0.00150 | 0.100 | 0 | 97.6 | 90 | 110 | | | |

| Sample ID **ILCVL-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 12:39:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00207 | 0.00250 | 0.00200 | 0 | 104 | 70 | 130 | | | |
| Arsenic | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00500 | 0.0100 | 0.00500 | 0 | 99.9 | 70 | 130 | | | |
| Beryllium | 0.00110 | 0.00100 | 0.00100 | 0 | 110 | 70 | 130 | | | |
| Cadmium | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Calcium | 0.0938 | 0.300 | 0.100 | 0 | 93.8 | 70 | 130 | | | |
| Chromium | 0.00537 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Cobalt | 0.00521 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lead | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Lithium | 0.0103 | 0.0100 | 0.0100 | 0 | 103 | 70 | 130 | | | |
| Molybdenum | 0.00494 | 0.00500 | 0.00500 | 0 | 98.8 | 70 | 130 | | | |
| Selenium | 0.00516 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Thallium | 0.00109 | 0.00150 | 0.00100 | 0 | 109 | 70 | 130 | | | |

| Sample ID **CCV2-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 4:14:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.196 | 0.0100 | 0.200 | 0 | 97.8 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.196 | 0.00100 | 0.200 | 0 | 98.2 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

| Sample ID **CCV2-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 4:14:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.31 | 0.300 | 5.00 | 0 | 106 | 90 | 110 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 98.2 | 90 | 110 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Molybdenum | 0.194 | 0.00500 | 0.200 | 0 | 96.8 | 90 | 110 | | | |
| Selenium | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL2-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 4:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00228 | 0.00250 | 0.00200 | 0 | 114 | 70 | 130 | | | |
| Arsenic | 0.00545 | 0.00500 | 0.00500 | 0 | 109 | 70 | 130 | | | |
| Barium | 0.00498 | 0.0100 | 0.00500 | 0 | 99.6 | 70 | 130 | | | |
| Beryllium | 0.00112 | 0.00100 | 0.00100 | 0 | 112 | 70 | 130 | | | |
| Cadmium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Calcium | 0.0878 | 0.300 | 0.100 | 0 | 87.8 | 70 | 130 | | | |
| Chromium | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Cobalt | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Lead | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 70 | 130 | | | |
| Lithium | 0.00965 | 0.0100 | 0.0100 | 0 | 96.5 | 70 | 130 | | | |
| Molybdenum | 0.00496 | 0.00500 | 0.00500 | 0 | 99.2 | 70 | 130 | | | |
| Selenium | 0.00496 | 0.00500 | 0.00500 | 0 | 99.1 | 70 | 130 | | | |
| Thallium | 0.00117 | 0.00150 | 0.00100 | 0 | 117 | 70 | 130 | | | |

| Sample ID **CCV3-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:31:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.207 | 0.00250 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Arsenic | 0.212 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Barium | 0.197 | 0.0100 | 0.200 | 0 | 98.6 | 90 | 110 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 5.30 | 0.300 | 5.00 | 0 | 106 | 90 | 110 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Lithium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

| Sample ID **CCV3-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:31:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.208 | 0.00150 | 0.200 | 0 | 104 | 90 | 110 | | | |

| Sample ID **LCVL3-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 6:49:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00225 | 0.00250 | 0.00200 | 0 | 113 | 70 | 130 | | | |
| Arsenic | 0.00527 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Barium | 0.00501 | 0.0100 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Beryllium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Cadmium | 0.00105 | 0.00100 | 0.00100 | 0 | 105 | 70 | 130 | | | |
| Calcium | 0.0851 | 0.300 | 0.100 | 0 | 85.1 | 70 | 130 | | | |
| Chromium | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lead | 0.00105 | 0.00100 | 0.00100 | 0 | 105 | 70 | 130 | | | |
| Lithium | 0.00969 | 0.0100 | 0.0100 | 0 | 96.9 | 70 | 130 | | | |
| Molybdenum | 0.00491 | 0.00500 | 0.00500 | 0 | 98.2 | 70 | 130 | | | |
| Selenium | 0.00516 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Thallium | 0.00111 | 0.00150 | 0.00100 | 0 | 111 | 70 | 130 | | | |

| Sample ID **CCV4-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 8:02:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 98.8 | 90 | 110 | | | |
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 99.1 | 90 | 110 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 98.0 | 90 | 110 | | | |
| Lithium | 0.212 | 0.0100 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 98.8 | 90 | 110 | | | |
| Thallium | 0.208 | 0.00150 | 0.200 | 0 | 104 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

| Sample ID **LCVL4-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 8:20:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00210 | 0.00250 | 0.00200 | 0 | 105 | 70 | 130 | | | |
| Arsenic | 0.00521 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Barium | 0.00504 | 0.0100 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Beryllium | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 70 | 130 | | | |
| Cadmium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Chromium | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00502 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Lead | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Molybdenum | 0.00487 | 0.00500 | 0.00500 | 0 | 97.4 | 70 | 130 | | | |
| Thallium | 0.00103 | 0.00150 | 0.00100 | 0 | 103 | 70 | 130 | | | |

| Sample ID **CCV5-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 9:32:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.210 | 0.00250 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Arsenic | 0.213 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.211 | 0.00150 | 0.200 | 0 | 105 | 90 | 110 | | | |

| Sample ID **LCVL5-160902** | Batch ID: **R87956** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_160902A** | Analysis Date: **9/2/2016 9:50:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00205 | 0.00250 | 0.00200 | 0 | 102 | 70 | 130 | | | |
| Arsenic | 0.00532 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Barium | 0.00497 | 0.0100 | 0.00500 | 0 | 99.5 | 70 | 130 | | | |
| Beryllium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Cadmium | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 70 | 130 | | | |
| Chromium | 0.00505 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Cobalt | 0.00491 | 0.00500 | 0.00500 | 0 | 98.2 | 70 | 130 | | | |
| Lead | 0.000982 | 0.00100 | 0.00100 | 0 | 98.2 | 70 | 130 | | | |
| Lithium | 0.00953 | 0.0100 | 0.0100 | 0 | 95.3 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_160902A**

Sample ID **LCVL5-160902** Batch ID: **R87956** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS3_160902A** Analysis Date: **9/2/2016 9:50:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.00485 | 0.00500 | 0.00500 | 0 | 97.0 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160906B**

The QC data in batch 77018 applies to the following samples: 1608278-01A

| Sample ID | **MB-77018** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 2:28:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

| Sample ID | **LCS-77018** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 2:31:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.189 | 0.0300 | 0.200 | 0 | 94.5 | 80 | 120 | | | |

| Sample ID | **LCSD-77018** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 2:34:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.188 | 0.0300 | 0.200 | 0 | 94.0 | 80 | 120 | 0.514 | 15 | |

| Sample ID | **1608276-06A SD** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 3:14:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0778 | 0.150 | 0 | 0.0602 | | | | 25.6 | 10 | R |

| Sample ID | **1608276-06A PDS** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 3:56:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.267 | 0.0300 | 0.200 | 0.0601 | 103 | 80 | 120 | | | |

| Sample ID | **1608276-06A MS** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 3:59:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.271 | 0.0300 | 0.200 | 0.0601 | 105 | 80 | 120 | | | |

| Sample ID | **1608276-06A MSD** | Batch ID: | **77018** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **ICP-MS4_160906B** | Analysis Date: | **9/6/2016 4:02:00 PM** | Prep Date: | **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.269 | 0.0300 | 0.200 | 0.0601 | 104 | 80 | 120 | 0.591 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160906B**

| Sample ID **ICV-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 12:51:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Barium | 0.101 | 0.0100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Calcium | 2.38 | 0.300 | 2.50 | 0 | 95.3 | 90 | 110 | | | |
| Selenium | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 12:57:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Barium | 0.00501 | 0.0100 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Calcium | 0.0939 | 0.300 | 0.100 | 0 | 93.9 | 70 | 130 | | | |
| Selenium | 0.00464 | 0.00500 | 0.00500 | 0 | 92.9 | 70 | 130 | | | |

| Sample ID **CCV1-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 1:24:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.199 | 0.0300 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Calcium | 4.87 | 0.300 | 5.00 | 0 | 97.5 | 90 | 110 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL1-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 1:30:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0241 | 0.0300 | 0.0200 | 0 | 120 | 70 | 130 | | | |
| Calcium | 0.0972 | 0.300 | 0.100 | 0 | 97.2 | 70 | 130 | | | |
| Selenium | 0.00531 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |

| Sample ID **CCV2-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 2:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.201 | 0.0300 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.91 | 0.300 | 5.00 | 0 | 98.3 | 90 | 110 | | | |
| Selenium | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |

| Sample ID **LCVL2-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 3:05:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0219 | 0.0300 | 0.0200 | 0 | 109 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_160906B**

| Sample ID **LCVL2-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 3:05:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0979 | 0.300 | 0.100 | 0 | 97.9 | 70 | 130 | | | |
| Selenium | 0.00566 | 0.00500 | 0.00500 | 0 | 113 | 70 | 130 | | | |

| Sample ID **CCV3-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 4:11:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.207 | 0.0300 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL3-160906** | Batch ID: **R87979** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_160906B** | Analysis Date: **9/6/2016 4:31:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0240 | 0.0300 | 0.0200 | 0 | 120 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160830A**

The QC data in batch 77028 applies to the following samples: 1608278-01B

Sample ID **MB-77028** Batch ID: **77028** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_160830A** Analysis Date: **8/30/2016 10:36:06 AM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-77028** Batch ID: **77028** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_160830A** Analysis Date: **8/30/2016 10:51:06 AM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.4 | 1.00 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Fluoride | 3.82 | 0.400 | 4.000 | 0 | 95.4 | 90 | 110 | | | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

Sample ID **LCSD-77028** Batch ID: **77028** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_160830A** Analysis Date: **8/30/2016 11:06:06 AM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.4 | 1.00 | 10.00 | 0 | 104 | 90 | 110 | 0.161 | 20 | |
| Fluoride | 3.75 | 0.400 | 4.000 | 0 | 93.8 | 90 | 110 | 1.68 | 20 | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | 0.128 | 20 | |

Sample ID **1608276-11DMS** Batch ID: **77028** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_160830A** Analysis Date: **8/30/2016 3:22:20 PM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 309 | 10.0 | 200.0 | 106.8 | 101 | 90 | 110 | | | |
| Fluoride | 193 | 4.00 | 200.0 | 0 | 96.7 | 90 | 110 | | | |
| Sulfate | 256 | 30.0 | 200.0 | 40.70 | 108 | 90 | 110 | | | |

Sample ID **1608276-11DMSD** Batch ID: **77028** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_160830A** Analysis Date: **8/30/2016 3:37:20 PM** Prep Date: **8/30/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 310 | 10.0 | 200.0 | 106.8 | 102 | 90 | 110 | 0.409 | 20 | |
| Fluoride | 194 | 4.00 | 200.0 | 0 | 97.1 | 90 | 110 | 0.452 | 20 | |
| Sulfate | 258 | 30.0 | 200.0 | 40.70 | 108 | 90 | 110 | 0.558 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_160830A**

| Sample ID **ICV-160830** | Batch ID: **R87889** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_160830A** | Analysis Date: **8/30/2016 9:57:10 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 26.5 | 1.00 | 25.00 | 0 | 106 | 90 | 110 | | | |
| Fluoride | 9.51 | 0.400 | 10.00 | 0 | 95.1 | 90 | 110 | | | |
| Sulfate | 81.9 | 3.00 | 75.00 | 0 | 109 | 90 | 110 | | | |

| Sample ID **CCV1-160830** | Batch ID: **R87889** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160830A** | Analysis Date: **8/30/2016 2:14:39 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.84 | 0.400 | 4.000 | 0 | 96.1 | 90 | 110 | | | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV2-160830** | Batch ID: **R87889** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_160830A** | Analysis Date: **8/30/2016 5:22:20 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.85 | 0.400 | 4.000 | 0 | 96.2 | 90 | 110 | | | |
| Sulfate | 31.5 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160831A**

The QC data in batch 77050 applies to the following samples: 1608278-01B

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID | **1608276-14D-DUP** | Batch ID: | **77050** | TestNo: | **M4500-H+ B** | Units: | **pH Units@18.2°C** |
| SampType: | **DUP** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 1:47:00 PM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.30 | 0 | 0 | 6.310 | | | | 0.159 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_160831A**

| Sample ID | **ICV-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.9°C** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 8:53:00 AM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.94 | 0 | 10.00 | 0 | 99.4 | 99 | 101 | | | |

| Sample ID | **CCV1-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.1°C** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 10:26:00 AM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV2-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.1°C** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 10:59:00 AM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV3-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.4°C** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 11:28:00 AM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV4-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@22°C** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 1:08:00 PM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV5-160831** | Batch ID: | **R87906** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.6°C** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_160831A** | Analysis Date: | **8/31/2016 2:02:00 PM** | Prep Date: | **8/31/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.98 | 0 | 7.000 | 0 | 99.7 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1608278
**Project:** Luminant - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_160830B**

The QC data in batch 77033 applies to the following samples: 1608278-01B

| Sample ID **MB-77033** | Batch ID: **77033** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_160830B** | Analysis Date: **8/31/2016 8:40:00 AM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID **LCS-77033** | Batch ID: **77033** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_160830B** | Analysis Date: **8/31/2016 8:40:00 AM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 787 | 10.0 | 745.6 | 0 | 106 | 90 | 113 | | | |

| Sample ID **1608284-03C-DUP** | Batch ID: **77033** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_160830B** | Analysis Date: **8/31/2016 8:40:00 AM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 4960 | 50.0 | 0 | 5130 | | | | 3.37 | 5 | |

| Sample ID **1608284-04C-DUP** | Batch ID: **77033** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_160830B** | Analysis Date: **8/31/2016 8:40:00 AM** | Prep Date: **8/30/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 908 | 10.0 | 0 | 923.0 | | | | 1.64 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

November 02, 2016

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1610036

RE: Luminant - Oak Grove - Ash Landfill

Dear Will Vienne:

DHL Analytical, Inc. received 16 sample(s) on 10/6/2016 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-16-17

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# CHAIN-OF-CUSTODY

№ 72887

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL MIENNIE
ADDITIONAL REPORT COPIES TO:

DATE: 10-5-16 PAGE 1 OF 1
PO #: 5164-D DHL WORK ORDER #: 1610036
PROJECT LOCATION OR NAME: LUMINANT - OAK GROVE - ASH LANDFILL
CLENT PROJECT #: 5164-D COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT
P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ (METHOD 8021) | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO (METHOD 8015) ☐ DRO (METHOD 8105) ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ | RCRA ☐ TX11 ☐ ____ ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ____ ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | CCR SAMPLING

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ NaOH | ICE | UNPRESERVED | CCR SAMPLING | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-02 | 01 | 10-4-16 | 0950 | W | P | 4 | | X | | X | X | X | |
| AL-10 | 02 | | 1050 | W | P | 4 | | X | | X | X | X | |
| MW-09 | 03 | | 1145 | W | P | 4 | | X | | X | X | X | |
| MW-05 | 04 | | 1240 | W | P | 4 | | X | | X | X | X | |
| DUP-01 | 05 | | 1240 | W | P | 4 | | X | | X | X | X | |
| MW-07 | 06 | ↓ | 1325 | W | P | 4 | | X | | X | X | X | |

RELINQUISHED BY: (Signature) DATE/TIME 10-5-16 1730 RECEIVED BY: (Signature) Fedex
RELINQUISHED BY: (Signature) Fedex DATE/TIME 10/6/16 9:25 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

TURN AROUND TIME
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ ____

LABORATORY USE ONLY:
RECEIVING TEMP: 4.5 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 72886

# CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 10-5-16 PAGE 1 OF 1
PO #: 5164-D DHL WORK ORDER #: 1610036
PROJECT LOCATION OR NAME: LUMINANT - OAK GROVE - FGD POND AREA
CLENT PROJECT #: 5164-D COLLECTOR: J. BEAMON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | ANALYSES: CCR SAMPLING | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-11 | 07 | 10-4-16 | 1615 | W | P | 4 | | X | | X | X | X | |
| FGD-12 | 08 | 10-4-16 | 1710 | W | P | 4 | | X | | X | X | X | |
| FGD-8 | 09 | 10-5-16 | 0755 | W | P | 4 | | X | | X | X | X | |
| FGD-1 | 10 | | 0845 | W | P | 4 | | X | | X | X | X | |
| FGD-5 | 11 | | 0930 | W | P | 4 | | X | | X | X | X | |
| FGD-2 | 12 | | 1020 | W | P | 4 | | X | | X | X | X | |
| FGD-4 | 13 | | 1110 | W | P | 4 | | X | | X | X | X | |
| FGD-6 | 14 | | 1155 | W | P | 4 | | X | | X | X | X | |
| FGD-3 | 15 | | 1250 | W | P | 4 | | X | | X | X | X | |
| EB-1 | 16 | | 1320 | W | P | 4 | | X | | X | X | X | |

RELINQUISHED BY: (Signature) DATE/TIME 10-5-16 1730 RECEIVED BY: (Signature) Fedex
RELINQUISHED BY: (Signature) Fedex DATE/TIME 10/6/16 9:35 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

APPENDIX E-Revision 1 November 21, 2022

☐ DHL DISPOSAL @ $5.00 each ☐ Return 4

**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 4.9 | 3.4 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

John Dupont

| | |
|---|---|
| From: | Sara Taube [Sara.Taube@pbwllc.com] |
| Sent: | Wednesday, July 22, 2015 12:05 PM |
| To: | John Dupont |
| Subject: | CCR Appendix III and IV |
| Follow Up Flag: | Follow up |
| Flag Status: | Completed |

Hi John,

Here are the Appendix III and Appendix IV constituents that we will need to have analyzed under the CCR Rule.

Appendix III
Boron
Calcium
Chloride
Fluoride
pH
sulfate
TDS

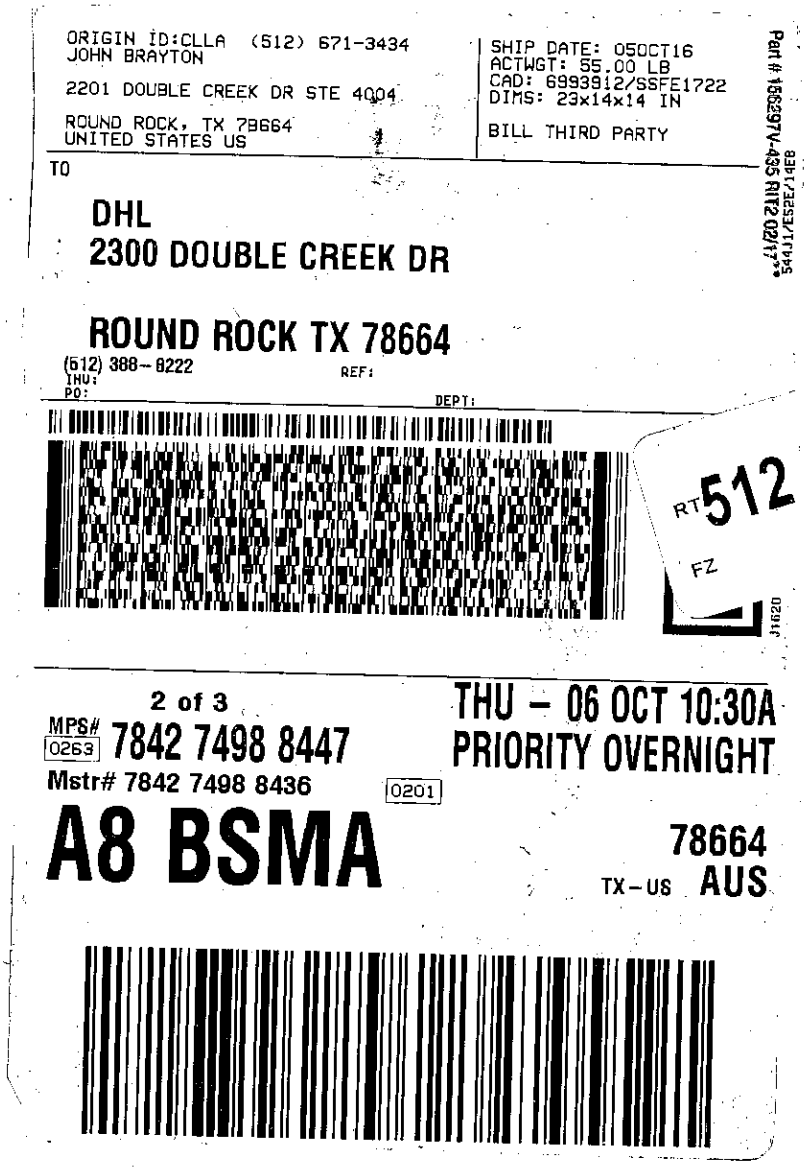
Appendix IV
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluorides
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228

We are looking to have approximately 74 wells sampled 8 times over the course of the next two years. Please let me know if there is any more information you might need.

Cheers,

Sara

10/26/2015


ORIGIN ID:CLLA (512) 671-3434
JOHN BRAYTON
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DATE: 05OCT16
ACTWGT: 55.00 LB
CAD: 6993912/SSFE1722
DIMS: 23x14x14 IN
BILL THIRD PARTY
TO
DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
INV:
PO:
REF:
DEPT:
RT 512
FZ
2 of 3
MPS# 0263 7842 7498 8447
Mstr# 7842 7498 8436
0201
THU - 06 OCT 10:30A
PRIORITY OVERNIGHT
A8 BSMA
78664
TX-US AUS

ORIGIN ID:CLLA (512) 671-3434
JOHN BRAYTON

2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 05OCT16
ACTWGT: 55.00 LB
CAD: 6993912/SSFE1722
DIMS: 23x15x13 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(512) 388-8222

INV:
PO:
REF:
DEPT:

FedEx
Express

1 of 3

TRK# 0201 7842 7498 8436

## MASTER ##

THU - 06 OCT 10:30A
PRIORITY OVERNIGHT

A8 BSMA

78664
TX-US AUS

ORIGIN ID:CLLA (512) 671-3434
JOHN BRAYTON

2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(512) 388-8222

INV:
PO:
REF:
DEPT:

FedEx
Express

3 of 3

MPS# 0263 7842 7498 8458

Mstr# 7842 7498 8436

0201

THU - 06 OCT 10:30A
PRIORITY OVERNIGHT

A8 BSMA

78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Pastor, Behling & Wheeler

Date Received: 10/6/2016

Work Order Number 1610036

Received by JT

Checklist completed by: Signature 10/6/2016 Date

Reviewed by Initials 10/6/2016 Date

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 4.5 °C, 4.9, 3.4 |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? NO | | Checked by |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

Page 1 of 1

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904/9320 and SM 7500 Ra B M. Analyzed at ESC Lab Sciences.

## LOG IN

The samples were received and log-in performed on 10/6/16. A total of 16 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 10/13/16 and 10/25/16 the matrix spike and matrix spike duplicate recoveries were out of control limits for three analytes. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

For Metals analysis performed on 10/25/16 the RPD for the serial dilution was slightly above control limits for Boron. This is flagged accordingly. The PDS was within control limits for this analyte. No further corrective actions were taken.

For Metals analysis performed on 10/13/16 the PDS recovery was out of control limits for Calcium and Lithium. These are flagged accordingly. The serial dilution was within control limits for these analytes. No further corrective actions were taken.

## MERCURY ANALYSIS

For Mercury analysis performed on 10/11/16 (batch 77501) the PDS recovery was slightly below control limits. This is flagged accordingly in the QC summary report. The serial dilution was within control limits. No further corrective actions were taken.

## ANIONS ANALYSIS

| | |
|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler |
| **Project:** | Luminant - Oak Grove - Ash Landfill |
| **Lab Order:** | 1610036 |

## CASE NARRATIVE

For Anions analysis performed on 10/17/16 (batch 77577) the matrix spike and matrix spike duplicate recoveries were slightly below control limits for Chloride. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *02-Nov-16*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove - Ash Landfill
**Lab Order:** 1610036

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1610036-01 | MW-02 | | 10/04/16 09:50 AM | 10/6/2016 |
| 1610036-02 | AL-10 | | 10/04/16 10:50 AM | 10/6/2016 |
| 1610036-03 | MW-09 | | 10/04/16 11:45 AM | 10/6/2016 |
| 1610036-04 | MW-05 | | 10/04/16 12:40 PM | 10/6/2016 |
| 1610036-05 | DUP-01 | | 10/04/16 12:40 PM | 10/6/2016 |
| 1610036-06 | MW-07 | | 10/04/16 01:25 PM | 10/6/2016 |
| 1610036-07 | FGD-11 | | 10/04/16 04:15 PM | 10/6/2016 |
| 1610036-08 | FGD-12 | | 10/04/16 05:10 PM | 10/6/2016 |
| 1610036-09 | FGD-8 | | 10/05/16 07:55 AM | 10/6/2016 |
| 1610036-10 | FGD-1 | | 10/05/16 08:45 AM | 10/6/2016 |
| 1610036-11 | FGD-5 | | 10/05/16 09:30 AM | 10/6/2016 |
| 1610036-12 | FGD-2 | | 10/05/16 10:20 AM | 10/6/2016 |
| 1610036-13 | FGD-4 | | 10/05/16 11:10 AM | 10/6/2016 |
| 1610036-14 | FGD-6 | | 10/05/16 11:55 AM | 10/6/2016 |
| 1610036-15 | FGD-3 | | 10/05/16 12:50 PM | 10/6/2016 |
| 1610036-16 | EB-1 | | 10/05/16 01:20 PM | 10/6/2016 |

**Lab Order:** 1610036
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove - Ash Landf

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1610036-01A | MW-02 | 10/04/16 09:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | MW-02 | 10/04/16 09:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | MW-02 | 10/04/16 09:50 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/10/16 01:05 PM | 77501 |
| 1610036-01D | MW-02 | 10/04/16 09:50 AM | Aqueous | E300 | Anion Preparation | 10/13/16 09:18 AM | 77547 |
| | MW-02 | 10/04/16 09:50 AM | Aqueous | E300 | Anion Preparation | 10/13/16 09:18 AM | 77547 |
| | MW-02 | 10/04/16 09:50 AM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | MW-02 | 10/04/16 09:50 AM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-02A | AL-10 | 10/04/16 10:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | AL-10 | 10/04/16 10:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | AL-10 | 10/04/16 10:50 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/10/16 01:05 PM | 77501 |
| 1610036-02D | AL-10 | 10/04/16 10:50 AM | Aqueous | E300 | Anion Preparation | 10/13/16 09:18 AM | 77547 |
| | AL-10 | 10/04/16 10:50 AM | Aqueous | E300 | Anion Preparation | 10/13/16 09:18 AM | 77547 |
| | AL-10 | 10/04/16 10:50 AM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | AL-10 | 10/04/16 10:50 AM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-03A | MW-09 | 10/04/16 11:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | MW-09 | 10/04/16 11:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | MW-09 | 10/04/16 11:45 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/10/16 01:05 PM | 77501 |
| 1610036-03D | MW-09 | 10/04/16 11:45 AM | Aqueous | E300 | Anion Preparation | 10/13/16 09:18 AM | 77547 |
| | MW-09 | 10/04/16 11:45 AM | Aqueous | E300 | Anion Preparation | 10/13/16 09:18 AM | 77547 |
| | MW-09 | 10/04/16 11:45 AM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | MW-09 | 10/04/16 11:45 AM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-04A | MW-05 | 10/04/16 12:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | MW-05 | 10/04/16 12:40 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/10/16 01:05 PM | 77501 |
| 1610036-04D | MW-05 | 10/04/16 12:40 PM | Aqueous | E300 | Anion Preparation | 10/13/16 09:18 AM | 77547 |
| | MW-05 | 10/04/16 12:40 PM | Aqueous | E300 | Anion Preparation | 10/13/16 09:18 AM | 77547 |
| | MW-05 | 10/04/16 12:40 PM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | MW-05 | 10/04/16 12:40 PM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-05A | DUP-01 | 10/04/16 12:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |

**Lab Order:** 1610036
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove - Ash Landf

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1610036-05A | DUP-01 | 10/04/16 12:40 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-05D | DUP-01 | 10/04/16 12:40 PM | Aqueous | E300 | Anion Preparation | 10/13/16 09:18 AM | 77547 |
| | DUP-01 | 10/04/16 12:40 PM | Aqueous | E300 | Anion Preparation | 10/13/16 09:18 AM | 77547 |
| | DUP-01 | 10/04/16 12:40 PM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | DUP-01 | 10/04/16 12:40 PM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-06A | MW-07 | 10/04/16 01:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | MW-07 | 10/04/16 01:25 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-06D | MW-07 | 10/04/16 01:25 PM | Aqueous | E300 | Anion Preparation | 10/13/16 10:07 AM | 77551 |
| | MW-07 | 10/04/16 01:25 PM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | MW-07 | 10/04/16 01:25 PM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-07A | FGD-11 | 10/04/16 04:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-11 | 10/04/16 04:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-11 | 10/04/16 04:15 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-07D | FGD-11 | 10/04/16 04:15 PM | Aqueous | E300 | Anion Preparation | 10/13/16 10:07 AM | 77551 |
| | FGD-11 | 10/04/16 04:15 PM | Aqueous | E300 | Anion Preparation | 10/13/16 10:07 AM | 77551 |
| | FGD-11 | 10/04/16 04:15 PM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | FGD-11 | 10/04/16 04:15 PM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-08A | FGD-12 | 10/04/16 05:10 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-12 | 10/04/16 05:10 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-08D | FGD-12 | 10/04/16 05:10 PM | Aqueous | E300 | Anion Preparation | 10/13/16 10:07 AM | 77551 |
| | FGD-12 | 10/04/16 05:10 PM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | FGD-12 | 10/04/16 05:10 PM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-09A | FGD-8 | 10/05/16 07:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-8 | 10/05/16 07:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-8 | 10/05/16 07:55 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-09D | FGD-8 | 10/05/16 07:55 AM | Aqueous | E300 | Anion Preparation | 10/13/16 10:07 AM | 77551 |
| | FGD-8 | 10/05/16 07:55 AM | Aqueous | E300 | Anion Preparation | 10/13/16 10:07 AM | 77551 |
| | FGD-8 | 10/05/16 07:55 AM | Aqueous | E300 | Anion Preparation | 10/13/16 10:07 AM | 77551 |

**Lab Order:** 1610036
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove - Ash Landf

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1610036-09D | FGD-8 | 10/05/16 07:55 AM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | FGD-8 | 10/05/16 07:55 AM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-10A | FGD-1 | 10/05/16 08:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-1 | 10/05/16 08:45 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-10D | FGD-1 | 10/05/16 08:45 AM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-1 | 10/05/16 08:45 AM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | FGD-1 | 10/05/16 08:45 AM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-11A | FGD-5 | 10/05/16 09:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-5 | 10/05/16 09:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-5 | 10/05/16 09:30 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-11D | FGD-5 | 10/05/16 09:30 AM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-5 | 10/05/16 09:30 AM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-5 | 10/05/16 09:30 AM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | FGD-5 | 10/05/16 09:30 AM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-12A | FGD-2 | 10/05/16 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-2 | 10/05/16 10:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-2 | 10/05/16 10:20 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-12D | FGD-2 | 10/05/16 10:20 AM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-2 | 10/05/16 10:20 AM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-2 | 10/05/16 10:20 AM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | FGD-2 | 10/05/16 10:20 AM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-13A | FGD-4 | 10/05/16 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-4 | 10/05/16 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-4 | 10/05/16 11:10 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-13D | FGD-4 | 10/05/16 11:10 AM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-4 | 10/05/16 11:10 AM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-4 | 10/05/16 11:10 AM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | FGD-4 | 10/05/16 11:10 AM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |

**Lab Order:** 1610036
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove - Ash Landf

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1610036-14A | FGD-6 | 10/05/16 11:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-6 | 10/05/16 11:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-6 | 10/05/16 11:55 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-14D | FGD-6 | 10/05/16 11:55 AM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-6 | 10/05/16 11:55 AM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-6 | 10/05/16 11:55 AM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | FGD-6 | 10/05/16 11:55 AM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-15A | FGD-3 | 10/05/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-3 | 10/05/16 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | FGD-3 | 10/05/16 12:50 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-15D | FGD-3 | 10/05/16 12:50 PM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-3 | 10/05/16 12:50 PM | Aqueous | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | FGD-3 | 10/05/16 12:50 PM | Aqueous | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | FGD-3 | 10/05/16 12:50 PM | Aqueous | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |
| 1610036-16A | EB-1 | 10/05/16 01:20 PM | Equip Blank | SW3005A | Aq Prep Metals : ICP-MS | 10/07/16 08:34 AM | 77469 |
| | EB-1 | 10/05/16 01:20 PM | Equip Blank | SW7470A | Mercury Aq Prep, Total | 10/11/16 11:24 AM | 77519 |
| 1610036-16D | EB-1 | 10/05/16 01:20 PM | Equip Blank | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | EB-1 | 10/05/16 01:20 PM | Equip Blank | E300 | Anion Preparation | 10/17/16 08:40 AM | 77577 |
| | EB-1 | 10/05/16 01:20 PM | Equip Blank | M4500-H+ B | pH Preparation | 10/07/16 08:00 AM | 77467 |
| | EB-1 | 10/05/16 01:20 PM | Equip Blank | M2540C | TDS Preparation | 10/07/16 02:44 PM | 77471 |

**Lab Order:** 1610036
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove - Ash Landf

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1610036-01A | MW-02 | Aqueous | SW7470A | Mercury Total: Aqueous | 77501 | 1 | 10/11/16 11:34 AM | CETAC2_HG_161011A |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 01:21 PM | ICP-MS3_161025B |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 10 | 10/25/16 04:05 PM | ICP-MS3_161025B |
| 1610036-01D | MW-02 | Aqueous | E300 | Anions by IC method - Water | 77547 | 1 | 10/13/16 11:34 AM | IC2_161013A |
| | MW-02 | Aqueous | E300 | Anions by IC method - Water | 77547 | 10 | 10/13/16 02:18 PM | IC2_161013A |
| | MW-02 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 09:47 AM | TITRATOR_161007A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-02A | AL-10 | Aqueous | SW7470A | Mercury Total: Aqueous | 77501 | 1 | 10/11/16 11:36 AM | CETAC2_HG_161011A |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 01:27 PM | ICP-MS3_161025B |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 10 | 10/25/16 04:11 PM | ICP-MS3_161025B |
| 1610036-02D | AL-10 | Aqueous | E300 | Anions by IC method - Water | 77547 | 1 | 10/13/16 11:49 AM | IC2_161013A |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 77547 | 10 | 10/13/16 02:33 PM | IC2_161013A |
| | AL-10 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 09:49 AM | TITRATOR_161007A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-03A | MW-09 | Aqueous | SW7470A | Mercury Total: Aqueous | 77501 | 1 | 10/11/16 11:38 AM | CETAC2_HG_161011A |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 01:33 PM | ICP-MS3_161025B |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 10 | 10/25/16 04:17 PM | ICP-MS3_161025B |
| 1610036-03D | MW-09 | Aqueous | E300 | Anions by IC method - Water | 77547 | 1 | 10/13/16 12:04 PM | IC2_161013A |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 77547 | 10 | 10/13/16 02:48 PM | IC2_161013A |
| | MW-09 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 09:52 AM | TITRATOR_161007A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-04A | MW-05 | Aqueous | SW7470A | Mercury Total: Aqueous | 77501 | 1 | 10/11/16 11:41 AM | CETAC2_HG_161011A |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 01:39 PM | ICP-MS3_161025B |
| 1610036-04D | MW-05 | Aqueous | E300 | Anions by IC method - Water | 77547 | 1 | 10/13/16 12:18 PM | IC2_161013A |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 77547 | 10 | 10/13/16 03:02 PM | IC2_161013A |
| | MW-05 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 09:54 AM | TITRATOR_161007A |

**Lab Order:** 1610036
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove - Ash Landf

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1610036-04D | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-05A | DUP-01 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 09:57 AM | CETAC2_HG_161012A |
| | DUP-01 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 01:45 PM | ICP-MS3_161025B |
| 1610036-05D | DUP-01 | Aqueous | E300 | Anions by IC method - Water | 77547 | 1 | 10/13/16 12:33 PM | IC2_161013A |
| | DUP-01 | Aqueous | E300 | Anions by IC method - Water | 77547 | 10 | 10/13/16 03:17 PM | IC2_161013A |
| | DUP-01 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 09:56 AM | TITRATOR_161007A |
| | DUP-01 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-06A | MW-07 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:00 AM | CETAC2_HG_161012A |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 01:51 PM | ICP-MS3_161025B |
| 1610036-06D | MW-07 | Aqueous | E300 | Anions by IC method - Water | 77551 | 1 | 10/13/16 11:46 AM | IC3_161013A |
| | MW-07 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 10:01 AM | TITRATOR_161007A |
| | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-07A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:02 AM | CETAC2_HG_161012A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 01:57 PM | ICP-MS3_161025B |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 10 | 10/25/16 04:23 PM | ICP-MS3_161025B |
| 1610036-07D | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 77551 | 1 | 10/13/16 12:06 PM | IC3_161013A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 77551 | 100 | 10/13/16 01:17 PM | IC3_161013A |
| | FGD-11 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 10:04 AM | TITRATOR_161007A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-08A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:04 AM | CETAC2_HG_161012A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 02:03 PM | ICP-MS3_161025B |
| 1610036-08D | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 77551 | 1 | 10/13/16 12:27 PM | IC3_161013A |
| | FGD-12 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 10:08 AM | TITRATOR_161007A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-09A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:06 AM | CETAC2_HG_161012A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 50 | 10/25/16 04:32 PM | ICP-MS3_161025B |

**Lab Order:** 1610036
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove - Ash Landf

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1610036-09A | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 02:09 PM | ICP-MS3_161025B |
| 1610036-09D | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 77551 | 1 | 10/13/16 12:48 PM | IC3_161013A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 77551 | 10 | 10/13/16 01:41 PM | IC3_161013A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 77551 | 100 | 10/13/16 02:01 PM | IC3_161013A |
| | FGD-8 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 10:11 AM | TITRATOR_161007A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-10A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:09 AM | CETAC2_HG_161012A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 02:58 PM | ICP-MS3_161025B |
| 1610036-10D | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 77577 | 1 | 10/17/16 10:41 AM | IC2_161017A |
| | FGD-1 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 10:14 AM | TITRATOR_161007A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-11A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:11 AM | CETAC2_HG_161012A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 03:04 PM | ICP-MS3_161025B |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 10 | 10/25/16 04:38 PM | ICP-MS3_161025B |
| 1610036-11D | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 77577 | 10 | 10/17/16 01:54 PM | IC2_161017A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 77577 | 1 | 10/17/16 10:55 AM | IC2_161017A |
| | FGD-5 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 10:17 AM | TITRATOR_161007A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-12A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:13 AM | CETAC2_HG_161012A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 03:10 PM | ICP-MS3_161025B |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 10 | 10/25/16 04:44 PM | ICP-MS3_161025B |
| 1610036-12D | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 77577 | 1 | 10/17/16 11:10 AM | IC2_161017A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 77577 | 10 | 10/17/16 02:47 PM | IC2_161017A |
| | FGD-2 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 10:19 AM | TITRATOR_161007A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-13A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:16 AM | CETAC2_HG_161012A |

**Lab Order:** 1610036
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Oak Grove - Ash Landf

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1610036-13A | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 10 | 10/25/16 04:51 PM | ICP-MS3_161025B |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 03:16 PM | ICP-MS3_161025B |
| 1610036-13D | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 77577 | 1 | 10/17/16 11:25 AM | IC2_161017A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 77577 | 10 | 10/17/16 03:01 PM | IC2_161017A |
| | FGD-4 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 10:21 AM | TITRATOR_161007A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-14A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:18 AM | CETAC2_HG_161012A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 03:22 PM | ICP-MS3_161025B |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 10 | 10/25/16 04:57 PM | ICP-MS3_161025B |
| 1610036-14D | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 77577 | 1 | 10/17/16 11:45 AM | IC2_161017A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 77577 | 10 | 10/17/16 03:16 PM | IC2_161017A |
| | FGD-6 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 10:23 AM | TITRATOR_161007A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-15A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:25 AM | CETAC2_HG_161012A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 10 | 10/25/16 05:04 PM | ICP-MS3_161025B |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 03:28 PM | ICP-MS3_161025B |
| 1610036-15D | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 77577 | 1 | 10/17/16 11:59 AM | IC2_161017A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 77577 | 10 | 10/17/16 03:31 PM | IC2_161017A |
| | FGD-3 | Aqueous | M4500-H+ B | pH | 77467 | 1 | 10/07/16 11:01 AM | TITRATOR_161007A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |
| 1610036-16A | EB-1 | Equip Blank | SW7470A | Mercury Total: Aqueous | 77519 | 1 | 10/12/16 10:27 AM | CETAC2_HG_161012A |
| | EB-1 | Equip Blank | SW6020A | Trace Metals: ICP-MS - Water | 77469 | 1 | 10/25/16 03:34 PM | ICP-MS3_161025B |
| 1610036-16D | EB-1 | Equip Blank | E300 | Anions by IC method - Water | 77577 | 1 | 10/17/16 12:14 PM | IC2_161017A |
| | EB-1 | Equip Blank | E300 | Anions by IC method - Water | 77577 | 1 | 10/17/16 04:29 PM | IC2_161017A |
| | EB-1 | Equip Blank | M4500-H+ B | pH | 77467 | 1 | 10/07/16 11:03 AM | TITRATOR_161007A |
| | EB-1 | Equip Blank | M2540C | Total Dissolved Solids | 77471 | 1 | 10/10/16 08:42 AM | WC_161007C |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-02 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-01 |
| **Project No:** | 5164-D | **Collection Date:** | 10/04/16 09:50 AM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/11/16 11:34 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 01:21 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:21 PM |
| Barium | 0.119 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 01:21 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:21 PM |
| Boron | 0.113 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 01:21 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:21 PM |
| Calcium | 61.4 | 1.00 | 3.00 | | mg/L | 10 | 10/25/16 04:05 PM |
| Chromium | 0.00220 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/25/16 01:21 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 01:21 PM |
| Lead | 0.00112 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:21 PM |
| Lithium | 0.100 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 01:21 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:21 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:21 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 01:21 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 222 | 3.00 | 10.0 | | mg/L | 10 | 10/13/16 02:18 PM |
| Fluoride | 0.185 | 0.100 | 0.400 | J | mg/L | 1 | 10/13/16 11:34 AM |
| Sulfate | 97.4 | 1.00 | 3.00 | | mg/L | 1 | 10/13/16 11:34 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.46 | 0 | 0 | | pH Units@18.4℃ | 1 | 10/07/16 09:47 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 667 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | AL-10 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-02 |
| **Project No:** | 5164-D | **Collection Date:** | 10/04/16 10:50 AM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/11/16 11:36 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 01:27 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:27 PM |
| Barium | 0.0815 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 01:27 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:27 PM |
| Boron | 0.0756 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 01:27 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:27 PM |
| Calcium | 35.1 | 1.00 | 3.00 | | mg/L | 10 | 10/25/16 04:11 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:27 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 01:27 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:27 PM |
| Lithium | 0.00646 | 0.00500 | 0.0100 | J | mg/L | 1 | 10/25/16 01:27 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:27 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:27 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 01:27 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 57.3 | 3.00 | 10.0 | | mg/L | 10 | 10/13/16 02:33 PM |
| Fluoride | 0.278 | 0.100 | 0.400 | J | mg/L | 1 | 10/13/16 11:49 AM |
| Sulfate | 20.1 | 1.00 | 3.00 | | mg/L | 1 | 10/13/16 11:49 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.12 | 0 | 0 | | pH Units@18.8℃ | 1 | 10/07/16 09:49 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 507 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-09 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-03 |
| **Project No:** | 5164-D | **Collection Date:** | 10/04/16 11:45 AM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/11/16 11:38 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 01:33 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:33 PM |
| Barium | 0.125 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 01:33 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:33 PM |
| Boron | 0.0803 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 01:33 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:33 PM |
| Calcium | 47.8 | 1.00 | 3.00 | | mg/L | 10 | 10/25/16 04:17 PM |
| Chromium | 0.00302 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/25/16 01:33 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 01:33 PM |
| Lead | 0.00104 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:33 PM |
| Lithium | 0.0635 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 01:33 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:33 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:33 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 01:33 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 179 | 3.00 | 10.0 | | mg/L | 10 | 10/13/16 02:48 PM |
| Fluoride | 0.256 | 0.100 | 0.400 | J | mg/L | 1 | 10/13/16 12:04 PM |
| Sulfate | 108 | 1.00 | 3.00 | | mg/L | 1 | 10/13/16 12:04 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.17 | 0 | 0 | | pH Units@18.5℃ | 1 | 10/07/16 09:52 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 648 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-05 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-04 |
| **Project No:** | 5164-D | **Collection Date:** | 10/04/16 12:40 PM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/11/16 11:41 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 01:39 PM |
| Arsenic | 0.0139 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:39 PM |
| Barium | 0.0810 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 01:39 PM |
| Beryllium | 0.000342 | 0.000300 | 0.00100 | J | mg/L | 1 | 10/25/16 01:39 PM |
| Boron | 0.0590 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 01:39 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:39 PM |
| Calcium | 15.4 | 0.100 | 0.300 | | mg/L | 1 | 10/25/16 01:39 PM |
| Chromium | 0.00469 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/25/16 01:39 PM |
| Cobalt | 0.00333 | 0.00300 | 0.00500 | J | mg/L | 1 | 10/25/16 01:39 PM |
| Lead | 0.00213 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:39 PM |
| Lithium | 0.0416 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 01:39 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:39 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:39 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 01:39 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 57.9 | 3.00 | 10.0 | | mg/L | 10 | 10/13/16 03:02 PM |
| Fluoride | 0.477 | 0.100 | 0.400 | | mg/L | 1 | 10/13/16 12:18 PM |
| Sulfate | 10.9 | 1.00 | 3.00 | | mg/L | 1 | 10/13/16 12:18 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.63 | 0 | 0 | | pH Units@19.5℃ | 1 | 10/07/16 09:54 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 253 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | DUP-01 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-05 |
| **Project No:** | 5164-D | **Collection Date:** | 10/04/16 12:40 PM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 09:57 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 01:45 PM |
| Arsenic | 0.00653 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:45 PM |
| Barium | 0.0535 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 01:45 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:45 PM |
| Boron | 0.0548 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 01:45 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:45 PM |
| Calcium | 15.0 | 0.100 | 0.300 | | mg/L | 1 | 10/25/16 01:45 PM |
| Chromium | 0.00253 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/25/16 01:45 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 01:45 PM |
| Lead | 0.00124 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:45 PM |
| Lithium | 0.0417 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 01:45 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:45 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:45 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 01:45 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 57.6 | 3.00 | 10.0 | | mg/L | 10 | 10/13/16 03:17 PM |
| Fluoride | 0.473 | 0.100 | 0.400 | | mg/L | 1 | 10/13/16 12:33 PM |
| Sulfate | 10.7 | 1.00 | 3.00 | | mg/L | 1 | 10/13/16 12:33 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.66 | 0 | 0 | | pH Units@19.8℃ | 1 | 10/07/16 09:56 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 254 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-07 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-06 |
| **Project No:** | 5164-D | **Collection Date:** | 10/04/16 01:25 PM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:00 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 01:51 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:51 PM |
| Barium | 0.0424 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 01:51 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:51 PM |
| Boron | 0.0549 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 01:51 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:51 PM |
| Calcium | 10.3 | 0.100 | 0.300 | | mg/L | 1 | 10/25/16 01:51 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:51 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 01:51 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:51 PM |
| Lithium | 0.0125 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 01:51 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:51 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:51 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 01:51 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 15.6 | 0.300 | 1.00 | | mg/L | 1 | 10/13/16 11:46 AM |
| Fluoride | 0.277 | 0.100 | 0.400 | J | mg/L | 1 | 10/13/16 11:46 AM |
| Sulfate | 17.1 | 1.00 | 3.00 | | mg/L | 1 | 10/13/16 11:46 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.79 | 0 | 0 | | pH Units@17.7℃ | 1 | 10/07/16 10:01 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 256 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-07 |
| **Project No:** | 5164-D | **Collection Date:** | 10/04/16 04:15 PM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:02 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 01:57 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:57 PM |
| Barium | 0.550 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 01:57 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:57 PM |
| Boron | 0.127 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 01:57 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 01:57 PM |
| Calcium | 181 | 1.00 | 3.00 | | mg/L | 10 | 10/25/16 04:23 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:57 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 01:57 PM |
| Lead | 0.000618 | 0.000300 | 0.00100 | J | mg/L | 1 | 10/25/16 01:57 PM |
| Lithium | 0.0124 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 01:57 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:57 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 01:57 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 01:57 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 894 | 30.0 | 100 | | mg/L | 100 | 10/13/16 01:17 PM |
| Fluoride | 0.579 | 0.100 | 0.400 | | mg/L | 1 | 10/13/16 12:06 PM |
| Sulfate | 71.8 | 1.00 | 3.00 | | mg/L | 1 | 10/13/16 12:06 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.77 | 0 | 0 | | pH Units@18.6℃ | 1 | 10/07/16 10:04 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 2130 | 50.0 | 50.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-08 |
| **Project No:** | 5164-D | **Collection Date:** | 10/04/16 05:10 PM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:04 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 02:03 PM |
| Arsenic | 0.00402 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/25/16 02:03 PM |
| Barium | 0.122 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 02:03 PM |
| Beryllium | 0.000620 | 0.000300 | 0.00100 | J | mg/L | 1 | 10/25/16 02:03 PM |
| Boron | 0.0682 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 02:03 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 02:03 PM |
| Calcium | 12.5 | 0.100 | 0.300 | | mg/L | 1 | 10/25/16 02:03 PM |
| Chromium | 0.0133 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 02:03 PM |
| Cobalt | 0.00395 | 0.00300 | 0.00500 | J | mg/L | 1 | 10/25/16 02:03 PM |
| Lead | 0.00840 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 02:03 PM |
| Lithium | 0.0259 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 02:03 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 02:03 PM |
| Selenium | 0.00292 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/25/16 02:03 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 02:03 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 17.8 | 0.300 | 1.00 | | mg/L | 1 | 10/13/16 12:27 PM |
| Fluoride | 0.129 | 0.100 | 0.400 | J | mg/L | 1 | 10/13/16 12:27 PM |
| Sulfate | 10.5 | 1.00 | 3.00 | | mg/L | 1 | 10/13/16 12:27 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.64 | 0 | 0 | | pH Units@18.2℃ | 1 | 10/07/16 10:08 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 142 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-09 |
| **Project No:** | 5164-D | **Collection Date:** | 10/05/16 07:55 AM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:06 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 02:09 PM |
| Arsenic | 0.00661 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 02:09 PM |
| Barium | 0.753 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 02:09 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 02:09 PM |
| Boron | 0.0794 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 02:09 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 02:09 PM |
| Calcium | 394 | 5.00 | 15.0 | | mg/L | 50 | 10/25/16 04:32 PM |
| Chromium | 0.00672 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 02:09 PM |
| Cobalt | 0.00899 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 02:09 PM |
| Lead | 0.000908 | 0.000300 | 0.00100 | J | mg/L | 1 | 10/25/16 02:09 PM |
| Lithium | 0.0224 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 02:09 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 02:09 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 02:09 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 02:09 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 1890 | 30.0 | 100 | | mg/L | 100 | 10/13/16 02:01 PM |
| Fluoride | 0.413 | 0.100 | 0.400 | | mg/L | 1 | 10/13/16 12:48 PM |
| Sulfate | 184 | 10.0 | 30.0 | | mg/L | 10 | 10/13/16 01:41 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.31 | 0 | 0 | | pH Units@18.3℃ | 1 | 10/07/16 10:11 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 4470 | 50.0 | 50.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-10 |
| **Project No:** | 5164-D | **Collection Date:** | 10/05/16 08:45 AM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:09 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 02:58 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 02:58 PM |
| Barium | 0.0319 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 02:58 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 02:58 PM |
| Boron | 0.0629 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 02:58 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 02:58 PM |
| Calcium | 14.2 | 0.100 | 0.300 | | mg/L | 1 | 10/25/16 02:58 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 02:58 PM |
| Cobalt | 0.00447 | 0.00300 | 0.00500 | J | mg/L | 1 | 10/25/16 02:58 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 02:58 PM |
| Lithium | 0.0331 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 02:58 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 02:58 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 02:58 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 02:58 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BJT** |
| Chloride | 38.7 | 0.300 | 1.00 | | mg/L | 1 | 10/17/16 10:41 AM |
| Fluoride | 0.483 | 0.100 | 0.400 | | mg/L | 1 | 10/17/16 10:41 AM |
| Sulfate | 44.2 | 1.00 | 3.00 | | mg/L | 1 | 10/17/16 10:41 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.46 | 0 | 0 | | pH Units@18.2℃ | 1 | 10/07/16 10:14 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 266 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-11 |
| **Project No:** | 5164-D | **Collection Date:** | 10/05/16 09:30 AM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:11 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 03:04 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:04 PM |
| Barium | 0.229 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 03:04 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:04 PM |
| Boron | 0.0995 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 03:04 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:04 PM |
| Calcium | 99.9 | 1.00 | 3.00 | | mg/L | 10 | 10/25/16 04:38 PM |
| Chromium | 0.00304 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/25/16 03:04 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 03:04 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:04 PM |
| Lithium | 0.153 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 03:04 PM |
| Molybdenum | 0.00355 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/25/16 03:04 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:04 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 03:04 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BJT** |
| Chloride | 344 | 3.00 | 10.0 | | mg/L | 10 | 10/17/16 01:54 PM |
| Fluoride | 0.380 | 0.100 | 0.400 | J | mg/L | 1 | 10/17/16 10:55 AM |
| Sulfate | 57.3 | 1.00 | 3.00 | | mg/L | 1 | 10/17/16 10:55 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.51 | 0 | 0 | | pH Units@19.1℃ | 1 | 10/07/16 10:17 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1260 | 50.0 | 50.0 | | mg/L | 1 | 10/10/16 08:42 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-12 |
| **Project No:** | 5164-D | **Collection Date:** | 10/05/16 10:20 AM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:13 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 03:10 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:10 PM |
| Barium | 0.129 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 03:10 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:10 PM |
| Boron | 0.182 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 03:10 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:10 PM |
| Calcium | 58.3 | 1.00 | 3.00 | | mg/L | 10 | 10/25/16 04:44 PM |
| Chromium | 0.00549 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:10 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 03:10 PM |
| Lead | 0.000693 | 0.000300 | 0.00100 | J | mg/L | 1 | 10/25/16 03:10 PM |
| Lithium | 0.0199 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 03:10 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:10 PM |
| Selenium | 0.0176 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:10 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 03:10 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BJT** |
| Chloride | 310 | 3.00 | 10.0 | | mg/L | 10 | 10/17/16 02:47 PM |
| Fluoride | 0.243 | 0.100 | 0.400 | J | mg/L | 1 | 10/17/16 11:10 AM |
| Sulfate | 114 | 1.00 | 3.00 | | mg/L | 1 | 10/17/16 11:10 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.76 | 0 | 0 | | pH Units@19.3℃ | 1 | 10/07/16 10:19 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 910 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-13 |
| **Project No:** | 5164-D | **Collection Date:** | 10/05/16 11:10 AM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:16 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 03:16 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:16 PM |
| Barium | 0.106 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 03:16 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:16 PM |
| Boron | 0.0672 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 03:16 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:16 PM |
| Calcium | 48.1 | 1.00 | 3.00 | | mg/L | 10 | 10/25/16 04:51 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:16 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 03:16 PM |
| Lead | 0.000489 | 0.000300 | 0.00100 | J | mg/L | 1 | 10/25/16 03:16 PM |
| Lithium | 0.0353 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 03:16 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:16 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:16 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 03:16 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BJT** |
| Chloride | 182 | 3.00 | 10.0 | | mg/L | 10 | 10/17/16 03:01 PM |
| Fluoride | 0.376 | 0.100 | 0.400 | J | mg/L | 1 | 10/17/16 11:25 AM |
| Sulfate | 56.0 | 1.00 | 3.00 | | mg/L | 1 | 10/17/16 11:25 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.78 | 0 | 0 | | pH Units@19.5℃ | 1 | 10/07/16 10:21 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 672 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-14 |
| **Project No:** | 5164-D | **Collection Date:** | 10/05/16 11:55 AM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:18 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 03:22 PM |
| Arsenic | 0.00536 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:22 PM |
| Barium | 0.117 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 03:22 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:22 PM |
| Boron | 0.102 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 03:22 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:22 PM |
| Calcium | 35.3 | 1.00 | 3.00 | | mg/L | 10 | 10/25/16 04:57 PM |
| Chromium | 0.00427 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/25/16 03:22 PM |
| Cobalt | 0.00414 | 0.00300 | 0.00500 | J | mg/L | 1 | 10/25/16 03:22 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:22 PM |
| Lithium | 0.00985 | 0.00500 | 0.0100 | J | mg/L | 1 | 10/25/16 03:22 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:22 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:22 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 03:22 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BJT** |
| Chloride | 275 | 3.00 | 10.0 | | mg/L | 10 | 10/17/16 03:16 PM |
| Fluoride | 0.364 | 0.100 | 0.400 | J | mg/L | 1 | 10/17/16 11:45 AM |
| Sulfate | 60.2 | 1.00 | 3.00 | | mg/L | 1 | 10/17/16 11:45 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.81 | 0 | 0 | | pH Units@20℃ | 1 | 10/07/16 10:23 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1010 | 50.0 | 50.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-15 |
| **Project No:** | 5164-D | **Collection Date:** | 10/05/16 12:50 PM |
| **Lab Order:** | 1610036 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:25 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 03:28 PM |
| Arsenic | 0.00225 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/25/16 03:28 PM |
| Barium | 0.0390 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 03:28 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:28 PM |
| Boron | 0.212 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 03:28 PM |
| Cadmium | 0.00152 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:28 PM |
| Calcium | 88.1 | 1.00 | 3.00 | | mg/L | 10 | 10/25/16 05:04 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:28 PM |
| Cobalt | 0.0226 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 03:28 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:28 PM |
| Lithium | 0.113 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 03:28 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:28 PM |
| Selenium | 0.0276 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:28 PM |
| Thallium | 0.00114 | 0.000500 | 0.00150 | J | mg/L | 1 | 10/25/16 03:28 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BJT** |
| Chloride | 264 | 3.00 | 10.0 | | mg/L | 10 | 10/17/16 03:31 PM |
| Fluoride | 0.723 | 0.100 | 0.400 | | mg/L | 1 | 10/17/16 11:59 AM |
| Sulfate | 324 | 10.0 | 30.0 | | mg/L | 10 | 10/17/16 03:31 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.74 | 0 | 0 | | pH Units@19.7℃ | 1 | 10/07/16 11:01 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1370 | 50.0 | 50.0 | | mg/L | 1 | 10/10/16 08:42 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *02-Nov-16*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | EB-1 |
| **Project:** | Luminant - Oak Grove - Ash Landfill | **Lab ID:** | 1610036-16 |
| **Project No:** | 5164-D | **Collection Date:** | 10/05/16 01:20 PM |
| **Lab Order:** | 1610036 | **Matrix:** | EQUIP BLANK |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/12/16 10:27 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/25/16 03:34 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:34 PM |
| Barium | 0.0279 | 0.00300 | 0.0100 | | mg/L | 1 | 10/25/16 03:34 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:34 PM |
| Boron | 0.0577 | 0.0100 | 0.0300 | | mg/L | 1 | 10/25/16 03:34 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:34 PM |
| Calcium | 1.83 | 0.100 | 0.300 | | mg/L | 1 | 10/25/16 03:34 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:34 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/25/16 03:34 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/25/16 03:34 PM |
| Lithium | <0.00500 | 0.00500 | 0.0100 | | mg/L | 1 | 10/25/16 03:34 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:34 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/25/16 03:34 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/25/16 03:34 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BJT** |
| Chloride | 7.19 | 0.300 | 1.00 | | mg/L | 1 | 10/17/16 12:14 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 10/17/16 12:14 PM |
| Sulfate | 3.07 | 1.00 | 3.00 | | mg/L | 1 | 10/17/16 12:14 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.98 | 0 | 0 | | pH Units@19.8℃ | 1 | 10/07/16 11:03 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | <10.0 | 10.0 | 10.0 | | mg/L | 1 | 10/10/16 08:42 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_161011A**

The QC data in batch 77501 applies to the following samples: 1610036-01A, 1610036-02A, 1610036-03A, 1610036-04A

| Sample ID | **MB-77501** | Batch ID: | **77501** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_161011A** | Analysis Date: | **10/11/2016 10:43:15 A** | Prep Date: | **10/10/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-77501** | Batch ID: | **77501** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_161011A** | Analysis Date: | **10/11/2016 10:45:30 A** | Prep Date: | **10/10/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00204 | 0.000200 | 0.00200 | 0 | 102 | 85 | 115 | | | |

| Sample ID | **LCSD-77501** | Batch ID: | **77501** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_161011A** | Analysis Date: | **10/11/2016 10:47:46 A** | Prep Date: | **10/10/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00203 | 0.000200 | 0.00200 | 0 | 102 | 85 | 115 | 0.491 | 15 | |

| Sample ID | **1610028-02A SD** | Batch ID: | **77501** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_161011A** | Analysis Date: | **10/11/2016 10:54:34 A** | Prep Date: | **10/10/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1610028-02A MS** | Batch ID: | **77501** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_161011A** | Analysis Date: | **10/11/2016 10:59:05 A** | Prep Date: | **10/10/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00171 | 0.000200 | 0.00200 | 0 | 85.5 | 80 | 120 | | | |

| Sample ID | **1610028-02A MSD** | Batch ID: | **77501** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_161011A** | Analysis Date: | **10/11/2016 11:01:21 A** | Prep Date: | **10/10/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00169 | 0.000200 | 0.00200 | 0 | 84.5 | 80 | 120 | 1.18 | 15 | |

| Sample ID | **1610028-02A PDS** | Batch ID: | **77501** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_161011A** | Analysis Date: | **10/11/2016 11:04:54 A** | Prep Date: | **10/10/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00201 | 0.000200 | 0.00250 | 0 | 80.4 | 85 | 115 | | | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_161011A**

| Sample ID | **ICV-161011** | Batch ID: | **R88493** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_161011A** | Analysis Date: | **10/11/2016 10:38:41 A** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00399 | 0.000200 | 0.00400 | 0 | 99.8 | 90 | 110 | | | |

| Sample ID | **CCV1-161011** | Batch ID: | **R88493** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_161011A** | Analysis Date: | **10/11/2016 11:25:19 A** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00193 | 0.000200 | 0.00200 | 0 | 96.5 | 90 | 110 | | | |

| Sample ID | **CCV2-161011** | Batch ID: | **R88493** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_161011A** | Analysis Date: | **10/11/2016 11:52:39 A** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00195 | 0.000200 | 0.00200 | 0 | 97.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1610036

**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_161012A**

The QC data in batch 77519 applies to the following samples: 1610036-05A, 1610036-06A, 1610036-07A, 1610036-08A, 1610036-09A, 1610036-10A, 1610036-11A, 1610036-12A, 1610036-13A, 1610036-14A, 1610036-15A, 1610036-16A

| Sample ID | **MB-77519** | Batch ID: | **77519** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_161012A** | Analysis Date: | **10/12/2016 9:51:07 AM** | Prep Date: | **10/11/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-77519** | Batch ID: | **77519** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_161012A** | Analysis Date: | **10/12/2016 9:53:23 AM** | Prep Date: | **10/11/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00208 | 0.000200 | 0.00200 | 0 | 104 | 85 | 115 | | | |

| Sample ID | **LCSD-77519** | Batch ID: | **77519** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_161012A** | Analysis Date: | **10/12/2016 9:55:39 AM** | Prep Date: | **10/11/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00216 | 0.000200 | 0.00200 | 0 | 108 | 85 | 115 | 3.77 | 15 | |

| Sample ID | **1610075-03C SD** | Batch ID: | **77519** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_161012A** | Analysis Date: | **10/12/2016 10:34:15 A** | Prep Date: | **10/11/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1610075-03C PDS** | Batch ID: | **77519** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_161012A** | Analysis Date: | **10/12/2016 10:36:31 A** | Prep Date: | **10/11/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00247 | 0.000200 | 0.00250 | 0 | 98.8 | 85 | 115 | | | |

| Sample ID | **1610075-03C MS** | Batch ID: | **77519** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_161012A** | Analysis Date: | **10/12/2016 10:38:47 A** | Prep Date: | **10/11/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00206 | 0.000200 | 0.00200 | 0 | 103 | 80 | 120 | | | |

| Sample ID | **1610075-03C MSD** | Batch ID: | **77519** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_161012A** | Analysis Date: | **10/12/2016 10:41:03 A** | Prep Date: | **10/11/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00207 | 0.000200 | 0.00200 | 0 | 104 | 80 | 120 | 0.484 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_161012A**

| Sample ID | **ICV-161012** | Batch ID: | **R88509** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_161012A** | Analysis Date: | **10/12/2016 9:46:33 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00397 | 0.000200 | 0.00400 | 0 | 99.2 | 90 | 110 | | | |

| Sample ID | **CCV1-161012** | Batch ID: | **R88509** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_161012A** | Analysis Date: | **10/12/2016 10:20:36 A** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00197 | 0.000200 | 0.00200 | 0 | 98.5 | 90 | 110 | | | |

| Sample ID | **CCV2-161012** | Batch ID: | **R88509** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_161012A** | Analysis Date: | **10/12/2016 10:47:54 A** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00198 | 0.000200 | 0.00200 | 0 | 99.0 | 90 | 110 | | | |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1610036

**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_161025B**

The QC data in batch 77469 applies to the following samples: 1610036-01A, 1610036-02A, 1610036-03A, 1610036-04A, 1610036-05A, 1610036-06A, 1610036-07A, 1610036-08A, 1610036-09A, 1610036-10A, 1610036-11A, 1610036-12A, 1610036-13A, 1610036-14A, 1610036-15A, 1610036-16A

Sample ID **MB-77469** Batch ID: **77469** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS3_161025B** Analysis Date: **10/25/2016 12:45:00 P** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

Sample ID **LCS-77469** Batch ID: **77469** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS3_161025B** Analysis Date: **10/25/2016 12:51:00 P** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.171 | 0.0300 | 0.200 | 0 | 85.6 | 80 | 120 | | | |

Sample ID **LCSD-77469** Batch ID: **77469** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS3_161025B** Analysis Date: **10/25/2016 12:57:00 P** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.173 | 0.0300 | 0.200 | 0 | 86.7 | 80 | 120 | 1.22 | 15 | |

Sample ID **1610007-24B SD** Batch ID: **77469** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS3_161025B** Analysis Date: **10/25/2016 1:15:00 PM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 6.78 | 7.50 | 0 | 5.60 | | | | 19.0 | 10 | R |

Sample ID **1610007-24B PDS** Batch ID: **77469** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS3_161025B** Analysis Date: **10/25/2016 2:15:00 PM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 15.0 | 1.50 | 10.0 | 5.60 | 94.4 | 80 | 120 | | | |

Sample ID **1610007-24B MS** Batch ID: **77469** TestNo: **SW6020A** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS3_161025B** Analysis Date: **10/25/2016 2:21:00 PM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 5.62 | 1.50 | 0.200 | 5.60 | 12.5 | 80 | 120 | | | S |

Sample ID **1610007-24B MSD** Batch ID: **77469** TestNo: **SW6020A** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS3_161025B** Analysis Date: **10/25/2016 2:27:00 PM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 5.60 | 1.50 | 0.200 | 5.60 | 0 | 80 | 120 | 0.445 | 15 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_161025B**

| Sample ID **ICV1-161025** | Batch ID: **R88704** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS3_161025B** | Analysis Date: **10/25/2016 9:52:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.0983 | 0.00250 | 0.100 | 0 | 98.3 | 90 | 110 | | | |
| Arsenic | 0.100 | 0.00500 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Barium | 0.0945 | 0.0100 | 0.100 | 0 | 94.5 | 90 | 110 | | | |
| Beryllium | 0.0929 | 0.00100 | 0.100 | 0 | 92.9 | 90 | 110 | | | |
| Boron | 0.0909 | 0.0300 | 0.100 | 0 | 90.9 | 90 | 110 | | | |
| Cadmium | 0.0930 | 0.00100 | 0.100 | 0 | 93.0 | 90 | 110 | | | |
| Calcium | 2.38 | 0.300 | 2.50 | 0 | 95.4 | 90 | 110 | | | |
| Chromium | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.0946 | 0.00100 | 0.100 | 0 | 94.6 | 90 | 110 | | | |
| Lithium | 0.0944 | 0.0100 | 0.100 | 0 | 94.4 | 90 | 110 | | | |
| Molybdenum | 0.0909 | 0.00500 | 0.100 | 0 | 90.9 | 90 | 110 | | | |
| Selenium | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.0935 | 0.00150 | 0.100 | 0 | 93.5 | 90 | 110 | | | |

| Sample ID **ILCVL-161025** | Batch ID: **R88704** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_161025B** | Analysis Date: **10/25/2016 10:04:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00198 | 0.00250 | 0.00200 | 0 | 99.0 | 70 | 130 | | | |
| Arsenic | 0.00513 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Barium | 0.00497 | 0.0100 | 0.00500 | 0 | 99.4 | 70 | 130 | | | |
| Beryllium | 0.000966 | 0.00100 | 0.00100 | 0 | 96.6 | 70 | 130 | | | |
| Boron | 0.0189 | 0.0300 | 0.0200 | 0 | 94.3 | 70 | 130 | | | |
| Cadmium | 0.000965 | 0.00100 | 0.00100 | 0 | 96.5 | 70 | 130 | | | |
| Calcium | 0.0746 | 0.300 | 0.100 | 0 | 74.6 | 70 | 130 | | | |
| Chromium | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00509 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Lead | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Lithium | 0.00967 | 0.0100 | 0.0100 | 0 | 96.7 | 70 | 130 | | | |
| Molybdenum | 0.00431 | 0.00500 | 0.00500 | 0 | 86.2 | 70 | 130 | | | |
| Selenium | 0.00528 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Thallium | 0.00105 | 0.00150 | 0.00100 | 0 | 104 | 70 | 130 | | | |

| Sample ID **CCV1-161025** | Batch ID: **R88704** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_161025B** | Analysis Date: **10/25/2016 11:54:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Barium | 0.189 | 0.0100 | 0.200 | 0 | 94.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_161025B**

Sample ID **CCV1-161025** Batch ID: **R88704** TestNo: **SW6020A** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS3_161025B** Analysis Date: **10/25/2016 11:54:00 A** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.182 | 0.00100 | 0.200 | 0 | 91.2 | 90 | 110 | | | |
| Boron | 0.212 | 0.0300 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Cadmium | 0.189 | 0.00100 | 0.200 | 0 | 94.4 | 90 | 110 | | | |
| Calcium | 5.47 | 0.300 | 5.00 | 0 | 109 | 90 | 110 | | | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 98.1 | 90 | 110 | | | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.5 | 90 | 110 | | | |
| Lithium | 0.190 | 0.0100 | 0.200 | 0 | 95.0 | 90 | 110 | | | |
| Molybdenum | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 90 | 110 | | | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.4 | 90 | 110 | | | |

Sample ID **LCVL1-161025** Batch ID: **R88704** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS3_161025B** Analysis Date: **10/25/2016 12:39:00 P** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00188 | 0.00250 | 0.00200 | 0 | 94.0 | 70 | 130 | | | |
| Arsenic | 0.00497 | 0.00500 | 0.00500 | 0 | 99.4 | 70 | 130 | | | |
| Barium | 0.00465 | 0.0100 | 0.00500 | 0 | 93.0 | 70 | 130 | | | |
| Beryllium | 0.000865 | 0.00100 | 0.00100 | 0 | 86.5 | 70 | 130 | | | |
| Boron | 0.0237 | 0.0300 | 0.0200 | 0 | 119 | 70 | 130 | | | |
| Cadmium | 0.000978 | 0.00100 | 0.00100 | 0 | 97.9 | 70 | 130 | | | |
| Calcium | 0.0882 | 0.300 | 0.100 | 0 | 88.2 | 70 | 130 | | | |
| Chromium | 0.00485 | 0.00500 | 0.00500 | 0 | 97.0 | 70 | 130 | | | |
| Cobalt | 0.00505 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lead | 0.000981 | 0.00100 | 0.00100 | 0 | 98.1 | 70 | 130 | | | |
| Lithium | 0.00928 | 0.0100 | 0.0100 | 0 | 92.8 | 70 | 130 | | | |
| Molybdenum | 0.00394 | 0.00500 | 0.00500 | 0 | 78.7 | 70 | 130 | | | |
| Selenium | 0.00547 | 0.00500 | 0.00500 | 0 | 109 | 70 | 130 | | | |
| Thallium | 0.000962 | 0.00150 | 0.00100 | 0 | 96.2 | 70 | 130 | | | |

Sample ID **CCV2-161025** Batch ID: **R88704** TestNo: **SW6020A** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS3_161025B** Analysis Date: **10/25/2016 2:33:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.196 | 0.00250 | 0.200 | 0 | 98.2 | 90 | 110 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.188 | 0.0100 | 0.200 | 0 | 94.2 | 90 | 110 | | | |
| Beryllium | 0.188 | 0.00100 | 0.200 | 0 | 94.0 | 90 | 110 | | | |
| Boron | 0.206 | 0.0300 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Cadmium | 0.188 | 0.00100 | 0.200 | 0 | 93.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_161025B**

| Sample ID **CCV2-161025** | Batch ID: **R88704** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_161025B** | Analysis Date: **10/25/2016 2:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.46 | 0.300 | 5.00 | 0 | 109 | 90 | 110 | | | |
| Chromium | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 90 | 110 | | | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Lead | 0.189 | 0.00100 | 0.200 | 0 | 94.6 | 90 | 110 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.189 | 0.00500 | 0.200 | 0 | 94.6 | 90 | 110 | | | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.191 | 0.00150 | 0.200 | 0 | 95.3 | 90 | 110 | | | |

| Sample ID **LCVL2-161025** | Batch ID: **R88704** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_161025B** | Analysis Date: **10/25/2016 2:46:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00208 | 0.00250 | 0.00200 | 0 | 104 | 70 | 130 | | | |
| Arsenic | 0.00527 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Barium | 0.00495 | 0.0100 | 0.00500 | 0 | 98.9 | 70 | 130 | | | |
| Beryllium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Boron | 0.0208 | 0.0300 | 0.0200 | 0 | 104 | 70 | 130 | | | |
| Cadmium | 0.000993 | 0.00100 | 0.00100 | 0 | 99.3 | 70 | 130 | | | |
| Calcium | 0.110 | 0.300 | 0.100 | 0 | 110 | 70 | 130 | | | |
| Chromium | 0.00476 | 0.00500 | 0.00500 | 0 | 95.1 | 70 | 130 | | | |
| Cobalt | 0.00503 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lead | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Lithium | 0.00991 | 0.0100 | 0.0100 | 0 | 99.1 | 70 | 130 | | | |
| Molybdenum | 0.00408 | 0.00500 | 0.00500 | 0 | 81.7 | 70 | 130 | | | |
| Selenium | 0.00540 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Thallium | 0.00104 | 0.00150 | 0.00100 | 0 | 104 | 70 | 130 | | | |

| Sample ID **CCV3-161025** | Batch ID: **R88704** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_161025B** | Analysis Date: **10/25/2016 3:40:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.7 | 90 | 110 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.190 | 0.0100 | 0.200 | 0 | 94.9 | 90 | 110 | | | |
| Beryllium | 0.193 | 0.00100 | 0.200 | 0 | 96.6 | 90 | 110 | | | |
| Boron | 0.208 | 0.0300 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cadmium | 0.186 | 0.00100 | 0.200 | 0 | 93.2 | 90 | 110 | | | |
| Calcium | 5.14 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Chromium | 0.191 | 0.00500 | 0.200 | 0 | 95.6 | 90 | 110 | | | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS3_161025B**

| Sample ID **CCV3-161025** | Batch ID: **R88704** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_161025B** | Analysis Date: **10/25/2016 3:40:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 96.0 | 90 | 110 | | | |
| Lithium | 0.197 | 0.0100 | 0.200 | 0 | 98.4 | 90 | 110 | | | |
| Molybdenum | 0.186 | 0.00500 | 0.200 | 0 | 93.2 | 90 | 110 | | | |
| Selenium | 0.209 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.4 | 90 | 110 | | | |

| Sample ID **LCVL3-161025** | Batch ID: **R88704** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_161025B** | Analysis Date: **10/25/2016 3:52:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00197 | 0.00250 | 0.00200 | 0 | 98.6 | 70 | 130 | | | |
| Arsenic | 0.00523 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Barium | 0.00486 | 0.0100 | 0.00500 | 0 | 97.1 | 70 | 130 | | | |
| Beryllium | 0.000959 | 0.00100 | 0.00100 | 0 | 95.9 | 70 | 130 | | | |
| Boron | 0.0208 | 0.0300 | 0.0200 | 0 | 104 | 70 | 130 | | | |
| Cadmium | 0.00107 | 0.00100 | 0.00100 | 0 | 107 | 70 | 130 | | | |
| Calcium | 0.0946 | 0.300 | 0.100 | 0 | 94.6 | 70 | 130 | | | |
| Chromium | 0.00478 | 0.00500 | 0.00500 | 0 | 95.7 | 70 | 130 | | | |
| Cobalt | 0.00518 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lead | 0.000998 | 0.00100 | 0.00100 | 0 | 99.8 | 70 | 130 | | | |
| Lithium | 0.00995 | 0.0100 | 0.0100 | 0 | 99.5 | 70 | 130 | | | |
| Molybdenum | 0.00410 | 0.00500 | 0.00500 | 0 | 81.9 | 70 | 130 | | | |
| Selenium | 0.00548 | 0.00500 | 0.00500 | 0 | 110 | 70 | 130 | | | |
| Thallium | 0.00101 | 0.00150 | 0.00100 | 0 | 101 | 70 | 130 | | | |

| Sample ID **CCV4-161025** | Batch ID: **R88704** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS3_161025B** | Analysis Date: **10/25/2016 5:34:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.92 | 0.300 | 5.00 | 0 | 98.4 | 90 | 110 | | | |

| Sample ID **LCVL4-161025** | Batch ID: **R88704** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS3_161025B** | Analysis Date: **10/25/2016 5:52:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0955 | 0.300 | 0.100 | 0 | 95.5 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1610036

**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_161013C**

The QC data in batch 77469 applies to the following samples: 1610036-01A, 1610036-02A, 1610036-03A, 1610036-04A, 1610036-05A, 1610036-06A, 1610036-07A, 1610036-08A, 1610036-09A, 1610036-10A, 1610036-11A, 1610036-12A, 1610036-13A, 1610036-14A, 1610036-15A, 1610036-16A

Sample ID **MB-77469** Batch ID: **77469** TestNo: **SW6020A** Units: **mg/L**

SampType: **MBLK** Run ID: **ICP-MS4_161013C** Analysis Date: **10/13/2016 9:07:00 PM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-77469** Batch ID: **77469** TestNo: **SW6020A** Units: **mg/L**

SampType: **LCS** Run ID: **ICP-MS4_161013C** Analysis Date: **10/13/2016 9:09:00 PM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.189 | 0.00250 | 0.200 | 0 | 94.6 | 80 | 120 | | | |
| Arsenic | 0.194 | 0.00500 | 0.200 | 0 | 97.1 | 80 | 120 | | | |
| Barium | 0.190 | 0.0100 | 0.200 | 0 | 94.9 | 80 | 120 | | | |
| Beryllium | 0.191 | 0.00100 | 0.200 | 0 | 95.5 | 80 | 120 | | | |
| Cadmium | 0.190 | 0.00100 | 0.200 | 0 | 94.9 | 80 | 120 | | | |
| Calcium | 4.65 | 0.300 | 5.00 | 0 | 93.0 | 80 | 120 | | | |
| Chromium | 0.194 | 0.00500 | 0.200 | 0 | 97.1 | 80 | 120 | | | |
| Cobalt | 0.194 | 0.00500 | 0.200 | 0 | 96.8 | 80 | 120 | | | |
| Lead | 0.188 | 0.00100 | 0.200 | 0 | 93.9 | 80 | 120 | | | |
| Lithium | 0.190 | 0.0100 | 0.200 | 0 | 95.2 | 80 | 120 | | | |
| Molybdenum | 0.183 | 0.00500 | 0.200 | 0 | 91.7 | 80 | 120 | | | |
| Selenium | 0.193 | 0.00500 | 0.200 | 0 | 96.5 | 80 | 120 | | | |
| Thallium | 0.185 | 0.00150 | 0.200 | 0 | 92.4 | 80 | 120 | | | |

Sample ID **LCSD-77469** Batch ID: **77469** TestNo: **SW6020A** Units: **mg/L**

SampType: **LCSD** Run ID: **ICP-MS4_161013C** Analysis Date: **10/13/2016 9:11:00 PM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.188 | 0.00250 | 0.200 | 0 | 93.9 | 80 | 120 | 0.752 | 15 | |
| Arsenic | 0.194 | 0.00500 | 0.200 | 0 | 97.2 | 80 | 120 | 0.101 | 15 | |
| Barium | 0.188 | 0.0100 | 0.200 | 0 | 94.0 | 80 | 120 | 1.02 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

| Sample ID **LCSD-77469** | Batch ID: **77469** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 9:11:00 PM** | Prep Date: **10/7/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.196 | 0.00100 | 0.200 | 0 | 98.0 | 80 | 120 | 2.57 | 15 | |
| Cadmium | 0.188 | 0.00100 | 0.200 | 0 | 94.2 | 80 | 120 | 0.827 | 15 | |
| Calcium | 4.57 | 0.300 | 5.00 | 0 | 91.4 | 80 | 120 | 1.73 | 15 | |
| Chromium | 0.194 | 0.00500 | 0.200 | 0 | 97.2 | 80 | 120 | 0.063 | 15 | |
| Cobalt | 0.193 | 0.00500 | 0.200 | 0 | 96.7 | 80 | 120 | 0.076 | 15 | |
| Lead | 0.188 | 0.00100 | 0.200 | 0 | 94.0 | 80 | 120 | 0.198 | 15 | |
| Lithium | 0.192 | 0.0100 | 0.200 | 0 | 96.0 | 80 | 120 | 0.801 | 15 | |
| Molybdenum | 0.183 | 0.00500 | 0.200 | 0 | 91.4 | 80 | 120 | 0.345 | 15 | |
| Selenium | 0.192 | 0.00500 | 0.200 | 0 | 95.9 | 80 | 120 | 0.625 | 15 | |
| Thallium | 0.187 | 0.00150 | 0.200 | 0 | 93.3 | 80 | 120 | 1.03 | 15 | |

| Sample ID **1610007-24B SD** | Batch ID: **77469** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 9:17:00 PM** | Prep Date: **10/7/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0336 | 0.0500 | 0 | 0.0327 | | | | 2.66 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Calcium | 412 | 1.50 | 0 | 406 | | | | 1.56 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.644 | 0.0500 | 0 | 0.601 | | | | 6.85 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1610007-24B PDS** | Batch ID: **77469** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 9:25:00 PM** | Prep Date: **10/7/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.170 | 0.00250 | 0.200 | 0 | 84.8 | 80 | 120 | | | |
| Arsenic | 0.197 | 0.00500 | 0.200 | 0 | 98.7 | 80 | 120 | | | |
| Barium | 0.219 | 0.0100 | 0.200 | 0.0327 | 93.0 | 80 | 120 | | | |
| Beryllium | 0.180 | 0.00100 | 0.200 | 0 | 90.2 | 80 | 120 | | | |
| Cadmium | 0.173 | 0.00100 | 0.200 | 0 | 86.5 | 80 | 120 | | | |
| Calcium | 392 | 0.300 | 5.00 | 406 | -272 | 80 | 120 | | | S |
| Chromium | 0.183 | 0.00500 | 0.200 | 0 | 91.3 | 80 | 120 | | | |
| Cobalt | 0.182 | 0.00500 | 0.200 | 0 | 90.8 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_161013C**

| Sample ID **1610007-24B PDS** | Batch ID: **77469** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 9:25:00 PM** | Prep Date: **10/7/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.183 | 0.00100 | 0.200 | 0 | 91.5 | 80 | 120 | | | |
| Lithium | 0.708 | 0.0100 | 0.200 | 0.601 | 53.8 | 80 | 120 | | | S |
| Molybdenum | 0.183 | 0.00500 | 0.200 | 0 | 91.4 | 80 | 120 | | | |
| Selenium | 0.194 | 0.00500 | 0.200 | 0 | 96.9 | 80 | 120 | | | |
| Thallium | 0.181 | 0.00150 | 0.200 | 0 | 90.6 | 80 | 120 | | | |

| Sample ID **1610007-24B MS** | Batch ID: **77469** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 9:27:00 PM** | Prep Date: **10/7/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 99.9 | 80 | 120 | | | |
| Arsenic | 0.210 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Barium | 0.227 | 0.0100 | 0.200 | 0.0327 | 97.2 | 80 | 120 | | | |
| Beryllium | 0.183 | 0.00100 | 0.200 | 0 | 91.7 | 80 | 120 | | | |
| Cadmium | 0.182 | 0.00100 | 0.200 | 0 | 91.0 | 80 | 120 | | | |
| Calcium | 414 | 0.300 | 5.00 | 406 | 159 | 80 | 120 | | | S |
| Chromium | 0.185 | 0.00500 | 0.200 | 0 | 92.3 | 80 | 120 | | | |
| Cobalt | 0.185 | 0.00500 | 0.200 | 0 | 92.7 | 80 | 120 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.6 | 80 | 120 | | | |
| Lithium | 0.707 | 0.0100 | 0.200 | 0.601 | 53.0 | 80 | 120 | | | S |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.4 | 80 | 120 | | | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.5 | 80 | 120 | | | |

| Sample ID **1610007-24B MSD** | Batch ID: **77469** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 9:29:00 PM** | Prep Date: **10/7/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 99.1 | 80 | 120 | 0.811 | 15 | |
| Arsenic | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 1.44 | 15 | |
| Barium | 0.230 | 0.0100 | 0.200 | 0.0327 | 98.4 | 80 | 120 | 1.05 | 15 | |
| Beryllium | 0.183 | 0.00100 | 0.200 | 0 | 91.3 | 80 | 120 | 0.336 | 15 | |
| Cadmium | 0.180 | 0.00100 | 0.200 | 0 | 90.1 | 80 | 120 | 1.07 | 15 | |
| Calcium | 437 | 0.300 | 5.00 | 406 | 614 | 80 | 120 | 5.34 | 15 | S |
| Chromium | 0.184 | 0.00500 | 0.200 | 0 | 92.2 | 80 | 120 | 0.140 | 15 | |
| Cobalt | 0.185 | 0.00500 | 0.200 | 0 | 92.4 | 80 | 120 | 0.359 | 15 | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 95.8 | 80 | 120 | 0.817 | 15 | |
| Lithium | 0.722 | 0.0100 | 0.200 | 0.601 | 60.3 | 80 | 120 | 2.06 | 15 | S |
| Molybdenum | 0.194 | 0.00500 | 0.200 | 0 | 96.8 | 80 | 120 | 0.558 | 15 | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 1.09 | 15 | |
| Thallium | 0.190 | 0.00150 | 0.200 | 0 | 95.2 | 80 | 120 | 1.38 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_161013C**

| Sample ID **ICV-161013** | Batch ID: **R88546** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 10:34:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.100 | 0.00250 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Arsenic | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.0990 | 0.0100 | 0.100 | 0 | 99.0 | 90 | 110 | | | |
| Beryllium | 0.0984 | 0.00100 | 0.100 | 0 | 98.4 | 90 | 110 | | | |
| Cadmium | 0.0984 | 0.00100 | 0.100 | 0 | 98.4 | 90 | 110 | | | |
| Calcium | 2.40 | 0.300 | 2.50 | 0 | 96.0 | 90 | 110 | | | |
| Chromium | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.0992 | 0.00100 | 0.100 | 0 | 99.2 | 90 | 110 | | | |
| Lithium | 0.0948 | 0.0100 | 0.100 | 0 | 94.8 | 90 | 110 | | | |
| Molybdenum | 0.0957 | 0.00500 | 0.100 | 0 | 95.7 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.0969 | 0.00150 | 0.100 | 0 | 96.9 | 90 | 110 | | | |

| Sample ID **LCVL-161013** | Batch ID: **R88546** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 10:39:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00191 | 0.00250 | 0.00200 | 0 | 95.5 | 70 | 130 | | | |
| Arsenic | 0.00507 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Barium | 0.00485 | 0.0100 | 0.00500 | 0 | 97.1 | 70 | 130 | | | |
| Beryllium | 0.000841 | 0.00100 | 0.00100 | 0 | 84.1 | 70 | 130 | | | |
| Cadmium | 0.000934 | 0.00100 | 0.00100 | 0 | 93.4 | 70 | 130 | | | |
| Calcium | 0.0926 | 0.300 | 0.100 | 0 | 92.6 | 70 | 130 | | | |
| Chromium | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Cobalt | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lead | 0.00106 | 0.00100 | 0.00100 | 0 | 106 | 70 | 130 | | | |
| Lithium | 0.00991 | 0.0100 | 0.0100 | 0 | 99.1 | 70 | 130 | | | |
| Molybdenum | 0.00499 | 0.00500 | 0.00500 | 0 | 99.7 | 70 | 130 | | | |
| Selenium | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Thallium | 0.000974 | 0.00150 | 0.00100 | 0 | 97.4 | 70 | 130 | | | |

| Sample ID **CCV12-161013** | Batch ID: **R88546** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 8:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Beryllium | 0.203 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 99.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_161013C**

| Sample ID **CCV12-161013** | Batch ID: **R88546** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 8:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.69 | 0.300 | 5.00 | 0 | 93.7 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 96.9 | 90 | 110 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.3 | 90 | 110 | | | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.191 | 0.00150 | 0.200 | 0 | 95.5 | 90 | 110 | | | |

| Sample ID **LCVL12-161013** | Batch ID: **R88546** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 9:03:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00199 | 0.00250 | 0.00200 | 0 | 99.3 | 70 | 130 | | | |
| Arsenic | 0.00511 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00485 | 0.0100 | 0.00500 | 0 | 96.9 | 70 | 130 | | | |
| Beryllium | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Cadmium | 0.000951 | 0.00100 | 0.00100 | 0 | 95.1 | 70 | 130 | | | |
| Calcium | 0.0804 | 0.300 | 0.100 | 0 | 80.4 | 70 | 130 | | | |
| Chromium | 0.00511 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00507 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lead | 0.000907 | 0.00100 | 0.00100 | 0 | 90.7 | 70 | 130 | | | |
| Lithium | 0.0107 | 0.0100 | 0.0100 | 0 | 107 | 70 | 130 | | | |
| Molybdenum | 0.00483 | 0.00500 | 0.00500 | 0 | 96.5 | 70 | 130 | | | |
| Selenium | 0.00582 | 0.00500 | 0.00500 | 0 | 116 | 70 | 130 | | | |
| Thallium | 0.000973 | 0.00150 | 0.00100 | 0 | 97.3 | 70 | 130 | | | |

| Sample ID **CCV13-161013** | Batch ID: **R88546** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 10:01:00 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.86 | 0.300 | 5.00 | 0 | 97.1 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.5 | 90 | 110 | | | |
| Lithium | 0.203 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_161013C**

| Sample ID **CCV13-161013** | Batch ID: **R88546** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 10:01:00 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.192 | 0.00500 | 0.200 | 0 | 96.2 | 90 | 110 | | | |
| Selenium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.194 | 0.00150 | 0.200 | 0 | 97.1 | 90 | 110 | | | |

| Sample ID **LCVL13-161013** | Batch ID: **R88546** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_161013C** | Analysis Date: **10/13/2016 10:05:00 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00228 | 0.00250 | 0.00200 | 0 | 114 | 70 | 130 | | | |
| Arsenic | 0.00557 | 0.00500 | 0.00500 | 0 | 111 | 70 | 130 | | | |
| Barium | 0.00486 | 0.0100 | 0.00500 | 0 | 97.2 | 70 | 130 | | | |
| Beryllium | 0.000879 | 0.00100 | 0.00100 | 0 | 87.9 | 70 | 130 | | | |
| Cadmium | 0.000970 | 0.00100 | 0.00100 | 0 | 97.0 | 70 | 130 | | | |
| Calcium | 0.0833 | 0.300 | 0.100 | 0 | 83.3 | 70 | 130 | | | |
| Chromium | 0.00512 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00518 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lead | 0.000911 | 0.00100 | 0.00100 | 0 | 91.1 | 70 | 130 | | | |
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |
| Molybdenum | 0.00481 | 0.00500 | 0.00500 | 0 | 96.1 | 70 | 130 | | | |
| Selenium | 0.00621 | 0.00500 | 0.00500 | 0 | 124 | 70 | 130 | | | |
| Thallium | 0.000988 | 0.00150 | 0.00100 | 0 | 98.8 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_161013A**

The QC data in batch 77547 applies to the following samples: 1610036-01D, 1610036-02D, 1610036-03D, 1610036-04D, 1610036-05D

Sample ID **MB-77547** Batch ID: **77547** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_161013A** Analysis Date: **10/13/2016 9:54:08 AM** Prep Date: **10/13/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-77547** Batch ID: **77547** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_161013A** Analysis Date: **10/13/2016 10:08:45 A** Prep Date: **10/13/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.89 | 1.00 | 10.00 | 0 | 98.9 | 90 | 110 | | | |
| Fluoride | 3.74 | 0.400 | 4.000 | 0 | 93.4 | 90 | 110 | | | |
| Sulfate | 29.8 | 3.00 | 30.00 | 0 | 99.3 | 90 | 110 | | | |

Sample ID **LCSD-77547** Batch ID: **77547** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_161013A** Analysis Date: **10/13/2016 10:23:21 A** Prep Date: **10/13/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.90 | 1.00 | 10.00 | 0 | 99.0 | 90 | 110 | 0.094 | 20 | |
| Fluoride | 3.79 | 0.400 | 4.000 | 0 | 94.8 | 90 | 110 | 1.43 | 20 | |
| Sulfate | 29.8 | 3.00 | 30.00 | 0 | 99.3 | 90 | 110 | 0.035 | 20 | |

Sample ID **1610104-03BMS** Batch ID: **77547** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_161013A** Analysis Date: **10/13/2016 1:49:37 PM** Prep Date: **10/13/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 344 | 10.0 | 200.0 | 140.2 | 102 | 90 | 110 | | | |
| Fluoride | 199 | 4.00 | 200.0 | 0 | 99.3 | 90 | 110 | | | |
| Sulfate | 279 | 30.0 | 200.0 | 80.53 | 99.3 | 90 | 110 | | | |

Sample ID **1610104-03BMSD** Batch ID: **77547** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_161013A** Analysis Date: **10/13/2016 2:04:13 PM** Prep Date: **10/13/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 344 | 10.0 | 200.0 | 140.2 | 102 | 90 | 110 | 0.020 | 20 | |
| Fluoride | 199 | 4.00 | 200.0 | 0 | 99.7 | 90 | 110 | 0.443 | 20 | |
| Sulfate | 279 | 30.0 | 200.0 | 80.53 | 99.2 | 90 | 110 | 0.035 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_161013A**

| Sample ID **ICV-161013** | Batch ID: **R88570** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_161013A** | Analysis Date: **10/13/2016 9:18:47 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.2 | 1.00 | 25.00 | 0 | 101 | 90 | 110 | | | |
| Fluoride | 9.05 | 0.400 | 10.00 | 0 | 90.5 | 90 | 110 | | | |
| Sulfate | 75.8 | 3.00 | 75.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **CCV1-161013** | Batch ID: **R88570** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_161013A** | Analysis Date: **10/13/2016 12:49:16 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.91 | 1.00 | 10.00 | 0 | 99.1 | 90 | 110 | | | |
| Fluoride | 3.93 | 0.400 | 4.000 | 0 | 98.2 | 90 | 110 | | | |
| Sulfate | 29.7 | 3.00 | 30.00 | 0 | 99.0 | 90 | 110 | | | |

| Sample ID **CCV2-161013** | Batch ID: **R88570** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_161013A** | Analysis Date: **10/13/2016 3:31:52 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.0 | 1.00 | 10.00 | 0 | 100 | 90 | 110 | | | |
| Fluoride | 4.00 | 0.400 | 4.000 | 0 | 99.9 | 90 | 110 | | | |
| Sulfate | 30.1 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1610036

**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_161017A**

The QC data in batch 77577 applies to the following samples: 1610036-10D, 1610036-11D, 1610036-12D, 1610036-13D, 1610036-14D, 1610036-15D, 1610036-16D

| Sample ID | **MB-77577** | Batch ID: | **77577** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC2_161017A** | Analysis Date: | **10/17/2016 9:46:26 AM** | Prep Date: | **10/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-77577** | Batch ID: | **77577** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC2_161017A** | Analysis Date: | **10/17/2016 10:01:02 A** | Prep Date: | **10/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.64 | 1.00 | 10.00 | 0 | 96.4 | 90 | 110 | | | |
| Fluoride | 3.70 | 0.400 | 4.000 | 0 | 92.6 | 90 | 110 | | | |
| Sulfate | 29.1 | 3.00 | 30.00 | 0 | 97.1 | 90 | 110 | | | |

| Sample ID | **LCSD-77577** | Batch ID: | **77577** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC2_161017A** | Analysis Date: | **10/17/2016 10:15:39 A** | Prep Date: | **10/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.84 | 1.00 | 10.00 | 0 | 98.4 | 90 | 110 | 2.06 | 20 | |
| Fluoride | 3.85 | 0.400 | 4.000 | 0 | 96.3 | 90 | 110 | 4.01 | 20 | |
| Sulfate | 29.8 | 3.00 | 30.00 | 0 | 99.3 | 90 | 110 | 2.27 | 20 | |

| Sample ID | **1610036-11DMS** | Batch ID: | **77577** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_161017A** | Analysis Date: | **10/17/2016 2:18:06 PM** | Prep Date: | **10/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 513 | 10.0 | 200.0 | 343.9 | 84.6 | 90 | 110 | | | S |
| Fluoride | 198 | 4.00 | 200.0 | 0 | 99.0 | 90 | 110 | | | |
| Sulfate | 249 | 30.0 | 200.0 | 54.68 | 97.3 | 90 | 110 | | | |

| Sample ID | **1610036-11DMSD** | Batch ID: | **77577** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_161017A** | Analysis Date: | **10/17/2016 2:32:43 PM** | Prep Date: | **10/17/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 513 | 10.0 | 200.0 | 343.9 | 84.8 | 90 | 110 | 0.040 | 20 | S |
| Fluoride | 201 | 4.00 | 200.0 | 0 | 100 | 90 | 110 | 1.45 | 20 | |
| Sulfate | 251 | 30.0 | 200.0 | 54.68 | 98.0 | 90 | 110 | 0.567 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_161017A**

| Sample ID **ICV-161017** | Batch ID: **R88589** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_161017A** | Analysis Date: **10/17/2016 9:17:13 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.1 | 1.00 | 25.00 | 0 | 100 | 90 | 110 | | | |
| Fluoride | 9.33 | 0.400 | 10.00 | 0 | 93.3 | 90 | 110 | | | |
| Sulfate | 75.1 | 3.00 | 75.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV1-161017** | Batch ID: **R88589** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_161017A** | Analysis Date: **10/17/2016 1:12:55 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.95 | 1.00 | 10.00 | 0 | 99.5 | 90 | 110 | | | |
| Fluoride | 4.01 | 0.400 | 4.000 | 0 | 100 | 90 | 110 | | | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **CCV2-161017** | Batch ID: **R88589** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_161017A** | Analysis Date: **10/17/2016 4:59:39 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.88 | 1.00 | 10.00 | 0 | 98.8 | 90 | 110 | | | |
| Fluoride | 4.00 | 0.400 | 4.000 | 0 | 99.9 | 90 | 110 | | | |
| Sulfate | 29.9 | 3.00 | 30.00 | 0 | 99.6 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1610036

**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC3_161013A**

The QC data in batch 77551 applies to the following samples: 1610036-06D, 1610036-07D, 1610036-08D, 1610036-09D

Sample ID **MB-77551** Batch ID: **77551** TestNo: **E300** Units: **mg/L**

SampType: **MBLK** Run ID: **IC3_161013A** Analysis Date: **10/13/2016 10:13:35 A** Prep Date: **10/13/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-77551** Batch ID: **77551** TestNo: **E300** Units: **mg/L**

SampType: **LCS** Run ID: **IC3_161013A** Analysis Date: **10/13/2016 10:37:04 A** Prep Date: **10/13/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.56 | 1.00 | 10.00 | 0 | 95.6 | 90 | 110 | | | |
| Fluoride | 4.39 | 0.400 | 4.000 | 0 | 110 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | | | |

Sample ID **LCSD-77551** Batch ID: **77551** TestNo: **E300** Units: **mg/L**

SampType: **LCSD** Run ID: **IC3_161013A** Analysis Date: **10/13/2016 10:57:42 A** Prep Date: **10/13/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.58 | 1.00 | 10.00 | 0 | 95.8 | 90 | 110 | 0.136 | 20 | |
| Fluoride | 4.14 | 0.400 | 4.000 | 0 | 103 | 90 | 110 | 5.84 | 20 | |
| Sulfate | 28.8 | 3.00 | 30.00 | 0 | 96.1 | 90 | 110 | 1.40 | 20 | |

Sample ID **1610036-07DMS** Batch ID: **77551** TestNo: **E300** Units: **mg/L**

SampType: **MS** Run ID: **IC3_161013A** Analysis Date: **10/13/2016 2:26:56 PM** Prep Date: **10/13/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2800 | 100 | 2000 | 894.5 | 95.2 | 90 | 110 | | | |
| Fluoride | 1880 | 40.0 | 2000 | 0 | 93.9 | 90 | 110 | | | |
| Sulfate | 1940 | 300 | 2000 | 0 | 97.2 | 90 | 110 | | | |

Sample ID **1610036-07DMSD** Batch ID: **77551** TestNo: **E300** Units: **mg/L**

SampType: **MSD** Run ID: **IC3_161013A** Analysis Date: **10/13/2016 2:50:29 PM** Prep Date: **10/13/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2790 | 100 | 2000 | 894.5 | 94.8 | 90 | 110 | 0.268 | 20 | |
| Fluoride | 1880 | 40.0 | 2000 | 0 | 94.0 | 90 | 110 | 0.106 | 20 | |
| Sulfate | 1950 | 300 | 2000 | 0 | 97.7 | 90 | 110 | 0.539 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC3_161013A**

| Sample ID **ICV-161013** | Batch ID: **R88569** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC3_161013A** | Analysis Date: **10/13/2016 9:25:12 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 23.6 | 1.00 | 25.00 | 0 | 94.6 | 90 | 110 | | | |
| Fluoride | 9.82 | 0.400 | 10.00 | 0 | 98.2 | 90 | 110 | | | |
| Sulfate | 70.4 | 3.00 | 75.00 | 0 | 93.9 | 90 | 110 | | | |

| Sample ID **CCV1-161013** | Batch ID: **R88569** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC3_161013A** | Analysis Date: **10/13/2016 3:31:46 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.58 | 1.00 | 10.00 | 0 | 95.8 | 90 | 110 | | | |
| Fluoride | 4.19 | 0.400 | 4.000 | 0 | 105 | 90 | 110 | | | |
| Sulfate | 29.1 | 3.00 | 30.00 | 0 | 97.1 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1610036

**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_161007A**

The QC data in batch 77467 applies to the following samples: 1610036-01D, 1610036-02D, 1610036-03D, 1610036-04D, 1610036-05D, 1610036-06D, 1610036-07D, 1610036-08D, 1610036-09D, 1610036-10D, 1610036-11D, 1610036-12D, 1610036-13D, 1610036-14D, 1610036-15D, 1610036-16D

Sample ID **1610028-09D-DUP** Batch ID: **77467** TestNo: **M4500-H+ B** Units: **pH Units@18.2℃**

SampType: **DUP** Run ID: **TITRATOR_161007A** Analysis Date: **10/7/2016 9:39:00 AM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.40 | 0 | 0 | 6.370 | | | | 0.470 | 5 | |

Sample ID **1610036-07D-DUP** Batch ID: **77467** TestNo: **M4500-H+ B** Units: **pH Units@17.9℃**

SampType: **DUP** Run ID: **TITRATOR_161007A** Analysis Date: **10/7/2016 10:05:00 AM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.79 | 0 | 0 | 6.770 | | | | 0.295 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1610036
**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_161007A**

| Sample ID | **ICV-161007** | Batch ID: | **R88450** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.6℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_161007A** | Analysis Date: | **10/7/2016 8:13:00 AM** | Prep Date: | **10/7/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.91 | 0 | 10.00 | 0 | 99.1 | 99 | 101 | | | |

| Sample ID | **CCV1-161007** | Batch ID: | **R88450** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.3℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_161007A** | Analysis Date: | **10/7/2016 9:58:00 AM** | Prep Date: | **10/7/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV2-161007** | Batch ID: | **R88450** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.1℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_161007A** | Analysis Date: | **10/7/2016 10:24:00 AM** | Prep Date: | **10/7/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV3-161007** | Batch ID: | **R88450** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.8℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_161007A** | Analysis Date: | **10/7/2016 11:05:00 AM** | Prep Date: | **10/7/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1610036

**Project:** Luminant - Oak Grove - Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_161007C**

The QC data in batch 77471 applies to the following samples: 1610036-01D, 1610036-02D, 1610036-03D, 1610036-04D, 1610036-05D, 1610036-06D, 1610036-07D, 1610036-08D, 1610036-09D, 1610036-10D, 1610036-11D, 1610036-12D, 1610036-13D, 1610036-14D, 1610036-15D, 1610036-16D

Sample ID **MB-77471** Batch ID: **77471** TestNo: **M2540C** Units: **mg/L**

SampType: **MBLK** Run ID: **WC_161007C** Analysis Date: **10/10/2016 8:42:00 AM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

Sample ID **LCS-77471** Batch ID: **77471** TestNo: **M2540C** Units: **mg/L**

SampType: **LCS** Run ID: **WC_161007C** Analysis Date: **10/10/2016 8:42:00 AM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 752 | 10.0 | 745.6 | 0 | 101 | 90 | 113 | | | |

Sample ID **1610047-01A-DUP** Batch ID: **77471** TestNo: **M2540C** Units: **mg/L**

SampType: **DUP** Run ID: **WC_161007C** Analysis Date: **10/10/2016 8:42:00 AM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 10400 | 200 | 0 | 10640 | | | | 2.09 | 5 | |

Sample ID **1610047-04A-DUP** Batch ID: **77471** TestNo: **M2540C** Units: **mg/L**

SampType: **DUP** Run ID: **WC_161007C** Analysis Date: **10/10/2016 8:42:00 AM** Prep Date: **10/7/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 8780 | 200 | 0 | 8740 | | | | 0.457 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# Case Narrative

## Lab No: 20160977

This report contains the analytical results for the 16 sample(s) received under chain of custody by ESC Lab Sciences on 10/10/2016 10:21:52 AM. These samples are associated with your 1610036 project.

The analytical results included in this report meet all applicable quality control procedure requirements except as noted below:

The test results in this report meet all NELAC requirements unless noted below:

This report shall not be reproduced, except in full, without the written approval of ESC Lab Sciences.

All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client.

Results have been reviewed by the Director of Radiochemistry or their designees and is approved for release.

**Observations / Nonconformances**

20160977-04 Ra-228 confirmed.

L865240




*OUTREACH LABORATORY, A Divsion of ESC Lab Sciences*
*Address: 311 North Aspen Avenue, Broken Arrow, OK, 74012 EMail: outreach@esclabsciences.com - Tel: (918) 251-2515*

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160977-01** | | | | | | | | |
| **Client ID** : **MW-02** | | | | | | | | |
| **Date Sampled** : **10/4/2016 9:50:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 2.22 +/- 1.13 | 0.668 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.292 +/- 0.148 | 0.133 | pCi/l | | 10/25/16 | 10/26/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.93 +/- 0.979 | 0.535 | pCi/l | | 10/18/16 | 10/25/16 | JR |
| **Lab ID** : **20160977-02** | | | | | | | | |
| **Client ID** : **AL-10** | | | | | | | | |
| **Date Sampled** : **10/4/2016 10:50:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 0.719 +/- 1.04 | 0.674 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.719 +/- 0.255 | 0.215 | pCi/l | | 10/25/16 | 10/26/16 | AK |
| Radium-228 | EPA 904*/9320* | -0.071 +/- 0.780 | 0.459 | pCi/l | | 10/18/16 | 10/25/16 | JR |
| **Lab ID** : **20160977-03** | | | | | | | | |
| **Client ID** : **MW-09** | | | | | | | | |
| **Date Sampled** : **10/4/2016 11:45:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 1.33 +/- 1.34 | 1.06 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.33 +/- 0.302 | 0.221 | pCi/l | | 10/25/16 | 10/26/16 | AK |
| Radium-228 | EPA 904*/9320* | -0.136 +/- 1.04 | 0.839 | pCi/l | | 10/18/16 | 10/25/16 | JR |
| **Lab ID** : **20160977-04** | | | | | | | | |
| **Client ID** : **MW-05** | | | | | | | | |
| **Date Sampled** : **10/4/2016 12:40:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 1.24 +/- 1.25 | 0.794 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.677 +/- 0.183 | 0.142 | pCi/l | | 10/25/16 | 10/26/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.562 +/- 1.07 | 0.652 | pCi/l | | 10/18/16 | 10/25/16 | JR |

*NELAC Certified Parameter BDL = Below Detection Limit

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160977-05** | | | | | | | | |
| **Client ID** : **DUP-01** | | | | | | | | |
| **Date Sampled** : **10/4/2016 12:40:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 1.65 +/- 1.34 | 0.879 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.898 +/- 0.211 | 0.141 | pCi/l | | 10/25/16 | 10/26/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.749 +/- 1.13 | 0.738 | pCi/l | | 10/18/16 | 10/25/16 | JR |
| **Lab ID** : **20160977-06** | | | | | | | | |
| **Client ID** : **MW-07** | | | | | | | | |
| **Date Sampled** : **10/4/2016 1:25:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 1.34 +/- 1.19 | 0.793 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.560 +/- 0.191 | 0.188 | pCi/l | | 10/25/16 | 10/26/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.780 +/- 1.00 | 0.605 | pCi/l | | 10/18/16 | 10/25/16 | JR |
| **Lab ID** : **20160977-07** | | | | | | | | |
| **Client ID** : **FGD-11** | | | | | | | | |
| **Date Sampled** : **10/4/2016 4:15:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 4.26 +/- 1.15 | 0.618 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.73 +/- 0.315 | 0.126 | pCi/l | | 10/25/16 | 10/26/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.53 +/- 0.831 | 0.492 | pCi/l | | 10/18/16 | 10/31/16 | JR |
| **Lab ID** : **20160977-08** | | | | | | | | |
| **Client ID** : **FGD-12** | | | | | | | | |
| **Date Sampled** : **10/4/2016 5:10:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 1.41 +/- 1.29 | 0.968 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.41 +/- 0.284 | 0.208 | pCi/l | | 10/25/16 | 10/26/16 | AK |
| Radium-228 | EPA 904*/9320* | -0.136 +/- 1.01 | 0.760 | pCi/l | | 10/18/16 | 10/25/16 | JR |

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160977-09** | | | | | | | | |
| **Client ID** : **FGD-8** | | | | | | | | |
| **Date Sampled** : **10/5/2016 7:55:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 7.31 +/- 1.38 | 0.702 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.35 +/- 0.262 | 0.111 | pCi/l | | 10/25/16 | 10/26/16 | AK |
| Radium-228 | EPA 904*/9320* | 5.96 +/- 1.12 | 0.591 | pCi/l | | 10/18/16 | 10/25/16 | JR |
| **Lab ID** : **20160977-10** | | | | | | | | |
| **Client ID** : **FGD-1** | | | | | | | | |
| **Date Sampled** : **10/5/2016 8:45:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 0.937 +/- 0.915 | 0.543 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.430 +/- 0.159 | 0.101 | pCi/l | | 10/25/16 | 10/26/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.507 +/- 0.756 | 0.442 | pCi/l | | 10/18/16 | 10/25/16 | JR |
| **Lab ID** : **20160977-11** | | | | | | | | |
| **Client ID** : **FGD-5** | | | | | | | | |
| **Date Sampled** : **10/5/2016 9:30:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.04 +/- 1.07 | 0.651 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.877 +/- 0.248 | 0.176 | pCi/l | | 10/25/16 | 10/27/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.16 +/- 0.823 | 0.475 | pCi/l | | 10/18/16 | 10/25/16 | JR |
| **Lab ID** : **20160977-12** | | | | | | | | |
| **Client ID** : **FGD-2** | | | | | | | | |
| **Date Sampled** : **10/5/2016 10:20:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.42 +/- 1.22 | 0.969 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.716 +/- 0.209 | 0.107 | pCi/l | | 10/25/16 | 10/27/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.70 +/- 1.01 | 0.862 | pCi/l | | 10/18/16 | 10/25/16 | JR |

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20160977-13** | | | | | | | | |
| **Client ID** : **FGD-4** | | | | | | | | |
| **Date Sampled** : **10/5/2016 11:10:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.61 +/- 0.940 | 0.607 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.308 +/- 0.141 | 0.128 | pCi/l | | 10/25/16 | 10/27/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.30 +/- 0.799 | 0.479 | pCi/l | | 10/18/16 | 10/25/16 | JR |
| **Lab ID** : **20160977-14** | | | | | | | | |
| **Client ID** : **FGD-6** | | | | | | | | |
| **Date Sampled** : **10/5/2016 11:55:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.18 +/- 1.07 | 0.675 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.489 +/- 0.169 | 0.126 | pCi/l | | 10/25/16 | 10/27/16 | AK |
| Radium-228 | EPA 904*/9320* | 1.69 +/- 0.904 | 0.549 | pCi/l | | 10/18/16 | 10/25/16 | JR |
| **Lab ID** : **20160977-15** | | | | | | | | |
| **Client ID** : **FGD-3** | | | | | | | | |
| **Date Sampled** : **10/5/2016 12:50:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.90 +/- 0.932 | 0.591 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.455 +/- 0.186 | 0.168 | pCi/l | | 10/25/16 | 10/27/16 | AK |
| Radium-228 | EPA 904*/9320* | 2.44 +/- 0.746 | 0.423 | pCi/l | | 10/21/16 | 10/26/16 | JR |
| **Lab ID** : **20160977-16** | | | | | | | | |
| **Client ID** : **EB-1** | | | | | | | | |
| **Date Sampled** : **10/5/2016 1:20:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.13 +/- 1.17 | 0.720 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.523 +/- 0.195 | 0.164 | pCi/l | | 10/25/16 | 10/27/16 | AK |
| Radium-228 | EPA 904*/9320* | 0.604 +/- 0.977 | 0.556 | pCi/l | | 10/21/16 | 10/26/16 | JR |

# QC Report

| Parameter | Blank | LCS %REC | LCSD %REC | LCSD RPD | DUP RPD | RER, NAD or DER | MS %REC | MSD %REC | MSD RPD | Batch ID |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.064 | 109.0 | | | NC | 0.322 | 105.0 | 104.0 | 1.5 | R1148 |
| Radium-228 | -0.230 | 99.9 | | | NC | 0.396 | 85.5 | 78.5 | 7.8 | R3867 |
| Radium-228 | -0.091 | 89.4 | | | NC | 1.290 | 91.7 | 98.4 | 9.9 | R3868 |

**Lab Approval:**

Ron Eidson
Director of Radiochemistry

*NELAC Certified Parameter BDL = Below Detection Limit

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1610036

**Subcontractor:**

ESC Laboratory
311 North Aspen
Broken Arrow, Oklahoma 74012

TEL: (918) 251-2515
FAX:
Acct #: DHLRRTX

06-Oct-16

| | | Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | E904.0 | SM7500Ra-B M | | | | |
| 1 | 8 | MW-02 | Aqueous | -01B | 10/04/16 09:50 AM | 500HDPEHNO3 | 1 | | | | | |
| | | MW-02 | Aqueous | -01C | 10/04/16 09:50 AM | 500HDPEHNO3 | | 1 | | | | |
| 2 | 9 | AL-10 | Aqueous | -02B | 10/04/16 10:50 AM | 500HDPEHNO3 | 1 | | | | | |
| | | AL-10 | Aqueous | -02C | 10/04/16 10:50 AM | 500HDPEHNO3 | | 1 | | | | |
| 3 | 10 | MW-09 | Aqueous | -03B | 10/04/16 11:45 AM | 500HDPEHNO3 | 1 | | | | | |
| | | MW-09 | Aqueous | -03C | 10/04/16 11:45 AM | 500HDPEHNO3 | | 1 | | | | |
| 4 | 11 | MW-05 | Aqueous | -04B | 10/04/16 12:40 PM | 500HDPEHNO3 | 1 | | | | | |
| | | MW-05 | Aqueous | -04C | 10/04/16 12.40 PM | 500HDPEHNO3 | | 1 | | | | |
| 5 | 12 | DUP-01 | Aqueous | -05B | 10/04/16 12 40 PM | 500HDPEHNO3 | 1 | | | | | |
| | | DUP-01 | Aqueous | -05C | 10/04/16 12 40 PM | 500HDPEHNO3 | | 1 | | | | |
| 6 | 13 | MW-07 | Aqueous | -06B | 10/04/16 01 25 PM | 500HDPEHNO3 | 1 | | | | | |
| | | MW-07 | Aqueous | -06C | 10/04/16 01 25 PM | 500HDPEHNO3 | | 1 | | | | |
| 7 | 14 | FGD-11 | Aqueous | -07B | 10/04/16 04:15 PM | 500HDPEHNO3 | 1 | | | | | |
| | | FGD-11 | Aqueous | -07C | 10/04/16 04:15 PM | 500HDPEHNO3 | | 1 | | | | |
| 8 | 15 | FGD-12 | Aqueous | -08B | 10/04/16 05 10 PM | 500HDPEHNO3 | 1 | | | | | |
| | | FGD-12 | Aqueous | -08C | 10/04/16 05:10 PM | 500HDPEHNO3 | | 1 | | | | |
| 9 | 16 | FGD-8 | Aqueous | -09B | 10/05/16 07.55 AM | 500HDPEHNO3 | 1 | | | | | |
| | | FGD-8 | Aqueous | -09C | 10/05/16 07 55 AM | 500HDPEHNO3 | | 1 | | | | |

10/10/16

General Comments

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs DHLRRTX033116S.
Quality Control Package Needed Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical com & dupont@dhlanalytical.com

L865240
D60977

| | | Date/Time | | Date/Time |
|---|---|---|---|---|
| **Relinquished by:** | | 10/6/16 1730 | **Received by:** | 10/6/16 1730 |
| **Relinquished by:** | | | **Received by:** | 10/7/16 1010 |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1610036

**Subcontractor:**

ESC Laboratory
311 North Aspen
Broken Arrow, Oklahoma 74012

TEL: (918) 251-2515
FAX:
Acct #: DHLRRTX

06-Oct-16

| | Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | E904.0 | SM7500Ra-B M | | | | |
| 10 | FGD-1 | Aqueous | -10B | 10/05/16 08:45 AM | 500HDPEHNO3 | 1 | | | | | |
| | FGD-1 | Aqueous | -10C | 10/05/16 08:45 AM | 500HDPEHNO3 | | 1 | | | | |
| 11 | FGD-5 | Aqueous | -11B | 10/05/16 09:30 AM | 500HDPEHNO3 | 1 | | | | | |
| | FGD-5 | Aqueous | -11C | 10/05/16 09:30 AM | 500HDPEHNO3 | | 1 | | | | |
| 12 | FGD-2 | Aqueous | -12B | 10/05/16 10:20 AM | 500HDPEHNO3 | 1 | | | | | |
| | FGD-2 | Aqueous | -12C | 10/05/16 10:20 AM | 500HDPEHNO3 | | 1 | | | | |
| 13 | FGD-4 | Aqueous | -13B | 10/05/16 11:10 AM | 500HDPEHNO3 | 1 | | | | | |
| | FGD-4 | Aqueous | -13C | 10/05/16 11:10 AM | 500HDPEHNO3 | | 1 | | | | |
| 14 | FGD-6 | Aqueous | -14B | 10/05/16 11:55 AM | 500HDPEHNO3 | 1 | | | | | |
| | FGD-6 | Aqueous | -14C | 10/05/16 11:55 AM | 500HDPEHNO3 | | 1 | | | | |
| 15 | FGD-3 | Aqueous | -15B | 10/05/16 12:50 PM | 500HDPEHNO3 | 1 | | | | | |
| | FGD-3 | Aqueous | -15C | 10/05/16 12:50 PM | 500HDPEHNO3 | | 1 | | | | |
| 16 | EB-1 | Equip Blank | -16B | 10/05/16 01:20 PM | 500HDPEHNO3 | 1 | | | | | |
| | EB-1 | Equip Blank | -16C | 10/05/16 01:20 PM | 500HDPEHNO3 | | 1 | | | | |

10/10/16

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs DHLRRTX033116S.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

L865260
20160977

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | | 10/6/16 1730 | **Received by:** | | 10/6/16 1730 |
| **Relinquished by:** | | | **Received by:** | | 10/10/16 0900 |

# SAMPLE LOGIN

Date Received: *10/10/2016 10:21:* Lab Number: 20160977 Due: 11/7/2016

| Sample Number | Client Sample ID | Matrix | Date Sampled | Container Type | Container Size | Preservation | Preserved Upon Receipt | Custody Seal | Seal Intact |
|---|---|---|---|---|---|---|---|---|---|
| 20160977-01 B | MW-02 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| 20160977-01 A | MW-02 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| 20160977-02 A | AL-10 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| 20160977-02 B | AL-10 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| 20160977-03 A | MW-09 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| 20160977-03 B | MW-09 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| 20160977-04 B | MW-05 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| 20160977-04 A | MW-05 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| 20160977-05 A | DUP-01 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| 20160977-05 B | DUP-01 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| 20160977-06 A | MW-07 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| 20160977-06 B | MW-07 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| 20160977-07 A | FGD-11 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| 20160977-07 B | FGD-11 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | ☐ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 20160977-08 A | FGD-12 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| 20160977-08 B | FGD-12 | NPW | 10/04/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | |
| 20160977-09 B | FGD-8 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| 20160977-09 A | FGD-8 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | |
| 20160977-10 A | FGD-1 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| 20160977-10 B | FGD-1 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | |
| 20160977-11 A | FGD-5 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| 20160977-11 B | FGD-5 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | |
| 20160977-12 B | FGD-2 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| 20160977-12 A | FGD-2 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | |
| 20160977-13 A | FGD-4 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| 20160977-13 B | FGD-4 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | |
| 20160977-14 A | FGD-6 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| 20160977-14 B | FGD-6 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | |
| 20160977-15 A | FGD-3 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| 20160977-15 B | FGD-3 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | |
| 20160977-16 B | EB-1 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |
| 20160977-16 A | EB-1 | NPW | 10/05/16 | Plastic | 500 ml | HNO3, pH < 2 | Yes | Yes |

Radium-226 SM 7500 Ra B M*
Radium-228 EPA 904*/9320*

CONTAINER INSPECTION

# Coolers 1 Custody Seals Broken Ø Temperature: 4.6/5.6 C Ice Radiation Survey: <300 cpm

SAMPLE INSPECTION

Sample Seal Broken Ø Chain of Custody Record ✓ Labels in Tact ✓ Radiation Survey Complete N/A

Anomalies several labels had water damage making them illegible: FGD-4, FGD-6, FGD-3, FGD-11

Inspected By: _____ DATE 10/10/16

QA or Designee Review: Raymond Thomas DATE 10/10/16

Sample Custodian Review: Dawn Mamo DATE 10/10/16

Project Notes:

February 01, 2017

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1612275

RE: Oak Grove Ash Landfill

Dear Will Vienne:

DHL Analytical, Inc. received 8 sample(s) on 12/23/2016 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-16-17

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 73691

# CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 12-23-16 PAGE 1 OF 1
PO #: 5164-D DHL WORK ORDER #: 16/2275
PROJECT LOCATION OR NAME: OAK-GROVE - ASH LANDFILL
CLENT PROJECT #: 5164-D COLLECTOR: J. BRAMON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ 8270 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 608 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ | RCRA ☐ TX11 ☐ ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | CCR (ASH) VOC, METALS | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-02 | 01 | 12-21-16 | 1310 | W | P | 4 | | X | | | | | | | | | | | | | | | | | | | | X | |
| AL-10 | 02 | 12-22-16 | 0930 | W | P | 4 | | X | | | | | | | | | | | | | | | | | | | | X | |
| MW-09 | 03 | 12-22-16 | 1035 | W | P | 4 | | X | | | | | | | | | | | | | | | | | | | | X | |
| MW-08R | 04 | 12-22-16 | 1145 | W | P | 4 | | X | | | | | | | | | | | | | | | | | | | | X | |
| MW-05 | 05 | 12-22-16 | 1515 | W | P | 4 | | X | | | | | | | | | | | | | | | | | | | | X | |
| DUP-01 | 06 | 12-22-16 | 1515 | W | P | 4 | | X | | | | | | | | | | | | | | | | | | | | X | |
| EB-1 | 07 | 12-22-16 | 1645 | W | P | 4 | | X | | | | | | | | | | | | | | | | | | | | X | |
| MW-07 | 08 | 12-22-16 | 1425 | W | P | 4 | | X | | | | | | | | | | | | | | | | | | | | X | |

RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)
12/22/16 1440

RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

APPENDIX F-Revision 4 November 2012 ☐ DHL DISPOSAL @ $5.00 each ☐ Return

**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 1.8 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☐ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☒ HAND DELIVERED

John Dupont

| | |
|---|---|
| From: | Sara Taube [Sara.Taube@pbwllc.com] |
| Sent: | Wednesday, July 22, 2015 12:06 PM |
| To: | John Dupont |
| Subject: | CCR Appendix III and IV |
| Follow Up Flag: | Follow up |
| Flag Status: | Completed |

Hi John,

Here are the Appendix III and Appendix IV constituents that we will need to have analyzed under the CCR Rule.

Appendix III
Boron
Calcium
Chloride
Fluoride
pH
sulfate
TDS

Appendix IV
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228

We are looking to have approximately 74 wells sampled 8 times over the course of the next two years. Please let me know if there is any more information you might need.

Cheers,

Sara

10/26/2015

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Pastor, Behling & Wheeler** Date Received: 12/23/2016

Work Order Number **1612275** Received by **AL**

Checklist completed by _____ 12/27/2016 Reviewed by _____ 12/27/2016
Signature Date Initials Date

Carrier name Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 1.8 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? NO | | Checked by _____ |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? _____ | | Checked by _____ |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *01-Feb-17*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Oak Grove Ash Landfill
**Lab Order:** 1612275

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904/9320 and SM 7500 Ra B M. Analyzed at ESC Lab Sciences.

## LOG IN

The samples were received and log-in performed on 12/23/16. A total of 8 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 1/7/17 (batch 78492) the matrix spike and matrix spike duplicate recoveries were out of control limits for Calcium. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

For Metals analysis performed on 1/8/17 and 1/11/17 (batches 78492 & 78572) the PDS recoveries were above control limits for Calcium. These are flagged accordingly. The serial dilutions were within control limits for this analyte. No further corrective actions were taken.

For Metals analysis performed on 1/7/17 (batch 78492) the RPD for the serial dilution was slightly above control limits for Boron. This is flagged accordingly. The PDS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *01-Feb-17*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Oak Grove Ash Landfill
**Lab Order:** 1612275

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1612275-01 | MW-02 | | 12/21/16 01:10 PM | 12/23/2016 |
| 1612275-02 | AL-10 | | 12/22/16 09:30 AM | 12/23/2016 |
| 1612275-03 | MW-09 | | 12/22/16 10:35 AM | 12/23/2016 |
| 1612275-04 | MW-08R | | 12/22/16 11:45 AM | 12/23/2016 |
| 1612275-05 | MW-05 | | 12/22/16 03:15 PM | 12/23/2016 |
| 1612275-06 | DUP-01 | | 12/22/16 03:15 PM | 12/23/2016 |
| 1612275-07 | EB-1 | | 12/22/16 04:45 PM | 12/23/2016 |
| 1612275-08 | MW-07 | | 12/22/16 02:25 PM | 12/23/2016 |

**Lab Order:** 1612275
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove Ash Landfill

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1612275-01A | MW-02 | 12/21/16 01:10 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/28/16 08:24 AM | 78492 |
| | MW-02 | 12/21/16 01:10 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/28/16 08:24 AM | 78492 |
| | MW-02 | 12/21/16 01:10 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/28/16 08:24 AM | 78492 |
| | MW-02 | 12/21/16 01:10 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 01/03/17 11:27 AM | 78564 |
| 1612275-01D | MW-02 | 12/21/16 01:10 PM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | MW-02 | 12/21/16 01:10 PM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | MW-02 | 12/21/16 01:10 PM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | MW-02 | 12/21/16 01:10 PM | Aqueous | M2540C | TDS Preparation | 12/27/16 03:09 PM | 78478 |
| 1612275-02A | AL-10 | 12/22/16 09:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/28/16 08:24 AM | 78492 |
| | AL-10 | 12/22/16 09:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/28/16 08:24 AM | 78492 |
| | AL-10 | 12/22/16 09:30 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 01/03/17 11:27 AM | 78564 |
| 1612275-02D | AL-10 | 12/22/16 09:30 AM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | AL-10 | 12/22/16 09:30 AM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | AL-10 | 12/22/16 09:30 AM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | AL-10 | 12/22/16 09:30 AM | Aqueous | M2540C | TDS Preparation | 12/27/16 03:09 PM | 78478 |
| 1612275-03A | MW-09 | 12/22/16 10:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/28/16 08:24 AM | 78492 |
| | MW-09 | 12/22/16 10:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/28/16 08:24 AM | 78492 |
| | MW-09 | 12/22/16 10:35 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 01/03/17 11:27 AM | 78564 |
| 1612275-03D | MW-09 | 12/22/16 10:35 AM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | MW-09 | 12/22/16 10:35 AM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | MW-09 | 12/22/16 10:35 AM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | MW-09 | 12/22/16 10:35 AM | Aqueous | M2540C | TDS Preparation | 12/27/16 03:09 PM | 78478 |
| 1612275-04A | MW-08R | 12/22/16 11:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/28/16 08:24 AM | 78492 |
| | MW-08R | 12/22/16 11:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/28/16 08:24 AM | 78492 |
| | MW-08R | 12/22/16 11:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 12/28/16 08:24 AM | 78492 |
| | MW-08R | 12/22/16 11:45 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 01/03/17 11:27 AM | 78564 |
| 1612275-04D | MW-08R | 12/22/16 11:45 AM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | MW-08R | 12/22/16 11:45 AM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |

**Lab Order:** 1612275
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove Ash Landfill

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1612275-04D | MW-08R | 12/22/16 11:45 AM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | MW-08R | 12/22/16 11:45 AM | Aqueous | M2540C | TDS Preparation | 12/27/16 03:09 PM | 78478 |
| 1612275-05A | MW-05 | 12/22/16 03:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | MW-05 | 12/22/16 03:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | MW-05 | 12/22/16 03:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | MW-05 | 12/22/16 03:15 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 01/03/17 11:27 AM | 78564 |
| 1612275-05D | MW-05 | 12/22/16 03:15 PM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | MW-05 | 12/22/16 03:15 PM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | MW-05 | 12/22/16 03:15 PM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | MW-05 | 12/22/16 03:15 PM | Aqueous | M2540C | TDS Preparation | 12/27/16 03:09 PM | 78478 |
| 1612275-06A | DUP-01 | 12/22/16 03:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | DUP-01 | 12/22/16 03:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | DUP-01 | 12/22/16 03:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | DUP-01 | 12/22/16 03:15 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 01/03/17 11:27 AM | 78564 |
| 1612275-06D | DUP-01 | 12/22/16 03:15 PM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | DUP-01 | 12/22/16 03:15 PM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | DUP-01 | 12/22/16 03:15 PM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | DUP-01 | 12/22/16 03:15 PM | Aqueous | M2540C | TDS Preparation | 12/27/16 03:09 PM | 78478 |
| 1612275-07A | EB-1 | 12/22/16 04:45 PM | Equip Blank | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | EB-1 | 12/22/16 04:45 PM | Equip Blank | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | EB-1 | 12/22/16 04:45 PM | Equip Blank | SW7470A | Mercury Aq Prep, Total | 01/03/17 11:27 AM | 78564 |
| 1612275-07D | EB-1 | 12/22/16 04:45 PM | Equip Blank | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | EB-1 | 12/22/16 04:45 PM | Equip Blank | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | EB-1 | 12/22/16 04:45 PM | Equip Blank | M2540C | TDS Preparation | 12/27/16 03:09 PM | 78478 |
| 1612275-08A | MW-07 | 12/22/16 02:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | MW-07 | 12/22/16 02:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | MW-07 | 12/22/16 02:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/04/17 08:56 AM | 78572 |
| | MW-07 | 12/22/16 02:25 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 01/03/17 11:27 AM | 78564 |

**Lab Order:** 1612275
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove Ash Landfill

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1612275-08D | MW-07 | 12/22/16 02:25 PM | Aqueous | E300 | Anion Preparation | 01/03/17 08:50 AM | 78554 |
| | MW-07 | 12/22/16 02:25 PM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | MW-07 | 12/22/16 02:25 PM | Aqueous | M2540C | TDS Preparation | 12/27/16 03:09 PM | 78478 |

**Lab Order:** 1612275
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove Ash Landfill

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1612275-01A | MW-02 | Aqueous | SW7470A | Mercury Total: Aqueous | 78564 | 1 | 01/05/17 10:10 AM | CETAC2_HG_170105C |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78492 | 1 | 01/07/17 08:16 PM | ICP-MS4_170107D |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78492 | 5 | 01/08/17 01:20 PM | ICP-MS4_170108C |
| | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78492 | 1 | 01/08/17 01:39 PM | ICP-MS4_170108C |
| 1612275-01D | MW-02 | Aqueous | E300 | Anions by IC method - Water | 78554 | 1 | 01/03/17 10:11 AM | IC2_170103A |
| | MW-02 | Aqueous | E300 | Anions by IC method - Water | 78554 | 10 | 01/03/17 12:40 PM | IC2_170103A |
| | MW-02 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:23 AM | TITRATOR_161228A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 78478 | 1 | 12/28/16 08:41 AM | WC_161227C |
| 1612275-02A | AL-10 | Aqueous | SW7470A | Mercury Total: Aqueous | 78564 | 1 | 01/05/17 10:13 AM | CETAC2_HG_170105C |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78492 | 1 | 01/07/17 08:18 PM | ICP-MS4_170107D |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78492 | 2 | 01/08/17 01:22 PM | ICP-MS4_170108C |
| 1612275-02D | AL-10 | Aqueous | E300 | Anions by IC method - Water | 78554 | 1 | 01/03/17 10:25 AM | IC2_170103A |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 78554 | 10 | 01/03/17 12:55 PM | IC2_170103A |
| | AL-10 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:27 AM | TITRATOR_161228A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 78478 | 1 | 12/28/16 08:41 AM | WC_161227C |
| 1612275-03A | MW-09 | Aqueous | SW7470A | Mercury Total: Aqueous | 78564 | 1 | 01/05/17 10:15 AM | CETAC2_HG_170105C |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78492 | 1 | 01/07/17 08:20 PM | ICP-MS4_170107D |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78492 | 2 | 01/08/17 01:24 PM | ICP-MS4_170108C |
| 1612275-03D | MW-09 | Aqueous | E300 | Anions by IC method - Water | 78554 | 1 | 01/03/17 10:40 AM | IC2_170103A |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 78554 | 10 | 01/03/17 01:57 PM | IC2_170103A |
| | MW-09 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:30 AM | TITRATOR_161228A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 78478 | 1 | 12/28/16 08:41 AM | WC_161227C |
| 1612275-04A | MW-08R | Aqueous | SW7470A | Mercury Total: Aqueous | 78564 | 1 | 01/05/17 09:59 AM | CETAC2_HG_170105C |
| | MW-08R | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78492 | 1 | 01/07/17 08:22 PM | ICP-MS4_170107D |
| | MW-08R | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78492 | 1 | 01/08/17 01:26 PM | ICP-MS4_170108C |
| | MW-08R | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78492 | 10 | 01/08/17 06:58 PM | ICP-MS4_170108C |

**Lab Order:** 1612275
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove Ash Landfill

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1612275-04D | MW-08R | Aqueous | E300 | Anions by IC method - Water | 78554 | 1 | 01/03/17 10:54 AM | IC2_170103A |
| | MW-08R | Aqueous | E300 | Anions by IC method - Water | 78554 | 10 | 01/03/17 02:12 PM | IC2_170103A |
| | MW-08R | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:32 AM | TITRATOR_161228A |
| | MW-08R | Aqueous | M2540C | Total Dissolved Solids | 78478 | 1 | 12/28/16 08:41 AM | WC_161227C |
| 1612275-05A | MW-05 | Aqueous | SW7470A | Mercury Total: Aqueous | 78564 | 1 | 01/05/17 10:17 AM | CETAC2_HG_170105C |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 1 | 01/09/17 12:35 PM | ICP-MS4_170109B |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 1 | 01/11/17 05:13 PM | ICP-MS4_170111E |
| | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 10 | 01/12/17 08:25 AM | ICP-MS4_170111E |
| 1612275-05D | MW-05 | Aqueous | E300 | Anions by IC method - Water | 78554 | 1 | 01/03/17 11:09 AM | IC2_170103A |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 78554 | 10 | 01/03/17 02:27 PM | IC2_170103A |
| | MW-05 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:35 AM | TITRATOR_161228A |
| | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 78478 | 1 | 12/28/16 08:41 AM | WC_161227C |
| 1612275-06A | DUP-01 | Aqueous | SW7470A | Mercury Total: Aqueous | 78564 | 1 | 01/05/17 10:19 AM | CETAC2_HG_170105C |
| | DUP-01 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 1 | 01/09/17 12:37 PM | ICP-MS4_170109B |
| | DUP-01 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 1 | 01/11/17 05:15 PM | ICP-MS4_170111E |
| | DUP-01 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 10 | 01/12/17 08:27 AM | ICP-MS4_170111E |
| 1612275-06D | DUP-01 | Aqueous | E300 | Anions by IC method - Water | 78554 | 10 | 01/03/17 02:41 PM | IC2_170103A |
| | DUP-01 | Aqueous | E300 | Anions by IC method - Water | 78554 | 1 | 01/03/17 11:24 AM | IC2_170103A |
| | DUP-01 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:36 AM | TITRATOR_161228A |
| | DUP-01 | Aqueous | M2540C | Total Dissolved Solids | 78478 | 1 | 12/28/16 08:41 AM | WC_161227C |
| 1612275-07A | EB-1 | Equip Blank | SW7470A | Mercury Total: Aqueous | 78564 | 1 | 01/05/17 10:22 AM | CETAC2_HG_170105C |
| | EB-1 | Equip Blank | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 1 | 01/09/17 12:39 PM | ICP-MS4_170109B |
| | EB-1 | Equip Blank | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 1 | 01/11/17 05:17 PM | ICP-MS4_170111E |
| 1612275-07D | EB-1 | Equip Blank | E300 | Anions by IC method - Water | 78554 | 1 | 01/03/17 12:26 PM | IC2_170103A |
| | EB-1 | Equip Blank | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:39 AM | TITRATOR_161228A |
| | EB-1 | Equip Blank | M2540C | Total Dissolved Solids | 78478 | 1 | 12/28/16 08:41 AM | WC_161227C |

**Lab Order:** 1612275
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove Ash Landfill

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1612275-08A | MW-07 | Aqueous | SW7470A | Mercury Total: Aqueous | 78564 | 1 | 01/05/17 10:24 AM | CETAC2_HG_170105C |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 1 | 01/09/17 12:31 PM | ICP-MS4_170109B |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 1 | 01/11/17 05:09 PM | ICP-MS4_170111E |
| | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78572 | 10 | 01/11/17 09:42 PM | ICP-MS4_170111E |
| 1612275-08D | MW-07 | Aqueous | E300 | Anions by IC method - Water | 78554 | 1 | 01/03/17 11:38 AM | IC2_170103A |
| | MW-07 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:41 AM | TITRATOR_161228A |
| | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 78478 | 1 | 12/28/16 08:41 AM | WC_161227C |

# DHL Analytical, Inc.

**Date:** *01-Feb-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-02 |
| **Project:** | Oak Grove Ash Landfill | **Lab ID:** | 1612275-01 |
| **Project No:** | 5164-D | **Collection Date:** | 12/21/16 01:10 PM |
| **Lab Order:** | 1612275 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 01/05/17 10:10 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/07/17 08:16 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:16 PM |
| Barium | 0.110 | 0.00300 | 0.0100 | | mg/L | 1 | 01/07/17 08:16 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/07/17 08:16 PM |
| Boron | 0.110 | 0.0100 | 0.0300 | | mg/L | 1 | 01/08/17 01:39 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/07/17 08:16 PM |
| Calcium | 47.8 | 0.500 | 1.50 | | mg/L | 5 | 01/08/17 01:20 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:16 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/07/17 08:16 PM |
| Lead | 0.000403 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/07/17 08:16 PM |
| Lithium | 0.0971 | 0.00500 | 0.0100 | | mg/L | 1 | 01/07/17 08:16 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:16 PM |
| Selenium | 0.00232 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/07/17 08:16 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/07/17 08:16 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 185 | 3.00 | 10.0 | | mg/L | 10 | 01/03/17 12:40 PM |
| Fluoride | 0.293 | 0.100 | 0.400 | J | mg/L | 1 | 01/03/17 10:11 AM |
| Sulfate | 83.4 | 1.00 | 3.00 | | mg/L | 1 | 01/03/17 10:11 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.43 | 0 | 0 | | pH Units@19.5℃ | 1 | 12/28/16 09:23 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 590 | 10.0 | 10.0 | | mg/L | 1 | 12/28/16 08:41 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *01-Feb-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | AL-10 |
| **Project:** | Oak Grove Ash Landfill | **Lab ID:** | 1612275-02 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 09:30 AM |
| **Lab Order:** | 1612275 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 01/05/17 10:13 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/07/17 08:18 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:18 PM |
| Barium | 0.0846 | 0.00300 | 0.0100 | | mg/L | 1 | 01/07/17 08:18 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/07/17 08:18 PM |
| Boron | 0.0759 | 0.0200 | 0.0600 | | mg/L | 2 | 01/08/17 01:22 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/07/17 08:18 PM |
| Calcium | 32.5 | 0.200 | 0.600 | | mg/L | 2 | 01/08/17 01:22 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:18 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/07/17 08:18 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/07/17 08:18 PM |
| Lithium | 0.00647 | 0.00500 | 0.0100 | J | mg/L | 1 | 01/07/17 08:18 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:18 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:18 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/07/17 08:18 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 57.2 | 3.00 | 10.0 | | mg/L | 10 | 01/03/17 12:55 PM |
| Fluoride | 0.195 | 0.100 | 0.400 | J | mg/L | 1 | 01/03/17 10:25 AM |
| Sulfate | 21.5 | 1.00 | 3.00 | | mg/L | 1 | 01/03/17 10:25 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.16 | 0 | 0 | | pH Units@19.7℃ | 1 | 12/28/16 09:27 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 527 | 10.0 | 10.0 | | mg/L | 1 | 12/28/16 08:41 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *01-Feb-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-09 |
| **Project:** | Oak Grove Ash Landfill | **Lab ID:** | 1612275-03 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 10:35 AM |
| **Lab Order:** | 1612275 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 01/05/17 10:15 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/07/17 08:20 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:20 PM |
| Barium | 0.123 | 0.00300 | 0.0100 | | mg/L | 1 | 01/07/17 08:20 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/07/17 08:20 PM |
| Boron | 0.0776 | 0.0200 | 0.0600 | | mg/L | 2 | 01/08/17 01:24 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/07/17 08:20 PM |
| Calcium | 42.6 | 0.200 | 0.600 | | mg/L | 2 | 01/08/17 01:24 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:20 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/07/17 08:20 PM |
| Lead | 0.000411 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/07/17 08:20 PM |
| Lithium | 0.0636 | 0.00500 | 0.0100 | | mg/L | 1 | 01/07/17 08:20 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:20 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:20 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/07/17 08:20 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 290 | 3.00 | 10.0 | | mg/L | 10 | 01/03/17 01:57 PM |
| Fluoride | 0.159 | 0.100 | 0.400 | J | mg/L | 1 | 01/03/17 10:40 AM |
| Sulfate | 116 | 1.00 | 3.00 | | mg/L | 1 | 01/03/17 10:40 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.54 | 0 | 0 | | pH Units@19.5℃ | 1 | 12/28/16 09:30 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 791 | 10.0 | 10.0 | | mg/L | 1 | 12/28/16 08:41 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *01-Feb-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-08R |
| **Project:** | Oak Grove Ash Landfill | **Lab ID:** | 1612275-04 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 11:45 AM |
| **Lab Order:** | 1612275 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 01/05/17 09:59 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/07/17 08:22 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:22 PM |
| Barium | 0.0855 | 0.00300 | 0.0100 | | mg/L | 1 | 01/07/17 08:22 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/07/17 08:22 PM |
| Boron | 0.0702 | 0.0100 | 0.0300 | | mg/L | 1 | 01/08/17 01:26 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/07/17 08:22 PM |
| Calcium | 32.4 | 1.00 | 3.00 | | mg/L | 10 | 01/08/17 06:58 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:22 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/07/17 08:22 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/07/17 08:22 PM |
| Lithium | 0.00656 | 0.00500 | 0.0100 | J | mg/L | 1 | 01/07/17 08:22 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:22 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/07/17 08:22 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/07/17 08:22 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 166 | 3.00 | 10.0 | | mg/L | 10 | 01/03/17 02:12 PM |
| Fluoride | 0.355 | 0.100 | 0.400 | J | mg/L | 1 | 01/03/17 10:54 AM |
| Sulfate | 39.7 | 1.00 | 3.00 | | mg/L | 1 | 01/03/17 10:54 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.22 | 0 | 0 | | pH Units@19.2℃ | 1 | 12/28/16 09:32 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 617 | 10.0 | 10.0 | | mg/L | 1 | 12/28/16 08:41 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *01-Feb-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-05 |
| **Project:** | Oak Grove Ash Landfill | **Lab ID:** | 1612275-05 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 03:15 PM |
| **Lab Order:** | 1612275 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 01/05/17 10:17 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/09/17 12:35 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:35 PM |
| Barium | 0.0415 | 0.00300 | 0.0100 | | mg/L | 1 | 01/09/17 12:35 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/09/17 12:35 PM |
| Boron | 0.0759 | 0.0100 | 0.0300 | | mg/L | 1 | 01/11/17 05:13 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/09/17 12:35 PM |
| Calcium | 61.4 | 1.00 | 3.00 | | mg/L | 10 | 01/12/17 08:25 AM |
| Chromium | 0.0197 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:35 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/09/17 12:35 PM |
| Lead | 0.000570 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/09/17 12:35 PM |
| Lithium | 0.114 | 0.00500 | 0.0100 | | mg/L | 1 | 01/09/17 12:35 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:35 PM |
| Selenium | 0.00371 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/09/17 12:35 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/09/17 12:35 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 264 | 3.00 | 10.0 | | mg/L | 10 | 01/03/17 02:27 PM |
| Fluoride | 0.446 | 0.100 | 0.400 | | mg/L | 1 | 01/03/17 11:09 AM |
| Sulfate | 55.6 | 1.00 | 3.00 | | mg/L | 1 | 01/03/17 11:09 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.35 | 0 | 0 | | pH Units@19.4℃ | 1 | 12/28/16 09:35 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 778 | 10.0 | 10.0 | | mg/L | 1 | 12/28/16 08:41 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *01-Feb-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | DUP-01 |
| **Project:** | Oak Grove Ash Landfill | **Lab ID:** | 1612275-06 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 03:15 PM |
| **Lab Order:** | 1612275 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 01/05/17 10:19 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/09/17 12:37 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:37 PM |
| Barium | 0.0502 | 0.00300 | 0.0100 | | mg/L | 1 | 01/09/17 12:37 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/09/17 12:37 PM |
| Boron | 0.0578 | 0.0100 | 0.0300 | | mg/L | 1 | 01/11/17 05:15 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/09/17 12:37 PM |
| Calcium | 78.7 | 1.00 | 3.00 | | mg/L | 10 | 01/12/17 08:27 AM |
| Chromium | 0.0110 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:37 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/09/17 12:37 PM |
| Lead | 0.000461 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/09/17 12:37 PM |
| Lithium | 0.126 | 0.00500 | 0.0100 | | mg/L | 1 | 01/09/17 12:37 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:37 PM |
| Selenium | 0.00598 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:37 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/09/17 12:37 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 299 | 3.00 | 10.0 | | mg/L | 10 | 01/03/17 02:41 PM |
| Fluoride | 0.432 | 0.100 | 0.400 | | mg/L | 1 | 01/03/17 11:24 AM |
| Sulfate | 62.3 | 1.00 | 3.00 | | mg/L | 1 | 01/03/17 11:24 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 7.13 | 0 | 0 | | pH Units@18.5℃ | 1 | 12/28/16 09:36 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 845 | 10.0 | 10.0 | | mg/L | 1 | 12/28/16 08:41 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *01-Feb-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | EB-1 |
| **Project:** | Oak Grove Ash Landfill | **Lab ID:** | 1612275-07 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 04:45 PM |
| **Lab Order:** | 1612275 | **Matrix:** | EQUIP BLANK |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 01/05/17 10:22 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/09/17 12:39 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:39 PM |
| Barium | 0.0748 | 0.00300 | 0.0100 | | mg/L | 1 | 01/09/17 12:39 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/09/17 12:39 PM |
| Boron | 0.0182 | 0.0100 | 0.0300 | J | mg/L | 1 | 01/11/17 05:17 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/09/17 12:39 PM |
| Calcium | 3.02 | 0.100 | 0.300 | | mg/L | 1 | 01/09/17 12:39 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:39 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/09/17 12:39 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/09/17 12:39 PM |
| Lithium | <0.00500 | 0.00500 | 0.0100 | | mg/L | 1 | 01/09/17 12:39 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:39 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:39 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/09/17 12:39 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 8.39 | 0.300 | 1.00 | | mg/L | 1 | 01/03/17 12:26 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 01/03/17 12:26 PM |
| Sulfate | 1.67 | 1.00 | 3.00 | J | mg/L | 1 | 01/03/17 12:26 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.07 | 0 | 0 | | pH Units@19℃ | 1 | 12/28/16 09:39 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | <10.0 | 10.0 | 10.0 | | mg/L | 1 | 12/28/16 08:41 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *01-Feb-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-07 |
| **Project:** | Oak Grove Ash Landfill | **Lab ID:** | 1612275-08 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 02:25 PM |
| **Lab Order:** | 1612275 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 01/05/17 10:24 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/09/17 12:31 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:31 PM |
| Barium | 0.0476 | 0.00300 | 0.0100 | | mg/L | 1 | 01/09/17 12:31 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/09/17 12:31 PM |
| Boron | 0.0540 | 0.0100 | 0.0300 | | mg/L | 1 | 01/11/17 05:09 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/09/17 12:31 PM |
| Calcium | 12.5 | 1.00 | 3.00 | | mg/L | 10 | 01/11/17 09:42 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:31 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/09/17 12:31 PM |
| Lead | 0.000333 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/09/17 12:31 PM |
| Lithium | 0.0178 | 0.00500 | 0.0100 | | mg/L | 1 | 01/09/17 12:31 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:31 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/09/17 12:31 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/09/17 12:31 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 22.9 | 0.300 | 1.00 | | mg/L | 1 | 01/03/17 11:38 AM |
| Fluoride | 0.229 | 0.100 | 0.400 | J | mg/L | 1 | 01/03/17 11:38 AM |
| Sulfate | 34.7 | 1.00 | 3.00 | | mg/L | 1 | 01/03/17 11:38 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.58 | 0 | 0 | | pH Units@19℃ | 1 | 12/28/16 09:41 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 262 | 10.0 | 10.0 | | mg/L | 1 | 12/28/16 08:41 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_170105C**

The QC data in batch 78564 applies to the following samples: 1612275-01A, 1612275-02A, 1612275-03A, 1612275-04A, 1612275-05A, 1612275-06A, 1612275-07A, 1612275-08A

| Sample ID | **MB-78564** | Batch ID: | **78564** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_170105C** | Analysis Date: | **1/5/2017 9:52:46 AM** | Prep Date: | **1/3/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-78564** | Batch ID: | **78564** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_170105C** | Analysis Date: | **1/5/2017 9:55:02 AM** | Prep Date: | **1/3/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00214 | 0.000200 | 0.00200 | 0 | 107 | 85 | 115 | | | |

| Sample ID | **LCSD-78564** | Batch ID: | **78564** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_170105C** | Analysis Date: | **1/5/2017 9:57:18 AM** | Prep Date: | **1/3/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00214 | 0.000200 | 0.00200 | 0 | 107 | 85 | 115 | 0 | 15 | |

| Sample ID | **1612275-04A SD** | Batch ID: | **78564** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_170105C** | Analysis Date: | **1/5/2017 10:01:51 AM** | Prep Date: | **1/3/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1612275-04A PDS** | Batch ID: | **78564** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_170105C** | Analysis Date: | **1/5/2017 10:04:06 AM** | Prep Date: | **1/3/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00248 | 0.000200 | 0.00250 | 0 | 99.2 | 85 | 115 | | | |

| Sample ID | **1612275-04A MS** | Batch ID: | **78564** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_170105C** | Analysis Date: | **1/5/2017 10:06:22 AM** | Prep Date: | **1/3/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00216 | 0.000200 | 0.00200 | 0 | 108 | 80 | 120 | | | |

| Sample ID | **1612275-04A MSD** | Batch ID: | **78564** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_170105C** | Analysis Date: | **1/5/2017 10:08:38 AM** | Prep Date: | **1/3/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00211 | 0.000200 | 0.00200 | 0 | 106 | 80 | 120 | 2.34 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_170105C**

| Sample ID **ICV-170105** | Batch ID: **R89790** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_170105C** | Analysis Date: **1/5/2017 9:48:12 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00398 | 0.000200 | 0.00400 | 0 | 99.5 | 90 | 110 | | | |

| Sample ID **CCV1-170105** | Batch ID: **R89790** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_170105C** | Analysis Date: **1/5/2017 10:31:19 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170107D**

The QC data in batch 78492 applies to the following samples: 1612275-01A, 1612275-02A, 1612275-03A, 1612275-04A

Sample ID **MB-78492** Batch ID: **78492** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_170107D** Analysis Date: **1/7/2017 6:30:00 PM** Prep Date: **12/28/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-78492** Batch ID: **78492** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_170107D** Analysis Date: **1/7/2017 6:32:00 PM** Prep Date: **12/28/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.213 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Beryllium | 0.211 | 0.00100 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Boron | 0.208 | 0.0300 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Cadmium | 0.207 | 0.00100 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Calcium | 5.00 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | | | |
| Chromium | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Cobalt | 0.210 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Lead | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Selenium | 0.210 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

Sample ID **LCSD-78492** Batch ID: **78492** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_170107D** Analysis Date: **1/7/2017 6:34:00 PM** Prep Date: **12/28/2016**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | 0.682 | 15 | |
| Arsenic | 0.214 | 0.00500 | 0.200 | 0 | 107 | 80 | 120 | 0.821 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170107D**

| Sample ID **LCSD-78492** | Batch ID: **78492** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 6:34:00 PM** | Prep Date: **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Barium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 0.935 | 15 | |
| Beryllium | 0.217 | 0.00100 | 0.200 | 0 | 108 | 80 | 120 | 2.77 | 15 | |
| Boron | 0.212 | 0.0300 | 0.200 | 0 | 106 | 80 | 120 | 1.92 | 15 | |
| Cadmium | 0.208 | 0.00100 | 0.200 | 0 | 104 | 80 | 120 | 0.260 | 15 | |
| Calcium | 4.97 | 0.300 | 5.00 | 0 | 99.4 | 80 | 120 | 0.616 | 15 | |
| Chromium | 0.210 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | 1.14 | 15 | |
| Cobalt | 0.213 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | 1.33 | 15 | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | 1.53 | 15 | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 80 | 120 | 1.21 | 15 | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.444 | 15 | |
| Selenium | 0.211 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | 0.882 | 15 | |
| Thallium | 0.204 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | 0.908 | 15 | |

| Sample ID **1612246-04A SD** | Batch ID: **78492** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 6:40:00 PM** | Prep Date: **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0303 | 0.0500 | 0 | 0.0304 | | | | 0.372 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Boron | 0.388 | 0.150 | 0 | 0.337 | | | | 14.0 | 10 | R |
| Cadmium | 0.00485 | 0.00500 | 0 | 0.00475 | | | | 2.00 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0.00333 | | | | 0 | 10 | |
| Cobalt | 0.108 | 0.0250 | 0 | 0.105 | | | | 3.07 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.0471 | 0.0500 | 0 | 0.0438 | | | | 7.26 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1612246-04A PDS** | Batch ID: **78492** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 7:01:00 PM** | Prep Date: **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.211 | 0.00250 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Arsenic | 0.224 | 0.00500 | 0.200 | 0 | 112 | 80 | 120 | | | |
| Barium | 0.235 | 0.0100 | 0.200 | 0.0304 | 102 | 80 | 120 | | | |
| Beryllium | 0.210 | 0.00100 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Boron | 0.515 | 0.0300 | 0.200 | 0.337 | 89.0 | 80 | 120 | | | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0.00475 | 99.3 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170107D**

| Sample ID **1612246-04A PDS** | Batch ID: **78492** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 7:01:00 PM** | Prep Date: **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chromium | 0.213 | 0.00500 | 0.200 | 0.00333 | 105 | 80 | 120 | | | |
| Cobalt | 0.307 | 0.00500 | 0.200 | 0.105 | 101 | 80 | 120 | | | |
| Lead | 0.208 | 0.00100 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Lithium | 0.232 | 0.0100 | 0.200 | 0.0438 | 94.0 | 80 | 120 | | | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Selenium | 0.217 | 0.00500 | 0.200 | 0 | 108 | 80 | 120 | | | |
| Thallium | 0.207 | 0.00150 | 0.200 | 0 | 104 | 80 | 120 | | | |

| Sample ID **1612246-04A MS** | Batch ID: **78492** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 7:03:00 PM** | Prep Date: **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.209 | 0.00250 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Arsenic | 0.219 | 0.00500 | 0.200 | 0 | 110 | 80 | 120 | | | |
| Barium | 0.238 | 0.0100 | 0.200 | 0.0304 | 104 | 80 | 120 | | | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Boron | 0.548 | 0.0300 | 0.200 | 0.337 | 105 | 80 | 120 | | | |
| Cadmium | 0.207 | 0.00100 | 0.200 | 0.00475 | 101 | 80 | 120 | | | |
| Calcium | 357 | 0.300 | 5.00 | 355 | 52.0 | 80 | 120 | | | S |
| Chromium | 0.203 | 0.00500 | 0.200 | 0.00333 | 99.7 | 80 | 120 | | | |
| Cobalt | 0.304 | 0.00500 | 0.200 | 0.105 | 99.6 | 80 | 120 | | | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lithium | 0.230 | 0.0100 | 0.200 | 0.0438 | 93.3 | 80 | 120 | | | |
| Molybdenum | 0.209 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Selenium | 0.212 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 80 | 120 | | | |

| Sample ID **1612246-04A MSD** | Batch ID: **78492** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 7:05:00 PM** | Prep Date: **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.209 | 0.00250 | 0.200 | 0 | 104 | 80 | 120 | 0.127 | 15 | |
| Arsenic | 0.225 | 0.00500 | 0.200 | 0 | 112 | 80 | 120 | 2.39 | 15 | |
| Barium | 0.239 | 0.0100 | 0.200 | 0.0304 | 104 | 80 | 120 | 0.435 | 15 | |
| Beryllium | 0.207 | 0.00100 | 0.200 | 0 | 104 | 80 | 120 | 3.39 | 15 | |
| Boron | 0.540 | 0.0300 | 0.200 | 0.337 | 101 | 80 | 120 | 1.40 | 15 | |
| Cadmium | 0.205 | 0.00100 | 0.200 | 0.00475 | 100 | 80 | 120 | 1.06 | 15 | |
| Calcium | 365 | 0.300 | 5.00 | 355 | 211 | 80 | 120 | 2.21 | 15 | S |
| Chromium | 0.206 | 0.00500 | 0.200 | 0.00333 | 102 | 80 | 120 | 1.87 | 15 | |
| Cobalt | 0.309 | 0.00500 | 0.200 | 0.105 | 102 | 80 | 120 | 1.62 | 15 | |
| Lead | 0.207 | 0.00100 | 0.200 | 0 | 104 | 80 | 120 | 1.21 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170107D**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **1612246-04A MSD** | Batch ID: **78492** | TestNo: **SW6020A** | Units: **mg/L** | | |
| SampType: **MSD** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 7:05:00 PM** | Prep Date: **12/28/2016** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.240 | 0.0100 | 0.200 | 0.0438 | 98.0 | 80 | 120 | 3.95 | 15 | |
| Molybdenum | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 0.478 | 15 | |
| Selenium | 0.218 | 0.00500 | 0.200 | 0 | 109 | 80 | 120 | 2.83 | 15 | |
| Thallium | 0.210 | 0.00150 | 0.200 | 0 | 105 | 80 | 120 | 2.06 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170107D**

| Sample ID **ICV-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 12:28:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.0993 | 0.00250 | 0.100 | 0 | 99.3 | 90 | 110 | | | |
| Arsenic | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.103 | 0.0100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Beryllium | 0.101 | 0.00100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Boron | 0.100 | 0.0300 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.32 | 0.300 | 2.50 | 0 | 92.7 | 90 | 110 | | | |
| Chromium | 0.107 | 0.00500 | 0.100 | 0 | 107 | 90 | 110 | | | |
| Cobalt | 0.106 | 0.00500 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Lead | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Lithium | 0.100 | 0.0100 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Molybdenum | 0.0993 | 0.00500 | 0.100 | 0 | 99.3 | 90 | 110 | | | |
| Selenium | 0.103 | 0.00500 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.101 | 0.00150 | 0.100 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 12:32:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00190 | 0.00250 | 0.00200 | 0 | 95.0 | 70 | 130 | | | |
| Arsenic | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Barium | 0.00514 | 0.0100 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Beryllium | 0.000982 | 0.00100 | 0.00100 | 0 | 98.2 | 70 | 130 | | | |
| Boron | 0.0210 | 0.0300 | 0.0200 | 0 | 105 | 70 | 130 | | | |
| Cadmium | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Calcium | 0.105 | 0.300 | 0.100 | 0 | 105 | 70 | 130 | | | |
| Chromium | 0.00526 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Cobalt | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lead | 0.00107 | 0.00100 | 0.00100 | 0 | 107 | 70 | 130 | | | |
| Lithium | 0.00973 | 0.0100 | 0.0100 | 0 | 97.3 | 70 | 130 | | | |
| Molybdenum | 0.00532 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Selenium | 0.00521 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

| Sample ID **CCV5-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 6:06:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.217 | 0.00500 | 0.200 | 0 | 108 | 90 | 110 | | | |
| Barium | 0.205 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

| Sample ID **CCV5-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 6:06:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.206 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.207 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Calcium | 4.93 | 0.300 | 5.00 | 0 | 98.7 | 90 | 110 | | | |
| Chromium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.212 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Lead | 0.207 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.198 | 0.0100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Selenium | 0.216 | 0.00500 | 0.200 | 0 | 108 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL5-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 6:24:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00181 | 0.00250 | 0.00200 | 0 | 90.5 | 70 | 130 | | | |
| Arsenic | 0.00542 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Barium | 0.00498 | 0.0100 | 0.00500 | 0 | 99.5 | 70 | 130 | | | |
| Beryllium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Boron | 0.0236 | 0.0300 | 0.0200 | 0 | 118 | 70 | 130 | | | |
| Cadmium | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 70 | 130 | | | |
| Calcium | 0.0994 | 0.300 | 0.100 | 0 | 99.4 | 70 | 130 | | | |
| Chromium | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Cobalt | 0.00526 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Lead | 0.000946 | 0.00100 | 0.00100 | 0 | 94.6 | 70 | 130 | | | |
| Lithium | 0.00994 | 0.0100 | 0.0100 | 0 | 99.4 | 70 | 130 | | | |
| Molybdenum | 0.00483 | 0.00500 | 0.00500 | 0 | 96.6 | 70 | 130 | | | |
| Selenium | 0.00597 | 0.00500 | 0.00500 | 0 | 119 | 70 | 130 | | | |
| Thallium | 0.00100 | 0.00150 | 0.00100 | 0 | 100 | 70 | 130 | | | |

| Sample ID **CCV6-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 7:16:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Arsenic | 0.218 | 0.00500 | 0.200 | 0 | 109 | 90 | 110 | | | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.214 | 0.00100 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Boron | 0.215 | 0.0300 | 0.200 | 0 | 108 | 90 | 110 | | | |
| Cadmium | 0.205 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170107D**

| Sample ID **CCV6-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 7:16:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.93 | 0.300 | 5.00 | 0 | 98.7 | 90 | 110 | | | |
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Cobalt | 0.215 | 0.00500 | 0.200 | 0 | 108 | 90 | 110 | | | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Selenium | 0.220 | 0.00500 | 0.200 | 0 | 110 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL6-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 8:02:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00178 | 0.00250 | 0.00200 | 0 | 89.0 | 70 | 130 | | | |
| Arsenic | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Barium | 0.00493 | 0.0100 | 0.00500 | 0 | 98.7 | 70 | 130 | | | |
| Beryllium | 0.00113 | 0.00100 | 0.00100 | 0 | 113 | 70 | 130 | | | |
| Boron | 0.0234 | 0.0300 | 0.0200 | 0 | 117 | 70 | 130 | | | |
| Cadmium | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 70 | 130 | | | |
| Calcium | 0.0962 | 0.300 | 0.100 | 0 | 96.2 | 70 | 130 | | | |
| Chromium | 0.00491 | 0.00500 | 0.00500 | 0 | 98.2 | 70 | 130 | | | |
| Cobalt | 0.00526 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Lead | 0.000928 | 0.00100 | 0.00100 | 0 | 92.8 | 70 | 130 | | | |
| Lithium | 0.00949 | 0.0100 | 0.0100 | 0 | 94.9 | 70 | 130 | | | |
| Molybdenum | 0.00486 | 0.00500 | 0.00500 | 0 | 97.1 | 70 | 130 | | | |
| Selenium | 0.00519 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Thallium | 0.000958 | 0.00150 | 0.00100 | 0 | 95.8 | 70 | 130 | | | |

| Sample ID **CCV7-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 8:24:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Arsenic | 0.219 | 0.00500 | 0.200 | 0 | 110 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.209 | 0.00100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.211 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170107D**

| Sample ID **CCV7-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 8:24:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.196 | 0.00500 | 0.200 | 0 | 97.9 | 90 | 110 | | | |
| Selenium | 0.218 | 0.00500 | 0.200 | 0 | 109 | 90 | 110 | | | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL7-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/7/2017 8:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00182 | 0.00250 | 0.00200 | 0 | 91.2 | 70 | 130 | | | |
| Arsenic | 0.00542 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Barium | 0.00483 | 0.0100 | 0.00500 | 0 | 96.5 | 70 | 130 | | | |
| Beryllium | 0.00115 | 0.00100 | 0.00100 | 0 | 115 | 70 | 130 | | | |
| Cadmium | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 70 | 130 | | | |
| Chromium | 0.00494 | 0.00500 | 0.00500 | 0 | 98.7 | 70 | 130 | | | |
| Cobalt | 0.00514 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Lead | 0.000931 | 0.00100 | 0.00100 | 0 | 93.1 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Molybdenum | 0.00461 | 0.00500 | 0.00500 | 0 | 92.2 | 70 | 130 | | | |
| Selenium | 0.00587 | 0.00500 | 0.00500 | 0 | 117 | 70 | 130 | | | |
| Thallium | 0.000962 | 0.00150 | 0.00100 | 0 | 96.2 | 70 | 130 | | | |

| Sample ID **CCV13-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/8/2017 12:01:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.209 | 0.00100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Lithium | 0.193 | 0.0100 | 0.200 | 0 | 96.6 | 90 | 110 | | | |
| Molybdenum | 0.196 | 0.00500 | 0.200 | 0 | 98.0 | 90 | 110 | | | |
| Selenium | 0.220 | 0.00500 | 0.200 | 0 | 110 | 90 | 110 | | | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL13-170107** | Batch ID: **R89825** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170107D** | Analysis Date: **1/8/2017 12:05:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00253 | 0.00250 | 0.00200 | 0 | 126 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170107D**

Sample ID **LCVL13-170107** Batch ID: **R89825** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_170107D** Analysis Date: **1/8/2017 12:05:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Barium | 0.00515 | 0.0100 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Beryllium | 0.00124 | 0.00100 | 0.00100 | 0 | 124 | 70 | 130 | | | |
| Cadmium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Chromium | 0.00509 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00540 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Lithium | 0.00977 | 0.0100 | 0.0100 | 0 | 97.7 | 70 | 130 | | | |
| Molybdenum | 0.00501 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Selenium | 0.00649 | 0.00500 | 0.00500 | 0 | 130 | 70 | 130 | | | |
| Thallium | 0.00106 | 0.00150 | 0.00100 | 0 | 106 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170108C**

The QC data in batch 78492 applies to the following samples: 1612275-01A, 1612275-02A, 1612275-03A, 1612275-04A

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID **1612246-04A SD** | Batch ID: **78492** | TestNo: **SW6020A** | Units: **mg/L** | | | | |
| SampType: **SD** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 1:51:00 PM** | Prep Date: **12/28/2016** | | | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 339 | 150 | 0 | 339 | | | | 0.120 | 10 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID **1612246-04A PDS** | Batch ID: **78492** | TestNo: **SW6020A** | Units: **mg/L** | | | | |
| SampType: **PDS** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 2:12:00 PM** | Prep Date: **12/28/2016** | | | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 817 | 30.0 | 5.00 | 339 | 9550 | 80 | 120 | | | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170108C**

| Sample ID **ICV-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 11:44:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.104 | 0.0300 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Calcium | 2.27 | 0.300 | 2.50 | 0 | 90.9 | 90 | 110 | | | |

| Sample ID **LCVL-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 11:49:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0195 | 0.0300 | 0.0200 | 0 | 97.3 | 70 | 130 | | | |
| Calcium | 0.0957 | 0.300 | 0.100 | 0 | 95.7 | 70 | 130 | | | |

| Sample ID **CCV2-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 1:02:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.212 | 0.0300 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Calcium | 4.72 | 0.300 | 5.00 | 0 | 94.5 | 90 | 110 | | | |

| Sample ID **LCVL2-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 1:06:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0189 | 0.0300 | 0.0200 | 0 | 94.3 | 70 | 130 | | | |
| Calcium | 0.0988 | 0.300 | 0.100 | 0 | 98.8 | 70 | 130 | | | |

| Sample ID **CCV3-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 1:41:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.207 | 0.0300 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Calcium | 4.80 | 0.300 | 5.00 | 0 | 95.9 | 90 | 110 | | | |

| Sample ID **LCVL3-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 1:45:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0151 | 0.0300 | 0.0200 | 0 | 75.3 | 70 | 130 | | | |
| Calcium | 0.0987 | 0.300 | 0.100 | 0 | 98.7 | 70 | 130 | | | |

**Qualifiers:**

| | |
|---|---|
| B | Analyte detected in the associated Method Blank |
| J | Analyte detected between MDL and RL |
| ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit |
| J | Analyte detected between SDL and RL |
| DF | Dilution Factor |
| MDL | Method Detection Limit |
| R | RPD outside accepted control limits |
| S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified |

| Sample ID **CCV4-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 2:17:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.79 | 0.300 | 5.00 | 0 | 95.7 | 90 | 110 | | | |

| Sample ID **LCVL4-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 2:21:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0957 | 0.300 | 0.100 | 0 | 95.7 | 70 | 130 | | | |

| Sample ID **CCV11-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 6:44:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.73 | 0.300 | 5.00 | 0 | 94.6 | 90 | 110 | | | |

| Sample ID **LCVL11-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 6:48:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.115 | 0.300 | 0.100 | 0 | 115 | 70 | 130 | | | |

| Sample ID **CCV12-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 7:17:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.65 | 0.300 | 5.00 | 0 | 93.1 | 90 | 110 | | | |

| Sample ID **LCVL12-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 7:21:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170109B**

The QC data in batch 78572 applies to the following samples: 1612275-05A, 1612275-06A, 1612275-07A, 1612275-08A

Sample ID **MB-78572** Batch ID: **78572** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_170109B** Analysis Date: **1/9/2017 12:23:00 PM** Prep Date: **1/4/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-78572** Batch ID: **78572** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_170109B** Analysis Date: **1/9/2017 12:25:00 PM** Prep Date: **1/4/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Beryllium | 0.207 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Calcium | 5.01 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | | | |
| Chromium | 0.210 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 80 | 120 | | | |
| Lithium | 0.210 | 0.0100 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 80 | 120 | | | |

Sample ID **LCSD-78572** Batch ID: **78572** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_170109B** Analysis Date: **1/9/2017 12:27:00 PM** Prep Date: **1/4/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | 0.821 | 15 | |
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.198 | 15 | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | 0.084 | 15 | |
| Beryllium | 0.210 | 0.00100 | 0.200 | 0 | 105 | 80 | 120 | 1.41 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170109B**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **LCSD-78572** | Batch ID: **78572** | TestNo: **SW6020A** | Units: **mg/L** | | |
| SampType: **LCSD** | Run ID: **ICP-MS4_170109B** | Analysis Date: **1/9/2017 12:27:00 PM** | Prep Date: **1/4/2017** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 1.20 | 15 | |
| Calcium | 5.06 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.976 | 15 | |
| Chromium | 0.211 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | 0.425 | 15 | |
| Cobalt | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.253 | 15 | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | 0.813 | 15 | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 80 | 120 | 0.668 | 15 | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | 0.600 | 15 | |
| Selenium | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 80 | 120 | 1.21 | 15 | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | 0.580 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170109B**

| Sample ID **ICV-170109** | Batch ID: **R89854** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_170109B** | Analysis Date: **1/9/2017 10:24:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.101 | 0.00250 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Beryllium | 0.106 | 0.00100 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Cadmium | 0.101 | 0.00100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Calcium | 2.38 | 0.300 | 2.50 | 0 | 95.2 | 90 | 110 | | | |
| Chromium | 0.109 | 0.00500 | 0.100 | 0 | 109 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.100 | 0.00100 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Lithium | 0.0999 | 0.0100 | 0.100 | 0 | 99.9 | 90 | 110 | | | |
| Molybdenum | 0.0978 | 0.00500 | 0.100 | 0 | 97.8 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.0996 | 0.00150 | 0.100 | 0 | 99.6 | 90 | 110 | | | |

| Sample ID **LCVL-170109** | Batch ID: **R89854** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170109B** | Analysis Date: **1/9/2017 10:28:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00196 | 0.00250 | 0.00200 | 0 | 97.9 | 70 | 130 | | | |
| Arsenic | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00484 | 0.0100 | 0.00500 | 0 | 96.7 | 70 | 130 | | | |
| Beryllium | 0.00112 | 0.00100 | 0.00100 | 0 | 112 | 70 | 130 | | | |
| Cadmium | 0.000999 | 0.00100 | 0.00100 | 0 | 99.9 | 70 | 130 | | | |
| Calcium | 0.0978 | 0.300 | 0.100 | 0 | 97.8 | 70 | 130 | | | |
| Chromium | 0.00520 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Cobalt | 0.00516 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Lead | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Lithium | 0.0100 | 0.0100 | 0.0100 | 0 | 100 | 70 | 130 | | | |
| Molybdenum | 0.00506 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Selenium | 0.00528 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Thallium | 0.00101 | 0.00150 | 0.00100 | 0 | 101 | 70 | 130 | | | |

| Sample ID **CCV3-170109** | Batch ID: **R89854** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170109B** | Analysis Date: **1/9/2017 12:08:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.210 | 0.00250 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Arsenic | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.210 | 0.00100 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Cadmium | 0.205 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170109B**

| Sample ID **CCV3-170109** | Batch ID: **R89854** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170109B** | Analysis Date: **1/9/2017 12:08:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.00 | 0.300 | 5.00 | 0 | 99.9 | 90 | 110 | | | |
| Chromium | 0.214 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Cobalt | 0.211 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lithium | 0.212 | 0.0100 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL3-170109** | Batch ID: **R89854** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170109B** | Analysis Date: **1/9/2017 12:16:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00210 | 0.00250 | 0.00200 | 0 | 105 | 70 | 130 | | | |
| Arsenic | 0.00497 | 0.00500 | 0.00500 | 0 | 99.4 | 70 | 130 | | | |
| Barium | 0.00496 | 0.0100 | 0.00500 | 0 | 99.1 | 70 | 130 | | | |
| Beryllium | 0.000938 | 0.00100 | 0.00100 | 0 | 93.8 | 70 | 130 | | | |
| Cadmium | 0.000942 | 0.00100 | 0.00100 | 0 | 94.2 | 70 | 130 | | | |
| Calcium | 0.0971 | 0.300 | 0.100 | 0 | 97.1 | 70 | 130 | | | |
| Chromium | 0.00526 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Cobalt | 0.00514 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Lead | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.00948 | 0.0100 | 0.0100 | 0 | 94.8 | 70 | 130 | | | |
| Molybdenum | 0.00481 | 0.00500 | 0.00500 | 0 | 96.1 | 70 | 130 | | | |
| Selenium | 0.00496 | 0.00500 | 0.00500 | 0 | 99.2 | 70 | 130 | | | |
| Thallium | 0.000989 | 0.00150 | 0.00100 | 0 | 98.9 | 70 | 130 | | | |

| Sample ID **CCV4-170109** | Batch ID: **R89854** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170109B** | Analysis Date: **1/9/2017 12:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.208 | 0.00250 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Arsenic | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Barium | 0.207 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Beryllium | 0.209 | 0.00100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Calcium | 5.14 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Chromium | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170109B**

| Sample ID **CCV4-170109** | Batch ID: **R89854** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170109B** | Analysis Date: **1/9/2017 12:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Selenium | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Thallium | 0.207 | 0.00150 | 0.200 | 0 | 104 | 90 | 110 | | | |

| Sample ID **LCVL4-170109** | Batch ID: **R89854** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170109B** | Analysis Date: **1/9/2017 1:10:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00194 | 0.00250 | 0.00200 | 0 | 97.2 | 70 | 130 | | | |
| Arsenic | 0.00531 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Barium | 0.00489 | 0.0100 | 0.00500 | 0 | 97.8 | 70 | 130 | | | |
| Beryllium | 0.000980 | 0.00100 | 0.00100 | 0 | 98.0 | 70 | 130 | | | |
| Cadmium | 0.000940 | 0.00100 | 0.00100 | 0 | 94.0 | 70 | 130 | | | |
| Calcium | 0.109 | 0.300 | 0.100 | 0 | 109 | 70 | 130 | | | |
| Chromium | 0.00511 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Lead | 0.000998 | 0.00100 | 0.00100 | 0 | 99.8 | 70 | 130 | | | |
| Lithium | 0.0108 | 0.0100 | 0.0100 | 0 | 108 | 70 | 130 | | | |
| Molybdenum | 0.00472 | 0.00500 | 0.00500 | 0 | 94.4 | 70 | 130 | | | |
| Selenium | 0.00560 | 0.00500 | 0.00500 | 0 | 112 | 70 | 130 | | | |
| Thallium | 0.000985 | 0.00150 | 0.00100 | 0 | 98.5 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170111E**

The QC data in batch 78572 applies to the following samples: 1612275-05A, 1612275-06A, 1612275-07A, 1612275-08A

| Sample ID | **MB-78572** | Batch ID: | **78572** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_170111E** | Analysis Date: | **1/11/2017 5:00:00 PM** | Prep Date: | **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

| Sample ID | **LCS-78572** | Batch ID: | **78572** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_170111E** | Analysis Date: | **1/11/2017 5:02:00 PM** | Prep Date: | **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.199 | 0.0300 | 0.200 | 0 | 99.6 | 80 | 120 | | | |

| Sample ID | **LCSD-78572** | Batch ID: | **78572** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_170111E** | Analysis Date: | **1/11/2017 5:04:00 PM** | Prep Date: | **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.187 | 0.0300 | 0.200 | 0 | 93.6 | 80 | 120 | 6.22 | 15 | |

| Sample ID | **1612275-08A SD** | Batch ID: | **78572** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_170111E** | Analysis Date: | **1/11/2017 5:11:00 PM** | Prep Date: | **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0473 | 0.0500 | 0 | 0.0487 | | | | 2.82 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Boron | <0.0500 | 0.150 | 0 | 0.0540 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0.000334 | | | | 0 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.0174 | | | | 0 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1612275-08A PDS** | Batch ID: | **78572** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_170111E** | Analysis Date: | **1/11/2017 5:31:00 PM** | Prep Date: | **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.188 | 0.00250 | 0.200 | 0 | 94.1 | 80 | 120 | | | |
| Arsenic | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 80 | 120 | | | |
| Barium | 0.252 | 0.0100 | 0.200 | 0.0487 | 101 | 80 | 120 | | | |
| Beryllium | 0.192 | 0.00100 | 0.200 | 0 | 96.1 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170111E**

| Sample ID **1612275-08A PDS** | Batch ID: **78572** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 5:31:00 PM** | Prep Date: **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.240 | 0.0300 | 0.200 | 0.0540 | 93.0 | 80 | 120 | | | |
| Cadmium | 0.197 | 0.00100 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Chromium | 0.209 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Cobalt | 0.195 | 0.00500 | 0.200 | 0 | 97.4 | 80 | 120 | | | |
| Lead | 0.195 | 0.00100 | 0.200 | 0.000334 | 97.1 | 80 | 120 | | | |
| Lithium | 0.200 | 0.0100 | 0.200 | 0.0174 | 91.4 | 80 | 120 | | | |
| Molybdenum | 0.196 | 0.00500 | 0.200 | 0 | 97.8 | 80 | 120 | | | |
| Selenium | 0.195 | 0.00500 | 0.200 | 0 | 97.4 | 80 | 120 | | | |
| Thallium | 0.192 | 0.00150 | 0.200 | 0 | 96.0 | 80 | 120 | | | |

| Sample ID **1612275-08A MS** | Batch ID: **78572** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 5:33:00 PM** | Prep Date: **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.208 | 0.00250 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Barium | 0.250 | 0.0100 | 0.200 | 0.0487 | 101 | 80 | 120 | | | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.5 | 80 | 120 | | | |
| Boron | 0.252 | 0.0300 | 0.200 | 0.0540 | 99.0 | 80 | 120 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Chromium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Cobalt | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 80 | 120 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0.000334 | 98.1 | 80 | 120 | | | |
| Lithium | 0.210 | 0.0100 | 0.200 | 0.0174 | 96.3 | 80 | 120 | | | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 80 | 120 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 98.0 | 80 | 120 | | | |

| Sample ID **1612275-08A MSD** | Batch ID: **78572** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 5:35:00 PM** | Prep Date: **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.214 | 0.00250 | 0.200 | 0 | 107 | 80 | 120 | 2.81 | 15 | |
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.988 | 15 | |
| Barium | 0.259 | 0.0100 | 0.200 | 0.0487 | 105 | 80 | 120 | 3.62 | 15 | |
| Beryllium | 0.193 | 0.00100 | 0.200 | 0 | 96.5 | 80 | 120 | 1.05 | 15 | |
| Boron | 0.249 | 0.0300 | 0.200 | 0.0540 | 97.6 | 80 | 120 | 1.06 | 15 | |
| Cadmium | 0.205 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | 2.11 | 15 | |
| Chromium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.134 | 15 | |
| Cobalt | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 80 | 120 | 0.811 | 15 | |
| Lead | 0.196 | 0.00100 | 0.200 | 0.000334 | 98.0 | 80 | 120 | 0.016 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170111E**

| Sample ID **1612275-08A MSD** | Batch ID: **78572** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 5:35:00 PM** | Prep Date: **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.211 | 0.0100 | 0.200 | 0.0174 | 96.6 | 80 | 120 | 0.302 | 15 | |
| Molybdenum | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 3.39 | 15 | |
| Selenium | 0.198 | 0.00500 | 0.200 | 0 | 99.2 | 80 | 120 | 1.59 | 15 | |
| Thallium | 0.198 | 0.00150 | 0.200 | 0 | 98.8 | 80 | 120 | 0.842 | 15 | |

| Sample ID **1612275-08A SD** | Batch ID: **78572** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/12/2017 8:23:00 AM** | Prep Date: **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 12.9 | 15.0 | 0 | 12.5 | | | | 3.21 | 10 | |

| Sample ID **1612275-08A PDS** | Batch ID: **78572** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/12/2017 8:29:00 AM** | Prep Date: **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 169 | 3.00 | 50.0 | 12.5 | 313 | 80 | 120 | | | S |

| Sample ID **1612275-08A MS** | Batch ID: **78572** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/12/2017 8:32:00 AM** | Prep Date: **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 17.6 | 3.00 | 5.00 | 12.5 | 103 | 80 | 120 | | | |

| Sample ID **1612275-08A MSD** | Batch ID: **78572** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/12/2017 8:34:00 AM** | Prep Date: **1/4/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 17.7 | 3.00 | 5.00 | 12.5 | 103 | 80 | 120 | 0.218 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170111E**

| Sample ID **ICV-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 1:37:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.101 | 0.00250 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.0975 | 0.00500 | 0.100 | 0 | 97.5 | 90 | 110 | | | |
| Barium | 0.100 | 0.0100 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.0988 | 0.00100 | 0.100 | 0 | 98.8 | 90 | 110 | | | |
| Boron | 0.0919 | 0.0300 | 0.100 | 0 | 91.9 | 90 | 110 | | | |
| Cadmium | 0.0990 | 0.00100 | 0.100 | 0 | 99.0 | 90 | 110 | | | |
| Chromium | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Cobalt | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.0975 | 0.00100 | 0.100 | 0 | 97.5 | 90 | 110 | | | |
| Lithium | 0.0975 | 0.0100 | 0.100 | 0 | 97.5 | 90 | 110 | | | |
| Molybdenum | 0.0993 | 0.00500 | 0.100 | 0 | 99.3 | 90 | 110 | | | |
| Selenium | 0.0960 | 0.00500 | 0.100 | 0 | 96.0 | 90 | 110 | | | |
| Thallium | 0.0966 | 0.00150 | 0.100 | 0 | 96.6 | 90 | 110 | | | |

| Sample ID **LCVL-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 1:41:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00197 | 0.00250 | 0.00200 | 0 | 98.4 | 70 | 130 | | | |
| Arsenic | 0.00484 | 0.00500 | 0.00500 | 0 | 96.7 | 70 | 130 | | | |
| Barium | 0.00485 | 0.0100 | 0.00500 | 0 | 97.0 | 70 | 130 | | | |
| Beryllium | 0.000892 | 0.00100 | 0.00100 | 0 | 89.2 | 70 | 130 | | | |
| Boron | 0.0156 | 0.0300 | 0.0200 | 0 | 78.2 | 70 | 130 | | | |
| Cadmium | 0.000960 | 0.00100 | 0.00100 | 0 | 96.0 | 70 | 130 | | | |
| Chromium | 0.00459 | 0.00500 | 0.00500 | 0 | 91.7 | 70 | 130 | | | |
| Cobalt | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lead | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Molybdenum | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Selenium | 0.00471 | 0.00500 | 0.00500 | 0 | 94.2 | 70 | 130 | | | |
| Thallium | 0.00100 | 0.00150 | 0.00100 | 0 | 100 | 70 | 130 | | | |

| Sample ID **CCV3-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 4:55:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.208 | 0.00250 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 90 | 110 | | | |
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170111E**

| Sample ID **CCV3-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 4:55:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.205 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.6 | 90 | 110 | | | |
| Lithium | 0.203 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Selenium | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.6 | 90 | 110 | | | |

| Sample ID **LCVL3-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 4:57:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00218 | 0.00250 | 0.00200 | 0 | 109 | 70 | 130 | | | |
| Arsenic | 0.00511 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00510 | 0.0100 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Beryllium | 0.00112 | 0.00100 | 0.00100 | 0 | 112 | 70 | 130 | | | |
| Boron | 0.0215 | 0.0300 | 0.0200 | 0 | 108 | 70 | 130 | | | |
| Cadmium | 0.00112 | 0.00100 | 0.00100 | 0 | 112 | 70 | 130 | | | |
| Chromium | 0.00465 | 0.00500 | 0.00500 | 0 | 93.1 | 70 | 130 | | | |
| Cobalt | 0.00520 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Lead | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Lithium | 0.0109 | 0.0100 | 0.0100 | 0 | 109 | 70 | 130 | | | |
| Molybdenum | 0.00537 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Selenium | 0.00577 | 0.00500 | 0.00500 | 0 | 115 | 70 | 130 | | | |
| Thallium | 0.00108 | 0.00150 | 0.00100 | 0 | 108 | 70 | 130 | | | |

| Sample ID **CCV4-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 5:37:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.209 | 0.00250 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.4 | 90 | 110 | | | |
| Boron | 0.189 | 0.0300 | 0.200 | 0 | 94.4 | 90 | 110 | | | |
| Cadmium | 0.205 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Lithium | 0.196 | 0.0100 | 0.200 | 0 | 98.1 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

| Sample ID **CCV4-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 5:37:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Selenium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.7 | 90 | 110 | | | |

| Sample ID **LCVL4-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 5:39:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00238 | 0.00250 | 0.00200 | 0 | 119 | 70 | 130 | | | |
| Arsenic | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00513 | 0.0100 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Beryllium | 0.000939 | 0.00100 | 0.00100 | 0 | 93.9 | 70 | 130 | | | |
| Boron | 0.0166 | 0.0300 | 0.0200 | 0 | 83.2 | 70 | 130 | | | |
| Cadmium | 0.00112 | 0.00100 | 0.00100 | 0 | 112 | 70 | 130 | | | |
| Chromium | 0.00475 | 0.00500 | 0.00500 | 0 | 95.0 | 70 | 130 | | | |
| Cobalt | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Lead | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Lithium | 0.0109 | 0.0100 | 0.0100 | 0 | 109 | 70 | 130 | | | |
| Molybdenum | 0.00560 | 0.00500 | 0.00500 | 0 | 112 | 70 | 130 | | | |
| Selenium | 0.00565 | 0.00500 | 0.00500 | 0 | 113 | 70 | 130 | | | |
| Thallium | 0.00115 | 0.00150 | 0.00100 | 0 | 115 | 70 | 130 | | | |

| Sample ID **CCV9-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 9:20:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.72 | 0.300 | 5.00 | 0 | 94.4 | 90 | 110 | | | |

| Sample ID **LCVL9-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/11/2017 9:24:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |

| Sample ID **CCV10-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/12/2017 8:40:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.83 | 0.300 | 5.00 | 0 | 96.5 | 90 | 110 | | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170111E**

| Sample ID **LCVL10-170111** | Batch ID: **R89913** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170111E** | Analysis Date: **1/12/2017 8:44:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0935 | 0.300 | 0.100 | 0 | 93.5 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_170103A**

The QC data in batch 78554 applies to the following samples: 1612275-01D, 1612275-02D, 1612275-03D, 1612275-04D, 1612275-05D, 1612275-06D, 1612275-07D, 1612275-08D

Sample ID **MB-78554** Batch ID: **78554** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_170103A** Analysis Date: **1/3/2017 9:25:23 AM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-78554** Batch ID: **78554** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_170103A** Analysis Date: **1/3/2017 9:39:59 AM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.92 | 1.00 | 10.00 | 0 | 99.2 | 90 | 110 | | | |
| Fluoride | 3.86 | 0.400 | 4.000 | 0 | 96.5 | 90 | 110 | | | |
| Sulfate | 30.6 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | | | |

Sample ID **LCSD-78554** Batch ID: **78554** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_170103A** Analysis Date: **1/3/2017 9:54:36 AM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.97 | 1.00 | 10.00 | 0 | 99.7 | 90 | 110 | 0.450 | 20 | |
| Fluoride | 3.92 | 0.400 | 4.000 | 0 | 98.0 | 90 | 110 | 1.57 | 20 | |
| Sulfate | 30.9 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | 1.09 | 20 | |

Sample ID **1612275-02DMS** Batch ID: **78554** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_170103A** Analysis Date: **1/3/2017 1:09:52 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 273 | 10.0 | 200.0 | 57.22 | 108 | 90 | 110 | | | |
| Fluoride | 203 | 4.00 | 200.0 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 231 | 30.0 | 200.0 | 19.67 | 105 | 90 | 110 | | | |

Sample ID **1612275-02DMSD** Batch ID: **78554** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_170103A** Analysis Date: **1/3/2017 1:24:29 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 273 | 10.0 | 200.0 | 57.22 | 108 | 90 | 110 | 0.224 | 20 | |
| Fluoride | 205 | 4.00 | 200.0 | 0 | 102 | 90 | 110 | 0.866 | 20 | |
| Sulfate | 231 | 30.0 | 200.0 | 19.67 | 106 | 90 | 110 | 0.083 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_170103A**

| Sample ID **ICV-170103** | Batch ID: **R89763** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_170103A** | Analysis Date: **1/3/2017 8:48:31 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.8 | 1.00 | 25.00 | 0 | 103 | 90 | 110 | | | |
| Fluoride | 10.1 | 0.400 | 10.00 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 79.9 | 3.00 | 75.00 | 0 | 106 | 90 | 110 | | | |

| Sample ID **CCV1-170103** | Batch ID: **R89763** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_170103A** | Analysis Date: **1/3/2017 11:55:37 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.1 | 1.00 | 10.00 | 0 | 101 | 90 | 110 | | | |
| Fluoride | 3.97 | 0.400 | 4.000 | 0 | 99.2 | 90 | 110 | | | |
| Sulfate | 31.2 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID **CCV2-170103** | Batch ID: **R89763** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_170103A** | Analysis Date: **1/3/2017 3:28:49 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.1 | 1.00 | 10.00 | 0 | 101 | 90 | 110 | | | |
| Fluoride | 4.07 | 0.400 | 4.000 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 31.0 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_161228A**

The QC data in batch 78491 applies to the following samples: 1612275-01D, 1612275-02D, 1612275-03D, 1612275-04D, 1612275-05D, 1612275-06D, 1612275-07D, 1612275-08D

| Sample ID | **1612275-01D-DUP** | Batch ID: | **78491** | TestNo: | **M4500-H+ B** | Units: | **pH Units@19.3℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **TITRATOR_161228A** | Analysis Date: | **12/28/2016 9:24:00 AM** | Prep Date: | **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.50 | 0 | 0 | 6.430 | | | | 1.08 | 5 | |

| Sample ID | **1612277-01D-DUP** | Batch ID: | **78491** | TestNo: | **M4500-H+ B** | Units: | **pH Units@19.9℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **TITRATOR_161228A** | Analysis Date: | **12/28/2016 9:48:00 AM** | Prep Date: | **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.79 | 0 | 0 | 6.750 | | | | 0.591 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_161228A**

| Sample ID | **ICV-161228** | Batch ID: | **R89686** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.7℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_161228A** | Analysis Date: | **12/28/2016 8:24:00 AM** | Prep Date: | **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.91 | 0 | 10.00 | 0 | 99.1 | 99 | 101 | | | |

| Sample ID | **CCV1-161228** | Batch ID: | **R89686** | TestNo: | **M4500-H+ B** | Units: | **pH Units@20.9℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_161228A** | Analysis Date: | **12/28/2016 9:45:00 AM** | Prep Date: | **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV2-161228** | Batch ID: | **R89686** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.8℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_161228A** | Analysis Date: | **12/28/2016 10:06:00 A** | Prep Date: | **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612275
**Project:** Oak Grove Ash Landfill

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_161227C**

The QC data in batch 78478 applies to the following samples: 1612275-01D, 1612275-02D, 1612275-03D, 1612275-04D, 1612275-05D, 1612275-06D, 1612275-07D, 1612275-08D

| Sample ID | **MB-78478** | Batch ID: | **78478** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_161227C** | Analysis Date: | **12/28/2016 8:41:00 AM** | Prep Date: | **12/27/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-78478** | Batch ID: | **78478** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_161227C** | Analysis Date: | **12/28/2016 8:41:00 AM** | Prep Date: | **12/27/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 750 | 10.0 | 745.6 | 0 | 101 | 90 | 113 | | | |

| Sample ID | **1612246-12D-DUP** | Batch ID: | **78478** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_161227C** | Analysis Date: | **12/28/2016 8:41:00 AM** | Prep Date: | **12/27/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 3990 | 50.0 | 0 | 4125 | | | | 3.45 | 5 | |

| Sample ID | **1612277-01D-DUP** | Batch ID: | **78478** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_161227C** | Analysis Date: | **12/28/2016 8:41:00 AM** | Prep Date: | **12/27/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 915 | 50.0 | 0 | 905.0 | | | | 1.10 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# Case Narrative

## Lab No: 20161290

This report contains the analytical results for the 8 sample(s) received under chain of custody by ESC Lab Sciences on 12/29/2016 1:35:08 PM. These samples are associated with your 1612275 project.

The analytical results included in this report meet all applicable quality control procedure requirements except as noted below:

The test results in this report meet all NELAC requirements unless noted below:

This report shall not be reproduced, except in full, without the written approval of ESC Lab Sciences.

All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client.

Results have been reviewed by the Director of Radiochemistry or their designees and is approved for release.

**Observations / Nonconformances**

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20161290-01** | | | | | | | | |
| **Client ID** : **MW-02** | | | | | | | | |
| **Date Sampled** : **12/21/2016 1:10:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.20 +/- 0.601 | 0.686 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.342 +/- 0.167 | 0.183 | pCi/l | | 01/19/17 | 01/24/17 | AK |
| Radium-228 | EPA 904*/9320* | 1.86 +/- 0.434 | 0.503 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161290-02** | | | | | | | | |
| **Client ID** : **AL-10** | | | | | | | | |
| **Date Sampled** : **12/22/2016 9:30:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.06 +/- 0.701 | 0.853 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.467 +/- 0.173 | 0.156 | pCi/l | | 01/19/17 | 01/24/17 | AK |
| Radium-228 | EPA 904*/9320* | 1.59 +/- 0.528 | 0.697 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161290-03** | | | | | | | | |
| **Client ID** : **MW-09** | | | | | | | | |
| **Date Sampled** : **12/22/2016 10:35:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.62 +/- 0.747 | 0.866 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.935 +/- 0.219 | 0.159 | pCi/l | | 01/20/17 | 01/27/17 | AK |
| Radium-228 | EPA 904*/9320* | 1.68 +/- 0.528 | 0.707 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161290-04** | | | | | | | | |
| **Client ID** : **MW-08R** | | | | | | | | |
| **Date Sampled** : **12/22/2016 11:45:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.21 +/- 0.721 | 0.875 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.604 +/- 0.204 | 0.161 | pCi/l | | 01/20/17 | 01/27/17 | AK |
| Radium-228 | EPA 904*/9320* | 1.61 +/- 0.517 | 0.714 | pCi/l | | 01/23/17 | 01/26/17 | JR |

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20161290-05** | | | | | | | | |
| **Client ID** : **MW-05** | | | | | | | | |
| **Date Sampled** : **12/22/2016 3:15:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 0.450 +/- 0.656 | 0.942 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.146 +/- 0.181 | 0.270 | pCi/l | | 01/20/17 | 01/27/17 | AK |
| Radium-228 | EPA 904*/9320* | 0.304 +/- 0.475 | 0.672 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161290-06** | | | | | | | | |
| **Client ID** : **DUP-01** | | | | | | | | |
| **Date Sampled** : **12/22/2016 3:15:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 0.040 +/- 0.713 | 1.11 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.040 +/- 0.205 | 0.337 | pCi/l | | 01/20/17 | 01/27/17 | AK |
| Radium-228 | EPA 904*/9320* | -0.055 +/- 0.508 | 0.775 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161290-07** | | | | | | | | |
| **Client ID** : **EB-1** | | | | | | | | |
| **Date Sampled** : **12/22/2016 4:45:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.18 +/- 0.622 | 0.781 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.402 +/- 0.176 | 0.160 | pCi/l | | 01/20/17 | 01/27/17 | AK |
| Radium-228 | EPA 904*/9320* | 0.774 +/- 0.446 | 0.621 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161290-08** | | | | | | | | |
| **Client ID** : **MW-07** | | | | | | | | |
| **Date Sampled** : **12/22/2016 2:25:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 0.457 +/- 0.530 | 0.734 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.108 +/- 0.157 | 0.245 | pCi/l | | 01/20/17 | 01/27/17 | AK |
| Radium-228 | EPA 904*/9320* | 0.349 +/- 0.373 | 0.489 | pCi/l | | 01/23/17 | 01/26/17 | JR |

| | | |
|---|---|---|
| Client | : | DHL Analytical, Inc. |
| Client Project | : | 1612275 |
| Lab Number | : | 20161290 |
| Date Reported | : | 01/31/17 |
| Date Received | : | 12/29/16 |
| Page Number | : | 4 of 4 |

# QC Report

| Parameter | Blank | LCS %REC | LCSD %REC | LCSD RPD | DUP RPD | RER, NAD or DER | MS %REC | MSD %REC | MSD RPD | Batch ID |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.009 | 107.0 | | | NC | 1.140 | 123.0 | 125.0 | 1.9 | R1182 |
| Radium-226 | 0.002 | 103.0 | | | NC | 0.547 | 94.2 | 108.0 | 13.6 | R1181 |
| Radium-228 | -0.276 | 83.3 | | | NC | 0.521 | 77.1 | 73.4 | 4.8 | R3912 |

**Lab Approval:**

Ron Eidson
Director of Radiochemistry

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1612275

**Subcontractor:**

ESC Laboratory
311 North Aspen
Broken Arrow, Oklahoma 74012

TEL: (918) 251-2515
FAX:
Acct #: DHLRRTX

27-Dec-16

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E904.0 | SM7500Ra-B M | | | | |
| MW-02 | Aqueous | -01B | 12/21/16 01:10 PM | 1LHDPEHNO3 | 1 | | | | | |
| MW-02 | Aqueous | -01C | 12/21/16 01:10 PM | 500HDPEHNO3 | | 1 | | | | |
| AL-10 | Aqueous | -02B | 12/22/16 09:30 AM | 1LHDPEHNO3 | 1 | | | | | |
| AL-10 | Aqueous | -02C | 12/22/16 09:30 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-09 | Aqueous | -03B | 12/22/16 10:35 AM | 1LHDPEHNO3 | 1 | | | | | |
| MW-09 | Aqueous | -03C | 12/22/16 10:35 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-08R | Aqueous | -04B | 12/22/16 11:45 AM | 1LHDPEHNO3 | 1 | | | | | |
| MW-08R | Aqueous | -04C | 12/22/16 11:45 AM | 500HDPEHNO3 | | 1 | | | | |
| MW-05 | Aqueous | -05B | 12/22/16 03:15 PM | 1LHDPEHNO3 | 1 | | | | | |
| MW-05 | Aqueous | -05C | 12/22/16 03:15 PM | 500HDPEHNO3 | | 1 | | | | |
| DUP-01 | Aqueous | -06B | 12/22/16 03:15 PM | 1LHDPEHNO3 | 1 | | | | | |
| DUP-01 | Aqueous | -06C | 12/22/16 03:15 PM | 500HDPEHNO3 | | 1 | | | | |
| EB-1 | Equip Blank | -07B | 12/22/16 04:45 PM | 1LHDPEHNO3 | 1 | | | | | |
| EB-1 | Equip Blank | -07C | 12/22/16 04:45 PM | 500HDPEHNO3 | | 1 | | | | |
| MW-07 | Aqueous | -08B | 12/22/16 02:25 PM | 1LHDPEHNO3 | 1 | | | | | |
| MW-07 | Aqueous | -08C | 12/22/16 02:25 PM | 500HDPEHNO3 | | 1 | | | | |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

761290
L881420

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | Barker | 12/27/16 1730 | **Received by:** | Loresta | 12/27/16 1730 |
| **Relinquished by:** | | | **Received by:** | | 12/29/16 1335 |

# SAMPLE LOGIN

**Date Received:** *12/29/2016 1:35:0* **Lab Number:** **20161290** **Due:** **1/27/2017**

| Sample Number | Client Sample ID | Matrix | Date Sampled | Container Type | Container Size | Preservation | Preserved Upon Receipt | Custody Seal | Seal Intact |
|---|---|---|---|---|---|---|---|---|---|
| **20161290-01 B** | MW-02 | NPW | 12/21/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161290-01 A** | MW-02 | NPW | 12/21/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161290-02 A** | AL-10 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161290-02 B** | AL-10 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161290-03 A** | MW-09 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161290-03 B** | MW-09 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161290-04 B** | MW-08R | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161290-04 A** | MW-08R | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161290-05 B** | MW-05 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161290-05 A** | MW-05 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161290-06 A** | DUP-01 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161290-06 B** | DUP-01 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161290-07 A** | EB-1 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161290-07 B** | EB-1 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **20161290-08 B** | MW-07 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ✓ | Yes | Yes |
| **20161290-08 A** | MW-07 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ✓ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |

**CONTAINER INSPECTION**

**# Coolers** 2 **Custody Seals Broken** Ø **Temperature:** 4.6 °C **Ice** **Radiation Survey:** <300 cpm

**SAMPLE INSPECTION**

**Sample Seal Broken** Ø **Chain of Custody Record** ✓ **Labels in Tact** ✓ **Radiation Survey Complete** N/A

**Anomalies**

**Inspected By:** _____ **DATE** 12/29/16

**QA or Designee Review:** Raymond Thomas **DATE** 12/29/16

**Sample Custodian Review:** Christen Howard **DATE** 12/29/16

**Project Notes:**

January 31, 2017

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1612277

RE: Oak Grove FGD Pond Area

Dear Will Vienne:

DHL Analytical, Inc. received 9 sample(s) on 12/23/2016 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-16-17

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**Subcontract Report 1612277** ..... 40

DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# № 73694
# CHAIN-OF-CUSTODY

CLIENT: PBW
ADDRESS: 2201 Double Creek Drive Suite 4004
PHONE: 512 671 3434 FAX/E-MAIL: 512 671 3446
DATA REPORTED TO: Will Vienne
ADDITIONAL REPORT COPIES TO:

DATE: 12/22/16 PAGE 1 OF 1
PO #: 5164-D DHL WORK ORDER #: 1612277
PROJECT LOCATION OR NAME: OAK GROVE FGD POND AREA
CLENT PROJECT #: 5164-D COLLECTOR: CHRIS KAKOLEWSKI

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ | RCRA ☐ TX11 ☐ ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | CCR

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | CCR | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 01 | 12/22/16 | 915 | W | P | 4 | | 3 | | X | 1 | X | |
| FGD-4 | 02 | 12/22/16 | 1025 | W | P | 4 | | 3 | | X | 1 | X | |
| FGD-2 | 03 | 12/22/16 | 1130 | W | P | 4 | | 3 | | X | 1 | X | |
| FGD-5 | 04 | 12/22/16 | 1225 | W | P | 4 | | 3 | | X | 1 | X | |
| FGD-1 | 05 | 12/22/16 | 1325 | W | P | 4 | | 3 | | X | 1 | X | |
| ~~MW-07~~ | | ~~12/22/16~~ | ~~1425~~ | ~~W~~ | ~~P~~ | ~~4~~ | | ~~3~~ | | ~~X~~ | ~~1~~ | X | CK |
| FGD-3 | 06 | 12/22/16 | 1525 | W | P | 4 | | 3 | | X | 1 | X | |
| ~~DUP-01~~ | | ~~12/22/16~~ | ~~1010~~ | ~~W~~ | ~~P~~ | ~~4~~ | | ~~3~~ | | ~~X~~ | ~~1~~ | X | CK |
| ~~DUP-02~~ | | ~~12/22/16~~ | ~~1310~~ | ~~W~~ | ~~P~~ | ~~4~~ | | ~~3~~ | | ~~X~~ | ~~1~~ | X | CK |
| FGD-8 | 07 | 12/23/16 | 0820 | W | P | 4 | | 3 | | X | 1 | X | |
| FGD-12 | 08 | 12/23/16 | 0930 | W | P | 4 | | 3 | | X | 1 | X | |
| FGD-11 | 09 | 12/22/16 | 1625 | W | P | 4 | | 3 | | X | 1 | X | |

RELINQUISHED BY: (Signature) Chris Kakolewski DATE/TIME 12/23/16 1440 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

☐ DHL DISPOSAL @ $5.00 each ☐ Return

**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 0.1, 0.2, 0.1 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☐ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☒ HAND DELIVERED

## John Dupont

**From:** Sara Taube [Sara.Taube@pbwllc.com]
**Sent:** Wednesday, July 22, 2015 12:05 PM
**To:** John Dupont
**Subject:** CCR Appendix III and IV
**Follow Up Flag:** Follow up
**Flag Status:** Completed

Hi John,

Here are the Appendix III and Appendix IV constituents that we will need to have analyzed under the CCR Rule.

**Appendix III**
Boron
Calcium
Chloride
Fluoride
pH
sulfate
TDS

**Appendix IV**
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228

We are looking to have approximately 74 wells sampled 8 times over the course of the next two years. Please let me know if there is any more information you might need.

Cheers,

Sara

10/26/2015

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Pastor, Behling & Wheeler** Date Received: **12/23/2016**

Work Order Number **1612277** Received by **AL**

Checklist completed by: Signature 12/27/2016 Date Reviewed by Initials 12/27/2016 Date

Carrier name Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 0.1 °C, 0.2, 0.1 |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 8086 |
| | Adjusted? NO | | Checked by |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *31-Jan-17*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Oak Grove FGD Pond Area
**Lab Order:** 1612277

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M4500-H+ B - pH of a Water Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904/9320 and SM 7500 Ra B M. Analyzed at ESC Lab Sciences.

## LOG IN

The samples were received and log-in performed on 12/23/16. A total of 9 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 1/8/17 the matrix spike recovery was slightly below control limits for Calcium. This is flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

For Metals analysis performed on 1/8/17 the PDS recovery was below control limits for Calcium. This is flagged accordingly. The serial dilution was within control limits for this analyte. No further corrective actions were taken.

For Metals analysis performed on 1/8/17 the RPD for the serial dilution was slightly above control limits for Lithium. This is flagged accordingly. The PDS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *31-Jan-17*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Oak Grove FGD Pond Area
**Lab Order:** 1612277

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1612277-01 | FGD-6 | | 12/22/16 09:15 AM | 12/23/2016 |
| 1612277-02 | FGD-4 | | 12/22/16 10:25 AM | 12/23/2016 |
| 1612277-03 | FGD-2 | | 12/22/16 11:30 AM | 12/23/2016 |
| 1612277-04 | FGD-5 | | 12/22/16 12:25 PM | 12/23/2016 |
| 1612277-05 | FGD-1 | | 12/22/16 01:25 PM | 12/23/2016 |
| 1612277-06 | FGD-3 | | 12/22/16 03:25 PM | 12/23/2016 |
| 1612277-07 | FGD-8 | | 12/23/16 08:20 AM | 12/23/2016 |
| 1612277-08 | FGD-12 | | 12/23/16 09:30 AM | 12/23/2016 |
| 1612277-09 | FGD-11 | | 12/22/16 04:25 PM | 12/23/2016 |

**Lab Order:** 1612277
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove FGD Pond Area

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1612277-01A | FGD-6 | 12/22/16 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-6 | 12/22/16 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-6 | 12/22/16 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-6 | 12/22/16 09:15 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/29/16 09:04 AM | 78517 |
| 1612277-01D | FGD-6 | 12/22/16 09:15 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-6 | 12/22/16 09:15 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-6 | 12/22/16 09:15 AM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | FGD-6 | 12/22/16 09:15 AM | Aqueous | M2540C | TDS Preparation | 12/27/16 03:09 PM | 78478 |
| 1612277-02A | FGD-4 | 12/22/16 10:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-4 | 12/22/16 10:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-4 | 12/22/16 10:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-4 | 12/22/16 10:25 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/29/16 09:04 AM | 78517 |
| 1612277-02D | FGD-4 | 12/22/16 10:25 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-4 | 12/22/16 10:25 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-4 | 12/22/16 10:25 AM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | FGD-4 | 12/22/16 10:25 AM | Aqueous | M2540C | TDS Preparation | 12/29/16 03:29 PM | 78513 |
| 1612277-03A | FGD-2 | 12/22/16 11:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-2 | 12/22/16 11:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-2 | 12/22/16 11:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-2 | 12/22/16 11:30 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/29/16 09:04 AM | 78517 |
| 1612277-03D | FGD-2 | 12/22/16 11:30 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-2 | 12/22/16 11:30 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-2 | 12/22/16 11:30 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-2 | 12/22/16 11:30 AM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | FGD-2 | 12/22/16 11:30 AM | Aqueous | M2540C | TDS Preparation | 12/29/16 03:29 PM | 78513 |
| 1612277-04A | FGD-5 | 12/22/16 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-5 | 12/22/16 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-5 | 12/22/16 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |

**Lab Order:** 1612277
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove FGD Pond Area

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1612277-04A | FGD-5 | 12/22/16 12:25 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/29/16 09:04 AM | 78517 |
| 1612277-04D | FGD-5 | 12/22/16 12:25 PM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-5 | 12/22/16 12:25 PM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-5 | 12/22/16 12:25 PM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | FGD-5 | 12/22/16 12:25 PM | Aqueous | M2540C | TDS Preparation | 12/29/16 03:29 PM | 78513 |
| 1612277-05A | FGD-1 | 12/22/16 01:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-1 | 12/22/16 01:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-1 | 12/22/16 01:25 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/29/16 09:04 AM | 78517 |
| 1612277-05D | FGD-1 | 12/22/16 01:25 PM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-1 | 12/22/16 01:25 PM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | FGD-1 | 12/22/16 01:25 PM | Aqueous | M2540C | TDS Preparation | 12/29/16 03:29 PM | 78513 |
| 1612277-06A | FGD-3 | 12/22/16 03:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-3 | 12/22/16 03:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-3 | 12/22/16 03:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-3 | 12/22/16 03:25 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/29/16 09:04 AM | 78517 |
| 1612277-06D | FGD-3 | 12/22/16 03:25 PM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-3 | 12/22/16 03:25 PM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-3 | 12/22/16 03:25 PM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | FGD-3 | 12/22/16 03:25 PM | Aqueous | M2540C | TDS Preparation | 12/29/16 03:29 PM | 78513 |
| 1612277-07A | FGD-8 | 12/23/16 08:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-8 | 12/23/16 08:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-8 | 12/23/16 08:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-8 | 12/23/16 08:20 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/29/16 09:04 AM | 78517 |
| 1612277-07D | FGD-8 | 12/23/16 08:20 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-8 | 12/23/16 08:20 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-8 | 12/23/16 08:20 AM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | FGD-8 | 12/23/16 08:20 AM | Aqueous | M2540C | TDS Preparation | 12/29/16 03:29 PM | 78513 |
| 1612277-08A | FGD-12 | 12/23/16 09:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |

**Lab Order:** 1612277
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove FGD Pond Area

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1612277-08A | FGD-12 | 12/23/16 09:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-12 | 12/23/16 09:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-12 | 12/23/16 09:30 AM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/29/16 09:04 AM | 78517 |
| 1612277-08D | FGD-12 | 12/23/16 09:30 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-12 | 12/23/16 09:30 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-12 | 12/23/16 09:30 AM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-12 | 12/23/16 09:30 AM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | FGD-12 | 12/23/16 09:30 AM | Aqueous | M2540C | TDS Preparation | 12/29/16 03:29 PM | 78513 |
| 1612277-09A | FGD-11 | 12/22/16 04:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-11 | 12/22/16 04:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-11 | 12/22/16 04:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 01/03/17 10:40 AM | 78561 |
| | FGD-11 | 12/22/16 04:25 PM | Aqueous | SW7470A | Mercury Aq Prep, Total | 12/29/16 09:04 AM | 78517 |
| 1612277-09D | FGD-11 | 12/22/16 04:25 PM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-11 | 12/22/16 04:25 PM | Aqueous | E300 | Anion Preparation | 01/04/17 09:03 AM | 78574 |
| | FGD-11 | 12/22/16 04:25 PM | Aqueous | M4500-H+ B | pH Preparation | 12/28/16 08:16 AM | 78491 |
| | FGD-11 | 12/22/16 04:25 PM | Aqueous | M2540C | TDS Preparation | 12/29/16 03:29 PM | 78513 |

**Lab Order:** 1612277
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1612277-01A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 78517 | 1 | 12/30/16 11:11 AM | CETAC2_HG_161230B |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/08/17 04:49 PM | ICP-MS4_170108C |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 10 | 01/09/17 11:50 AM | ICP-MS4_170109B |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/10/17 11:55 AM | ICP-MS4_170110C |
| 1612277-01D | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 78574 | 1 | 01/04/17 10:27 AM | IC2_170104A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 78574 | 10 | 01/04/17 12:44 PM | IC2_170104A |
| | FGD-6 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:43 AM | TITRATOR_161228A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 78478 | 1 | 12/28/16 08:41 AM | WC_161227C |
| 1612277-02A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 78517 | 1 | 12/30/16 11:13 AM | CETAC2_HG_161230B |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/10/17 11:51 AM | ICP-MS4_170110C |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/08/17 04:45 PM | ICP-MS4_170108C |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 10 | 01/09/17 11:46 AM | ICP-MS4_170109B |
| 1612277-02D | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 78574 | 1 | 01/04/17 10:41 AM | IC2_170104A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 78574 | 10 | 01/04/17 02:00 PM | IC2_170104A |
| | FGD-4 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:49 AM | TITRATOR_161228A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 78513 | 1 | 12/30/16 08:43 AM | WC_161229B |
| 1612277-03A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 78517 | 1 | 12/30/16 11:15 AM | CETAC2_HG_161230B |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/08/17 04:51 PM | ICP-MS4_170108C |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/10/17 11:57 AM | ICP-MS4_170110C |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 50 | 01/09/17 11:52 AM | ICP-MS4_170109B |
| 1612277-03D | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 78574 | 1 | 01/04/17 10:56 AM | IC2_170104A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 78574 | 10 | 01/04/17 02:15 PM | IC2_170104A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 78574 | 100 | 01/04/17 04:04 PM | IC2_170104A |
| | FGD-2 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:51 AM | TITRATOR_161228A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 78513 | 1 | 12/30/16 08:43 AM | WC_161229B |
| 1612277-04A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 78517 | 1 | 12/30/16 11:18 AM | CETAC2_HG_161230B |

**Lab Order:** 1612277
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1612277-04A | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/08/17 04:53 PM | ICP-MS4_170108C |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 10 | 01/09/17 11:54 AM | ICP-MS4_170109B |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/10/17 11:59 AM | ICP-MS4_170110C |
| 1612277-04D | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 78574 | 1 | 01/04/17 11:10 AM | IC2_170104A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 78574 | 100 | 01/04/17 02:29 PM | IC2_170104A |
| | FGD-5 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:52 AM | TITRATOR_161228A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 78513 | 1 | 12/30/16 08:43 AM | WC_161229B |
| 1612277-05A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 78517 | 1 | 12/30/16 11:20 AM | CETAC2_HG_161230B |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/08/17 04:55 PM | ICP-MS4_170108C |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/10/17 12:01 PM | ICP-MS4_170110C |
| 1612277-05D | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 78574 | 1 | 01/04/17 11:25 AM | IC2_170104A |
| | FGD-1 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:55 AM | TITRATOR_161228A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 78513 | 1 | 12/30/16 08:43 AM | WC_161229B |
| 1612277-06A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 78517 | 1 | 12/30/16 11:22 AM | CETAC2_HG_161230B |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/08/17 04:57 PM | ICP-MS4_170108C |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 10 | 01/09/17 11:56 AM | ICP-MS4_170109B |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/10/17 12:03 PM | ICP-MS4_170110C |
| 1612277-06D | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 78574 | 10 | 01/04/17 02:44 PM | IC2_170104A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 78574 | 1 | 01/04/17 11:40 AM | IC2_170104A |
| | FGD-3 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:57 AM | TITRATOR_161228A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 78513 | 1 | 12/30/16 08:43 AM | WC_161229B |
| 1612277-07A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 78517 | 1 | 12/30/16 11:25 AM | CETAC2_HG_161230B |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/08/17 04:59 PM | ICP-MS4_170108C |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 100 | 01/09/17 11:58 AM | ICP-MS4_170109B |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/10/17 12:05 PM | ICP-MS4_170110C |
| 1612277-07D | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 78574 | 1 | 01/04/17 11:54 AM | IC2_170104A |

**Lab Order:** 1612277
**Client:** Pastor, Behling & Wheeler
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1612277-07D | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 78574 | 100 | 01/04/17 02:59 PM | IC2_170104A |
| | FGD-8 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 09:59 AM | TITRATOR_161228A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 78513 | 1 | 12/30/16 08:43 AM | WC_161229B |
| 1612277-08A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 78517 | 1 | 12/30/16 11:27 AM | CETAC2_HG_161230B |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/08/17 05:01 PM | ICP-MS4_170108C |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 100 | 01/09/17 12:00 PM | ICP-MS4_170109B |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/10/17 12:07 PM | ICP-MS4_170110C |
| 1612277-08D | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 78574 | 1 | 01/04/17 12:09 PM | IC2_170104A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 78574 | 100 | 01/04/17 03:13 PM | IC2_170104A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 78574 | 10 | 01/04/17 03:50 PM | IC2_170104A |
| | FGD-12 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 10:01 AM | TITRATOR_161228A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 78513 | 1 | 12/30/16 08:43 AM | WC_161229B |
| 1612277-09A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 78517 | 1 | 12/30/16 11:29 AM | CETAC2_HG_161230B |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/08/17 05:03 PM | ICP-MS4_170108C |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 100 | 01/09/17 12:02 PM | ICP-MS4_170109B |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 78561 | 1 | 01/10/17 12:09 PM | ICP-MS4_170110C |
| 1612277-09D | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 78574 | 1 | 01/04/17 12:23 PM | IC2_170104A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 78574 | 100 | 01/04/17 03:28 PM | IC2_170104A |
| | FGD-11 | Aqueous | M4500-H+ B | pH | 78491 | 1 | 12/28/16 10:03 AM | TITRATOR_161228A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 78513 | 1 | 12/30/16 08:43 AM | WC_161229B |

# DHL Analytical, Inc.

**Date:** *31-Jan-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-6 |
| **Project:** | Oak Grove FGD Pond Area | **Lab ID:** | 1612277-01 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 09:15 AM |
| **Lab Order:** | 1612277 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/30/16 11:11 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/08/17 04:49 PM |
| Arsenic | 0.00458 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/08/17 04:49 PM |
| Barium | 0.129 | 0.00300 | 0.0100 | | mg/L | 1 | 01/08/17 04:49 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:49 PM |
| Boron | 0.0847 | 0.0100 | 0.0300 | | mg/L | 1 | 01/10/17 11:55 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:49 PM |
| Calcium | 35.6 | 1.00 | 3.00 | | mg/L | 10 | 01/09/17 11:50 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:49 PM |
| Cobalt | 0.00352 | 0.00300 | 0.00500 | J | mg/L | 1 | 01/08/17 04:49 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:49 PM |
| Lithium | 0.0102 | 0.00500 | 0.0100 | | mg/L | 1 | 01/08/17 04:49 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:49 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:49 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/08/17 04:49 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 286 | 3.00 | 10.0 | | mg/L | 10 | 01/04/17 12:44 PM |
| Fluoride | 0.204 | 0.100 | 0.400 | J | mg/L | 1 | 01/04/17 10:27 AM |
| Sulfate | 64.4 | 1.00 | 3.00 | | mg/L | 1 | 01/04/17 10:27 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.75 | 0 | 0 | | pH Units@19.5℃ | 1 | 12/28/16 09:43 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 905 | 50.0 | 50.0 | | mg/L | 1 | 12/28/16 08:41 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *31-Jan-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-4 |
| **Project:** | Oak Grove FGD Pond Area | **Lab ID:** | 1612277-02 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 10:25 AM |
| **Lab Order:** | 1612277 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/30/16 11:13 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/08/17 04:45 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:45 PM |
| Barium | 0.114 | 0.00300 | 0.0100 | | mg/L | 1 | 01/08/17 04:45 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:45 PM |
| Boron | 0.0628 | 0.0100 | 0.0300 | | mg/L | 1 | 01/10/17 11:51 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:45 PM |
| Calcium | 44.5 | 1.00 | 3.00 | | mg/L | 10 | 01/09/17 11:46 AM |
| Chromium | 0.00230 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/08/17 04:45 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/08/17 04:45 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:45 PM |
| Lithium | 0.0273 | 0.00500 | 0.0100 | | mg/L | 1 | 01/08/17 04:45 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:45 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:45 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/08/17 04:45 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 181 | 3.00 | 10.0 | | mg/L | 10 | 01/04/17 02:00 PM |
| Fluoride | 0.251 | 0.100 | 0.400 | J | mg/L | 1 | 01/04/17 10:41 AM |
| Sulfate | 65.4 | 1.00 | 3.00 | | mg/L | 1 | 01/04/17 10:41 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.71 | 0 | 0 | | pH Units@20℃ | 1 | 12/28/16 09:49 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 676 | 10.0 | 10.0 | | mg/L | 1 | 12/30/16 08:43 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *31-Jan-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-2 |
| **Project:** | Oak Grove FGD Pond Area | **Lab ID:** | 1612277-03 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 11:30 AM |
| **Lab Order:** | 1612277 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/30/16 11:15 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/08/17 04:51 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:51 PM |
| Barium | 0.158 | 0.00300 | 0.0100 | | mg/L | 1 | 01/08/17 04:51 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:51 PM |
| Boron | 0.251 | 0.0100 | 0.0300 | | mg/L | 1 | 01/10/17 11:57 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:51 PM |
| Calcium | 95.3 | 5.00 | 15.0 | | mg/L | 50 | 01/09/17 11:52 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:51 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/08/17 04:51 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:51 PM |
| Lithium | 0.0217 | 0.00500 | 0.0100 | | mg/L | 1 | 01/08/17 04:51 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:51 PM |
| Selenium | 0.0220 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:51 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/08/17 04:51 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 570 | 30.0 | 100 | | mg/L | 100 | 01/04/17 04:04 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 01/04/17 10:56 AM |
| Sulfate | 174 | 10.0 | 30.0 | | mg/L | 10 | 01/04/17 02:15 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.62 | 0 | 0 | | pH Units@19.8℃ | 1 | 12/28/16 09:51 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1450 | 50.0 | 50.0 | | mg/L | 1 | 12/30/16 08:43 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *31-Jan-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-5 |
| **Project:** | Oak Grove FGD Pond Area | **Lab ID:** | 1612277-04 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 12:25 PM |
| **Lab Order:** | 1612277 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/30/16 11:18 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/08/17 04:53 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:53 PM |
| Barium | 0.261 | 0.00300 | 0.0100 | | mg/L | 1 | 01/08/17 04:53 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:53 PM |
| Boron | 0.0982 | 0.0100 | 0.0300 | | mg/L | 1 | 01/10/17 11:59 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:53 PM |
| Calcium | 90.6 | 1.00 | 3.00 | | mg/L | 10 | 01/09/17 11:54 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:53 PM |
| Cobalt | 0.00471 | 0.00300 | 0.00500 | J | mg/L | 1 | 01/08/17 04:53 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:53 PM |
| Lithium | 0.152 | 0.00500 | 0.0100 | | mg/L | 1 | 01/08/17 04:53 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:53 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:53 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/08/17 04:53 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 301 | 30.0 | 100 | | mg/L | 100 | 01/04/17 02:29 PM |
| Fluoride | 0.291 | 0.100 | 0.400 | J | mg/L | 1 | 01/04/17 11:10 AM |
| Sulfate | 65.5 | 1.00 | 3.00 | | mg/L | 1 | 01/04/17 11:10 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.46 | 0 | 0 | | pH Units@19.7℃ | 1 | 12/28/16 09:52 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 893 | 10.0 | 10.0 | | mg/L | 1 | 12/30/16 08:43 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *31-Jan-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-1 |
| **Project:** | Oak Grove FGD Pond Area | **Lab ID:** | 1612277-05 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 01:25 PM |
| **Lab Order:** | 1612277 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/30/16 11:20 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/08/17 04:55 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:55 PM |
| Barium | 0.0418 | 0.00300 | 0.0100 | | mg/L | 1 | 01/08/17 04:55 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:55 PM |
| Boron | 0.0580 | 0.0100 | 0.0300 | | mg/L | 1 | 01/10/17 12:01 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:55 PM |
| Calcium | 13.7 | 0.100 | 0.300 | | mg/L | 1 | 01/08/17 04:55 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:55 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/08/17 04:55 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:55 PM |
| Lithium | 0.0385 | 0.00500 | 0.0100 | | mg/L | 1 | 01/08/17 04:55 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:55 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:55 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/08/17 04:55 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 42.6 | 0.300 | 1.00 | | mg/L | 1 | 01/04/17 11:25 AM |
| Fluoride | 0.326 | 0.100 | 0.400 | J | mg/L | 1 | 01/04/17 11:25 AM |
| Sulfate | 49.3 | 1.00 | 3.00 | | mg/L | 1 | 01/04/17 11:25 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.27 | 0 | 0 | | pH Units@20℃ | 1 | 12/28/16 09:55 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 271 | 10.0 | 10.0 | | mg/L | 1 | 12/30/16 08:43 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *31-Jan-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-3 |
| **Project:** | Oak Grove FGD Pond Area | **Lab ID:** | 1612277-06 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 03:25 PM |
| **Lab Order:** | 1612277 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/30/16 11:22 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/08/17 04:57 PM |
| Arsenic | 0.00226 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/08/17 04:57 PM |
| Barium | 0.0437 | 0.00300 | 0.0100 | | mg/L | 1 | 01/08/17 04:57 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:57 PM |
| Boron | 0.196 | 0.0100 | 0.0300 | | mg/L | 1 | 01/10/17 12:03 PM |
| Cadmium | 0.00173 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:57 PM |
| Calcium | 82.6 | 1.00 | 3.00 | | mg/L | 10 | 01/09/17 11:56 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:57 PM |
| Cobalt | 0.0266 | 0.00300 | 0.00500 | | mg/L | 1 | 01/08/17 04:57 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:57 PM |
| Lithium | 0.110 | 0.00500 | 0.0100 | | mg/L | 1 | 01/08/17 04:57 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:57 PM |
| Selenium | 0.0245 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:57 PM |
| Thallium | 0.00124 | 0.000500 | 0.00150 | J | mg/L | 1 | 01/08/17 04:57 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 290 | 3.00 | 10.0 | | mg/L | 10 | 01/04/17 02:44 PM |
| Fluoride | 1.32 | 0.100 | 0.400 | | mg/L | 1 | 01/04/17 11:40 AM |
| Sulfate | 392 | 10.0 | 30.0 | | mg/L | 10 | 01/04/17 02:44 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.45 | 0 | 0 | | pH Units@19.9℃ | 1 | 12/28/16 09:57 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 1490 | 50.0 | 50.0 | | mg/L | 1 | 12/30/16 08:43 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *31-Jan-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-8 |
| **Project:** | Oak Grove FGD Pond Area | **Lab ID:** | 1612277-07 |
| **Project No:** | 5164-D | **Collection Date:** | 12/23/16 08:20 AM |
| **Lab Order:** | 1612277 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/30/16 11:25 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/08/17 04:59 PM |
| Arsenic | 0.0119 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:59 PM |
| Barium | 0.894 | 0.00300 | 0.0100 | | mg/L | 1 | 01/08/17 04:59 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:59 PM |
| Boron | 0.0690 | 0.0100 | 0.0300 | | mg/L | 1 | 01/10/17 12:05 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:59 PM |
| Calcium | 340 | 10.0 | 30.0 | | mg/L | 100 | 01/09/17 11:58 AM |
| Chromium | 0.00259 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/08/17 04:59 PM |
| Cobalt | 0.00745 | 0.00300 | 0.00500 | | mg/L | 1 | 01/08/17 04:59 PM |
| Lead | 0.00228 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 04:59 PM |
| Lithium | 0.0185 | 0.00500 | 0.0100 | | mg/L | 1 | 01/08/17 04:59 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 04:59 PM |
| Selenium | 0.00217 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/08/17 04:59 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/08/17 04:59 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 1990 | 30.0 | 100 | | mg/L | 100 | 01/04/17 02:59 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 01/04/17 11:54 AM |
| Sulfate | 144 | 1.00 | 3.00 | | mg/L | 1 | 01/04/17 11:54 AM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.22 | 0 | 0 | | pH Units@20℃ | 1 | 12/28/16 09:59 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 4330 | 50.0 | 50.0 | | mg/L | 1 | 12/30/16 08:43 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *31-Jan-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-12 |
| **Project:** | Oak Grove FGD Pond Area | **Lab ID:** | 1612277-08 |
| **Project No:** | 5164-D | **Collection Date:** | 12/23/16 09:30 AM |
| **Lab Order:** | 1612277 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/30/16 11:27 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/08/17 05:01 PM |
| Arsenic | 0.00938 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 05:01 PM |
| Barium | 0.557 | 0.00300 | 0.0100 | | mg/L | 1 | 01/08/17 05:01 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 05:01 PM |
| Boron | 0.0512 | 0.0100 | 0.0300 | | mg/L | 1 | 01/10/17 12:07 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 05:01 PM |
| Calcium | 260 | 10.0 | 30.0 | | mg/L | 100 | 01/09/17 12:00 PM |
| Chromium | 0.00435 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/08/17 05:01 PM |
| Cobalt | 0.00609 | 0.00300 | 0.00500 | | mg/L | 1 | 01/08/17 05:01 PM |
| Lead | 0.00216 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 05:01 PM |
| Lithium | 0.0755 | 0.00500 | 0.0100 | | mg/L | 1 | 01/08/17 05:01 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 05:01 PM |
| Selenium | 0.00786 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 05:01 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/08/17 05:01 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 1250 | 30.0 | 100 | | mg/L | 100 | 01/04/17 03:13 PM |
| Fluoride | 0.112 | 0.100 | 0.400 | J | mg/L | 1 | 01/04/17 12:09 PM |
| Sulfate | 174 | 10.0 | 30.0 | | mg/L | 10 | 01/04/17 03:50 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.33 | 0 | 0 | | pH Units@20.2℃ | 1 | 12/28/16 10:01 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 3270 | 50.0 | 50.0 | | mg/L | 1 | 12/30/16 08:43 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *31-Jan-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | FGD-11 |
| **Project:** | Oak Grove FGD Pond Area | **Lab ID:** | 1612277-09 |
| **Project No:** | 5164-D | **Collection Date:** | 12/22/16 04:25 PM |
| **Lab Order:** | 1612277 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **AH** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 12/30/16 11:29 AM |
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **CVD** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 01/08/17 05:03 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 05:03 PM |
| Barium | 0.734 | 0.00300 | 0.0100 | | mg/L | 1 | 01/08/17 05:03 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 05:03 PM |
| Boron | 0.125 | 0.0100 | 0.0300 | | mg/L | 1 | 01/10/17 12:09 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 01/08/17 05:03 PM |
| Calcium | 201 | 10.0 | 30.0 | | mg/L | 100 | 01/09/17 12:02 PM |
| Chromium | 0.00258 | 0.00200 | 0.00500 | J | mg/L | 1 | 01/08/17 05:03 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 01/08/17 05:03 PM |
| Lead | 0.000635 | 0.000300 | 0.00100 | J | mg/L | 1 | 01/08/17 05:03 PM |
| Lithium | 0.0124 | 0.00500 | 0.0100 | | mg/L | 1 | 01/08/17 05:03 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 05:03 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 01/08/17 05:03 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 01/08/17 05:03 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **AV** |
| Chloride | 1150 | 30.0 | 100 | | mg/L | 100 | 01/04/17 03:28 PM |
| Fluoride | 0.127 | 0.100 | 0.400 | J | mg/L | 1 | 01/04/17 12:23 PM |
| Sulfate | 89.5 | 1.00 | 3.00 | | mg/L | 1 | 01/04/17 12:23 PM |
| **PH** | | **M4500-H+ B** | | | | | Analyst: **BJT** |
| pH | 6.76 | 0 | 0 | | pH Units@20.4℃ | 1 | 12/28/16 10:03 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **AJH** |
| Total Dissolved Solids (Residue, Filterable) | 2870 | 50.0 | 50.0 | | mg/L | 1 | 12/30/16 08:43 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_161230B**

The QC data in batch 78517 applies to the following samples: 1612277-01A, 1612277-02A, 1612277-03A, 1612277-04A, 1612277-05A, 1612277-06A, 1612277-07A, 1612277-08A, 1612277-09A

| Sample ID | **MB-78517** | Batch ID: | **78517** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_161230B** | Analysis Date: | **12/30/2016 10:28:07 A** | Prep Date: | **12/29/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-78517** | Batch ID: | **78517** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_161230B** | Analysis Date: | **12/30/2016 10:30:23 A** | Prep Date: | **12/29/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00189 | 0.000200 | 0.00200 | 0 | 94.5 | 85 | 115 | | | |

| Sample ID | **LCSD-78517** | Batch ID: | **78517** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_161230B** | Analysis Date: | **12/30/2016 10:32:39 A** | Prep Date: | **12/29/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00191 | 0.000200 | 0.00200 | 0 | 95.5 | 85 | 115 | 1.05 | 15 | |

| Sample ID | **1612246-03A SD** | Batch ID: | **78517** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_161230B** | Analysis Date: | **12/30/2016 10:37:11 A** | Prep Date: | **12/29/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1612246-03A PDS** | Batch ID: | **78517** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_161230B** | Analysis Date: | **12/30/2016 10:39:27 A** | Prep Date: | **12/29/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00229 | 0.000200 | 0.00250 | 0 | 91.6 | 85 | 115 | | | |

| Sample ID | **1612246-03A MS** | Batch ID: | **78517** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_161230B** | Analysis Date: | **12/30/2016 10:41:43 A** | Prep Date: | **12/29/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00196 | 0.000200 | 0.00200 | 0 | 98.0 | 80 | 120 | | | |

| Sample ID | **1612246-03A MSD** | Batch ID: | **78517** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_161230B** | Analysis Date: | **12/30/2016 10:44:00 A** | Prep Date: | **12/29/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00196 | 0.000200 | 0.00200 | 0 | 98.0 | 80 | 120 | 0 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_161230B**

| Sample ID **ICV-161230** | Batch ID: **R89725** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_161230B** | Analysis Date: **12/30/2016 9:49:30 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00394 | 0.000200 | 0.00400 | 0 | 98.5 | 90 | 110 | | | |

| Sample ID **CCV1-161230** | Batch ID: **R89725** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_161230B** | Analysis Date: **12/30/2016 10:23:33 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00200 | 0.000200 | 0.00200 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV2-161230** | Batch ID: **R89725** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_161230B** | Analysis Date: **12/30/2016 11:06:45 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 90 | 110 | | | |

| Sample ID **CCV3-161230** | Batch ID: **R89725** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_161230B** | Analysis Date: **12/30/2016 11:31:55 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00201 | 0.000200 | 0.00200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1612277

**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170108C**

The QC data in batch 78561 applies to the following samples: 1612277-01A, 1612277-02A, 1612277-03A, 1612277-04A, 1612277-05A, 1612277-06A, 1612277-07A, 1612277-08A, 1612277-09A

Sample ID **MB-78561** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**

SampType: **MBLK** Run ID: **ICP-MS4_170108C** Analysis Date: **1/8/2017 4:39:00 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-78561** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**

SampType: **LCS** Run ID: **ICP-MS4_170108C** Analysis Date: **1/8/2017 4:41:00 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.5 | 80 | 120 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 80 | 120 | | | |
| Calcium | 4.69 | 0.300 | 5.00 | 0 | 93.8 | 80 | 120 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 98.2 | 80 | 120 | | | |
| Lithium | 0.197 | 0.0100 | 0.200 | 0 | 98.3 | 80 | 120 | | | |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.5 | 80 | 120 | | | |
| Selenium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Thallium | 0.195 | 0.00150 | 0.200 | 0 | 97.3 | 80 | 120 | | | |

Sample ID **LCSD-78561** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**

SampType: **LCSD** Run ID: **ICP-MS4_170108C** Analysis Date: **1/8/2017 4:43:00 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | 2.71 | 15 | |
| Arsenic | 0.212 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | 1.62 | 15 | |
| Barium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 80 | 120 | 2.23 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170108C**

| Sample ID **LCSD-78561** | Batch ID: **78561** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 4:43:00 PM** | Prep Date: **1/3/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.206 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | 1.94 | 15 | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | 2.40 | 15 | |
| Calcium | 4.82 | 0.300 | 5.00 | 0 | 96.5 | 80 | 120 | 2.85 | 15 | |
| Chromium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.507 | 15 | |
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 1.92 | 15 | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | 1.85 | 15 | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.5 | 80 | 120 | 1.20 | 15 | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 80 | 120 | 1.94 | 15 | |
| Selenium | 0.211 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | 2.24 | 15 | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 99.9 | 80 | 120 | 2.62 | 15 | |

| Sample ID **1612277-02A MS** | Batch ID: **78561** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 5:11:00 PM** | Prep Date: **1/3/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Arsenic | 0.212 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Barium | 0.316 | 0.0100 | 0.200 | 0.114 | 101 | 80 | 120 | | | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.3 | 80 | 120 | | | |
| Cadmium | 0.193 | 0.00100 | 0.200 | 0 | 96.6 | 80 | 120 | | | |
| Calcium | 45.9 | 0.300 | 5.00 | 42.1 | 77.3 | 80 | 120 | | | S |
| Chromium | 0.196 | 0.00500 | 0.200 | 0.00230 | 97.1 | 80 | 120 | | | |
| Cobalt | 0.193 | 0.00500 | 0.200 | 0 | 96.6 | 80 | 120 | | | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 80 | 120 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0.0273 | 90.2 | 80 | 120 | | | |
| Molybdenum | 0.193 | 0.00500 | 0.200 | 0 | 96.4 | 80 | 120 | | | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.4 | 80 | 120 | | | |

| Sample ID **1612277-02A MSD** | Batch ID: **78561** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 5:13:00 PM** | Prep Date: **1/3/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 80 | 120 | 1.97 | 15 | |
| Arsenic | 0.211 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | 0.380 | 15 | |
| Barium | 0.323 | 0.0100 | 0.200 | 0.114 | 105 | 80 | 120 | 2.18 | 15 | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.7 | 80 | 120 | 0.561 | 15 | |
| Cadmium | 0.197 | 0.00100 | 0.200 | 0 | 98.4 | 80 | 120 | 1.75 | 15 | |
| Calcium | 46.4 | 0.300 | 5.00 | 42.1 | 87.3 | 80 | 120 | 1.08 | 15 | |
| Chromium | 0.195 | 0.00500 | 0.200 | 0.00230 | 96.6 | 80 | 120 | 0.507 | 15 | |
| Cobalt | 0.191 | 0.00500 | 0.200 | 0 | 95.4 | 80 | 120 | 1.24 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170108C**

Sample ID **1612277-02A MSD** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS4_170108C** Analysis Date: **1/8/2017 5:13:00 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.6 | 80 | 120 | 0.585 | 15 | |
| Lithium | 0.213 | 0.0100 | 0.200 | 0.0273 | 93.0 | 80 | 120 | 2.65 | 15 | |
| Molybdenum | 0.196 | 0.00500 | 0.200 | 0 | 98.1 | 80 | 120 | 1.79 | 15 | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.239 | 15 | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 97.8 | 80 | 120 | 0.598 | 15 | |

Sample ID **1612277-02A SD** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_170108C** Analysis Date: **1/8/2017 4:47:00 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.115 | 0.0500 | 0 | 0.114 | | | | 1.02 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Calcium | 42.7 | 1.50 | 0 | 42.1 | | | | 1.53 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0.00230 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.0313 | 0.0500 | 0 | 0.0273 | | | | 13.6 | 10 | R |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

Sample ID **1612277-02A PDS** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_170108C** Analysis Date: **1/8/2017 5:09:00 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.6 | 80 | 120 | | | |
| Arsenic | 0.210 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Barium | 0.316 | 0.0100 | 0.200 | 0.114 | 101 | 80 | 120 | | | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0 | 96.1 | 80 | 120 | | | |
| Calcium | 44.7 | 0.300 | 5.00 | 42.1 | 53.4 | 80 | 120 | | | S |
| Chromium | 0.205 | 0.00500 | 0.200 | 0.00230 | 102 | 80 | 120 | | | |
| Cobalt | 0.194 | 0.00500 | 0.200 | 0 | 97.0 | 80 | 120 | | | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Lithium | 0.207 | 0.0100 | 0.200 | 0.0273 | 89.8 | 80 | 120 | | | |
| Molybdenum | 0.191 | 0.00500 | 0.200 | 0 | 95.4 | 80 | 120 | | | |
| Selenium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Thallium | 0.195 | 0.00150 | 0.200 | 0 | 97.5 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170108C**

| Sample ID **ICV-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 11:44:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.101 | 0.00250 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.105 | 0.0100 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Beryllium | 0.103 | 0.00100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.27 | 0.300 | 2.50 | 0 | 90.9 | 90 | 110 | | | |
| Chromium | 0.106 | 0.00500 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Cobalt | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.101 | 0.00100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.0995 | 0.0100 | 0.100 | 0 | 99.5 | 90 | 110 | | | |
| Molybdenum | 0.0992 | 0.00500 | 0.100 | 0 | 99.2 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.0993 | 0.00150 | 0.100 | 0 | 99.3 | 90 | 110 | | | |

| Sample ID **LCVL-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 11:49:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00197 | 0.00250 | 0.00200 | 0 | 98.3 | 70 | 130 | | | |
| Arsenic | 0.00506 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Barium | 0.00510 | 0.0100 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Beryllium | 0.00115 | 0.00100 | 0.00100 | 0 | 115 | 70 | 130 | | | |
| Cadmium | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 70 | 130 | | | |
| Calcium | 0.0957 | 0.300 | 0.100 | 0 | 95.7 | 70 | 130 | | | |
| Chromium | 0.00527 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Cobalt | 0.00526 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Lead | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 70 | 130 | | | |
| Lithium | 0.00990 | 0.0100 | 0.0100 | 0 | 99.0 | 70 | 130 | | | |
| Molybdenum | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00525 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Thallium | 0.00102 | 0.00150 | 0.00100 | 0 | 102 | 70 | 130 | | | |

| Sample ID **CCV7-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 4:31:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Barium | 0.207 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | |
|---|---|
| B | Analyte detected in the associated Method Blank |
| J | Analyte detected between MDL and RL |
| ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit |
| J | Analyte detected between SDL and RL |
| DF | Dilution Factor |
| MDL | Method Detection Limit |
| R | RPD outside accepted control limits |
| S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170108C**

Sample ID **CCV7-170108** Batch ID: **R89833** TestNo: **SW6020A** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS4_170108C** Analysis Date: **1/8/2017 4:31:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.67 | 0.300 | 5.00 | 0 | 93.5 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.4 | 90 | 110 | | | |
| Lithium | 0.194 | 0.0100 | 0.200 | 0 | 96.8 | 90 | 110 | | | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 99.1 | 90 | 110 | | | |
| Selenium | 0.207 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Thallium | 0.194 | 0.00150 | 0.200 | 0 | 96.8 | 90 | 110 | | | |

Sample ID **LCVL7-170108** Batch ID: **R89833** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_170108C** Analysis Date: **1/8/2017 4:35:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00251 | 0.00250 | 0.00200 | 0 | 126 | 70 | 130 | | | |
| Arsenic | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Barium | 0.00524 | 0.0100 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Beryllium | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Cadmium | 0.000965 | 0.00100 | 0.00100 | 0 | 96.5 | 70 | 130 | | | |
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |
| Chromium | 0.00495 | 0.00500 | 0.00500 | 0 | 99.0 | 70 | 130 | | | |
| Cobalt | 0.00502 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Lead | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.00993 | 0.0100 | 0.0100 | 0 | 99.3 | 70 | 130 | | | |
| Molybdenum | 0.00501 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Selenium | 0.00583 | 0.00500 | 0.00500 | 0 | 117 | 70 | 130 | | | |
| Thallium | 0.00103 | 0.00150 | 0.00100 | 0 | 103 | 70 | 130 | | | |

Sample ID **CCV8-170108** Batch ID: **R89833** TestNo: **SW6020A** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS4_170108C** Analysis Date: **1/8/2017 5:15:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Barium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.6 | 90 | 110 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Calcium | 4.75 | 0.300 | 5.00 | 0 | 95.0 | 90 | 110 | | | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Lead | 0.203 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lithium | 0.190 | 0.0100 | 0.200 | 0 | 95.2 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170108C**

| Sample ID **CCV8-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 5:15:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 90 | 110 | | | |
| Selenium | 0.209 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 90 | 110 | | | |

| Sample ID **LCVL8-170108** | Batch ID: **R89833** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_170108C** | Analysis Date: **1/8/2017 5:19:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00211 | 0.00250 | 0.00200 | 0 | 106 | 70 | 130 | | | |
| Arsenic | 0.00542 | 0.00500 | 0.00500 | 0 | 108 | 70 | 130 | | | |
| Barium | 0.00516 | 0.0100 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Beryllium | 0.000832 | 0.00100 | 0.00100 | 0 | 83.2 | 70 | 130 | | | |
| Cadmium | 0.000952 | 0.00100 | 0.00100 | 0 | 95.2 | 70 | 130 | | | |
| Calcium | 0.130 | 0.300 | 0.100 | 0 | 130 | 70 | 130 | | | |
| Chromium | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Cobalt | 0.00499 | 0.00500 | 0.00500 | 0 | 99.8 | 70 | 130 | | | |
| Lead | 0.000996 | 0.00100 | 0.00100 | 0 | 99.6 | 70 | 130 | | | |
| Lithium | 0.0103 | 0.0100 | 0.0100 | 0 | 103 | 70 | 130 | | | |
| Molybdenum | 0.00491 | 0.00500 | 0.00500 | 0 | 98.1 | 70 | 130 | | | |
| Selenium | 0.00591 | 0.00500 | 0.00500 | 0 | 118 | 70 | 130 | | | |
| Thallium | 0.00103 | 0.00150 | 0.00100 | 0 | 103 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170109B**

| Sample ID | **ICV-170109** | Batch ID: | **R89854** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **ICP-MS4_170109B** | Analysis Date: | **1/9/2017 10:24:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.38 | 0.300 | 2.50 | 0 | 95.2 | 90 | 110 | | | |

| Sample ID | **LCVL-170109** | Batch ID: | **R89854** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_170109B** | Analysis Date: | **1/9/2017 10:28:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0978 | 0.300 | 0.100 | 0 | 97.8 | 70 | 130 | | | |

| Sample ID | **CCV2-170109** | Batch ID: | **R89854** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_170109B** | Analysis Date: | **1/9/2017 11:33:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.06 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID | **LCVL2-170109** | Batch ID: | **R89854** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_170109B** | Analysis Date: | **1/9/2017 11:42:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0963 | 0.300 | 0.100 | 0 | 96.3 | 70 | 130 | | | |

| Sample ID | **CCV3-170109** | Batch ID: | **R89854** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_170109B** | Analysis Date: | **1/9/2017 12:08:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.00 | 0.300 | 5.00 | 0 | 99.9 | 90 | 110 | | | |

| Sample ID | **LCVL3-170109** | Batch ID: | **R89854** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_170109B** | Analysis Date: | **1/9/2017 12:16:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0971 | 0.300 | 0.100 | 0 | 97.1 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1612277

**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170110C**

The QC data in batch 78561 applies to the following samples: 1612277-01A, 1612277-02A, 1612277-03A, 1612277-04A, 1612277-05A, 1612277-06A, 1612277-07A, 1612277-08A, 1612277-09A

Sample ID **MB-78561** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_170110C** Analysis Date: **1/10/2017 11:43:00 AM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

Sample ID **LCS-78561** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_170110C** Analysis Date: **1/10/2017 11:45:00 AM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.191 | 0.0300 | 0.200 | 0 | 95.7 | 80 | 120 | | | |

Sample ID **LCSD-78561** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_170110C** Analysis Date: **1/10/2017 11:47:00 AM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.205 | 0.0300 | 0.200 | 0 | 103 | 80 | 120 | 7.05 | 15 | |

Sample ID **1612277-02A SD** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_170110C** Analysis Date: **1/10/2017 11:53:00 AM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0500 | 0.150 | 0 | 0.0628 | | | | 0 | 10 | |

Sample ID **1612277-02A PDS** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_170110C** Analysis Date: **1/10/2017 12:13:00 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.273 | 0.0300 | 0.200 | 0.0628 | 105 | 80 | 120 | | | |

Sample ID **1612277-02A MS** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS4_170110C** Analysis Date: **1/10/2017 12:15:00 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.263 | 0.0300 | 0.200 | 0.0628 | 99.9 | 80 | 120 | | | |

Sample ID **1612277-02A MSD** Batch ID: **78561** TestNo: **SW6020A** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS4_170110C** Analysis Date: **1/10/2017 12:17:00 PM** Prep Date: **1/3/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.263 | 0.0300 | 0.200 | 0.0628 | 100 | 80 | 120 | 0.220 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_170110C**

| Sample ID | **ICV-170110** | Batch ID: | **R89874** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **ICP-MS4_170110C** | Analysis Date: | **1/10/2017 11:25:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0962 | 0.0300 | 0.100 | 0 | 96.2 | 90 | 110 | | | |

| Sample ID | **LCVL-170110** | Batch ID: | **R89874** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_170110C** | Analysis Date: | **1/10/2017 11:29:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0199 | 0.0300 | 0.0200 | 0 | 99.7 | 70 | 130 | | | |

| Sample ID | **CCV1-170110** | Batch ID: | **R89874** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_170110C** | Analysis Date: | **1/10/2017 12:19:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.193 | 0.0300 | 0.200 | 0 | 96.7 | 90 | 110 | | | |

| Sample ID | **LCVL1-170110** | Batch ID: | **R89874** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_170110C** | Analysis Date: | **1/10/2017 12:24:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0141 | 0.0300 | 0.0200 | 0 | 70.4 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_170104A**

The QC data in batch 78574 applies to the following samples: 1612277-01D, 1612277-02D, 1612277-03D, 1612277-04D, 1612277-05D, 1612277-06D, 1612277-07D, 1612277-08D, 1612277-09D

Sample ID **MB-78574** Batch ID: **78574** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_170104A** Analysis Date: **1/4/2017 9:39:47 AM** Prep Date: **1/4/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-78574** Batch ID: **78574** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_170104A** Analysis Date: **1/4/2017 9:54:24 AM** Prep Date: **1/4/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Fluoride | 3.97 | 0.400 | 4.000 | 0 | 99.1 | 90 | 110 | | | |
| Sulfate | 31.5 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

Sample ID **LCSD-78574** Batch ID: **78574** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_170104A** Analysis Date: **1/4/2017 10:09:00 AM** Prep Date: **1/4/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | 0.342 | 20 | |
| Fluoride | 3.94 | 0.400 | 4.000 | 0 | 98.4 | 90 | 110 | 0.699 | 20 | |
| Sulfate | 31.0 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | 1.61 | 20 | |

Sample ID **1612277-01DMS** Batch ID: **78574** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_170104A** Analysis Date: **1/4/2017 12:59:18 PM** Prep Date: **1/4/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 483 | 10.0 | 200.0 | 285.8 | 98.8 | 90 | 110 | | | |
| Fluoride | 204 | 4.00 | 200.0 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 272 | 30.0 | 200.0 | 58.41 | 107 | 90 | 110 | | | |

Sample ID **1612277-01DMSD** Batch ID: **78574** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_170104A** Analysis Date: **1/4/2017 1:13:54 PM** Prep Date: **1/4/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 482 | 10.0 | 200.0 | 285.8 | 98.0 | 90 | 110 | 0.310 | 20 | |
| Fluoride | 206 | 4.00 | 200.0 | 0 | 103 | 90 | 110 | 1.06 | 20 | |
| Sulfate | 274 | 30.0 | 200.0 | 58.41 | 108 | 90 | 110 | 0.956 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_170104A**

| Sample ID **ICV-170104** | Batch ID: **R89784** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_170104A** | Analysis Date: **1/4/2017 9:04:26 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.6 | 1.00 | 25.00 | 0 | 102 | 90 | 110 | | | |
| Fluoride | 9.90 | 0.400 | 10.00 | 0 | 99.0 | 90 | 110 | | | |
| Sulfate | 79.1 | 3.00 | 75.00 | 0 | 106 | 90 | 110 | | | |

| Sample ID **CCV1-170104** | Batch ID: **R89784** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_170104A** | Analysis Date: **1/4/2017 1:28:31 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.1 | 1.00 | 10.00 | 0 | 101 | 90 | 110 | | | |
| Fluoride | 4.02 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 31.0 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **CCV2-170104** | Batch ID: **R89784** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_170104A** | Analysis Date: **1/4/2017 4:19:15 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | | | |
| Fluoride | 4.10 | 0.400 | 4.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 31.5 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_161228A**

The QC data in batch 78491 applies to the following samples: 1612277-01D, 1612277-02D, 1612277-03D, 1612277-04D, 1612277-05D, 1612277-06D, 1612277-07D, 1612277-08D, 1612277-09D

| Sample ID | **1612275-01D-DUP** | Batch ID: | **78491** | TestNo: | **M4500-H+ B** | Units: | **pH Units@19.3℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **TITRATOR_161228A** | Analysis Date: | **12/28/2016 9:24:00 AM** | Prep Date: | **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.50 | 0 | 0 | 6.430 | | | | 1.08 | 5 | |

| Sample ID | **1612277-01D-DUP** | Batch ID: | **78491** | TestNo: | **M4500-H+ B** | Units: | **pH Units@19.9℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **TITRATOR_161228A** | Analysis Date: | **12/28/2016 9:48:00 AM** | Prep Date: | **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.79 | 0 | 0 | 6.750 | | | | 0.591 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_161228A**

| Sample ID | **ICV-161228** | Batch ID: | **R89686** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.7℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **TITRATOR_161228A** | Analysis Date: | **12/28/2016 8:24:00 AM** | Prep Date: | **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 9.91 | 0 | 10.00 | 0 | 99.1 | 99 | 101 | | | |

| Sample ID | **CCV1-161228** | Batch ID: | **R89686** | TestNo: | **M4500-H+ B** | Units: | **pH Units@20.9℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_161228A** | Analysis Date: | **12/28/2016 9:45:00 AM** | Prep Date: | **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

| Sample ID | **CCV2-161228** | Batch ID: | **R89686** | TestNo: | **M4500-H+ B** | Units: | **pH Units@21.8℃** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **TITRATOR_161228A** | Analysis Date: | **12/28/2016 10:06:00 A** | Prep Date: | **12/28/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.97 | 0 | 7.000 | 0 | 99.6 | 97.1 | 102.9 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_161227C**

The QC data in batch 78478 applies to the following samples: 1612277-01D

| Sample ID **MB-78478** | Batch ID: **78478** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_161227C** | Analysis Date: **12/28/2016 8:41:00 AM** | Prep Date: **12/27/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID **LCS-78478** | Batch ID: **78478** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_161227C** | Analysis Date: **12/28/2016 8:41:00 AM** | Prep Date: **12/27/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 750 | 10.0 | 745.6 | 0 | 101 | 90 | 113 | | | |

| Sample ID **1612246-12D-DUP** | Batch ID: **78478** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_161227C** | Analysis Date: **12/28/2016 8:41:00 AM** | Prep Date: **12/27/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 3990 | 50.0 | 0 | 4125 | | | | 3.45 | 5 | |

| Sample ID **1612277-01D-DUP** | Batch ID: **78478** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_161227C** | Analysis Date: **12/28/2016 8:41:00 AM** | Prep Date: **12/27/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 915 | 50.0 | 0 | 905.0 | | | | 1.10 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1612277
**Project:** Oak Grove FGD Pond Area

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_161229B**

The QC data in batch 78513 applies to the following samples: 1612277-02D, 1612277-03D, 1612277-04D, 1612277-05D, 1612277-06D, 1612277-07D, 1612277-08D, 1612277-09D

| Sample ID | **MB-78513** | Batch ID: | **78513** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_161229B** | Analysis Date: | **12/30/2016 8:43:00 AM** | Prep Date: | **12/29/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-78513** | Batch ID: | **78513** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_161229B** | Analysis Date: | **12/30/2016 8:43:00 AM** | Prep Date: | **12/29/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 747 | 10.0 | 745.6 | 0 | 100 | 90 | 113 | | | |

| Sample ID | **1612277-07D-DUP** | Batch ID: | **78513** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_161229B** | Analysis Date: | **12/30/2016 8:43:00 AM** | Prep Date: | **12/29/2016** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 4510 | 50.0 | 0 | 4330 | | | | 4.07 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# Case Narrative

## Lab No: 20161291

This report contains the analytical results for the 9 sample(s) received under chain of custody by ESC Lab Sciences on 12/29/2016 1:35:14 PM. These samples are associated with your 1612277 project.

The analytical results included in this report meet all applicable quality control procedure requirements except as noted below:

The test results in this report meet all NELAC requirements unless noted below:

This report shall not be reproduced, except in full, without the written approval of ESC Lab Sciences.

All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client.

Results have been reviewed by the Director of Radiochemistry or their designees and is approved for release.

**Observations / Nonconformances**

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20161291-01** | | | | | | | | |
| **Client ID** : **FGD-6** | | | | | | | | |
| **Date Sampled** : **12/22/2016 9:15:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.27 +/- 0.540 | 0.676 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.349 +/- 0.140 | 0.125 | pCi/l | | 01/20/17 | 01/28/17 | AK |
| Radium-228 | EPA 904*/9320* | 0.917 +/- 0.400 | 0.551 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161291-02** | | | | | | | | |
| **Client ID** : **FGD-4** | | | | | | | | |
| **Date Sampled** : **12/22/2016 10:25:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 0.227 +/- 0.601 | 0.822 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.227 +/- 0.130 | 0.155 | pCi/l | | 01/20/17 | 01/28/17 | AK |
| Radium-228 | EPA 904*/9320* | -0.209 +/- 0.471 | 0.667 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161291-03** | | | | | | | | |
| **Client ID** : **FGD-2** | | | | | | | | |
| **Date Sampled** : **12/22/2016 11:30:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 2.14 +/- 0.611 | 0.789 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.345 +/- 0.169 | 0.190 | pCi/l | | 01/20/17 | 01/28/17 | AK |
| Radium-228 | EPA 904*/9320* | 1.79 +/- 0.442 | 0.599 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161291-04** | | | | | | | | |
| **Client ID** : **FGD-5** | | | | | | | | |
| **Date Sampled** : **12/22/2016 12:25:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| | | **Radiochemical Analyses** | | | | | | |
| Combined Radium | | 1.29 +/- 0.743 | 0.954 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 0.579 +/- 0.224 | 0.194 | pCi/l | | 01/20/17 | 01/28/17 | AK |
| Radium-228 | EPA 904*/9320* | 0.712 +/- 0.519 | 0.760 | pCi/l | | 01/23/17 | 01/26/17 | JR |

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : **20161291-05** | | | | | | | | |
| **Client ID** : **FGD-1** | | | | | | | | |
| **Date Sampled** : **12/22/2016 1:25:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 0.189 +/- 0.544 | 0.918 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | -0.045 +/- 0.154 | 0.273 | pCi/l | | 01/20/17 | 01/28/17 | AK |
| Radium-228 | EPA 904*/9320* | 0.189 +/- 0.390 | 0.645 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161291-06** | | | | | | | | |
| **Client ID** : **FGD-3** | | | | | | | | |
| **Date Sampled** : **12/22/2016 3:25:00 PM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 2.46 +/- 0.746 | 1.14 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | -0.041 +/- 0.201 | 0.352 | pCi/l | | 01/20/17 | 01/28/17 | AK |
| Radium-228 | EPA 904*/9320* | 2.46 +/- 0.545 | 0.792 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161291-07** | | | | | | | | |
| **Client ID** : **FGD-8** | | | | | | | | |
| **Date Sampled** : **12/23/2016 8:20:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 5.87 +/- 0.791 | 0.669 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 2.17 +/- 0.338 | 0.132 | pCi/l | | 01/20/17 | 01/28/17 | AK |
| Radium-228 | EPA 904*/9320* | 3.70 +/- 0.453 | 0.537 | pCi/l | | 01/23/17 | 01/26/17 | JR |
| **Lab ID** : **20161291-08** | | | | | | | | |
| **Client ID** : **FGD-12** | | | | | | | | |
| **Date Sampled** : **12/23/2016 9:30:00 AM** | | | | | | | | |
| **Matrix** : **NPW** | | | | | | | | |
| **Radiochemical Analyses** | | | | | | | | |
| Combined Radium | | 5.43 +/- 0.830 | 0.777 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 1.89 +/- 0.336 | 0.179 | pCi/l | | 01/20/17 | 01/28/17 | AK |
| Radium-228 | EPA 904*/9320* | 3.54 +/- 0.494 | 0.598 | pCi/l | | 01/23/17 | 01/29/17 | JR |

| | | |
|---|---|---|
| Client | : | DHL Analytical, Inc. |
| Client Project | : | 1612277 |
| Lab Number | : | 20161291 |
| Date Reported | : | 01/31/17 |
| Date Received | : | 12/29/16 |
| Page Number | : | 4 of 4 |

# Analytical Report

| | Method | Result | DL | Units | Qual | Prep Date | Analysis Date | Analyst |
|---|---|---|---|---|---|---|---|---|
| **Lab ID** : | **20161291-09** | | | | | | | |
| **Client ID** : | **FGD-11** | | | | | | | |
| **Date Sampled** : | **12/23/2016 4:25:00 PM** | | | | | | | |
| **Matrix** : | **NPW** | | | | | | | |
| | **Radiochemical Analyses** | | | | | | | |
| Combined Radium | | 9.03 +/- 0.937 | 0.745 | pCi/l | | | | |
| Radium-226 | SM 7500 Ra B M* | 3.94 +/- 0.437 | 0.130 | pCi/l | | 01/20/17 | 01/29/17 | AK |
| Radium-228 | EPA 904*/9320* | 5.09 +/- 0.500 | 0.615 | pCi/l | | 01/23/17 | 01/29/17 | JR |

# QC Report

| Parameter | Blank | LCS %REC | LCSD %REC | LCSD RPD | DUP RPD | RER, NAD or DER | MS %REC | MSD %REC | MSD RPD | Batch ID |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.009 | 107.0 | | | NC | 1.140 | 123.0 | 125.0 | 1.9 | R1182 |
| Radium-228 | -0.276 | 83.3 | | | NC | 0.521 | 77.1 | 73.4 | 4.8 | R3912 |

**Lab Approval:**

Ron Eidson
Director of Radiochemistry

*NELAC Certified Parameter BDL = Below Detection Limit





*OUTREACH LABORATORY, A Divsion of ESC Lab Sciences*
*Address: 311 North Aspen Avenue, Broken Arrow, OK, 74012* *EMail: outreach@esclabsciences.com - Tel: (918) 251-2515*

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1612277

**Subcontractor:**
ESC Laboratory
311 North Aspen
Broken Arrow, Oklahoma 74012

TEL: (918) 251-2515
FAX:
Acct #: DHLRRTX

**27-Dec-16**

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | E904.0 | SM7500Ra-B M | | | | |
| FGD-6 | Aqueous | -01B | 12/22/16 09:15 AM | 1LHDPEHNO3 | 1 | | | | | |
| FGD-6 | Aqueous | -01C | 12/22/16 09:15 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-4 | Aqueous | -02B | 12/22/16 10:25 AM | 1LHDPEHNO3 | 1 | | | | | |
| FGD-4 | Aqueous | -02C | 12/22/16 10:25 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-2 | Aqueous | -03B | 12/22/16 11:30 AM | 1LHDPEHNO3 | 1 | | | | | |
| FGD-2 | Aqueous | -03C | 12/22/16 11:30 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-5 | Aqueous | -04B | 12/22/16 12:25 PM | 1LHDPEHNO3 | 1 | | | | | |
| FGD-5 | Aqueous | -04C | 12/22/16 12:25 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-1 | Aqueous | -05B | 12/22/16 01:25 PM | 1LHDPEHNO3 | 1 | | | | | |
| FGD-1 | Aqueous | -05C | 12/22/16 01:25 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-3 | Aqueous | -06B | 12/22/16 03:25 PM | 1LHDPEHNO3 | 1 | | | | | |
| FGD-3 | Aqueous | -06C | 12/22/16 03:25 PM | 500HDPEHNO3 | | 1 | | | | |
| FGD-8 | Aqueous | -07B | 12/23/16 08:20 AM | 1LHDPEHNO3 | 1 | | | | | |
| FGD-8 | Aqueous | -07C | 12/23/16 08:20 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-12 | Aqueous | -08B | 12/23/16 09:30 AM | 1LHDPEHNO3 | 1 | | | | | |
| FGD-12 | Aqueous | -08C | 12/23/16 09:30 AM | 500HDPEHNO3 | | 1 | | | | |
| FGD-11 | Aqueous | -09B | 12/22/16 04:25 PM | 1LHDPEHNO3 | 1 | | | | | |
| FGD-11 | Aqueous | -09C | 12/22/16 04:25 PM | 500HDPEHNO3 | | 1 | | | | |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

C881420
20161291

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | [signature] | 12/27/16 1730 | **Received by:** | Dorester | 12/27/16 1730 |
| **Relinquished by:** | | | **Received by:** | [signature] | 12/29/16 1335 |

# SAMPLE LOGIN

**Date Received:** *12/29/2016 1:35:1* **Lab Number:** 20161291 **Due:** 1/27/2017

| Sample Number | Client Sample ID | Matrix | Date Sampled | Container Type | Container Size | Preservation | Preserved Upon Receipt | Custody Seal | Seal Intact |
|---|---|---|---|---|---|---|---|---|---|
| **20161291-01 B** | FGD-6 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161291-01 A** | FGD-6 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161291-02 A** | FGD-4 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161291-02 B** | FGD-4 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161291-03 A** | FGD-2 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161291-03 B** | FGD-2 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161291-04 B** | FGD-5 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161291-04 A** | FGD-5 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161291-05 B** | FGD-1 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161291-05 A** | FGD-1 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161291-06 A** | FGD-3 | NPW | 12/22/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161291-06 B** | FGD-3 | NPW | 12/22/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161291-07 A** | FGD-8 | NPW | 12/23/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161291-07 B** | FGD-8 | NPW | 12/23/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **20161291-08 A** | FGD-12 | NPW | 12/23/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161291-08 B** | FGD-12 | NPW | 12/23/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |
| **20161291-09 B** | FGD-11 | NPW | 12/23/16 | Plastic | 1 L | HNO3, pH < 2 | ☑ | Yes | Yes |
| **20161291-09 A** | FGD-11 | NPW | 12/23/16 | Plastic | 500 ml | HNO3, pH < 2 | ☑ | Yes | Yes |
| Radium-226 | | | SM 7500 Ra B M* | | | | | | |
| Radium-228 | | | EPA 904*/9320* | | | | | | |

**CONTAINER INSPECTION**

**# Coolers** 2 **Custody Seals Broken** Ø **Temperature:** fmb C **Ice** **Radiation Survey:** <300 cpm

**SAMPLE INSPECTION**

**Sample Seal Broken** Ø **Chain of Custody Record** ☑ **Labels in Tact** ☑ **Radiation Survey Complete** N/A

**Anomalies**

**Inspected By:** _____ **DATE** 12/29/16

**QA or Designee Review:** Raymond Thomas **DATE** 12/29/16

**Sample Custodian Review:** Juliette Nowodu **DATE** 12/29/16

**Project Notes:**

# Appendix B

# Laboratory Analytical Reports – Detection Monitoring Data

October 12, 2017

Will Vienne
Pastor, Behling & Wheeler
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1710037

RE: Luminant - Ash Landfill - Oak Grove

Dear Will Vienne:

DHL Analytical, Inc. received 6 sample(s) on 10/5/2017 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-17-19

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# CHAIN-OF-CUSTODY

№ 77847

CLIENT: PBW
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 10-3-17 PAGE 1 OF 1
PO #: 5347-E DHL WORK ORDER #: 1710037
PROJECT LOCATION OR NAME: LUMINANT - ASH LANDFILL - OAKGROVE
CLENT PROJECT #: 5347-E COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL P=PAINT
W=WATER SL=SLUDGE
A=AIR O=OTHER
L=LIQUID SO=SOLID
SE=SEDIMENT

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | ANALYSES: CCR | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AL-10 | 01 | 10-2-17 | 1100 | W | P | 2 | | X | | X | X | X | |
| MW-02 | 02 | | 1205 | W | P | 2 | | X | | X | X | X | |
| MW-09 | 03 | | 1300 | W | P | 2 | | X | | X | X | X | |
| MW-05 | 04 | | 1445 | W | P | 2 | | X | | X | X | X | |
| MW-07 | 05 | | 1540 | W | P | 2 | | X | | X | X | X | |
| MW-08R | 06 | | 1645 | W | P | 2 | | X | | X | X | X | |

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ 8270 PCB ❑ 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ 8321 HERB ❑ T PHOS, AMMONIA ❑ METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ _____ ❑ RCRA ❑ TX11 ❑ _____ PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ CHLORIDE ❑ ANIONS _____ ❑ TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ RCI ❑ FLASHPOINT ❑ DGAS ❑ TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑

| RELINQUISHED BY: (Signature) | DATE/TIME | RECEIVED BY: (Signature) |
|---|---|---|
| | 10-4-17 1800 | Fed Ex |
| RELINQUISHED BY: (Signature) Fed Ex | DATE/TIME 10/5/17 9:20 | RECEIVED BY: (Signature) |
| RELINQUISHED BY: (Signature) | DATE/TIME | RECEIVED BY: (Signature) |

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 1.7 THERM #: 78
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ☒ NOT USED
CARRIER: ❑ LONE STAR ☒ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED


❑ DHL DISPOSAL @ $5.00 each ❑ Return

**John DuPont**

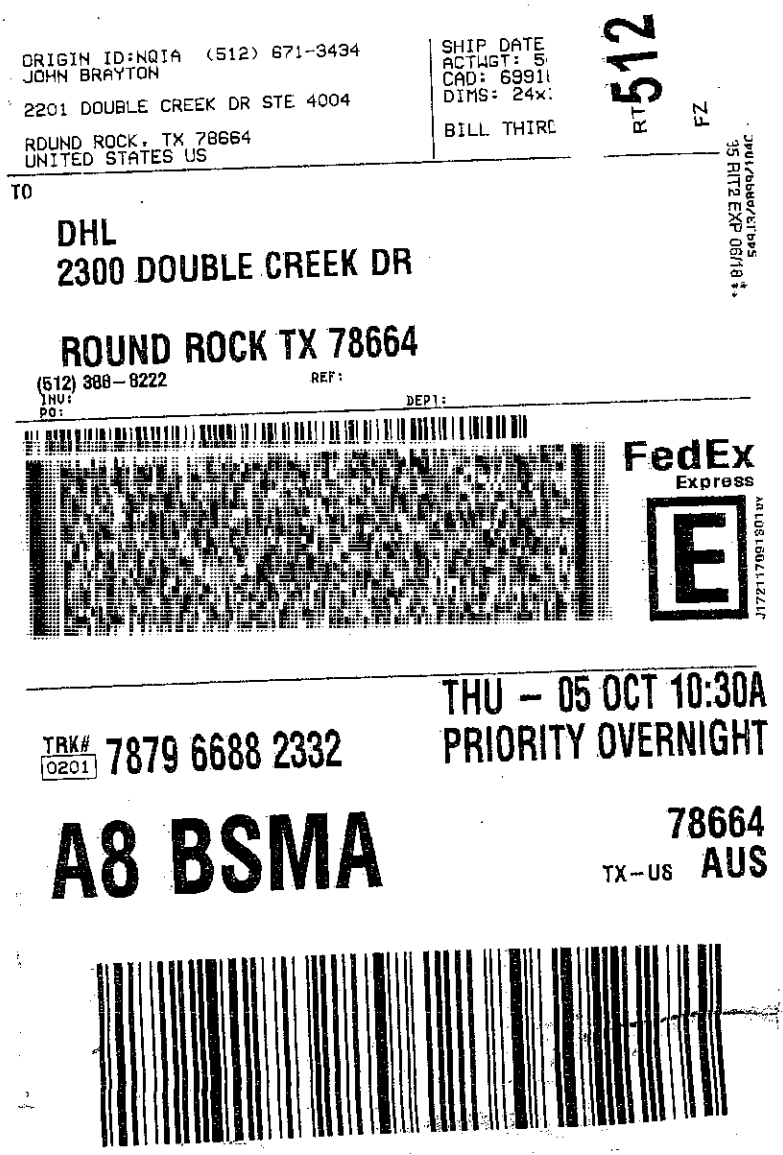
**From:** Will Vienne <will.vienne@pbwllc.com>
**Sent:**
**To:** John DuPont
**Cc:** John Brayton; Keith Starek; Pat Behling
**Subject:** CCR Sampling

**Follow Up Flag:** Follow up
**Flag Status:** Completed

Hi John,

We are starting the second phase of sampling for the CCR project, which includes sampling the CCR wells on a semi-annual basis. Only Appendix III constituents will be analyzed:

Boron
Calcium
Chloride
Fluoride
Field pH
Sulfate
Total Dissolved Solids


ORIGIN ID:NQIA (512) 671-3434
JOHN BRAYTON
2201 DOUBLE CREEK DR STE 4004
RDUND ROCK, TX 78664
UNITED STATES US
SHIP DATE
ACTWGT: 5
CAD: 6991
DIMS: 24x
BILL THIRD
RT 512
FZ
TO
DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
REF:
INV:
PO:
DEPT:
FedEx
Express
THU - 05 OCT 10:30A
PRIORITY OVERNIGHT
TRK# 0201 7879 6688 2332
A8 BSMA
78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Pastor, Behling & Wheeler** Date Received: **10/5/2017**

Work Order Number **1710037** Received by **EL**

Checklist completed by: _____ 10/5/2017 Reviewed by EL 10/5/2017
Signature Date Initials Date

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 1.7 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☐ | No ☑ | NA ☐ LOT # 8086 |
| | Adjusted? yes | | Checked by CVD |
| Water - ph>9 (S) or ph>12 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? _____ | | Checked by _____ |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: Sample MW-02 received w/ pH > 2.

Corrective Action Sample acidified in Login to pH<2 w/ $HNO_3$ (Lot # 11750) on 10/5/17 at 09:55

**DHL Analytical, Inc.** **Date:** *12-Oct-17*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Ash Landfill - Oak Grove
**Lab Order:** 1710037

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method E300 - Anions Analysis
Method M2540C - Total Dissolved Solids Analysis

## LOG IN

The samples were received and log-in performed on 10/5/2017. A total of 6 samples were received and analyzed. The samples arrived in good condition and were properly packaged. Sample MW-02 was preserved upon arrival to the laboratory to achieve proper pH level.

## METALS ANALYSIS

For Metals Analysis, the recovery of Calcium for the Post Digestion Spike, the Matrix Spike and Matrix Spike Duplicate (1710015-09 PDS/MS/MSD) was outside of the method control limits. These are flagged accordingly in the QC Summary Report. This analyte was within method control limits in the associated LCS and Serial Dilution. No further corrective action was taken.

## DHL Analytical, Inc.

**Date:** *12-Oct-17*

**CLIENT:** Pastor, Behling & Wheeler
**Project:** Luminant - Ash Landfill - Oak Grove
**Lab Order:** 1710037

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1710037-01 | AL-10 | | 10/02/17 11:00 AM | 10/5/2017 |
| 1710037-02 | MW-02 | | 10/02/17 12:05 PM | 10/5/2017 |
| 1710037-03 | MW-09 | | 10/02/17 01:00 PM | 10/5/2017 |
| 1710037-04 | MW-05 | | 10/02/17 02:45 PM | 10/5/2017 |
| 1710037-05 | MW-07 | | 10/02/17 03:40 PM | 10/5/2017 |
| 1710037-06 | MW-08R | | 10/02/17 04:45 PM | 10/5/2017 |

**Lab Order:** 1710037
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Ash Landfill - Oak Gro

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1710037-01A | AL-10 | 10/02/17 11:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/06/17 08:19 AM | 82680 |
| | AL-10 | 10/02/17 11:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/06/17 08:19 AM | 82680 |
| 1710037-01B | AL-10 | 10/02/17 11:00 AM | Aqueous | E300 | Anion Preparation | 10/09/17 09:41 AM | 82704 |
| | AL-10 | 10/02/17 11:00 AM | Aqueous | E300 | Anion Preparation | 10/09/17 09:41 AM | 82704 |
| | AL-10 | 10/02/17 11:00 AM | Aqueous | M2540C | TDS Preparation | 10/06/17 12:55 PM | 82694 |
| 1710037-02A | MW-02 | 10/02/17 12:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/06/17 08:19 AM | 82680 |
| 1710037-02B | MW-02 | 10/02/17 12:05 PM | Aqueous | E300 | Anion Preparation | 10/09/17 09:41 AM | 82704 |
| | MW-02 | 10/02/17 12:05 PM | Aqueous | E300 | Anion Preparation | 10/09/17 09:41 AM | 82704 |
| | MW-02 | 10/02/17 12:05 PM | Aqueous | M2540C | TDS Preparation | 10/06/17 12:55 PM | 82694 |
| 1710037-03A | MW-09 | 10/02/17 01:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/06/17 08:19 AM | 82680 |
| | MW-09 | 10/02/17 01:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/06/17 08:19 AM | 82680 |
| 1710037-03B | MW-09 | 10/02/17 01:00 PM | Aqueous | E300 | Anion Preparation | 10/09/17 09:41 AM | 82704 |
| | MW-09 | 10/02/17 01:00 PM | Aqueous | E300 | Anion Preparation | 10/09/17 09:41 AM | 82704 |
| | MW-09 | 10/02/17 01:00 PM | Aqueous | M2540C | TDS Preparation | 10/06/17 12:55 PM | 82694 |
| 1710037-04A | MW-05 | 10/02/17 02:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/06/17 08:19 AM | 82680 |
| 1710037-04B | MW-05 | 10/02/17 02:45 PM | Aqueous | E300 | Anion Preparation | 10/09/17 09:41 AM | 82704 |
| | MW-05 | 10/02/17 02:45 PM | Aqueous | E300 | Anion Preparation | 10/09/17 09:41 AM | 82704 |
| | MW-05 | 10/02/17 02:45 PM | Aqueous | M2540C | TDS Preparation | 10/06/17 12:55 PM | 82694 |
| 1710037-05A | MW-07 | 10/02/17 03:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/06/17 08:19 AM | 82680 |
| 1710037-05B | MW-07 | 10/02/17 03:40 PM | Aqueous | E300 | Anion Preparation | 10/05/17 09:38 AM | 82669 |
| | MW-07 | 10/02/17 03:40 PM | Aqueous | E300 | Anion Preparation | 10/06/17 10:37 AM | 82690 |
| | MW-07 | 10/02/17 03:40 PM | Aqueous | M2540C | TDS Preparation | 10/06/17 12:55 PM | 82694 |
| 1710037-06A | MW-08R | 10/02/17 04:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/06/17 08:19 AM | 82680 |
| 1710037-06B | MW-08R | 10/02/17 04:45 PM | Aqueous | E300 | Anion Preparation | 10/09/17 09:41 AM | 82704 |
| | MW-08R | 10/02/17 04:45 PM | Aqueous | E300 | Anion Preparation | 10/09/17 09:41 AM | 82704 |
| | MW-08R | 10/02/17 04:45 PM | Aqueous | M2540C | TDS Preparation | 10/06/17 12:55 PM | 82694 |

**Lab Order:** 1710037
**Client:** Pastor, Behling & Wheeler
**Project:** Luminant - Ash Landfill - Oak Gro

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1710037-01A | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 82680 | 5 | 10/09/17 02:07 PM | ICP-MS4_171009C |
| | AL-10 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 82680 | 1 | 10/09/17 12:45 PM | ICP-MS4_171009C |
| 1710037-01B | AL-10 | Aqueous | E300 | Anions by IC method - Water | 82704 | 10 | 10/09/17 12:06 PM | IC4_171009A |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 82704 | 1 | 10/09/17 03:18 PM | IC4_171009A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 82694 | 1 | 10/09/17 09:05 AM | WC_171006C |
| 1710037-02A | MW-02 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 82680 | 1 | 10/09/17 01:13 PM | ICP-MS4_171009C |
| 1710037-02B | MW-02 | Aqueous | E300 | Anions by IC method - Water | 82704 | 10 | 10/09/17 12:18 PM | IC4_171009A |
| | MW-02 | Aqueous | E300 | Anions by IC method - Water | 82704 | 1 | 10/09/17 03:30 PM | IC4_171009A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 82694 | 1 | 10/09/17 09:05 AM | WC_171006C |
| 1710037-03A | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 82680 | 1 | 10/09/17 01:15 PM | ICP-MS4_171009C |
| | MW-09 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 82680 | 5 | 10/09/17 02:25 PM | ICP-MS4_171009C |
| 1710037-03B | MW-09 | Aqueous | E300 | Anions by IC method - Water | 82704 | 1 | 10/09/17 03:42 PM | IC4_171009A |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 82704 | 10 | 10/09/17 12:30 PM | IC4_171009A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 82694 | 1 | 10/09/17 09:05 AM | WC_171006C |
| 1710037-04A | MW-05 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 82680 | 1 | 10/09/17 01:16 PM | ICP-MS4_171009C |
| 1710037-04B | MW-05 | Aqueous | E300 | Anions by IC method - Water | 82704 | 10 | 10/09/17 12:42 PM | IC4_171009A |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 82704 | 1 | 10/09/17 03:54 PM | IC4_171009A |
| | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 82694 | 1 | 10/09/17 09:05 AM | WC_171006C |
| 1710037-05A | MW-07 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 82680 | 1 | 10/09/17 01:18 PM | ICP-MS4_171009C |
| 1710037-05B | MW-07 | Aqueous | E300 | Anions by IC method - Water | 82669 | 1 | 10/05/17 06:25 PM | IC2_171005A |
| | MW-07 | Aqueous | E300 | Anions by IC method - Water | 82690 | 1 | 10/06/17 12:15 PM | IC4_171006A |
| | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 82694 | 1 | 10/09/17 09:05 AM | WC_171006C |
| 1710037-06A | MW-08R | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 82680 | 1 | 10/09/17 01:20 PM | ICP-MS4_171009C |
| 1710037-06B | MW-08R | Aqueous | E300 | Anions by IC method - Water | 82704 | 100 | 10/09/17 12:54 PM | IC4_171009A |
| | MW-08R | Aqueous | E300 | Anions by IC method - Water | 82704 | 1 | 10/09/17 04:06 PM | IC4_171009A |
| | MW-08R | Aqueous | M2540C | Total Dissolved Solids | 82694 | 1 | 10/09/17 09:05 AM | WC_171006C |

# DHL Analytical, Inc.

**Date:** *12-Oct-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | AL-10 |
| **Project:** | Luminant - Ash Landfill - Oak Grove | **Lab ID:** | 1710037-01 |
| **Project No:** | 5347-E | **Collection Date:** | 10/02/17 11:00 AM |
| **Lab Order:** | 1710037 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Boron | 0.0973 | 0.0100 | 0.0300 | | mg/L | 1 | 10/09/17 12:45 PM |
| Calcium | 27.0 | 0.500 | 1.50 | | mg/L | 5 | 10/09/17 02:07 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 50.6 | 3.00 | 10.0 | | mg/L | 10 | 10/09/17 12:06 PM |
| Fluoride | 0.120 | 0.100 | 0.400 | J | mg/L | 1 | 10/09/17 03:18 PM |
| Sulfate | 12.2 | 1.00 | 3.00 | | mg/L | 1 | 10/09/17 03:18 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JW** |
| Total Dissolved Solids (Residue, Filterable) | 398 | 10.0 | 10.0 | | mg/L | 1 | 10/09/17 09:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *12-Oct-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-02 |
| **Project:** | Luminant - Ash Landfill - Oak Grove | **Lab ID:** | 1710037-02 |
| **Project No:** | 5347-E | **Collection Date:** | 10/02/17 12:05 PM |
| **Lab Order:** | 1710037 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Boron | 0.0567 | 0.0100 | 0.0300 | | mg/L | 1 | 10/09/17 01:13 PM |
| Calcium | 22.2 | 0.100 | 0.300 | | mg/L | 1 | 10/09/17 01:13 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 42.4 | 0.300 | 1.00 | | mg/L | 1 | 10/09/17 03:30 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 10/09/17 03:30 PM |
| Sulfate | 9.67 | 1.00 | 3.00 | | mg/L | 1 | 10/09/17 03:30 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JW** |
| Total Dissolved Solids (Residue, Filterable) | 310 | 10.0 | 10.0 | | mg/L | 1 | 10/09/17 09:05 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *12-Oct-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-09 |
| **Project:** | Luminant - Ash Landfill - Oak Grove | **Lab ID:** | 1710037-03 |
| **Project No:** | 5347-E | **Collection Date:** | 10/02/17 01:00 PM |
| **Lab Order:** | 1710037 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Boron | 0.106 | 0.0100 | 0.0300 | | mg/L | 1 | 10/09/17 01:15 PM |
| Calcium | 58.2 | 0.500 | 1.50 | | mg/L | 5 | 10/09/17 02:25 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 140 | 3.00 | 10.0 | | mg/L | 10 | 10/09/17 12:30 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 10/09/17 03:42 PM |
| Sulfate | 95.3 | 1.00 | 3.00 | | mg/L | 1 | 10/09/17 03:42 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JW** |
| Total Dissolved Solids (Residue, Filterable) | 433 | 10.0 | 10.0 | | mg/L | 1 | 10/09/17 09:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *12-Oct-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-05 |
| **Project:** | Luminant - Ash Landfill - Oak Grove | **Lab ID:** | 1710037-04 |
| **Project No:** | 5347-E | **Collection Date:** | 10/02/17 02:45 PM |
| **Lab Order:** | 1710037 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Boron | 0.0665 | 0.0100 | 0.0300 | | mg/L | 1 | 10/09/17 01:16 PM |
| Calcium | 17.5 | 0.100 | 0.300 | | mg/L | 1 | 10/09/17 01:16 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 58.6 | 3.00 | 10.0 | | mg/L | 10 | 10/09/17 12:42 PM |
| Fluoride | 0.295 | 0.100 | 0.400 | J | mg/L | 1 | 10/09/17 03:54 PM |
| Sulfate | 10.4 | 1.00 | 3.00 | | mg/L | 1 | 10/09/17 03:54 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JW** |
| Total Dissolved Solids (Residue, Filterable) | 246 | 10.0 | 10.0 | | mg/L | 1 | 10/09/17 09:05 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *12-Oct-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-07 |
| **Project:** | Luminant - Ash Landfill - Oak Grove | **Lab ID:** | 1710037-05 |
| **Project No:** | 5347-E | **Collection Date:** | 10/02/17 03:40 PM |
| **Lab Order:** | 1710037 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Boron | 0.0733 | 0.0100 | 0.0300 | | mg/L | 1 | 10/09/17 01:18 PM |
| Calcium | 13.9 | 0.100 | 0.300 | | mg/L | 1 | 10/09/17 01:18 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 15.8 | 0.300 | 1.00 | | mg/L | 1 | 10/06/17 12:15 PM |
| Fluoride | 0.178 | 0.100 | 0.400 | J | mg/L | 1 | 10/06/17 12:15 PM |
| Sulfate | 38.4 | 1.00 | 3.00 | | mg/L | 1 | 10/06/17 12:15 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JW** |
| Total Dissolved Solids (Residue, Filterable) | 298 | 10.0 | 10.0 | | mg/L | 1 | 10/09/17 09:05 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| N | Parameter not NELAC certified | | |

# DHL Analytical, Inc.

**Date:** *12-Oct-17*

| | | | |
|---|---|---|---|
| **CLIENT:** | Pastor, Behling & Wheeler | **Client Sample ID:** | MW-08R |
| **Project:** | Luminant - Ash Landfill - Oak Grove | **Lab ID:** | 1710037-06 |
| **Project No:** | 5347-E | **Collection Date:** | 10/02/17 04:45 PM |
| **Lab Order:** | 1710037 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Boron | 0.0610 | 0.0100 | 0.0300 | | mg/L | 1 | 10/09/17 01:20 PM |
| Calcium | 13.1 | 0.100 | 0.300 | | mg/L | 1 | 10/09/17 01:20 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 14.4 | 0.300 | 1.00 | | mg/L | 1 | 10/09/17 04:06 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 10/09/17 04:06 PM |
| Sulfate | 28.7 | 1.00 | 3.00 | | mg/L | 1 | 10/09/17 04:06 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JW** |
| Total Dissolved Solids (Residue, Filterable) | 243 | 10.0 | 10.0 | | mg/L | 1 | 10/09/17 09:05 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | B | Analyte detected in the associated Method Blank |
| | C | Sample Result or QC discussed in the Case Narrative | DF | Dilution Factor |
| | E | TPH pattern not Gas or Diesel Range Pattern | J | Analyte detected between MDL and RL |
| | MDL | Method Detection Limit | ND | Not Detected at the Method Detection Limit |
| | RL | Reporting Limit | S | Spike Recovery outside control limits |
| | N | Parameter not NELAC certified | | |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1710037
**Project:** Luminant - Ash Landfill - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_171009C**

The QC data in batch 82680 applies to the following samples: 1710037-01A, 1710037-02A, 1710037-03A, 1710037-04A, 1710037-05A, 1710037-06A

Sample ID **MB-82680** Batch ID: **82680** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_171009C** Analysis Date: **10/9/2017 12:18:00 PM** Prep Date: **10/6/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |

Sample ID **LCS-82680** Batch ID: **82680** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_171009C** Analysis Date: **10/9/2017 12:20:00 PM** Prep Date: **10/6/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.203 | 0.0300 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Calcium | 5.18 | 0.300 | 5.00 | 0 | 104 | 80 | 120 | | | |

Sample ID **LCSD-82680** Batch ID: **82680** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_171009C** Analysis Date: **10/9/2017 12:22:00 PM** Prep Date: **10/6/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.209 | 0.0300 | 0.200 | 0 | 104 | 80 | 120 | 2.84 | 15 | |
| Calcium | 5.18 | 0.300 | 5.00 | 0 | 104 | 80 | 120 | 0.014 | 15 | |

Sample ID **1710015-09A SD** Batch ID: **82680** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_171009C** Analysis Date: **10/9/2017 12:28:00 PM** Prep Date: **10/6/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.342 | 0.150 | 0 | 0.314 | | | | 8.46 | 10 | |

Sample ID **1710015-09A PDS** Batch ID: **82680** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_171009C** Analysis Date: **10/9/2017 12:47:00 PM** Prep Date: **10/6/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.501 | 0.0300 | 0.200 | 0.314 | 93.2 | 80 | 120 | | | |

Sample ID **1710015-09A MS** Batch ID: **82680** TestNo: **SW6020A** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS4_171009C** Analysis Date: **10/9/2017 12:48:00 PM** Prep Date: **10/6/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.511 | 0.0300 | 0.200 | 0.314 | 98.5 | 80 | 120 | | | |

Sample ID **1710015-09A MSD** Batch ID: **82680** TestNo: **SW6020A** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS4_171009C** Analysis Date: **10/9/2017 12:50:00 PM** Prep Date: **10/6/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1710037
**Project:** Luminant - Ash Landfill - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_171009C**

| Sample ID | **1710015-09A MSD** | Batch ID: | **82680** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **ICP-MS4_171009C** | Analysis Date: | **10/9/2017 12:50:00 PM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.515 | 0.0300 | 0.200 | 0.314 | 100 | 80 | 120 | 0.713 | 15 | |

| Sample ID | **1710015-09A SD** | Batch ID: | **82680** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_171009C** | Analysis Date: | **10/9/2017 1:49:00 PM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 320 | 75.0 | 0 | 316 | | | | 1.28 | 10 | |

| Sample ID | **1710015-09A PDS** | Batch ID: | **82680** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_171009C** | Analysis Date: | **10/9/2017 2:09:00 PM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 626 | 15.0 | 250 | 316 | 124 | 80 | 120 | | | S |

| Sample ID | **1710015-09A MS** | Batch ID: | **82680** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **ICP-MS4_171009C** | Analysis Date: | **10/9/2017 2:11:00 PM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 314 | 15.0 | 5.00 | 316 | -30.9 | 80 | 120 | | | S |

| Sample ID | **1710015-09A MSD** | Batch ID: | **82680** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **ICP-MS4_171009C** | Analysis Date: | **10/9/2017 2:13:00 PM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 318 | 15.0 | 5.00 | 316 | 40.1 | 80 | 120 | 1.12 | 15 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1710037
**Project:** Luminant - Ash Landfill - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_171009C**

| Sample ID **ICV-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 10:07:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0991 | 0.0300 | 0.100 | 0 | 99.1 | 90 | 110 | | | |
| Calcium | 2.55 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 10:14:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0208 | 0.0300 | 0.0200 | 0 | 104 | 70 | 130 | | | |
| Calcium | 0.105 | 0.300 | 0.100 | 0 | 105 | 70 | 130 | | | |

| Sample ID **CCV2-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 11:22:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.212 | 0.0300 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Calcium | 5.18 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID **LCVL2-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 11:26:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0244 | 0.0300 | 0.0200 | 0 | 122 | 70 | 130 | | | |
| Calcium | 0.107 | 0.300 | 0.100 | 0 | 107 | 70 | 130 | | | |

| Sample ID **CCV3-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 12:57:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.218 | 0.0300 | 0.200 | 0 | 109 | 90 | 110 | | | |
| Calcium | 5.14 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL3-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 1:09:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0246 | 0.0300 | 0.0200 | 0 | 123 | 70 | 130 | | | |
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_171009C**

| Sample ID **CCV4-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 1:22:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.220 | 0.0300 | 0.200 | 0 | 110 | 90 | 110 | | | |
| Calcium | 5.14 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL4-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 1:28:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0246 | 0.0300 | 0.0200 | 0 | 123 | 70 | 130 | | | |
| Calcium | 0.0999 | 0.300 | 0.100 | 0 | 99.9 | 70 | 130 | | | |

| Sample ID **CCV5-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 2:15:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.07 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL5-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 2:19:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0965 | 0.300 | 0.100 | 0 | 96.5 | 70 | 130 | | | |

| Sample ID **CCV6-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 2:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.07 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL6-171009** | Batch ID: **R94582** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_171009C** | Analysis Date: **10/9/2017 2:37:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0994 | 0.300 | 0.100 | 0 | 99.4 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1710037
**Project:** Luminant - Ash Landfill - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_171006A**

The QC data in batch 82690 applies to the following samples: 1710037-05B

| Sample ID | **MB-82690** | Batch ID: | **82690** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC4_171006A** | Analysis Date: | **10/6/2017 11:30:46 AM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-82690** | Batch ID: | **82690** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC4_171006A** | Analysis Date: | **10/6/2017 11:42:46 AM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.77 | 1.00 | 10.00 | 0 | 97.7 | 90 | 110 | | | |
| Fluoride | 3.95 | 0.400 | 4.000 | 0 | 98.9 | 90 | 110 | | | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID | **LCSD-82690** | Batch ID: | **82690** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC4_171006A** | Analysis Date: | **10/6/2017 11:54:46 AM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.80 | 1.00 | 10.00 | 0 | 98.0 | 90 | 110 | 0.332 | 20 | |
| Fluoride | 4.01 | 0.400 | 4.000 | 0 | 100 | 90 | 110 | 1.29 | 20 | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 98.0 | 90 | 110 | 0.116 | 20 | |

| Sample ID | **1710037-05BMS** | Batch ID: | **82690** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_171006A** | Analysis Date: | **10/6/2017 12:27:42 PM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 35.2 | 1.00 | 20.00 | 15.80 | 96.8 | 90 | 110 | | | |
| Fluoride | 20.3 | 0.400 | 20.00 | 0.1780 | 101 | 90 | 110 | | | |
| Sulfate | 58.4 | 3.00 | 20.00 | 38.40 | 99.9 | 90 | 110 | | | |

| Sample ID | **1710037-05BMSD** | Batch ID: | **82690** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC4_171006A** | Analysis Date: | **10/6/2017 12:39:42 PM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 35.4 | 1.00 | 20.00 | 15.80 | 98.2 | 90 | 110 | 0.794 | 20 | |
| Fluoride | 20.6 | 0.400 | 20.00 | 0.1780 | 102 | 90 | 110 | 1.28 | 20 | |
| Sulfate | 58.6 | 3.00 | 20.00 | 38.40 | 101 | 90 | 110 | 0.402 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1710037
**Project:** Luminant - Ash Landfill - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_171006A**

| Sample ID **ICV-171006** | Batch ID: **R94565** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_171006A** | Analysis Date: **10/6/2017 11:06:46 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.9 | 1.00 | 25.00 | 0 | 99.5 | 90 | 110 | | | |
| Fluoride | 9.91 | 0.400 | 10.00 | 0 | 99.1 | 90 | 110 | | | |
| Sulfate | 75.7 | 3.00 | 75.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **CCV1-171006** | Batch ID: **R94565** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_171006A** | Analysis Date: **10/6/2017 3:03:42 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.86 | 1.00 | 10.00 | 0 | 98.6 | 90 | 110 | | | |
| Fluoride | 4.01 | 0.400 | 4.000 | 0 | 100 | 90 | 110 | | | |
| Sulfate | 29.5 | 3.00 | 30.00 | 0 | 98.4 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1710037
**Project:** Luminant - Ash Landfill - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_171009A**

The QC data in batch 82704 applies to the following samples: 1710037-01B, 1710037-02B, 1710037-03B, 1710037-04B, 1710037-06B

Sample ID **MB-82704** Batch ID: **82704** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_171009A** Analysis Date: **10/9/2017 10:35:35 AM** Prep Date: **10/9/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-82704** Batch ID: **82704** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_171009A** Analysis Date: **10/9/2017 10:47:35 AM** Prep Date: **10/9/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.62 | 1.00 | 10.00 | 0 | 96.2 | 90 | 110 | | | |
| Fluoride | 3.86 | 0.400 | 4.000 | 0 | 96.6 | 90 | 110 | | | |
| Sulfate | 28.6 | 3.00 | 30.00 | 0 | 95.5 | 90 | 110 | | | |

Sample ID **LCSD-82704** Batch ID: **82704** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_171009A** Analysis Date: **10/9/2017 10:59:35 AM** Prep Date: **10/9/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.63 | 1.00 | 10.00 | 0 | 96.3 | 90 | 110 | 0.094 | 20 | |
| Fluoride | 3.93 | 0.400 | 4.000 | 0 | 98.3 | 90 | 110 | 1.74 | 20 | |
| Sulfate | 28.6 | 3.00 | 30.00 | 0 | 95.5 | 90 | 110 | 0.009 | 20 | |

Sample ID **1710037-06BMS** Batch ID: **82704** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_171009A** Analysis Date: **10/9/2017 1:06:48 PM** Prep Date: **10/9/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2070 | 100 | 2000 | 0 | 104 | 90 | 110 | | | |
| Fluoride | 2010 | 40.0 | 2000 | 0 | 100 | 90 | 110 | | | |
| Sulfate | 1990 | 300 | 2000 | 0 | 99.6 | 90 | 110 | | | |

Sample ID **1710037-06BMSD** Batch ID: **82704** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_171009A** Analysis Date: **10/9/2017 1:18:48 PM** Prep Date: **10/9/2017**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2080 | 100 | 2000 | 0 | 104 | 90 | 110 | 0.130 | 20 | |
| Fluoride | 2010 | 40.0 | 2000 | 0 | 101 | 90 | 110 | 0.219 | 20 | |
| Sulfate | 1990 | 300 | 2000 | 0 | 99.4 | 90 | 110 | 0.156 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler
**Work Order:** 1710037
**Project:** Luminant - Ash Landfill - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_171009A**

| Sample ID **ICV-171009** | Batch ID: **R94591** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_171009A** | Analysis Date: **10/9/2017 10:11:35 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.4 | 1.00 | 25.00 | 0 | 97.6 | 90 | 110 | | | |
| Fluoride | 9.63 | 0.400 | 10.00 | 0 | 96.3 | 90 | 110 | | | |
| Sulfate | 73.7 | 3.00 | 75.00 | 0 | 98.3 | 90 | 110 | | | |

| Sample ID **CCV1-171009** | Batch ID: **R94591** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_171009A** | Analysis Date: **10/9/2017 2:54:48 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.74 | 1.00 | 10.00 | 0 | 97.4 | 90 | 110 | | | |
| Fluoride | 3.98 | 0.400 | 4.000 | 0 | 99.4 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.3 | 90 | 110 | | | |

| Sample ID **CCV2-171009** | Batch ID: **R94591** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_171009A** | Analysis Date: **10/9/2017 4:54:48 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.78 | 1.00 | 10.00 | 0 | 97.8 | 90 | 110 | | | |
| Fluoride | 4.05 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.7 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

**CLIENT:** Pastor, Behling & Wheeler

**Work Order:** 1710037

**Project:** Luminant - Ash Landfill - Oak Grove

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_171006C**

The QC data in batch 82694 applies to the following samples: 1710037-01B, 1710037-02B, 1710037-03B, 1710037-04B, 1710037-05B, 1710037-06B

| Sample ID | **MB-82694** | Batch ID: | **82694** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_171006C** | Analysis Date: | **10/9/2017 9:05:00 AM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-82694** | Batch ID: | **82694** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_171006C** | Analysis Date: | **10/9/2017 9:05:00 AM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 712 | 10.0 | 745.6 | 0 | 95.5 | 90 | 113 | | | |

| Sample ID | **1710050-02A-DUP** | Batch ID: | **82694** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_171006C** | Analysis Date: | **10/9/2017 9:05:00 AM** | Prep Date: | **10/6/2017** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 551 | 10.0 | 0 | 547.0 | | | | 0.729 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAC certified |

# 2020 Annual Groundwater Monitoring and Corrective Action Report

*Oak Grove Steam Electric Station Ash Landfill 1 - Robertson County, Texas*

Prepared for:

**Oak Grove Management Company LLC**

Prepared by:

**Golder Associates Inc.**
2201 Double Creek Dr, Suite 4004, Round Rock, Texas, USA 78664

+1 512 671-3434

January 29, 2021

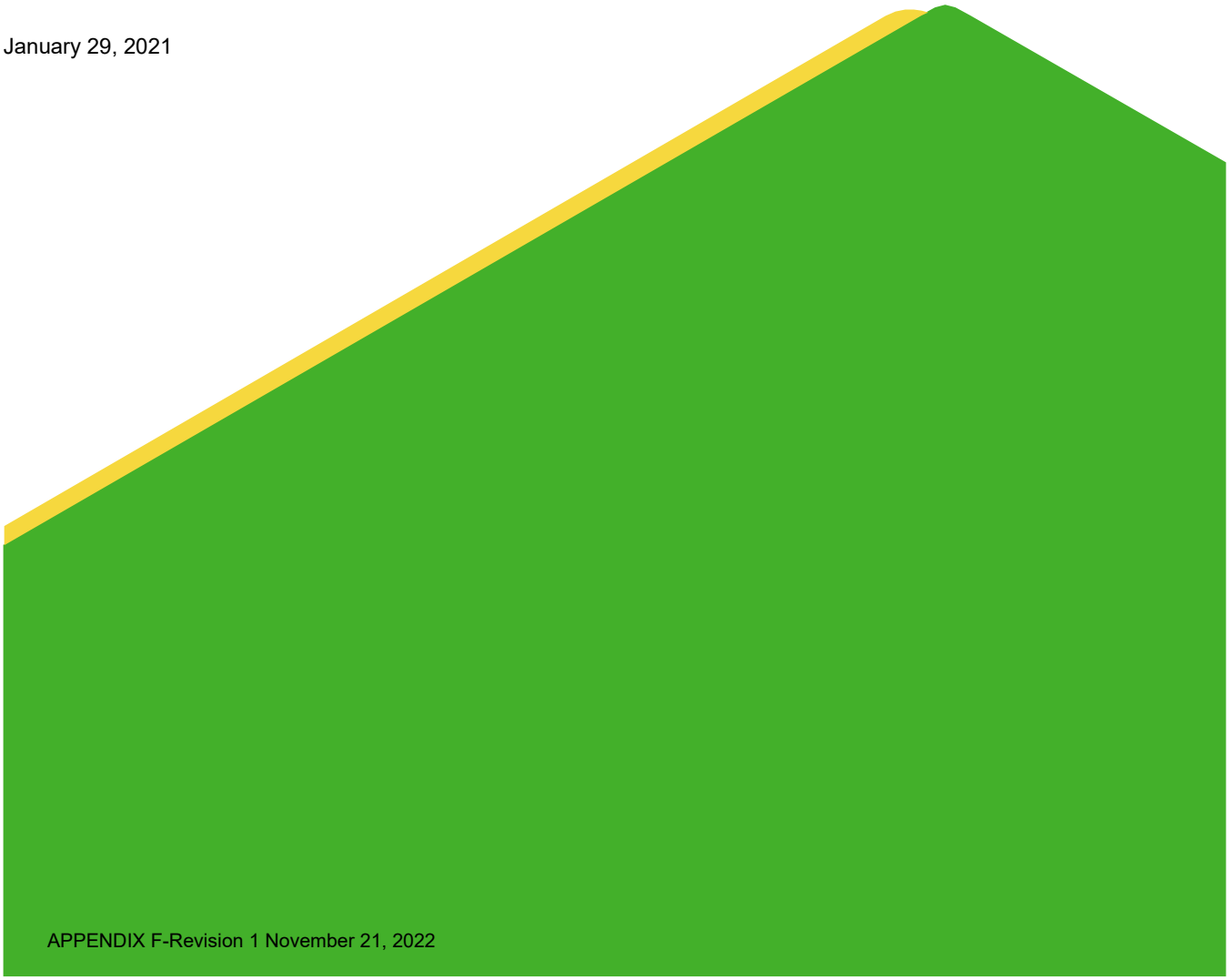


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Table 2 Appendix III Analytical Results

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Attachment 1 Alternate Source Demonstration Report

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| CCR | Coal Combustion Residuals |
| CFR | Code of Federal Regulations |
| GWPS | Groundwater Protection Standard |
| MCL | Maximum Concentration Level |
| mg/L | Milligrams per Liter |
| NA | Not Applicable |
| OGSES | Oak Grove Steam Electric Station |
| SSI | Statistically Significant Increase |
| SSL | Statistically Significant Level |
| USEPA | United States Environmental Protection Agency |

# EXECUTIVE SUMMARY

Golder Associates, Inc. (Golder) has prepared this report on behalf of Oak Grove Management Company LLC to satisfy the 2020 annual groundwater monitoring and corrective action reporting requirements of the Coal Combustion Residuals (CCR) Rule (40 CFR 257, Subpart D) for the Ash Landfill 1 (the "CCR unit") at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas. The CCR unit and CCR monitoring well network are shown on Figure 1.

At the beginning and end of the 2020 reporting period, the CCR unit was operating under a Detection Monitoring Program as described in 40 CFR § 257.94. The Detection Monitoring Program for the Ash Landfill 1 was established in September 2017. Statistically significant increases (SSIs) above background prediction limits were identified for several Appendix III parameters as part of the 2018 and 2019 Detection Monitoring events; however, Alternate Source Demonstrations were completed in 2019 and 2020 which indicated that a source other than the CCR unit caused the SSIs observed in 2018 and 2019. During 2020, SSIs above background prediction limits were also identified for several Appendix III constituents, including boron in wells MW-05 and MW-07 and sulfate in wells MW-07 and MW-09. Alternate sources for the SSIs identified in the 2020 sample data are being evaluated in accordance with 40 CFR § 257.94. If an alternate source is not identified to be the cause of the 2020 SSIs, an Assessment Monitoring Program will be established in accordance with 40 CFR § 257.94(e)(2)

# 1.0 INTRODUCTION

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the United States Environmental Protection Agency (USEPA) to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. For existing CCR landfills and surface impoundments, the CCR Rule requires that the owner or operator prepare an annual groundwater monitoring and corrective action report to document the status of the groundwater monitoring and corrective action program for the CCR unit for the previous calendar year. Per 40 CFR 257.90(e) of the CCR Rule, the report should contain the following information, to the extent available:

(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

(4) A narrative discussion of any transition between monitoring programs (*e.g.,* the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

(6) A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:

(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(iii) If it was determined that there was a statistically significant increase over background for one or more constituents listed in Appendix III to this part pursuant to § 257.94(e):

(A) Identify those constituents listed in Appendix III to this part and the names of the monitoring wells associated with such an increase; and

(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.

(iv) If it was determined that there was a SSL above the groundwater protection standard for one or more constituents listed in Appendix IV to this part pursuant to § 257.95(g) include all of the following:

(A) Identify those constituents listed in Appendix IV to this part and the names of the monitoring wells associated with such an increase;

(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;

(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and

(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.

(v) Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection; and

(vi) Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.

## 2.0 MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

The Ash Landfill 1 is currently in a Detection Monitoring Program. Golder collected the initial Detection Monitoring Program groundwater samples from the Ash Landfill 1 CCR monitoring well network in October 2017. Subsequent Detection Monitoring Program groundwater samples have been collected on a semi-annual basis since that time. Data evaluation is completed using procedures described in the Statistical Analysis Plan (PBW, 2017) to identify SSIs of Appendix III parameters over background concentrations. The Detection Monitoring Program sampling dates and parameters are summarized in the following table:

**Detection Monitoring Program Summary**

| Sampling Dates | Parameters | SSIs | Assessment Monitoring Program Established |
|---|---|---|---|
| October 2017 | Appendix III | No | No |
| June 2018<br>September 2018<br>November 2018 (re-samples) | Appendix III | Yes | No<br>(Alternate Source Demonstration Completed) |
| May 2019<br>August 2019 | Appendix III | Yes | No<br>(Alternate Source Demonstration Completed) |
| May 2020<br>September 2020 | Appendix III | Yes | To Be Determined<br>(Alternate Source Currently Being Assessed) |

The statistical background values and Appendix III analytical data are presented in Tables 1 and 2, respectively. SSIs of Appendix III parameters were identified during the 2018 through 2020 sampling events. An initial Alternate Source Demonstration was completed in 2019, which indicated that a source other than the CCR unit caused SSIs observed in the 2018 sample data. Similarly, an Alternate Source Demonstration was completed in 2020 based on the 2019 sample data. As such, the Ash Landfill 1 has remained in the Detection Monitoring Program. A summary of the Alternate Source Demonstration based on the 2019 sample data is presented in Attachment 1 as required by 40 CFR 257.94(e)(2).

Detection Monitoring Program groundwater samples were collected from the CCR groundwater monitoring network on a semi-annual basis in 2020, as required by the CCR Rule. The first 2020 semi-annual Detection

Monitoring Program sampling event was conducted in May 2020. The second 2020 semi-annual Detection Monitoring Program sampling event was conducted in September 2020. The analytical data from the 2020 semi-annual Detection Monitoring Program sampling events were evaluated using procedures described in the Statistical Analysis Plan to identify SSIs of Appendix III parameters over background concentrations. SSIs of Appendix III parameters over background concentrations were identified for two constituents (boron and sulfate) for which SSIs had been identified in previous years and attributed to alternate sources. Alternate sources for the SSIs identified in the 2020 sample data are being evaluated in accordance with 40 CFR § 257.94. If an alternate source is not identified to be the cause of the SSIs, an Assessment Monitoring Program will be established in accordance with 40 CFR § 257.94(e)(2).

## 3.0 KEY ACTIONS COMPLETED IN 2020

Semi-annual Detection Monitoring Program groundwater monitoring events were conducted in May and September 2020. The number of groundwater samples that were collected for analysis of each background and downgradient well, the dates the samples were collected, and the analytical results for the groundwater samples are summarized in Table 2. A map showing the CCR units and monitoring wells is provided as Figure 1. No CCR wells were installed or decommissioned in 2020.

An Alternate Source Demonstration was completed in April 2020 in accordance with 40 CFR 257.94(e)(2), which documented that a source other than Ash Landfill 1 caused the SSIs detected over background levels during the 2019 Detection Monitoring Program sampling events. A copy of the 2020 Alternate Source Demonstration is provided in Attachment 1.

# 4.0 PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the CCR groundwater monitoring program in 2020.

## 5.0 KEY ACTIVITIES PLANNED FOR 2021

The following key activities are planned for 2021:

- Continue the Detection Monitoring Program in accordance with 40 CFR § 257.94.

- Complete evaluation of Appendix III analytical data and compare results to statistical background values to determine whether an SSI has occurred.

- If an SSI is identified, potential alternate sources (i.e., a source other than the CCR unit caused the SSI or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality) will be evaluated. If an alternate source is identified to be the cause of the SSI, a written demonstration will be completed within 90 days of SSI determination and included in the Annual Groundwater Monitoring and Corrective Action Report.

- If an alternate source is not identified to be the cause of the SSI, an Assessment Monitoring Program will be established in accordance with 40 CFR § 257.94(e)(2).

# 6.0 REFERENCES

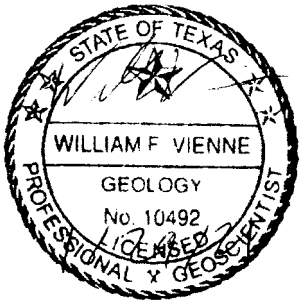
Pastor, Behling & Wheeler, LLC, 2017. Coal Combustion Residual Rule Statistical Analysis Plan, Oak Grove Steam Electric Station, Ash Landfill, Robertson County, Texas.

# Signature Page

**Golder Associates Inc.**

Patrick J. Behling
*Principal Engineer*

William F. Vienne
*Senior Hydrogeologist*

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# FIGURES

**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**DETAILED SITE PLAN - ASH LANDFILL**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 19122262 | 0 | 1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

Last Edited By: adiamond Date: 2020-01-23 Time:9:47:09 AM | Printed By: adiamond Date: 2020-01-23 Time:9:47:43 AM
Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (Ash Landfill).dwg

# TABLES

**Table 1**
**Statistical Background Value**
**OGSES Ash Landfill 1**

| Parameter | Statistical Background Value |
|---|---|
| Boron (mg/L) | 0.124 |
| Calcium (mg/L) | 74.9 |
| Chloride (mg/L) | 353 |
| Fluoride (mg/L) | 0.4 |
| field pH (s.u.) | 6.31<br>7.09 |
| Sulfate (mg/L) | 97.4 |
| Total Dissolved Solids (mg/L) | 948 |

**TABLE 2**
**APPENDIX III ANALYTICAL RESULTS**
**OGSES ASH LANDFILL 1**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | F (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| **Upgradient Wells** | | | | | | | | |
| AL-10 | 11/04/15 | 0.0682 | 34.5 | 149 | 0.149 J | 6.86 | 72.6 | 590 |
| | 12/18/15 | 0.0539 | 37.5 | 81 | 0.15 J | 6.45 | 20.6 | 414 |
| | 02/10/16 | 0.0637 | 48.6 | 108 | 0.197 J | 6.75 | 34.9 | 599 |
| | 04/15/16 | 0.0573 | 44.8 | 86 | 0.133 | 6.51 | 23.6 | 549 |
| | 06/16/16 | 0.0915 | 34.7 | 66.7 | 0.155 J | 6.44 | 23.5 | 436 |
| | 08/25/16 | 0.105 | 87.5 | 444 | <0.1 | 6.61 | 96.3 | 1,120 |
| | 10/04/16 | 0.0756 | 35.1 | 57.3 | 0.278 J | 6.92 | 20.1 | 507 |
| | 12/22/16 | 0.0759 | 32.5 | 57.2 | 0.195 J | 6.78 | 21.5 | 527 |
| | 10/02/17 | 0.0973 | 27 | 50.6 | 0.120 J | 6.85 | 12.2 | 398 |
| | 06/04/18 | 0.0875 | 21.9 | 62.1 | 0.183 J | 6.67 | 11.6 | 362 |
| | 09/06/18 | 0.113 | 21.9 | 56.7 | 0.260 J | 6.66 | 11.8 | 371 |
| | 05/17/19 | 0.114 | 16.8 | 67.9 | 0.262 J | 6.64 | 12.4 | 340 |
| | 08/20/19 | 0.115 | 18.8 | 66.2 | 0.363 J | 6.87 | 11.8 | 333 |
| | 05/07/20 | 0.128 | 18.8 | 52.2 | <0.100 | 6.78 | 11.1 | 317 |
| | 9/9/2020 | 0.139 | 16.8 | 49.2 | 0.208 J | 6.86 | 10.6 | 301 |
| MW-02 | 11/04/15 | 0.064 | 32.5 | 138 | 0.135 J | 6.92 | 71.4 | 539 |
| | 12/18/15 | 0.0476 | 29 | 61.7 | 0.118 J | 6.83 | 15.9 | 308 |
| | 02/10/16 | 0.0853 | 25.4 | 83.5 | 0.229 J | 6.63 | 34 | 320 |
| | 04/15/16 | 0.0597 | 39.6 | 68 | 0.102 | 6.51 | 18.1 | 440 |
| | 06/16/16 | 0.106 | 26.5 | 87.8 | 0.161 J | 6.89 | 34.8 | 343 |
| | 08/25/16 | 0.0492 | 12.9 | 21.9 | 0.164 J | 6.58 | 22.4 | 163 |
| | 10/04/16 | 0.113 | 61.4 | 222 | 0.185 J | 6.69 | 97.4 | 667 |
| | 12/21/16 | 0.11 | 47.8 | 185 | 0.293 J | 6.78 | 83.4 | 590 |
| | 10/02/17 | 0.0567 | 22.2 | 42.4 | <0.100 | 6.68 | 9.67 | 310 |
| | 06/04/18 | 0.144 | 82.4 | 275 | 0.139 J | 6.28 | 121 | 740 |
| | 09/06/18 | 0.148 | 70.9 | 259 | 0.221 J | 6.02 | 116 | 872 |
| | 05/17/19 | 0.0981 | 20 | 67.6 | 0.321 J | 6.63 | 31.1 | 306 |
| | 08/20/19 | 0.0875 | 19.9 | 53.8 | 0.558 | 6.59 | 20.1 | 260 |
| | 5/7/2020 | 0.0996 | 11.5 | 2.87 | <0.100 | 6.63 | 6.14 | 106 |
| | 9/9/2020 | 0.166 | 55.6 | 210 | 0.287 J | 6.76 | 99.2 | 592 |
| **Downgradient Wells** | | | | | | | | |
| MW-05 | 11/04/15 | 0.0628 | 15.4 | 64.8 | 0.272 J | 7.11 | 13.6 | 285 |
| | 12/18/15 | 0.0621 | 13 | 60.2 | 0.476 | 6.52 | 10.5 | 232 |
| | 02/10/16 | 0.0447 | 14 | 59.7 | 0.397 J | 6.67 | 11.9 | 235 |
| | 04/15/16 | 0.0458 | 14.3 | 55.4 | 0.284 | 6.42 | 10.7 | 288 |
| | 06/15/16 | 0.058 | 14.2 | 60.4 | 0.306 J | 6.61 | 11.8 | 269 |
| | 08/24/16 | 0.0877 | 13.1 | 63 | 0.262 J | 6.75 | 11.8 | 287 |
| | 10/04/16 | 0.059 | 15.4 | 57.9 | 0.477 | 6.87 | 10.9 | 253 |
| | 12/22/16 | 0.0759 | 61.4 | 264 | 0.446 | 6.63 | 55.6 | 778 |
| | 10/02/17 | 0.0665 | 17.5 | 58.6 | 0.295 J | 6.89 | 10.4 | 246 |
| | 06/05/18 | 0.0739 | 16.8 | 60 | 0.391 J | 6.43 | 12.1 | 253 |
| | 09/07/18 | 0.077 | 15.8 | 63.3 | 0.392 J | 6.11 | 10.6 | 249 |
| | 05/17/19 | 0.0686 | 13.5 | 66.4 | 0.462 | 6.57 | 11.2 | 257 |
| | 08/20/19 | 0.079 | 16 | 66.7 | 0.514 | 6.78 | 10.8 | 263 |
| | 05/07/20 | 0.0985 | 18 | 71.8 | 0.344 J | 6.68 | 10.6 | 264 |
| | 09/09/20 | 0.201 | 20.5 | 79.8 | 0.372 J | 6.81 | 66.5 | 407 |

**TABLE 2**
**APPENDIX III ANALYTICAL RESULTS**
**OGSES ASH LANDFILL 1**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | F (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| MW-07 | 11/03/15 | 0.0483 | 8.57 | 20.2 | 0.289 J | 6.42 | 11.5 | 276 |
| | 12/17/15 | 0.0539 | 8.75 | 17.7 | 0.319 J | 6.86 | 14.7 | 243 |
| | 02/09/16 | 0.0547 | 13.3 | 28.9 | 0.276 J | 7.18 | 25.3 | 283 |
| | 04/15/16 | 0.0567 | 10 | 20.9 | 0.187 | 6.71 | 16 | 341 |
| | 06/15/16 | 0.0639 | 10.5 | 22.9 | 0.226 J | 6.75 | 23.2 | 294 |
| | 08/24/16 | 0.0691 | 9.58 | 20.4 | 0.159 J | 6.89 | 21.8 | 290 |
| | 10/04/16 | 0.0549 | 10.3 | 15.6 | 0.277 J | 6.82 | 17.1 | 256 |
| | 12/22/16 | 0.054 | 12.5 | 22.9 | 0.229 J | 6.29 | 34.7 | 262 |
| | 10/02/17 | 0.0733 | 13.9 | 15.8 | 0.178 J | 6.59 | 38.4 | 298 |
| | 06/05/18 | 0.105 | 17.5 | 15.7 | 0.169 J | 5.98 | 61.1 | 316 |
| | 09/07/18 | 0.151 | 19.7 | 21.5 | 0.250 J | 6.18 | 80.3 | 357 |
| | 11/6/2018 re-sample | 0.154 | -- | -- | -- | -- | -- | -- |
| | 05/17/19 | 0.132 | 17.1 | 20.2 | 0.244 J | 6.83 | 84.1 | 355 |
| | 08/19/19 | 0.215 | 22.8 | 19.7 | 0.367 J | 6.77 | 100 | 385 |
| | 05/07/20 | 0.302 | 29.7 | 22.4 | 0.234 J | 6.84 | 123 | 432 |
| | 9/9/2020 | 0.297 | 26.9 | 24.7 | 0.302 J | 6.58 | 121 | 413 |
| MW-08 | 11/04/15 | 0.0631 | 120 | 599 | 0.17 J | 6.81 | 138 | 2,070 |
| | 12/18/15 | 0.0604 | 70.4 | 488 | 0.158 J | 6.78 | 49.8 | 1,140 |
| | 02/09/16 | 0.0695 | 140 | 612 | 0.175 J | 6.42 | 170 | 1,530 |
| | 04/15/16 | 0.0726 | 133 | 566 | <0.1 | 6.61 | 139 | 1,680 |
| | 06/16/16 | 0.0677 | 76.6 | 520 | <0.1 | 6.76 | 83.6 | 1,090 |
| | 8/2016 | Destroyed | | | | | | |
| MW-08R | 12/22/16 | 0.0702 | 32.4 | 166 | 0.355 J | 6.93 | 39.7 | 617 |
| | 03/21/17 | 0.0662 | 117 | 563 | 0.2 J | 5.83 | 98.3 | 1,220 |
| | 04/20/17 | 0.0696 | 115 | 560 | 0.149 J | 5.91 | 94.9 | 1,190 |
| | 10/02/17 | 0.061 | 13.1 | 14.4 | <0.100 | 6.63 | 28.7 | 243 |
| | 06/05/18 | 0.082 | 18.9 | 53.9 | 0.138 J | 6.37 | 9.66 | 302 |
| | 09/07/18 | 0.0921 | 106 | 504 | 0.242 J | 5.84 | 96.9 | 1,550 |
| | 11/06/18 | -- | 15.7 | 19 | -- | -- | -- | 268 |
| | 05/17/19 | 0.102 | 16.7 | 69.8 | 0.269 J | 6.54 | 12.4 | 326 |
| | 08/20/19 | 0.096 | 24.9 | 48 | 0.501 | 6.84 | 30.7 | 255 |
| | 05/07/20 | 0.122 | 19 | 51.8 | 0.117 J | 6.83 | 11.1 | 320 |
| | 9/9/2020 | 0.0977 | 15.8 | 55.5 | 0.344 J | 6.68 | 19.0 | 256 |
| MW-09 | 11/03/15 | 0.0722 | 36.4 | 155 | 0.149 J | 6.45 | 74.9 | 583 |
| | 12/18/15 | 0.077 | 40.3 | 157 | 0.266 J | 6.48 | 83.1 | 528 |
| | 02/09/16 | 0.072 | 38.4 | 158 | 0.152 J | 6.16 | 80 | 445 |
| | 04/15/16 | 0.0734 | 42.2 | 151 | <0.1 | 6.41 | 80.9 | 568 |
| | 06/15/16 | 0.0778 | 43.1 | 174 | <0.1 | 6.52 | 98.7 | 574 |
| | 08/25/16 | 0.0829 | 45.6 | 195 | <0.1 | 6.76 | 116 | 715 |
| | 10/04/16 | 0.0803 | 47.8 | 179 | 0.256 J | 6.64 | 108 | 648 |
| | 12/22/16 | 0.0776 | 42.6 | 290 | 0.159 J | 6.87 | 116 | 791 |
| | 10/02/17 | 0.106 | 58.2 | 140 | <0.100 | 6.76 | 95.3 | 433 |
| | 06/04/18 | 0.091 | 21.7 | 6.48 | 0.162 J | 6.28 | 6.08 | 135 |
| | 09/06/18 | 0.0999 | 49.8 | 186 | 0.134 J | 5.61 | 104 | 704 |
| | 11/6/2018 re-sample | -- | -- | -- | -- | -- | 58.6 | -- |
| | 05/17/19 | 0.12 | 17.2 | 366 | 0.541 | 6.72 | 53.2 | 935 |
| | 08/20/19 | 0.117 | 26 | 61.2 | 0.359 J | 6.96 | 22.3 | 331 |
| | 05/07/20 | 0.0988 | 20.2 | 45.1 | 0.234 J | 6.68 | 17.3 | 212 |
| | 9/9/2020 | 0.123 | 48.5 | 156 | 0.152 J | 6.72 | 99.6 | 468 |

Notes:
1. Abbreviations: mg/L - milligrams per liter; TDS - total dissolved solids; s.u. - standard units.
2. J - concentration is below method quantitation limit; result is an estimate.

## ATTACHMENT 1

## ALTERNATE SOURCE DEMONSTRATION REPORT

# ALTERNATE SOURCE DEMONSTRATION SUMMARY

# OAK GROVE STEAM ELECTRIC STATION – ASH LANDFILL 1

## Introduction

This Alternative Source Demonstration Summary was prepared to document that a source other than the Ash Landfill 1 (the Site) caused the statistically significant increases (SSIs) over background levels observed during the 2019 Detection Monitoring Program sampling events as required by 40 CFR 257.94(e)(2). A detailed Site plan of the Coal Combustion Residual (CCR) groundwater monitoring network for Ash Landfill 1 is shown on Figure 1. Detection Monitoring Program groundwater data from 2018 and 2019 are summarized in Table 1.

## Ash Landfill 1 Groundwater Monitoring System

The CCR groundwater monitoring well system at the Ash Landfill 1 consists of six monitoring wells (MW-02, MW-05, MW-07, MW-08R, MW-09, and AL-10) that are each screened in the uppermost aquifer at the Site. The uppermost aquifer at the Site occurs under unconfined conditions within the shallow sand units at the Site (PBW, 2017a). Groundwater elevations have consistently been highest west of the Ash Landfill 1 and lowest east of the Ash Landfill 1 during the background and detection monitoring period, with a groundwater flow direction from west to east. Based on the observed groundwater potentiometric surface at the Site, the location of each CCR monitoring well relative to the Ash Landfill 1 is as follows:

| Upgradient/Background Wells | Downgradient Wells |
|---|---|
| MW-02<br>AL-10 | MW-05<br>MW-07<br>MW-08R<br>MW-09 |

## 2019 Semi-Annual Detection Monitoring Results and Discussion

Detection Monitoring Program groundwater samples were collected on a semi-annual basis from the Site CCR monitoring well network in 2019 in accordance with 40 CFR 257.94. Golder collected the first semi-annual 2019 Detection Monitoring Program groundwater samples in May 2019 and the second semi-annual Detection Monitoring Program groundwater samples in August 2019.

Based on the 2019 semi-annual results, SSIs were identified for boron in downgradient well MW-07 and fluoride in downgradient well MW-05. Potential SSIs were also noted for fluoride in upgradient well MW-02 and downgradient well MW-08R and for sulfate in downgradient well MW-07, since prediction limits for fluoride and sulfate were exceeded in these wells during the second semi-annual 2019 monitoring event, but not the first semi-annual 2019 event. Prediction limits for chloride and fluoride were exceeded in downgradient well MW-09 during the first semi-annual 2019 sampling event; however, since the prediction limits were not exceeded during the second semi-annual 2019 event, SSIs were not indicated for these constituents in accordance with the procedures outlined in the Statistical Analysis Plan (PBW, 2017b).

Boron, fluoride and sulfate concentrations exceeded prediction limits in upgradient well MW-02 during 2019 (fluoride) and 2018 (boron and sulfate) and the concentrations reported for these constituents in upgradient well MW-02 were similar to the SSI concentrations reported for wells MW-05, MW-07 and MW-08R in 2019. Based on the similarity between the upgradient and downgradient groundwater data, the SSIs observed during the 2019

sampling events are attributed to natural variation in groundwater quality related to the heterogeneity of the uppermost aquifer at the Site rather than a release from the Ash Landfill 1.

**Conclusion**

SSIs or potential SSIs were observed in downgradient wells MW-05, MW-07 and MW-08R and upgradient well MW-02 during the 2019 Detection Monitoring Program sampling events at Ash Landfill 1. All SSIs are attributed to natural variation in groundwater quality due to the heterogeneity of the groundwater system and are not considered evidence of a release from the CCR unit. In accordance with Section 257.94(e)(2), Luminant should continue the Detection Monitoring Program. Initiation of an Assessment Monitoring Program is not required at this time.

**References**

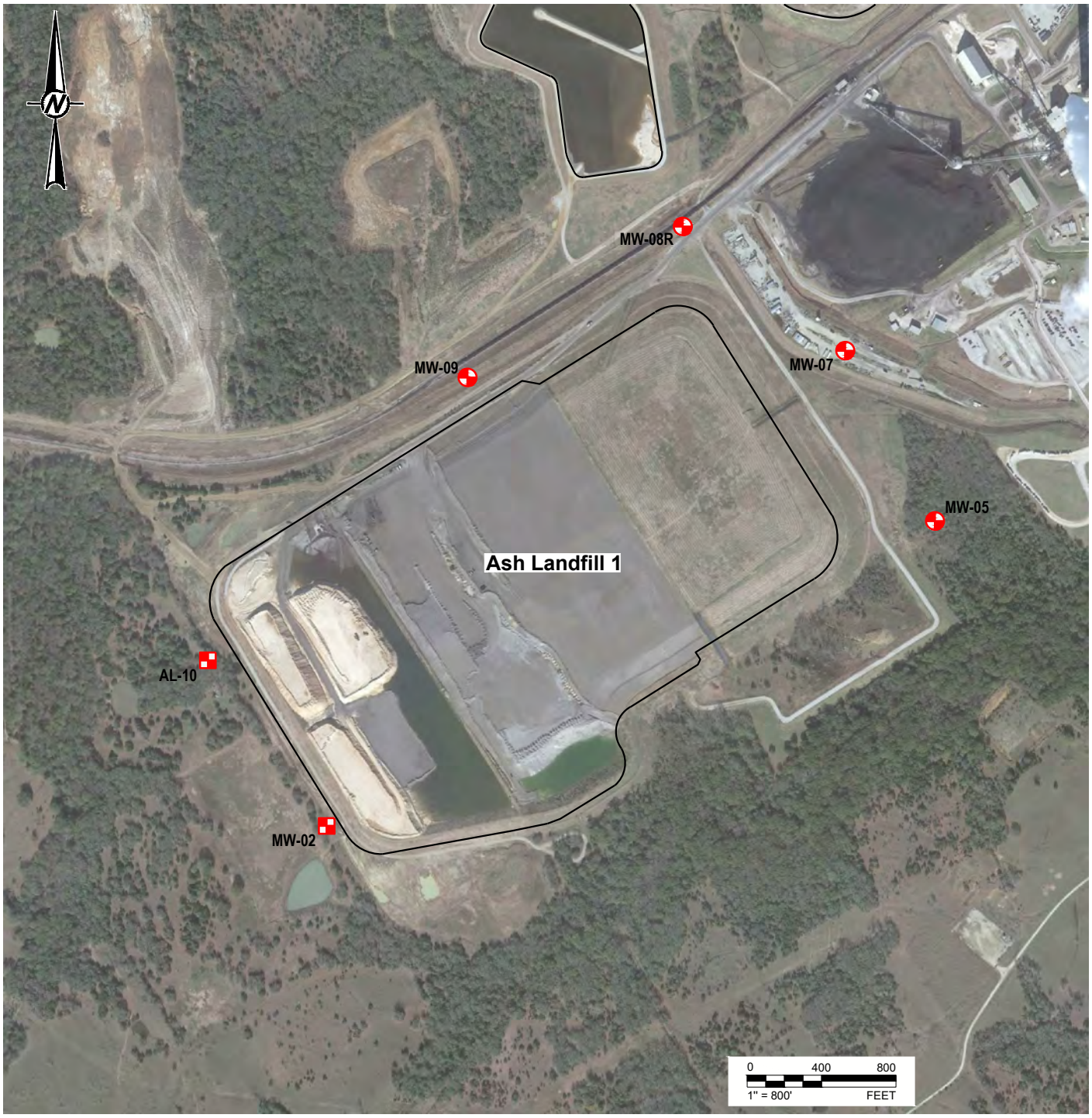
Pastor, Behling & Wheeler, LLC (PBW), 2017a. Coal Combustion Residual Rule, Groundwater Monitoring System Certification, Oak Grove Steam Electric Station, Ash Landfill 1, Robertson County, Texas. October 16, 2017.

Pastor, Behling & Wheeler, LLC (PBW), 2017b. Coal Combustion Residual Rule, Statistical Analysis Plan, Ash Landfill 1, Robertson County, Texas. October 11, 2017.

**PROFESSIONAL CERTIFICATION**

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the alternative source demonstration at the referenced facility meets the requirements of Section 257.94(e)(2) of the CCR Rule.

Patrick J. Behling, P.E.
Principal Engineer
GOLDER ASSOCIATES INC.




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**DETAILED SITE PLAN - ASH LANDFILL**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 19122262 | 0 | 1 |

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Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (Ash Landfill).dwg

**Table 1**
**2018 - 2019 CCR Groundwater Detection Monitoring Data Summary**
**Ash Landfill I**
**Oak Grove Steam Electric Station**

| Sample Location | Date Sampled | B | Ca | Cl | Fl | field pH | $SO_4$ | TDS |
|---|---|---|---|---|---|---|---|---|
| **Prediction Limit** | | 0.124 | 74.9 | 353 | 0.4 | 6.31<br>7.09 | 97.4 | 948 |
| **Upgradient Wells** | | | | | | | | |
| AL-10 | 06/04/18 | 0.0875 | 21.9 | 62.1 | 0.183 J | 6.67 | 11.6 | 362 |
| | 09/06/18 | 0.113 | 21.9 | 56.7 | 0.260 J | 6.66 | 11.8 | 371 |
| | 05/17/19 | 0.114 | 16.8 | 67.9 | 0.262 J | 6.64 | 12.4 | 340 |
| | 08/20/19 | 0.115 | 18.8 | 66.2 | 0.363 J | 6.87 | 11.8 | 333 |
| MW-02 | 06/04/18 | **0.144** | **82.4** | 275 | 0.139 J | 6.28 | **121** | 740 |
| | 09/06/18 | **0.148** | 70.9 | 259 | 0.221 J | 6.02 | **116** | 872 |
| | 05/17/19 | 0.0981 | 20 | 67.6 | 0.321J | 6.63 | 31.1 | 306 |
| | 08/20/19 | 0.0875 | 19.9 | 53.8 | **0.558** | 6.59 | 20.1 | 260 |
| **Downgradient Wells** | | | | | | | | |
| MW-05 | 06/05/18 | 0.0739 | 16.8 | 60 | 0.391 J | 6.43 | 12.1 | 253 |
| | 09/07/18 | 0.077 | 15.8 | 63.3 | 0.392 J | 6.11 | 10.6 | 249 |
| | 05/17/19 | 0.0686 | 13.5 | 66.4 | **0.462** | 6.57 | 11.2 | 257 |
| | 08/20/19 | 0.079 | 16 | 66.7 | **0.514** | 6.78 | 10.8 | 263 |
| MW-07 | 06/05/18 | 0.105 | 17.5 | 15.7 | 0.169 J | 5.98 | 61.1 | 316 |
| | 09/07/18 | **0.151** | 19.7 | 21.5 | 0.250 J | 6.18 | 80.3 | 357 |
| | 11/06/18 | **0.154** | -- | -- | -- | -- | -- | -- |
| | 05/17/19 | **0.132** | 17.1 | 20.2 | 0.244 J | 6.83 | 84.1 | 355 |
| | 08/19/19 | **0.215** | 22.8 | 19.7 | 0.367 J | 6.77 | **100** | 385 |
| MW-08R | 06/05/18 | 0.082 | 18.9 | 53.9 | 0.138 J | 6.37 | 9.66 | 302 |
| | 09/07/18 | 0.0921 | **106** | **504** | 0.242 J | 5.84 | 96.9 | **1,550** |
| | 11/06/18 | -- | 15.7 | 19 | -- | -- | -- | 268 |
| | 05/17/19 | 0.102 | 16.7 | 69.8 | 0.269 J | 6.54 | 12.4 | 326 |
| | 08/20/19 | 0.096 | 24.9 | 48 | **0.501** | 6.84 | 30.7 | 255 |
| MW-09 | 06/04/18 | 0.091 | 21.7 | 6.48 | 0.162 J | 6.28 | 6.08 | 135 |
| | 09/06/18 | 0.0999 | 49.8 | 186 | 0.134 J | 5.61 | **104** | 704 |
| | 11/06/18 | -- | -- | -- | -- | -- | 58.6 | -- |
| | 05/17/19 | 0.120 | 17.2 | **366** | **0.541** | 6.72 | 53.2 | 935 |
| | 08/20/19 | 0.117 | 26 | 61.2 | 0.359 J | 6.96 | 22.3 | 331 |

Notes:
1. All concentrations in mg/L. pH in standard units.
2. J - concentration is below sample quantitation limit; result is an estimate.
3. Highlighted sample results exeed the prediction limit.

golder.com

# 2021 Annual Groundwater Monitoring and Corrective Action Report - Revision 1

*Oak Grove Steam Electric Station Ash Landfill 1 - Robertson County, Texas*

Prepared for:

**Oak Grove Management Company LLC**

Prepared by:

**Golder Associates Inc., Member of WSP**

1601 S. Mopac Expy, Suite 325D, Austin, Texas, USA 78746

+1 737 703 3900

November 2022

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Attachment 1 Laboratory Analytical Reports

Attachment 2 Alternate Source Demonstration Report

Attachment 3 2021 Groundwater Poetentiometric Surface Maps

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| CCR | Coal Combustion Residuals |
| C.F.R. | Code of Federal Regulations |
| GWPS | Groundwater Protection Standard |
| MCL | Maximum Concentration Level |
| mg/L | Milligrams per Liter |
| NA | Not Applicable |
| OGSES | Oak Grove Steam Electric Station |
| SSI | Statistically Significant Increase |
| SSL | Statistically Significant Level |
| T.A.C. | Texas Administrative Code |
| USEPA | United States Environmental Protection Agency |

# DOCUMENT REVISION RECORD

| Issue No. | Date | Details of Revisions |
|---|---|---|
| **Revision 0** | January 31, 2022 | Original Document |
| **Revision 1** | November 2022 | Added laboratory analytical reports, groundwater potentiometric surface maps, and professional seals to figures where applicable |

# EXECUTIVE SUMMARY

Golder Associates USA Inc. (Golder), Member of WSP, has prepared this report on behalf of Oak Grove Management Company LLC to satisfy the 2021 annual groundwater monitoring and corrective action reporting requirements of 40 C.F.R. Part 257 and 30 T.A.C. Chapter 352 for the Ash Landfill 1 (the "CCR unit") at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas. The CCR unit and CCR monitoring well network are shown on Figure 1.

At the beginning and end of the 2021 reporting period, the CCR unit was operating under a Detection Monitoring Program as described in §257.94. The Detection Monitoring Program for the Ash Landfill 1 was established in September 2017. Statistically significant increases (SSIs) above background prediction limits were identified for several Appendix III parameters as part of the 2018 through 2020 Detection Monitoring events; however, Alternate Source Demonstrations were completed which indicated that a source other than the CCR unit caused the SSIs. During 2021, SSIs above background prediction limits were also identified for several Appendix III constituents, including for boron in well MW-07 and sulfate in wells MW-07 and MW-08R. Alternate sources for the SSIs identified in the 2021 sample data are being evaluated in accordance with §257.94. If an alternate source is not identified to be the cause of the 2021 SSIs, an Assessment Monitoring Program will be established in accordance with §257.94(e)(2).

# 1.0 INTRODUCTION

The CCR Rule (40 C.F.R. 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the United States Environmental Protection Agency (USEPA) to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. TCEQ has adopted portions of the federal CCR rule at 30 T.A.C. Chapter 352 (Texas CCR Rule), and USEPA published its final approval of the Texas CCR rule on June 28, 2021. *See* 86 Fed. Reg. 33,892 (June 28, 2021). The Texas CCR Rule became effective on July 28, 2021, and it adopts and incorporates by reference the requirements for the annual groundwater monitoring report located at 40 C.F.R. § 257.90. *See* 30 T.A.C. § 352.901. It further adopts and incorporates by reference the Federal CCR Program requirements for detection and assessment monitoring in 30 T.A.C. §352.941 and 30 T.A.C. §352.951, respectively. Pursuant to 30 T.A.C. § 352.902, this report will be submitted to TCEQ for review no later than 30 days after the report has been placed in the facility's operating record. For existing CCR landfills and surface impoundments, the CCR Rule requires that the owner or operator prepare an annual groundwater monitoring and corrective action report to document the status of the groundwater monitoring and corrective action program for the CCR unit for the previous calendar year. Per §257.90(e) of the CCR Rule, the report should contain the following information, to the extent available:

(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

(4) A narrative discussion of any transition between monitoring programs (*e.g.,* the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

(6) A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:

(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(iii) If it was determined that there was a statistically significant increase over background for one or more constituents listed in Appendix III to this part pursuant to § 257.94(e):

(A) Identify those constituents listed in Appendix III to this part and the names of the monitoring wells associated with such an increase; and

(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.

(iv) If it was determined that there was a SSL above the groundwater protection standard for one or more constituents listed in Appendix IV to this part pursuant to § 257.95(g) include all of the following:

(A) Identify those constituents listed in Appendix IV to this part and the names of the monitoring wells associated with such an increase;

(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;

(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and

(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.

(v) Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection; and

(vi) Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.

## 2.0 MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

The Ash Landfill 1 is currently in a Detection Monitoring Program. Golder collected the initial Detection Monitoring Program groundwater samples from the Ash Landfill 1 CCR monitoring well network in October 2017. Subsequent Detection Monitoring Program groundwater samples have been collected on a semi-annual basis since that time. Data evaluation is completed using procedures described in the Statistical Analysis Plan (PBW, 2017) to identify SSIs of Appendix III parameters over background concentrations. The Detection Monitoring Program sampling dates and parameters are summarized in the following table:

**Detection Monitoring Program Summary**

| Sampling Dates | Parameters | SSIs | Assessment Monitoring Program Established |
|---|---|---|---|
| October 2017 | Appendix III | No | No |
| June 2018<br>September 2018<br>November 2018 (re-samples) | Appendix III | Yes | No<br>(Alternate Source Demonstration Completed) |
| May 2019<br>August 2019 | Appendix III | Yes | No<br>(Alternate Source Demonstration Completed) |
| May 2020<br>September 2020 | Appendix III | Yes | No<br>(Alternate Source Demonstration Completed) |
| June 2021<br>October 2021 | Appendix III | Yes | To Be Determined<br>(Alternate Source Currently Being Assessed) |

The statistical background values and Appendix III analytical data are presented in Tables 1 and 2, respectively. Laboratory analytical reports are provided in Attachment 1. SSIs of Appendix III parameters were identified during the 2018 through 2021 sampling events. An initial Alternate Source Demonstration was completed in 2019, which indicated that a source other than the CCR unit caused SSIs observed in the 2018 sample data. Similarly, Alternate Source Demonstrations were completed in 2020 and 2021 based on the 2019 and 2020 sample data. As a result, the Ash Landfill 1 has remained in the Detection Monitoring Program. A summary of the Alternate

Source Demonstration based on the 2020 sample data is presented in Attachment 2 as required by §257.94(e)(2).

Detection Monitoring Program groundwater samples were collected from the CCR groundwater monitoring network on a semi-annual basis in 2021, as required by the CCR Rule. The first 2021 semi-annual Detection Monitoring Program sampling event was conducted in June 2021. The second 2021 semi-annual Detection Monitoring Program sampling event was conducted in October 2021. The analytical data from the 2021 semi-annual Detection Monitoring Program sampling events were evaluated using procedures described in the Statistical Analysis Plan to identify SSIs of Appendix III parameters over background concentrations. SSIs of Appendix III parameters over background concentrations were identified for two constituents (boron and sulfate) for which SSIs had been identified in previous years and attributed to alternate sources. Alternate sources for the SSIs identified in the 2021 sample data are being evaluated in accordance with §257.94. If an alternate source is not identified to be the cause of the SSIs, an Assessment Monitoring Program will be established in accordance with §257.94(e)(2).

# 3.0 KEY ACTIONS COMPLETED IN 2021

Semi-annual Detection Monitoring Program groundwater monitoring events were conducted in June and October 2021. The number of groundwater samples that were collected for analysis of each background and downgradient well, the dates the samples were collected, and the analytical results for the groundwater samples are summarized in Table 2. A map showing the CCR units and monitoring wells is provided as Figure 1. No CCR wells were installed or decommissioned in 2021.

Water elevations measured in the CCR wells during the semi-annual groundwater sampling events were used to develop groundwater potentiometric surface maps, which are presented in Attachment 3. The inferred direction of groundwater flow near the Ash Landfill 1 was generally to the northeast during both semi-annual ground sampling events in 2021.

An Alternate Source Demonstration was completed in March 2021 in accordance with §257.94(e)(2), which documented that a source other than Ash Landfill 1 caused the SSIs detected over background levels during the 2020 Detection Monitoring Program sampling events. Per §257.94(e)(2) a copy of the 2020 Alternate Source Demonstration is provided in Attachment 2 in this annual report.

# 4.0 PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the CCR groundwater monitoring program in 2021.

# 5.0 KEY ACTIVITIES PLANNED FOR 2022

The following key activities are planned for 2022:

- Luminant submitted a registration application to TCEQ under the Texas CCR Rule for the Oak Grove Ash Landfill 1 on January 24, 2022.
- Continue the Detection Monitoring Program in accordance with applicable provisions of §257.95 and 30 T.A.C. §352.941.
- If an alternate source is identified to be the cause of the SSIs observed in 2021, which are described in this report, a written demonstration will be completed within 90 days of SSI determination and included in the following Annual Groundwater Monitoring and Corrective Action Report.

# 6.0 REFERENCES

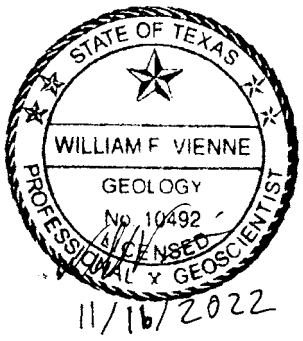
Pastor, Behling & Wheeler, LLC, 2017. Coal Combustion Residual Rule Statistical Analysis Plan, Oak Grove Steam Electric Station, Ash Landfill, Robertson County, Texas.

# Signature Page

**Golder Associates Inc.**

Patrick J. Behling
*Principal Engineer*

William F. Vienne
*Senior Hydrogeologist*

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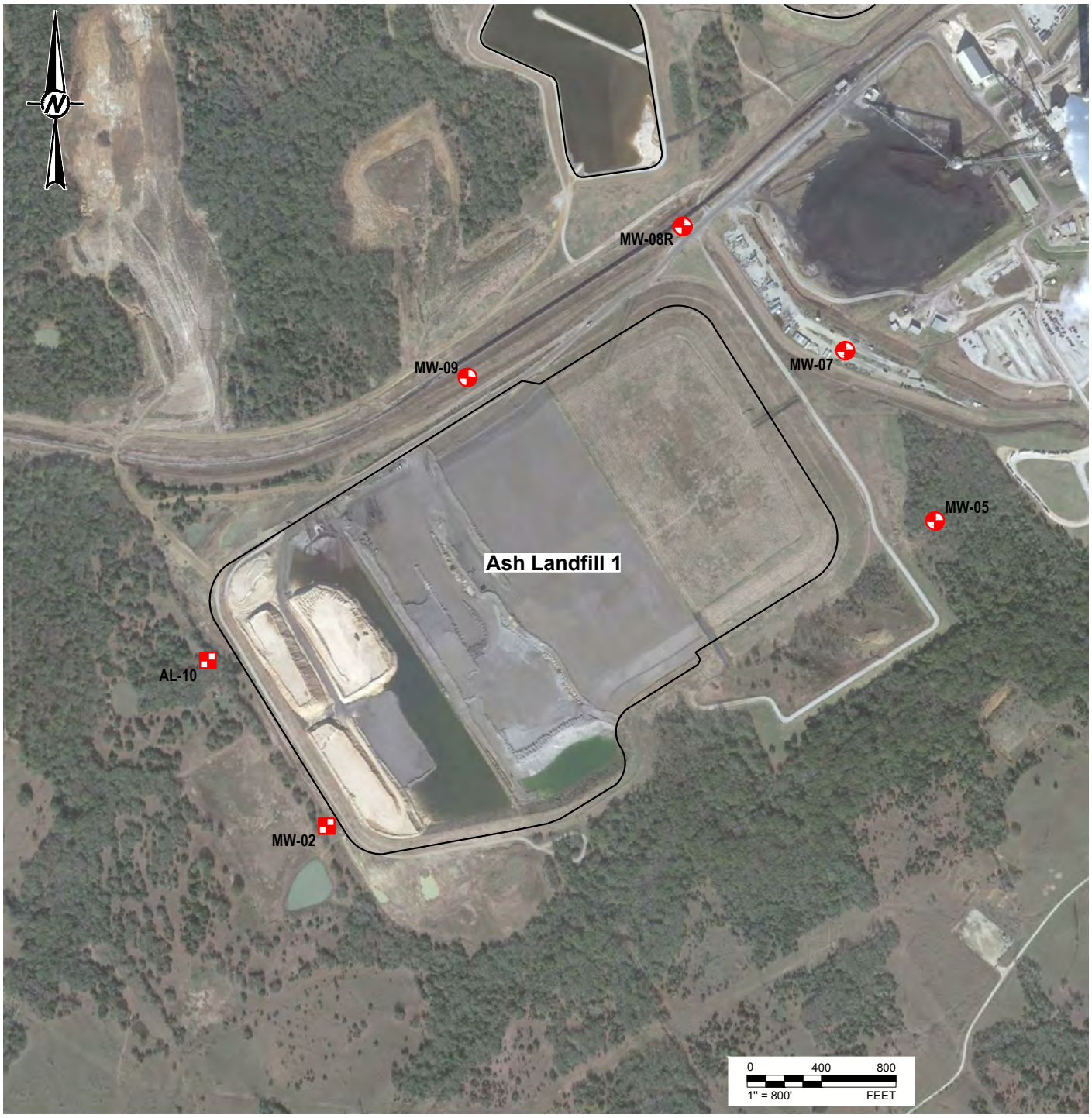
# FIGURES




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**DETAILED SITE PLAN - ASH LANDFILL**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 19122262 | 0 | 1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

Last Edited By: adiamond Date: 2020-01-23 Time:9:47:09 AM | Printed By: adiamond Date: 2020-01-23 Time:9:47:43 AM
Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (Ash Landfill).dwg

# TABLES

**Table 1**
**Statistical Background Value**
**OGSES Ash Landfill 1**

| Parameter | Statistical Background Value |
|---|---|
| Boron (mg/L) | 0.124 |
| Calcium (mg/L) | 74.9 |
| Chloride (mg/L) | 353 |
| Fluoride (mg/L) | 0.4 |
| field pH (s.u.) | 6.31<br>7.09 |
| Sulfate (mg/L) | 97.4 |
| Total Dissolved Solids (mg/L) | 948 |

**TABLE 2**
**APPENDIX III ANALYTICAL RESULTS**
**OGSES ASH LANDFILL 1**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | F (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| **Upgradient Wells** | | | | | | | | |
| AL-10 | 11/04/15 | 0.0682 | 34.5 | 149 | 0.149 J | 6.86 | 72.6 | 590 |
| | 12/18/15 | 0.0539 | 37.5 | 81 | 0.15 J | 6.45 | 20.6 | 414 |
| | 02/10/16 | 0.0637 | 48.6 | 108 | 0.197 J | 6.75 | 34.9 | 599 |
| | 04/15/16 | 0.0573 | 44.8 | 86 | 0.133 | 6.51 | 23.6 | 549 |
| | 06/16/16 | 0.0915 | 34.7 | 66.7 | 0.155 J | 6.44 | 23.5 | 436 |
| | 08/25/16 | 0.105 | 87.5 | 444 | <0.1 | 6.61 | 96.3 | 1,120 |
| | 10/04/16 | 0.0756 | 35.1 | 57.3 | 0.278 J | 6.92 | 20.1 | 507 |
| | 12/22/16 | 0.0759 | 32.5 | 57.2 | 0.195 J | 6.78 | 21.5 | 527 |
| | 10/02/17 | 0.0973 | 27 | 50.6 | 0.120 J | 6.85 | 12.2 | 398 |
| | 06/04/18 | 0.0875 | 21.9 | 62.1 | 0.183 J | 6.67 | 11.6 | 362 |
| | 09/06/18 | 0.113 | 21.9 | 56.7 | 0.260 J | 6.66 | 11.8 | 371 |
| | 05/17/19 | 0.114 | 16.8 | 67.9 | 0.262 J | 6.64 | 12.4 | 340 |
| | 08/20/19 | 0.115 | 18.8 | 66.2 | 0.363 J | 6.87 | 11.8 | 333 |
| | 05/07/20 | 0.128 | 18.8 | 52.2 | <0.100 | 6.78 | 11.1 | 317 |
| | 09/09/20 | 0.139 | 16.8 | 49.2 | 0.208 J | 6.86 | 10.6 | 301 |
| | 06/16/21 | 0.107 | 15.2 | 41.9 | 0.27 J | 6.82 | 9.92 | 267 |
| | 10/12/21 | 0.0878 | 15.1 | 51.4 | <0.1 | 6.82 | 9.84 | 269 |
| MW-02 | 11/04/15 | 0.064 | 32.5 | 138 | 0.135 J | 6.92 | 71.4 | 539 |
| | 12/18/15 | 0.0476 | 29 | 61.7 | 0.118 J | 6.83 | 15.9 | 308 |
| | 02/10/16 | 0.0853 | 25.4 | 83.5 | 0.229 J | 6.63 | 34 | 320 |
| | 04/15/16 | 0.0597 | 39.6 | 68 | 0.102 | 6.51 | 18.1 | 440 |
| | 06/16/16 | 0.106 | 26.5 | 87.8 | 0.161 J | 6.89 | 34.8 | 343 |
| | 08/25/16 | 0.0492 | 12.9 | 21.9 | 0.164 J | 6.58 | 22.4 | 163 |
| | 10/04/16 | 0.113 | 61.4 | 222 | 0.185 J | 6.69 | 97.4 | 667 |
| | 12/21/16 | 0.11 | 47.8 | 185 | 0.293 J | 6.78 | 83.4 | 590 |
| | 10/02/17 | 0.0567 | 22.2 | 42.4 | <0.100 | 6.68 | 9.67 | 310 |
| | 06/04/18 | 0.144 | 82.4 | 275 | 0.139 J | 6.28 | 121 | 740 |
| | 09/06/18 | 0.148 | 70.9 | 259 | 0.221 J | 6.02 | 116 | 872 |
| | 05/17/19 | 0.0981 | 20 | 67.6 | 0.321 J | 6.63 | 31.1 | 306 |
| | 08/20/19 | 0.0875 | 19.9 | 53.8 | 0.558 | 6.59 | 20.1 | 260 |
| | 05/07/20 | 0.0996 | 11.5 | 2.87 | <0.100 | 6.63 | 6.14 | 106 |
| | 09/09/20 | 0.166 | 55.6 | 210 | 0.287 J | 6.76 | 99.2 | 592 |
| | 06/16/21 | 0.0756 | 48 | 164 | 0.977 | 6.62 | 35.9 | 646 |
| | 10/12/21 | 0.0848 | 23.8 | 56.6 | 0.36 | 6.62 | 20.7 | 245 |
| **Downgradient Wells** | | | | | | | | |
| MW-05 | 11/04/15 | 0.0628 | 15.4 | 64.8 | 0.272 J | 7.11 | 13.6 | 285 |
| | 12/18/15 | 0.0621 | 13 | 60.2 | 0.476 | 6.52 | 10.5 | 232 |
| | 02/10/16 | 0.0447 | 14 | 59.7 | 0.397 J | 6.67 | 11.9 | 235 |
| | 04/15/16 | 0.0458 | 14.3 | 55.4 | 0.284 | 6.42 | 10.7 | 288 |
| | 06/15/16 | 0.058 | 14.2 | 60.4 | 0.306 J | 6.61 | 11.8 | 269 |
| | 08/24/16 | 0.0877 | 13.1 | 63 | 0.262 J | 6.75 | 11.8 | 287 |
| | 10/04/16 | 0.059 | 15.4 | 57.9 | 0.477 | 6.87 | 10.9 | 253 |
| | 12/22/16 | 0.0759 | 61.4 | 264 | 0.446 | 6.63 | 55.6 | 778 |
| | 10/02/17 | 0.0665 | 17.5 | 58.6 | 0.295 J | 6.89 | 10.4 | 246 |
| | 06/05/18 | 0.0739 | 16.8 | 60 | 0.391 J | 6.43 | 12.1 | 253 |
| | 09/07/18 | 0.077 | 15.8 | 63.3 | 0.392 J | 6.11 | 10.6 | 249 |
| | 05/17/19 | 0.0686 | 13.5 | 66.4 | 0.462 | 6.57 | 11.2 | 257 |
| | 08/20/19 | 0.079 | 16 | 66.7 | 0.514 | 6.78 | 10.8 | 263 |
| | 05/07/20 | 0.0985 | 18 | 71.8 | 0.344 J | 6.68 | 10.6 | 264 |
| | 09/09/20 | 0.201 | 20.5 | 79.8 | 0.372 J | 6.81 | 66.5 | 407 |
| | 06/16/21 | 0.0753 | 17.7 | 77.7 | 0.415 | 6.69 | 10 | 255 |
| | 10/12/21 | 0.0615 | 20.9 | 83.6 | 0.433 | 6.52 | 11.7 | 282 |
| | 10/12/2021 DUP | 0.0703 J | 20.9 | 85.5 | 0.425 | 6.52 | 12.1 | 272 |

**TABLE 2**
**APPENDIX III ANALYTICAL RESULTS**
**OGSES ASH LANDFILL 1**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | F (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| MW-07 | 11/03/15 | 0.0483 | 8.57 | 20.2 | 0.289 J | 6.42 | 11.5 | 276 |
| | 12/17/15 | 0.0539 | 8.75 | 17.7 | 0.319 J | 6.86 | 14.7 | 243 |
| | 02/09/16 | 0.0547 | 13.3 | 28.9 | 0.276 J | 7.18 | 25.3 | 283 |
| | 04/15/16 | 0.0567 | 10 | 20.9 | 0.187 | 6.71 | 16 | 341 |
| | 06/15/16 | 0.0639 | 10.5 | 22.9 | 0.226 J | 6.75 | 23.2 | 294 |
| | 08/24/16 | 0.0691 | 9.58 | 20.4 | 0.159 J | 6.89 | 21.8 | 290 |
| | 10/04/16 | 0.0549 | 10.3 | 15.6 | 0.277 J | 6.82 | 17.1 | 256 |
| | 12/22/16 | 0.054 | 12.5 | 22.9 | 0.229 J | 6.29 | 34.7 | 262 |
| | 10/02/17 | 0.0733 | 13.9 | 15.8 | 0.178 J | 6.59 | 38.4 | 298 |
| | 06/05/18 | 0.105 | 17.5 | 15.7 | 0.169 J | 5.98 | 61.1 | 316 |
| | 09/07/18 | 0.151 | 19.7 | 21.5 | 0.250 J | 6.18 | 80.3 | 357 |
| | 11/6/2018 resample | 0.154 | -- | -- | -- | -- | -- | -- |
| | 05/17/19 | 0.132 | 17.1 | 20.2 | 0.244 J | 6.83 | 84.1 | 355 |
| | 08/19/19 | 0.215 | 22.8 | 19.7 | 0.367 J | 6.77 | 100 | 385 |
| | 05/07/20 | 0.302 | 29.7 | 22.4 | 0.234 J | 6.84 | 123 | 432 |
| | 09/09/20 | 0.297 | 26.9 | 24.7 | 0.302 J | 6.58 | 121 | 413 |
| | 06/16/21 | 0.186 | 25.8 | 26.2 | 0.378 J | 6.84 | 108 | 404 |
| | 6/16/21 DUP | 0.177 | 25.5 | 26.6 | 0.378 J | 6.84 | 110 | 399 |
| | 10/13/21 | 0.181 | 31.6 | 29.6 | 0.353 | 6.85 | 130 | 422 |
| MW-08 | 11/04/15 | 0.0631 | 120 | 599 | 0.17 J | 6.81 | 138 | 2,070 |
| | 12/18/15 | 0.0604 | 70.4 | 488 | 0.158 J | 6.78 | 49.8 | 1,140 |
| | 02/09/16 | 0.0695 | 140 | 612 | 0.175 J | 6.42 | 170 | 1,530 |
| | 04/15/16 | 0.0726 | 133 | 566 | <0.1 | 6.61 | 139 | 1,680 |
| | 06/16/16 | 0.0677 | 76.6 | 520 | <0.1 | 6.76 | 83.6 | 1,090 |
| | 8/2016 | Destroyed | | | | | | |
| MW-08R | 12/22/16 | 0.0702 | 32.4 | 166 | 0.355 J | 6.93 | 39.7 | 617 |
| | 03/21/17 | 0.0662 | 117 | 563 | 0.2 J | 5.83 | 98.3 | 1,220 |
| | 04/20/17 | 0.0696 | 115 | 560 | 0.149 J | 5.91 | 94.9 | 1,190 |
| | 10/02/17 | 0.061 | 13.1 | 14.4 | <0.100 | 6.63 | 28.7 | 243 |
| | 06/05/18 | 0.082 | 18.9 | 53.9 | 0.138 J | 6.37 | 9.66 | 302 |
| | 09/07/18 | 0.0921 | 106 | 504 | 0.242 J | 5.84 | 96.9 | 1,550 |
| | 11/6/2018 resample | -- | 15.7 | 19 | -- | -- | -- | 268 |
| | 05/17/19 | 0.102 | 16.7 | 69.8 | 0.269 J | 6.54 | 12.4 | 326 |
| | 08/20/19 | 0.096 | 24.9 | 48 | 0.501 | 6.84 | 30.7 | 255 |
| | 05/07/20 | 0.122 | 19 | 51.8 | 0.117 J | 6.83 | 11.1 | 320 |
| | 09/09/20 | 0.0977 | 15.8 | 55.5 | 0.344 J | 6.68 | 19.0 | 256 |
| | 06/16/21 | 0.116 | 15.3 | 43.5 | 0.263 J | 6.76 | 9.26 | 266 |
| | 10/12/21 | 0.107 | 32.8 | 268 | <0.1 | 6.76 | 136 | 874 |
| MW-09 | 11/03/15 | 0.0722 | 36.4 | 155 | 0.149 J | 6.45 | 74.9 | 583 |
| | 12/18/15 | 0.077 | 40.3 | 157 | 0.266 J | 6.48 | 83.1 | 528 |
| | 02/09/16 | 0.072 | 38.4 | 158 | 0.152 J | 6.16 | 80 | 445 |
| | 04/15/16 | 0.0734 | 42.2 | 151 | <0.1 | 6.41 | 80.9 | 568 |
| | 06/15/16 | 0.0778 | 43.1 | 174 | <0.1 | 6.52 | 98.7 | 574 |
| | 08/25/16 | 0.0829 | 45.6 | 195 | <0.1 | 6.76 | 116 | 715 |
| | 10/04/16 | 0.0803 | 47.8 | 179 | 0.256 J | 6.64 | 108 | 648 |
| | 12/22/16 | 0.0776 | 42.6 | 290 | 0.159 J | 6.87 | 116 | 791 |
| | 10/02/17 | 0.106 | 58.2 | 140 | <0.100 | 6.76 | 95.3 | 433 |
| | 06/04/18 | 0.091 | 21.7 | 6.48 | 0.162 J | 6.28 | 6.08 | 135 |
| | 09/06/18 | 0.0999 | 49.8 | 186 | 0.134 J | 5.61 | 104 | 704 |
| | 11/6/2018 resample | -- | -- | -- | -- | -- | 58.6 | -- |
| | 05/17/19 | 0.12 | 17.2 | 366 | 0.541 | 6.72 | 53.2 | 935 |
| | 08/20/19 | 0.117 | 26 | 61.2 | 0.359 J | 6.96 | 22.3 | 331 |
| | 05/07/20 | 0.0988 | 20.2 | 45.1 | 0.234 J | 6.68 | 17.3 | 212 |
| | 09/09/20 | 0.123 | 48.5 | 156 | 0.152 J | 6.72 | 99.6 | 468 |
| | 06/16/21 | 0.0682 | 16.3 | 4.18 | <0.100 | 6.84 | 8.19 | 127 |
| | 10/12/21 | 0.0821 | 20.7 | 29.9 | <0.1 | 6.84 | 31.2 | 223 |

Notes:
1. Abbreviations: mg/L - milligrams per liter; TDS - total dissolved solids; s.u. - standard units.
2. J - concentration is below method quantitation limit; result is an estimate.

**ATTACHMENT 1**

**LABORATORY ANALYTICAL REPORTS**

June 24, 2021

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX: (512) 671-3446

Order No.: 2106123

RE: Luminant-OGSES-CCR-Ash Landfill 1

Dear Will Vienne:

DHL Analytical, Inc. received 7 sample(s) on 6/18/2021 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-21-27

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DHL ANALYTICAL
2300 Double Creek Dr. Round Rock, TX 78664
Phone 512.388.8222
Web: **www.dhlanalytical.com**
Email: **login@dhlanalytical.com**

# CHAIN-OF-CUSTODY



CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX
PHONE: 512-671-3434 EMAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

**PO#:**
PROJECT LOCATION OR NAME: LUMINANT - OGSES - CCR - ASH LANDFILL I
CLIENT PROJECT # 19122262

**LABORATORY USE ONLY**
**DHL WORKORDER #:** 2106123
COLLECTOR: JOHN BEAUTON

**Authorize 5% surcharge for TRRP report?** ☐ Yes ☐ No

W=WATER L=LIQUID S=SOIL SO=SOLID SE=SEDIMENT P=PAINT SL=SLUDGE

| Field Sample I.D. | Lab Use Only DHL Lab # | Collection Date | Collection Time | Matrix | Container Type | # of Containers | PRESERVATION HCL | HNO3 | H2SO4 | NaOH ☐ Zn Acetate ☐ | ICE ☒ UNPRESERVED ☐ | ANALYSES | APPENDIX III | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-02 | 01 | 6-16-21 | 0930 | W | P | 2 | | X | | | X | | X | |
| AL-10 | 02 | 6-16-21 | 1105 | W | P | 2 | | X | | | X | | X | |
| MW-09 | 03 | 6-16-21 | 1225 | W | P | 2 | | X | | | X | | X | |
| MW-08R | 04 | 6-16-21 | 1345 | W | P | 2 | | X | | | X | | X | |
| MW-05 | 05 | 6-16-21 | 1445 | W | P | 2 | | X | | | X | | X | |
| MW-07 | 06 | 6-16-21 | 1540 | W | P | 2 | | X | | | X | | X | |
| DUP-1 | 07 | 6-16-21 | 1540 | W | P | 2 | | X | | | X | | X | |

Relinquished By: (Sign) DATE/TIME 6-17-21 1900 Received by: FedEx
Relinquished By: (Sign) FedEx DATE/TIME 6/18/21 0925 Received by:
Relinquished By: (Sign) DATE/TIME Received by:

**TURN AROUND TIME (CALL FIRST FOR RUSH)**
RUSH-1 DAY☐ RUSH-2 DAY☐ RUSH-3 DAY☐
NORMAL ☒ OTHER ☐
DUE DATE _____ ☐

**LABORATORY USE ONLY**
RECEIVING TEMP (°C): 4.9 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☒ INTACT ☐ NOT USED
CARRIER: ☐ LSO ☒ FEDEX ☐ UPS ☐ COURIER ☐ OTHER ☐ HAND DELIVERED

APPENDIX I FOR ANALYSIS ☐ DHL DISPOSAL @ 5.00 each ☐ Return

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

---

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis

ORIGIN ID:FWHA (512) 671-3434
GOLDER ASSOCIATES
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 17JUN21
ACTWGT: 26.95 LB
CAD: 6996427/SSFE2202
DIMS: 14x13x11 IN
BILL THIRD PARTY

Part # 156297-435 RRDW2 EXP 04/22

TO
DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx Express

6 of 6
MPS# 0263 2805 2123 9103
Mstr# 2805 2123 9055 0201
A8 BSMA

FRI - 18 JUN 10:30A
PRIORITY OVERNIGHT
78664
TX-US AUS

:AL

DHL ANALYTICA

CUSTODY SE

DATE 6.17.21

SIGNATURE

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder** Date Received: **6/18/2021**

Work Order Number **2106123** Received by: **EL**

Checklist completed by: Signature 6/18/2021 Date Reviewed by DL Initials 6/18/2021 Date

Carrier name: Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **4.9** °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? NO | | Checked by R.A. |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action: _____

## Laboratory Name: DHL Analytical, Inc.

## Laboratory Review Checklist: Reportable Data

| | |
|---|---|
| **Project Name:** Luminant-OGSES-CCR-Ash Landfill 1 | **LRC Date:** 6/24/2021 |
| **Reviewer Name:** Angie O'Donnell | **Laboratory Work Order: 2106123** |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | **X** | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | **X** | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | **X** | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | **X** | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | **X** | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | **X** | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | **X** | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | **X** | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | **X** | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | **X** | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | **X** | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | **X** | | |
| | | **9)** If required for the project, TICs reported? | | | **X** | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | **X** | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | **X** | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | **X** | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | **X** | | | | |
| | | **4)** Were blank concentrations < MDL? | **X** | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | **X** | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | **X** | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | **X** | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | **X** | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | **X** | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | **X** | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | **X** | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | **X** | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | **X** | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | **X** | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | **X** | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | **X** | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | **X** | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | **X** | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | **X** | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | **X** | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | **X** | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-CCR-Ash Landfill 1 | **LRC Date:** 6/24/2021 |
| **Reviewer Name:** Angie O'Donnell | **Laboratory Work Order: 2106123** |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | X | | | **S9-01** |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 23-26, 2021. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

06/24/21

Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *24-Jun-21*

**CLIENT:** Golder
**Project:** Luminant-OGSES-CCR-Ash Landfill 1
**Lab Order:** 2106123

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis

Exception Report R1-01

The samples were received and log-in performed on 6/18/2021. A total of 7 samples were received and analyzed. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Anions Analysis, for Batch 100964, the recoveries of up to two anions for the Matrix Spike and Matrix Spike Duplicate(s) (2106122-04, -08 MS/MSD) were below the method control limits. These are flagged accordingly in the QC Summary Report. These anions were within method control limits in the associated LCS. No further corrective action was taken.

Exception Report S9-01

For Metals Analysis, for Batch 100960, the RPD of Boron for the Serial Dilution (2106123-02 SD) was above the method control limit. This is flagged accordingly in the QC Summary Report. This analyte was within method control limits in the associated Post Digestion Spike. No further corrective action was taken.

## DHL Analytical, Inc.

**Date:** *24-Jun-21*

**CLIENT:** Golder
**Project:** Luminant-OGSES-CCR-Ash Landfill 1
**Lab Order:** 2106123

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2106123-01 | MW-02 | | 06/16/21 09:30 AM | 6/18/2021 |
| 2106123-02 | AL-10 | | 06/16/21 11:05 AM | 6/18/2021 |
| 2106123-03 | MW-09 | | 06/16/21 12:25 PM | 6/18/2021 |
| 2106123-04 | MW-08R | | 06/16/21 01:45 PM | 6/18/2021 |
| 2106123-05 | MW-05 | | 06/16/21 02:45 PM | 6/18/2021 |
| 2106123-06 | MW-07 | | 06/16/21 03:40 PM | 6/18/2021 |
| 2106123-07 | DUP-1 | | 06/16/21 03:40 PM | 6/18/2021 |

**Lab Order:** 2106123
**Client:** Golder
**Project:** Luminant-OGSES-CCR-Ash Landf

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2106123-01A | MW-02 | 06/16/21 09:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| | MW-02 | 06/16/21 09:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| | MW-02 | 06/16/21 09:30 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| 2106123-01B | MW-02 | 06/16/21 09:30 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | MW-02 | 06/16/21 09:30 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | MW-02 | 06/16/21 09:30 AM | Aqueous | M2540C | TDS Preparation | 06/21/21 09:12 AM | 100962 |
| 2106123-02A | AL-10 | 06/16/21 11:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| | AL-10 | 06/16/21 11:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| 2106123-02B | AL-10 | 06/16/21 11:05 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | AL-10 | 06/16/21 11:05 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | AL-10 | 06/16/21 11:05 AM | Aqueous | M2540C | TDS Preparation | 06/21/21 09:12 AM | 100962 |
| 2106123-03A | MW-09 | 06/16/21 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| | MW-09 | 06/16/21 12:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| 2106123-03B | MW-09 | 06/16/21 12:25 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | MW-09 | 06/16/21 12:25 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | MW-09 | 06/16/21 12:25 PM | Aqueous | M2540C | TDS Preparation | 06/21/21 09:12 AM | 100962 |
| 2106123-04A | MW-08R | 06/16/21 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| | MW-08R | 06/16/21 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| 2106123-04B | MW-08R | 06/16/21 01:45 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | MW-08R | 06/16/21 01:45 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | MW-08R | 06/16/21 01:45 PM | Aqueous | M2540C | TDS Preparation | 06/21/21 09:12 AM | 100962 |
| 2106123-05A | MW-05 | 06/16/21 02:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| | MW-05 | 06/16/21 02:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| 2106123-05B | MW-05 | 06/16/21 02:45 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | MW-05 | 06/16/21 02:45 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | MW-05 | 06/16/21 02:45 PM | Aqueous | M2540C | TDS Preparation | 06/21/21 09:12 AM | 100962 |
| 2106123-06A | MW-07 | 06/16/21 03:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| | MW-07 | 06/16/21 03:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |

**Lab Order:** 2106123
**Client:** Golder
**Project:** Luminant-OGSES-CCR-Ash Landf

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2106123-06B | MW-07 | 06/16/21 03:40 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | MW-07 | 06/16/21 03:40 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | MW-07 | 06/16/21 03:40 PM | Aqueous | M2540C | TDS Preparation | 06/21/21 09:12 AM | 100962 |
| 2106123-07A | DUP-1 | 06/16/21 03:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| | DUP-1 | 06/16/21 03:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/21/21 08:48 AM | 100960 |
| 2106123-07B | DUP-1 | 06/16/21 03:40 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | DUP-1 | 06/16/21 03:40 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | DUP-1 | 06/16/21 03:40 PM | Aqueous | M2540C | TDS Preparation | 06/21/21 09:12 AM | 100962 |

**Lab Order:** 2106123
**Client:** Golder
**Project:** Luminant-OGSES-CCR-Ash Landf

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2106123-01A | MW-02 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 10 | 06/22/21 02:30 PM | ICP-MS4_210622B |
| | MW-02 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 02:57 PM | ICP-MS4_210622B |
| | MW-02 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 12:08 PM | ICP-MS4_210622B |
| 2106123-01B | MW-02 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 10:50 PM | IC2_210621A |
| | MW-02 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 04:42 AM | IC2_210621A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 100962 | 1 | 06/21/21 02:10 PM | WC_210621B |
| 2106123-02A | AL-10 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 12:04 PM | ICP-MS4_210622B |
| | AL-10 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 02:53 PM | ICP-MS4_210622B |
| 2106123-02B | AL-10 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 11:06 PM | IC2_210621A |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 04:58 AM | IC2_210621A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 100962 | 1 | 06/21/21 02:10 PM | WC_210621B |
| 2106123-03A | MW-09 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 12:10 PM | ICP-MS4_210622B |
| | MW-09 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 02:59 PM | ICP-MS4_210622B |
| 2106123-03B | MW-09 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 11:22 PM | IC2_210621A |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 06:34 AM | IC2_210621A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 100962 | 1 | 06/21/21 02:10 PM | WC_210621B |
| 2106123-04A | MW-08R | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 12:12 PM | ICP-MS4_210622B |
| | MW-08R | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 03:01 PM | ICP-MS4_210622B |
| 2106123-04B | MW-08R | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 06:50 AM | IC2_210621A |
| | MW-08R | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 11:38 PM | IC2_210621A |
| | MW-08R | Aqueous | M2540C | Total Dissolved Solids | 100962 | 1 | 06/21/21 02:10 PM | WC_210621B |
| 2106123-05A | MW-05 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 12:14 PM | ICP-MS4_210622B |
| | MW-05 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 03:03 PM | ICP-MS4_210622B |
| 2106123-05B | MW-05 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 11:54 PM | IC2_210621A |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 07:06 AM | IC2_210621A |
| | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 100962 | 1 | 06/21/21 02:10 PM | WC_210621B |
| 2106123-06A | MW-07 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 12:16 PM | ICP-MS4_210622B |
| | MW-07 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 2 | 06/22/21 02:32 PM | ICP-MS4_210622B |

**Lab Order:** 2106123
**Client:** Golder
**Project:** Luminant-OGSES-CCR-Ash Landf

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2106123-06B | MW-07 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 07:22 AM | IC2_210621A |
| | MW-07 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/22/21 12:10 AM | IC2_210621A |
| | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 100962 | 1 | 06/21/21 02:10 PM | WC_210621B |
| 2106123-07A | DUP-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 1 | 06/22/21 12:18 PM | ICP-MS4_210622B |
| | DUP-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100960 | 2 | 06/22/21 02:34 PM | ICP-MS4_210622B |
| 2106123-07B | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/22/21 12:26 AM | IC2_210621A |
| | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 07:38 AM | IC2_210621A |
| | DUP-1 | Aqueous | M2540C | Total Dissolved Solids | 100962 | 1 | 06/21/21 02:10 PM | WC_210621B |

# DHL Analytical, Inc.

**Date:** *24-Jun-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | MW-02 |
| **Project:** | Luminant-OGSES-CCR-Ash Landfill 1 | **Lab ID:** | 2106123-01 |
| **Project No:** | 19122262 | **Collection Date:** | 06/16/21 09:30 AM |
| **Lab Order:** | 2106123 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.0756 | 0.0100 | 0.0300 | | mg/L | 1 | 06/22/21 02:57 PM |
| Calcium | 48.0 | 1.00 | 3.00 | | mg/L | 10 | 06/22/21 02:30 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 164 | 3.00 | 10.0 | | mg/L | 10 | 06/21/21 10:50 PM |
| Fluoride | 0.977 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 04:42 AM |
| Sulfate | 35.9 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 04:42 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 646 | 10.0 | 10.0 | | mg/L | 1 | 06/21/21 02:10 PM |

**Qualifiers:**

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- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *24-Jun-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | AL-10 |
| **Project:** | Luminant-OGSES-CCR-Ash Landfill 1 | **Lab ID:** | 2106123-02 |
| **Project No:** | 19122262 | **Collection Date:** | 06/16/21 11:05 AM |
| **Lab Order:** | 2106123 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.107 | 0.0100 | 0.0300 | | mg/L | 1 | 06/22/21 02:53 PM |
| Calcium | 15.2 | 0.100 | 0.300 | | mg/L | 1 | 06/22/21 12:04 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 41.9 | 0.300 | 1.00 | | mg/L | 1 | 06/22/21 04:58 AM |
| Fluoride | 0.270 | 0.100 | 0.400 | J | mg/L | 1 | 06/22/21 04:58 AM |
| Sulfate | 9.92 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 04:58 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 267 | 10.0 | 10.0 | | mg/L | 1 | 06/21/21 02:10 PM |

**Qualifiers:**

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- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *24-Jun-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | MW-09 |
| **Project:** | Luminant-OGSES-CCR-Ash Landfill 1 | **Lab ID:** | 2106123-03 |
| **Project No:** | 19122262 | **Collection Date:** | 06/16/21 12:25 PM |
| **Lab Order:** | 2106123 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.0682 | 0.0100 | 0.0300 | | mg/L | 1 | 06/22/21 02:59 PM |
| Calcium | 16.3 | 0.100 | 0.300 | | mg/L | 1 | 06/22/21 12:10 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 4.18 | 0.300 | 1.00 | | mg/L | 1 | 06/22/21 06:34 AM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 06:34 AM |
| Sulfate | 8.19 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 06:34 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 127 | 10.0 | 10.0 | | mg/L | 1 | 06/21/21 02:10 PM |

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- DF- Dilution Factor
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- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *24-Jun-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | MW-08R |
| **Project:** | Luminant-OGSES-CCR-Ash Landfill 1 | **Lab ID:** | 2106123-04 |
| **Project No:** | 19122262 | **Collection Date:** | 06/16/21 01:45 PM |
| **Lab Order:** | 2106123 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.116 | 0.0100 | 0.0300 | | mg/L | 1 | 06/22/21 03:01 PM |
| Calcium | 15.3 | 0.100 | 0.300 | | mg/L | 1 | 06/22/21 12:12 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 43.5 | 0.300 | 1.00 | | mg/L | 1 | 06/22/21 06:50 AM |
| Fluoride | 0.263 | 0.100 | 0.400 | J | mg/L | 1 | 06/22/21 06:50 AM |
| Sulfate | 9.26 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 06:50 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 266 | 10.0 | 10.0 | | mg/L | 1 | 06/21/21 02:10 PM |

**Qualifiers:**

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- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *24-Jun-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | MW-05 |
| **Project:** | Luminant-OGSES-CCR-Ash Landfill 1 | **Lab ID:** | 2106123-05 |
| **Project No:** | 19122262 | **Collection Date:** | 06/16/21 02:45 PM |
| **Lab Order:** | 2106123 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.0753 | 0.0100 | 0.0300 | | mg/L | 1 | 06/22/21 03:03 PM |
| Calcium | 17.7 | 0.100 | 0.300 | | mg/L | 1 | 06/22/21 12:14 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 77.7 | 3.00 | 10.0 | | mg/L | 10 | 06/21/21 11:54 PM |
| Fluoride | 0.415 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 07:06 AM |
| Sulfate | 10.0 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 07:06 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 255 | 10.0 | 10.0 | | mg/L | 1 | 06/21/21 02:10 PM |

**Qualifiers:**

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- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *24-Jun-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | MW-07 |
| **Project:** | Luminant-OGSES-CCR-Ash Landfill 1 | **Lab ID:** | 2106123-06 |
| **Project No:** | 19122262 | **Collection Date:** | 06/16/21 03:40 PM |
| **Lab Order:** | 2106123 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.186 | 0.0200 | 0.0600 | | mg/L | 2 | 06/22/21 02:32 PM |
| Calcium | 25.8 | 0.200 | 0.600 | | mg/L | 2 | 06/22/21 02:32 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 26.2 | 0.300 | 1.00 | | mg/L | 1 | 06/22/21 07:22 AM |
| Fluoride | 0.378 | 0.100 | 0.400 | J | mg/L | 1 | 06/22/21 07:22 AM |
| Sulfate | 108 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 07:22 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 404 | 10.0 | 10.0 | | mg/L | 1 | 06/21/21 02:10 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
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- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *24-Jun-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | DUP-1 |
| **Project:** | Luminant-OGSES-CCR-Ash Landfill 1 | **Lab ID:** | 2106123-07 |
| **Project No:** | 19122262 | **Collection Date:** | 06/16/21 03:40 PM |
| **Lab Order:** | 2106123 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.177 | 0.0200 | 0.0600 | | mg/L | 2 | 06/22/21 02:34 PM |
| Calcium | 25.5 | 0.200 | 0.600 | | mg/L | 2 | 06/22/21 02:34 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 26.6 | 0.300 | 1.00 | | mg/L | 1 | 06/22/21 07:38 AM |
| Fluoride | 0.378 | 0.100 | 0.400 | J | mg/L | 1 | 06/22/21 07:38 AM |
| Sulfate | 110 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 07:38 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 399 | 10.0 | 10.0 | | mg/L | 1 | 06/21/21 02:10 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2106123
**Project:** Luminant-OGSES-CCR-Ash Landfill 1

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_210428A**

| Sample ID: **DCS2-100323** | Batch ID: **100323** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS4_210428A** | Analysis Date: **4/28/2021 10:34:00 AM** | Prep Date: **4/27/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.302 | 0.300 | 0.300 | 0 | 101 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-100323** | Batch ID: **100323** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS4_210428A** | Analysis Date: **4/28/2021 10:39:00 AM** | Prep Date: **4/27/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0310 | 0.0300 | 0.0300 | 0 | 103 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106123
**Project:** Luminant-OGSES-CCR-Ash Landfill 1

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_210622B**

The QC data in batch 100960 applies to the following samples: 2106123-01A, 2106123-02A, 2106123-03A, 2106123-04A, 2106123-05A, 2106123-06A, 2106123-07A

| Sample ID: **MB-100960** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 11:56:00 AM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | <0.100 | 0.300 | | | | | | | | |

| Sample ID: **LCS-100960** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 11:58:00 AM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.97 | 0.300 | 5.00 | 0 | 99.4 | 80 | 120 | | | |

| Sample ID: **LCSD-100960** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 12:00:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.11 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | 2.82 | 15 | |

| Sample ID: **2106123-02A SD** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 12:06:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 15.1 | 1.50 | 0 | 15.2 | | | | 0.268 | 20 | |

| Sample ID: **2106123-02A PDS** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 12:26:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 19.5 | 0.300 | 5.00 | 15.2 | 86.4 | 75 | 125 | | | |

| Sample ID: **2106123-02A MS** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 12:29:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 20.3 | 0.300 | 5.00 | 15.2 | 104 | 75 | 125 | | | |

| Sample ID: **2106123-02A MSD** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 12:30:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 19.7 | 0.300 | 5.00 | 15.2 | 90.5 | 75 | 125 | 3.25 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106123
**Project:** Luminant-OGSES-CCR-Ash Landfill 1

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_210622B**

| Sample ID: **MB-100960** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 2:45:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

| Sample ID: **LCS-100960** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 2:47:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.218 | 0.0300 | 0.200 | 0 | 109 | 80 | 120 | | | |

| Sample ID: **LCSD-100960** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 2:49:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.220 | 0.0300 | 0.200 | 0 | 110 | 80 | 120 | 0.692 | 15 | |

| Sample ID: **2106123-02A SD** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 2:55:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.155 | 0.150 | 0 | 0.107 | | | | 36.3 | 20 | R |

| Sample ID: **2106123-02A PDS** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 3:13:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.302 | 0.0300 | 0.200 | 0.107 | 97.7 | 75 | 125 | | | |

| Sample ID: **2106123-02A MS** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 3:16:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.310 | 0.0300 | 0.200 | 0.107 | 101 | 75 | 125 | | | |

| Sample ID: **2106123-02A MSD** | Batch ID: **100960** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 3:18:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.315 | 0.0300 | 0.200 | 0.107 | 104 | 75 | 125 | 1.77 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106123
**Project:** Luminant-OGSES-CCR-Ash Landfill 1

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_210622B**

| Sample ID: **ICV-210622** | Batch ID: **R115891** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 10:53:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.101 | 0.0300 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Calcium | 2.49 | 0.300 | 2.50 | 0 | 99.5 | 90 | 110 | | | |

| Sample ID: **LCVL-210622** | Batch ID: **R115891** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 11:03:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0200 | 0.0300 | 0.0200 | 0 | 100 | 80 | 120 | | | |
| Calcium | 0.111 | 0.300 | 0.100 | 0 | 111 | 80 | 120 | | | |

| Sample ID: **CCV1-210622** | Batch ID: **R115891** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 11:44:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.10 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **CCV2-210622** | Batch ID: **R115891** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 12:32:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.94 | 0.300 | 5.00 | 0 | 98.8 | 90 | 110 | | | |

| Sample ID: **CCV4-210622** | Batch ID: **R115891** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 2:24:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.92 | 0.300 | 5.00 | 0 | 98.4 | 90 | 110 | | | |

| Sample ID: **CCV5-210622** | Batch ID: **R115891** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 2:38:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.199 | 0.0300 | 0.200 | 0 | 99.6 | 90 | 110 | | | |
| Calcium | 4.93 | 0.300 | 5.00 | 0 | 98.7 | 90 | 110 | | | |

| Sample ID: **CCV6-210622** | Batch ID: **R115891** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_210622B** | Analysis Date: **6/22/2021 3:25:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.212 | 0.0300 | 0.200 | 0 | 106 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106123
**Project:** Luminant-OGSES-CCR-Ash Landfill 1

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_210527A**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS3-100738** | Batch ID: **100738** | TestNo: **E300** | | Units: **mg/L** | |
| SampType: **DCS3** | Run ID: **IC2_210527A** | Analysis Date: **5/27/2021 4:13:05 PM** | | Prep Date: **5/27/2021** | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 1.25 | 1.00 | 1.000 | 0 | 125 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.408 | 0.400 | 0.4000 | 0 | 102 | 70 | 130 | 0 | 0 | |
| Sulfate | 3.03 | 3.00 | 3.000 | 0 | 101 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106123
**Project:** Luminant-OGSES-CCR-Ash Landfill 1

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_210621A**

The QC data in batch 100964 applies to the following samples: 2106123-01B, 2106123-02B, 2106123-03B, 2106123-04B, 2106123-05B, 2106123-06B, 2106123-07B

Sample ID: **MB-100964** Batch ID: **100964** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_210621A** Analysis Date: **6/21/2021 12:06:40 PM** Prep Date: **6/21/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-100964** Batch ID: **100964** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_210621A** Analysis Date: **6/21/2021 12:22:40 PM** Prep Date: **6/21/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.89 | 1.00 | 10.00 | 0 | 98.9 | 90 | 110 | | | |
| Fluoride | 3.72 | 0.400 | 4.000 | 0 | 93.0 | 90 | 110 | | | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | | | |

Sample ID: **LCSD-100964** Batch ID: **100964** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_210621A** Analysis Date: **6/21/2021 12:38:40 PM** Prep Date: **6/21/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.89 | 1.00 | 10.00 | 0 | 98.9 | 90 | 110 | 0.056 | 20 | |
| Fluoride | 3.71 | 0.400 | 4.000 | 0 | 92.7 | 90 | 110 | 0.260 | 20 | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.6 | 90 | 110 | 0.114 | 20 | |

Sample ID: **2106122-04BMS** Batch ID: **100964** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_210621A** Analysis Date: **6/21/2021 6:02:58 PM** Prep Date: **6/21/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2380 | 100 | 2000 | 416.3 | 98.3 | 90 | 110 | | | |
| Fluoride | 1960 | 40.0 | 2000 | 0 | 97.9 | 90 | 110 | | | |
| Sulfate | 1810 | 300 | 2000 | 145.8 | 83.2 | 90 | 110 | | | S |

Sample ID: **2106122-04BMSD** Batch ID: **100964** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_210621A** Analysis Date: **6/21/2021 6:18:58 PM** Prep Date: **6/21/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2370 | 100 | 2000 | 416.3 | 97.9 | 90 | 110 | 0.307 | 20 | |
| Fluoride | 1960 | 40.0 | 2000 | 0 | 97.8 | 90 | 110 | 0.024 | 20 | |
| Sulfate | 1810 | 300 | 2000 | 145.8 | 83.4 | 90 | 110 | 0.233 | 20 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106123
**Project:** Luminant-OGSES-CCR-Ash Landfill 1

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_210621A**

| Sample ID: **2106122-08BMS** | Batch ID: **100964** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_210621A** | Analysis Date: **6/21/2021 6:50:58 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3950 | 100 | 2000 | 2228 | 86.0 | 90 | 110 | | | S |
| Fluoride | 1930 | 40.0 | 2000 | 0 | 96.6 | 90 | 110 | | | |
| Sulfate | 1960 | 300 | 2000 | 310.0 | 82.3 | 90 | 110 | | | S |

| Sample ID: **2106122-08BMSD** | Batch ID: **100964** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_210621A** | Analysis Date: **6/21/2021 7:06:58 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3990 | 100 | 2000 | 2228 | 88.3 | 90 | 110 | 1.17 | 20 | S |
| Fluoride | 1960 | 40.0 | 2000 | 0 | 97.8 | 90 | 110 | 1.31 | 20 | |
| Sulfate | 1980 | 300 | 2000 | 310.0 | 83.7 | 90 | 110 | 1.35 | 20 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106123
**Project:** Luminant-OGSES-CCR-Ash Landfill 1

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_210621A**

| Sample ID: **ICV-210621** | Batch ID: **R115881** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_210621A** | Analysis Date: **6/21/2021 11:34:40 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.2 | 1.00 | 25.00 | 0 | 101 | 90 | 110 | | | |
| Fluoride | 9.67 | 0.400 | 10.00 | 0 | 96.7 | 90 | 110 | | | |
| Sulfate | 76.5 | 3.00 | 75.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **CCV1-210621** | Batch ID: **R115881** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_210621A** | Analysis Date: **6/21/2021 10:02:58 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.75 | 1.00 | 10.00 | 0 | 97.5 | 90 | 110 | | | |
| Fluoride | 3.83 | 0.400 | 4.000 | 0 | 95.8 | 90 | 110 | | | |
| Sulfate | 28.9 | 3.00 | 30.00 | 0 | 96.4 | 90 | 110 | | | |

| Sample ID: **CCV2-210621** | Batch ID: **R115881** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_210621A** | Analysis Date: **6/22/2021 2:02:58 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.97 | 1.00 | 10.00 | 0 | 99.7 | 90 | 110 | | | |
| Fluoride | 3.94 | 0.400 | 4.000 | 0 | 98.6 | 90 | 110 | | | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 98.2 | 90 | 110 | | | |

| Sample ID: **CCV3-210621** | Batch ID: **R115881** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_210621A** | Analysis Date: **6/22/2021 6:02:58 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.97 | 1.00 | 10.00 | 0 | 99.7 | 90 | 110 | | | |
| Fluoride | 3.96 | 0.400 | 4.000 | 0 | 99.1 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.2 | 90 | 110 | | | |

| Sample ID: **CCV4-210621** | Batch ID: **R115881** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_210621A** | Analysis Date: **6/22/2021 8:42:58 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.98 | 1.00 | 10.00 | 0 | 99.8 | 90 | 110 | | | |
| Fluoride | 3.96 | 0.400 | 4.000 | 0 | 98.9 | 90 | 110 | | | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 98.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106123
**Project:** Luminant-OGSES-CCR-Ash Landfill 1

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_210621B**

The QC data in batch 100962 applies to the following samples: 2106123-01B, 2106123-02B, 2106123-03B, 2106123-04B, 2106123-05B, 2106123-06B, 2106123-07B

| Sample ID: **MB-100962** | Batch ID: **100962** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_210621B** | Analysis Date: **6/21/2021 2:10:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-100962** | Batch ID: **100962** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_210621B** | Analysis Date: **6/21/2021 2:10:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 774 | 10.0 | 745.6 | 0 | 104 | 90 | 113 | | | |

| Sample ID: **2106122-08B-DUP** | Batch ID: **100962** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_210621B** | Analysis Date: **6/21/2021 2:10:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 4810 | 50.0 | 0 | 4870 | | | | 1.34 | 5 | |

| Sample ID: **2106122-09B-DUP** | Batch ID: **100962** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_210621B** | Analysis Date: **6/21/2021 2:10:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1140 | 50.0 | 0 | 1155 | | | | 1.75 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106123
**Project:** Luminant-OGSES-CCR-Ash Landfill 1

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Boron | 0.0100 | 0.0300 |
| Calcium | 0.100 | 0.300 |

| **TestNo: M2540C** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

October 20, 2021

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX: (512) 671-3446

Order No.: 2110096

RE: Luminant-OGSES-Ash Landfill-CCR

Dear Will Vienne:

DHL Analytical, Inc. received 7 sample(s) on 10/13/2021 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-21-27

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DHL ANALYTICAL
2300 Double Creek Dr. Round Rock, TX 78664
Phone 512.388.8222
Web: **www.dhlanalytical.com**
Email: **login@dhlanalytical.com**

# CHAIN-OF-CUSTODY



CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR #4004 ROUND ROCK, TX
PHONE: 512-671-3434 EMAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 10-12-21
**PO#:**

**LABORATORY USE ONLY**
**DHL WORKORDER #:** 2110096

PROJECT LOCATION OR NAME: LUMINANT - OGSES - ASH LANDFILL - CCR
CLIENT PROJECT # 1912262 COLLECTOR: JOHN BRAXTON

**Authorize 5% surcharge for TRRP report?** ☐ Yes ☐ No

**Lab Use Only**

W=WATER L=LIQUID S=SOIL SO=SOLID SE=SEDIMENT P=PAINT SL=SLUDGE

| Field Sample I.D. | DHL Lab # | Collection Date | Collection Time | Matrix | Container Type | # of Containers | PRESERVATION: HCL | $HNO_3$ | $H_2SO_4$ | NaOH ☐ Zn Acetate ☐ | ICE ☒ UNPRESERVED ☐ | ANALYSES | APPENDIX III | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-02 | 01 | 10-12-21 | 1330 | W | P | 2 | | X | | | X | | X | |
| MW-09 | 02 | " | 1620 | W | P | 2 | | X | | | X | | X | |
| AL-1D | 03 | " | 1520 | W | P | 2 | | X | | | X | | X | |
| MW-08R | 04 | " | 1715 | W | P | 2 | | X | | | X | | X | |
| MW-05 | 05 | " | 1805 | W | P | 2 | | X | | | X | | X | |
| DUP-1 | 06 | " | 1805 | W | P | 2 | | X | | | X | | X | |
| MW-07 | 07 | 10-13-21 | 0810 | W | P | 2 | | X | | | X | | X | |

Relinquished By: (Sign) DATE/TIME 10-13-21 1315 Received by:
Relinquished By: (Sign) DATE/TIME Received by:
Relinquished By: (Sign) DATE/TIME Received by:

**TURN AROUND TIME (CALL FIRST FOR RUSH)**
RUSH-1 DAY☐ RUSH-2 DAY☐ RUSH-3 DAY☐
NORMAL ☒ OTHER ☐
DUE DATE ☐

**LABORATORY USE ONLY**
RECEIVING TEMP (°C): 4.3 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LSO ☐ FEDEX ☐ UPS ☐ COURIER ☐ OTHER ☒ HAND DELIVERED

☐ **DHL DISPOSAL @ 5.00 each** ☐ **Return**

**DHL COC REV 3 | MAR 2021**

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder** Date Received: **10/13/2021**

Work Order Number **2110096** Received by: **EL**

Checklist completed by: 10/13/2021 (Signature / Date) Reviewed by SH 10/13/2021 (Initials / Date)

Carrier name: Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **4.3** °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? No | | Checked by R.A. |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action: _____

v

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist: Reportable Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-Ash Landfill-CCR | **LRC Date:** 10/20/2021 |
| **Reviewer Name:** Angie O'Donnell | **Laboratory Work Order: 2110096** |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | **X** | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | **X** | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | **X** | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | **X** | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | **X** | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | **X** | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | **X** | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | **X** | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | **X** | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | **X** | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | **X** | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | **X** | | |
| | | **9)** If required for the project, TICs reported? | | | **X** | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | **X** | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | **X** | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | **X** | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | **X** | | | | |
| | | **4)** Were blank concentrations < MDL? | **X** | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | **X** | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | **X** | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | **X** | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | **X** | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | **X** | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | **X** | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | **X** | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | **X** | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | **X** | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | **X** | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | **X** | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | **X** | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | **X** | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | **X** | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | **X** | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | **X** | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | **X** | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-Ash Landfill-CCR | **LRC Date:** 10/20/2021 |
| **Reviewer Name:** Angie O'Donnell | **Laboratory Work Order: 2110096** |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | X | | | | |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 23-26, 2021. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

10/20/21

Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *20-Oct-21*

**CLIENT:** Golder
**Project:** Luminant-OGSES-Ash Landfill-CCR
**Lab Order:** 2110096

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis

Exception Report R1-01

The samples were received and log-in performed on 10/13/2021. A total of 7 samples were received and analyzed. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Anions Analysis, the recovery of one anion (each) for the Matrix Spike and Matrix Spike Duplicate(s) (2110094-10, 2110096-07 MS/MSD) was below the method control limits. These are flagged accordingly in the QC Summary Report. These anions were within method control limits in the associated LCS. No further corrective action was taken.

## DHL Analytical, Inc.

**Date:** *20-Oct-21*

**CLIENT:** Golder
**Project:** Luminant-OGSES-Ash Landfill-CCR
**Lab Order:** 2110096

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2110096-01 | MW-02 | | 10/12/21 01:30 PM | 10/13/2021 |
| 2110096-02 | MW-09 | | 10/12/21 04:20 PM | 10/13/2021 |
| 2110096-03 | AL-10 | | 10/12/21 03:20 PM | 10/13/2021 |
| 2110096-04 | MW-08R | | 10/12/21 05:15 PM | 10/13/2021 |
| 2110096-05 | MW-05 | | 10/12/21 06:05 PM | 10/13/2021 |
| 2110096-06 | DUP-1 | | 10/12/21 06:05 PM | 10/13/2021 |
| 2110096-07 | MW-07 | | 10/13/21 08:10 AM | 10/13/2021 |

**Lab Order:** 2110096
**Client:** Golder
**Project:** Luminant-OGSES-Ash Landfill-C

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2110096-01A | MW-02 | 10/12/21 01:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:17 AM | 102438 |
| 2110096-01B | MW-02 | 10/12/21 01:30 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | MW-02 | 10/12/21 01:30 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | MW-02 | 10/12/21 01:30 PM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110096-02A | MW-09 | 10/12/21 04:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:17 AM | 102438 |
| 2110096-02B | MW-09 | 10/12/21 04:20 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | MW-09 | 10/12/21 04:20 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | MW-09 | 10/12/21 04:20 PM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110096-03A | AL-10 | 10/12/21 03:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:17 AM | 102438 |
| 2110096-03B | AL-10 | 10/12/21 03:20 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | AL-10 | 10/12/21 03:20 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | AL-10 | 10/12/21 03:20 PM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110096-04A | MW-08R | 10/12/21 05:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:17 AM | 102438 |
| | MW-08R | 10/12/21 05:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:17 AM | 102438 |
| 2110096-04B | MW-08R | 10/12/21 05:15 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | MW-08R | 10/12/21 05:15 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | MW-08R | 10/12/21 05:15 PM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110096-05A | MW-05 | 10/12/21 06:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:17 AM | 102438 |
| 2110096-05B | MW-05 | 10/12/21 06:05 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | MW-05 | 10/12/21 06:05 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | MW-05 | 10/12/21 06:05 PM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110096-06A | DUP-1 | 10/12/21 06:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:17 AM | 102438 |
| 2110096-06B | DUP-1 | 10/12/21 06:05 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | DUP-1 | 10/12/21 06:05 PM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | DUP-1 | 10/12/21 06:05 PM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110096-07A | MW-07 | 10/13/21 08:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:17 AM | 102438 |
| | MW-07 | 10/13/21 08:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:17 AM | 102438 |
| 2110096-07B | MW-07 | 10/13/21 08:10 AM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |

**Lab Order:** 2110096
**Client:** Golder
**Project:** Luminant-OGSES-Ash Landfill-C

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2110096-07B | MW-07 | 10/13/21 08:10 AM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102420 |
| | MW-07 | 10/13/21 08:10 AM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |

**Lab Order:** 2110096
**Client:** Golder
**Project:** Luminant-OGSES-Ash Landfill-C

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2110096-01A | MW-02 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102438 | 1 | 10/19/21 02:49 PM | ICP-MS4_211019A |
| 2110096-01B | MW-02 | Aqueous | E300 | Anions by IC method - Water | 102420 | 10 | 10/15/21 05:39 PM | IC2_211015A |
| | MW-02 | Aqueous | E300 | Anions by IC method - Water | 102420 | 1 | 10/16/21 01:07 AM | IC2_211015A |
| | MW-02 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110096-02A | MW-09 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102438 | 1 | 10/19/21 02:51 PM | ICP-MS4_211019A |
| 2110096-02B | MW-09 | Aqueous | E300 | Anions by IC method - Water | 102420 | 10 | 10/15/21 05:55 PM | IC2_211015A |
| | MW-09 | Aqueous | E300 | Anions by IC method - Water | 102420 | 1 | 10/16/21 01:23 AM | IC2_211015A |
| | MW-09 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110096-03A | AL-10 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102438 | 1 | 10/19/21 02:53 PM | ICP-MS4_211019A |
| 2110096-03B | AL-10 | Aqueous | E300 | Anions by IC method - Water | 102420 | 10 | 10/15/21 06:11 PM | IC2_211015A |
| | AL-10 | Aqueous | E300 | Anions by IC method - Water | 102420 | 1 | 10/16/21 01:39 AM | IC2_211015A |
| | AL-10 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110096-04A | MW-08R | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102438 | 10 | 10/19/21 03:12 PM | ICP-MS4_211019A |
| | MW-08R | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102438 | 1 | 10/19/21 02:55 PM | ICP-MS4_211019A |
| 2110096-04B | MW-08R | Aqueous | E300 | Anions by IC method - Water | 102420 | 1 | 10/16/21 01:55 AM | IC2_211015A |
| | MW-08R | Aqueous | E300 | Anions by IC method - Water | 102420 | 10 | 10/15/21 06:27 PM | IC2_211015A |
| | MW-08R | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110096-05A | MW-05 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102438 | 1 | 10/19/21 02:57 PM | ICP-MS4_211019A |
| 2110096-05B | MW-05 | Aqueous | E300 | Anions by IC method - Water | 102420 | 10 | 10/15/21 06:43 PM | IC2_211015A |
| | MW-05 | Aqueous | E300 | Anions by IC method - Water | 102420 | 1 | 10/16/21 02:11 AM | IC2_211015A |
| | MW-05 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110096-06A | DUP-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102438 | 1 | 10/19/21 02:59 PM | ICP-MS4_211019A |
| 2110096-06B | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 102420 | 10 | 10/15/21 06:59 PM | IC2_211015A |
| | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 102420 | 1 | 10/16/21 02:27 AM | IC2_211015A |
| | DUP-1 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110096-07A | MW-07 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102438 | 1 | 10/19/21 03:01 PM | ICP-MS4_211019A |
| | MW-07 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102438 | 10 | 10/19/21 03:14 PM | ICP-MS4_211019A |
| 2110096-07B | MW-07 | Aqueous | E300 | Anions by IC method - Water | 102420 | 10 | 10/15/21 07:15 PM | IC2_211015A |

**Lab Order:** 2110096
**Client:** Golder
**Project:** Luminant-OGSES-Ash Landfill-C

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2110096-07B | MW-07 | Aqueous | E300 | Anions by IC method - Water | 102420 | 1 | 10/16/21 02:43 AM | IC2_211015A |
| | MW-07 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |

# DHL Analytical, Inc.

**Date:** *20-Oct-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | MW-02 |
| **Project:** | Luminant-OGSES-Ash Landfill-CCR | **Lab ID:** | 2110096-01 |
| **Project No:** | 1912262 | **Collection Date:** | 10/12/21 01:30 PM |
| **Lab Order:** | 2110096 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.0848 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 02:49 PM |
| Calcium | 23.8 | 0.100 | 0.300 | | mg/L | 1 | 10/19/21 02:49 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 56.6 | 3.00 | 10.0 | | mg/L | 10 | 10/15/21 05:39 PM |
| Fluoride | 0.360 | 0.100 | 0.400 | J | mg/L | 1 | 10/16/21 01:07 AM |
| Sulfate | 20.7 | 1.00 | 3.00 | | mg/L | 1 | 10/16/21 01:07 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 245 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *20-Oct-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | MW-09 |
| **Project:** | Luminant-OGSES-Ash Landfill-CCR | **Lab ID:** | 2110096-02 |
| **Project No:** | 1912262 | **Collection Date:** | 10/12/21 04:20 PM |
| **Lab Order:** | 2110096 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.0821 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 02:51 PM |
| Calcium | 20.7 | 0.100 | 0.300 | | mg/L | 1 | 10/19/21 02:51 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 29.9 | 0.300 | 1.00 | | mg/L | 1 | 10/16/21 01:23 AM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 10/16/21 01:23 AM |
| Sulfate | 31.2 | 1.00 | 3.00 | | mg/L | 1 | 10/16/21 01:23 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 223 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *20-Oct-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | AL-10 |
| **Project:** | Luminant-OGSES-Ash Landfill-CCR | **Lab ID:** | 2110096-03 |
| **Project No:** | 1912262 | **Collection Date:** | 10/12/21 03:20 PM |
| **Lab Order:** | 2110096 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.0878 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 02:53 PM |
| Calcium | 15.1 | 0.100 | 0.300 | | mg/L | 1 | 10/19/21 02:53 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 51.4 | 3.00 | 10.0 | | mg/L | 10 | 10/15/21 06:11 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 10/16/21 01:39 AM |
| Sulfate | 9.84 | 1.00 | 3.00 | | mg/L | 1 | 10/16/21 01:39 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 269 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

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- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *20-Oct-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | MW-08R |
| **Project:** | Luminant-OGSES-Ash Landfill-CCR | **Lab ID:** | 2110096-04 |
| **Project No:** | 1912262 | **Collection Date:** | 10/12/21 05:15 PM |
| **Lab Order:** | 2110096 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.107 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 02:55 PM |
| Calcium | 32.8 | 1.00 | 3.00 | | mg/L | 10 | 10/19/21 03:12 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 268 | 3.00 | 10.0 | | mg/L | 10 | 10/15/21 06:27 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 10/16/21 01:55 AM |
| Sulfate | 136 | 1.00 | 3.00 | | mg/L | 1 | 10/16/21 01:55 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 874 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

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- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *20-Oct-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | MW-05 |
| **Project:** | Luminant-OGSES-Ash Landfill-CCR | **Lab ID:** | 2110096-05 |
| **Project No:** | 1912262 | **Collection Date:** | 10/12/21 06:05 PM |
| **Lab Order:** | 2110096 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.0615 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 02:57 PM |
| Calcium | 20.9 | 0.100 | 0.300 | | mg/L | 1 | 10/19/21 02:57 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 83.6 | 3.00 | 10.0 | | mg/L | 10 | 10/15/21 06:43 PM |
| Fluoride | 0.433 | 0.100 | 0.400 | | mg/L | 1 | 10/16/21 02:11 AM |
| Sulfate | 11.7 | 1.00 | 3.00 | | mg/L | 1 | 10/16/21 02:11 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 282 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *20-Oct-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | DUP-1 |
| **Project:** | Luminant-OGSES-Ash Landfill-CCR | **Lab ID:** | 2110096-06 |
| **Project No:** | 1912262 | **Collection Date:** | 10/12/21 06:05 PM |
| **Lab Order:** | 2110096 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.0703 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 02:59 PM |
| Calcium | 20.9 | 0.100 | 0.300 | | mg/L | 1 | 10/19/21 02:59 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 85.5 | 3.00 | 10.0 | | mg/L | 10 | 10/15/21 06:59 PM |
| Fluoride | 0.425 | 0.100 | 0.400 | | mg/L | 1 | 10/16/21 02:27 AM |
| Sulfate | 12.1 | 1.00 | 3.00 | | mg/L | 1 | 10/16/21 02:27 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 272 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *20-Oct-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | MW-07 |
| **Project:** | Luminant-OGSES-Ash Landfill-CCR | **Lab ID:** | 2110096-07 |
| **Project No:** | 1912262 | **Collection Date:** | 10/13/21 08:10 AM |
| **Lab Order:** | 2110096 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Boron | 0.181 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 03:01 PM |
| Calcium | 31.6 | 1.00 | 3.00 | | mg/L | 10 | 10/19/21 03:14 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 29.6 | 0.300 | 1.00 | | mg/L | 1 | 10/16/21 02:43 AM |
| Fluoride | 0.353 | 0.100 | 0.400 | J | mg/L | 1 | 10/16/21 02:43 AM |
| Sulfate | 130 | 1.00 | 3.00 | | mg/L | 1 | 10/16/21 02:43 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 422 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2110096
**Project:** Luminant-OGSES-Ash Landfill-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_210803A**

| Sample ID: **DCS2-101483** | Batch ID: **101483** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS4_210803A** | Analysis Date: **8/3/2021 1:21:00 PM** | Prep Date: **8/2/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.278 | 0.300 | 0.300 | 0 | 92.6 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-101483** | Batch ID: **101483** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS4_210803A** | Analysis Date: **8/3/2021 1:27:00 PM** | Prep Date: **8/2/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0315 | 0.0300 | 0.0300 | 0 | 105 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110096
**Project:** Luminant-OGSES-Ash Landfill-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS4_211019A**

The QC data in batch 102438 applies to the following samples: 2110096-01A, 2110096-02A, 2110096-03A, 2110096-04A, 2110096-05A, 2110096-06A, 2110096-07A

Sample ID: **MB-102438** Batch ID: **102438** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 2:01:00 PM** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |

Sample ID: **LCS-102438** Batch ID: **102438** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 2:03:00 PM** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.184 | 0.0300 | 0.200 | 0 | 91.9 | 80 | 120 | | | |
| Calcium | 5.43 | 0.300 | 5.00 | 0 | 109 | 80 | 120 | | | |

Sample ID: **LCSD-102438** Batch ID: **102438** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 2:05:00 PM** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.196 | 0.0300 | 0.200 | 0 | 97.8 | 80 | 120 | 6.17 | 15 | |
| Calcium | 5.73 | 0.300 | 5.00 | 0 | 115 | 80 | 120 | 5.34 | 15 | |

Sample ID: **2110094-01A SD** Batch ID: **102438** TestNo: **SW6020B** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 2:11:00 PM** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.130 | 0.150 | 0 | 0.116 | | | | 12.0 | 20 | |
| Calcium | 15.7 | 1.50 | 0 | 15.6 | | | | 0.484 | 20 | |

Sample ID: **2110094-01A PDS** Batch ID: **102438** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 2:31:00 PM** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.281 | 0.0300 | 0.200 | 0.116 | 82.7 | 75 | 125 | | | |
| Calcium | 19.7 | 0.300 | 5.00 | 15.6 | 82.9 | 75 | 125 | | | |

Sample ID: **2110094-01A MS** Batch ID: **102438** TestNo: **SW6020B** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 2:33:00 PM** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.285 | 0.0300 | 0.200 | 0.116 | 84.8 | 75 | 125 | | | |
| Calcium | 20.9 | 0.300 | 5.00 | 15.6 | 106 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110096
**Project:** Luminant-OGSES-Ash Landfill-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_211019A**

Sample ID: **2110094-01A MSD** Batch ID: **102438** TestNo: **SW6020B** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 2:35:00 PM** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.297 | 0.0300 | 0.200 | 0.116 | 90.7 | 75 | 125 | 4.03 | 15 | |
| Calcium | 20.7 | 0.300 | 5.00 | 15.6 | 103 | 75 | 125 | 0.757 | 15 | |

**Qualifiers:**

| | |
|---|---|
| B | Analyte detected in the associated Method Blank |
| J | Analyte detected between MDL and RL |
| ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit |
| J | Analyte detected between SDL and RL |
| DF | Dilution Factor |
| MDL | Method Detection Limit |
| R | RPD outside accepted control limits |
| S | Spike Recovery outside control limits |
| N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110096
**Project:** Luminant-OGSES-Ash Landfill-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_211019A**

| Sample ID: **ICV-211019** | Batch ID: **R117572** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 10:36:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0970 | 0.0300 | 0.100 | 0 | 97.0 | 90 | 110 | | | |
| Calcium | 2.59 | 0.300 | 2.50 | 0 | 104 | 90 | 110 | | | |

| Sample ID: **LCVL-211019** | Batch ID: **R117572** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 10:45:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0174 | 0.0300 | 0.0200 | 0 | 87.1 | 80 | 120 | | | |
| Calcium | 0.101 | 0.300 | 0.100 | 0 | 101 | 80 | 120 | | | |

| Sample ID: **CCV3-211019** | Batch ID: **R117572** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 12:26:00 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.191 | 0.0300 | 0.200 | 0 | 95.4 | 90 | 110 | | | |
| Calcium | 5.28 | 0.300 | 5.00 | 0 | 106 | 90 | 110 | | | |

| Sample ID: **CCV4-211019** | Batch ID: **R117572** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 2:39:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.186 | 0.0300 | 0.200 | 0 | 93.2 | 90 | 110 | | | |
| Calcium | 5.32 | 0.300 | 5.00 | 0 | 106 | 90 | 110 | | | |

| Sample ID: **CCV5-211019** | Batch ID: **R117572** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 3:08:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.195 | 0.0300 | 0.200 | 0 | 97.7 | 90 | 110 | | | |
| Calcium | 5.30 | 0.300 | 5.00 | 0 | 106 | 90 | 110 | | | |

| Sample ID: **CCV6-211019** | Batch ID: **R117572** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 3:17:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.40 | 0.300 | 5.00 | 0 | 108 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110096
**Project:** Luminant-OGSES-Ash Landfill-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_210928A**

Sample ID: **DCS2-102216** Batch ID: **102216** TestNo: **E300** Units: **mg/L**
SampType: **DCS2** Run ID: **IC2_210928A** Analysis Date: **9/28/2021 1:38:01 PM** Prep Date: **9/28/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.533 | 1.00 | 0.5000 | 0 | 107 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.179 | 0.400 | 0.2000 | 0 | 89.5 | 70 | 130 | 0 | 0 | |
| Sulfate | 1.55 | 3.00 | 1.500 | 0 | 104 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110096
**Project:** Luminant-OGSES-Ash Landfill-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_211015A**

The QC data in batch 102420 applies to the following samples: 2110096-01B, 2110096-02B, 2110096-03B, 2110096-04B, 2110096-05B, 2110096-06B, 2110096-07B

Sample ID: **MB-102420** Batch ID: **102420** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_211015A** Analysis Date: **10/15/2021 12:20:32 P** Prep Date: **10/15/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-102420** Batch ID: **102420** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_211015A** Analysis Date: **10/15/2021 12:36:33 P** Prep Date: **10/15/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | | | |
| Fluoride | 4.04 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 31.4 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

Sample ID: **LCSD-102420** Batch ID: **102420** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_211015A** Analysis Date: **10/15/2021 12:52:32 P** Prep Date: **10/15/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | 1.25 | 20 | |
| Fluoride | 4.04 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | 0.063 | 20 | |
| Sulfate | 31.4 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | 0.235 | 20 | |

Sample ID: **2110094-10BMS** Batch ID: **102420** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_211015A** Analysis Date: **10/15/2021 4:51:37 PM** Prep Date: **10/15/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 428 | 10.0 | 200.0 | 272.7 | 77.4 | 90 | 110 | | | S |
| Fluoride | 214 | 4.00 | 200.0 | 0 | 107 | 90 | 110 | | | |
| Sulfate | 317 | 30.0 | 200.0 | 131.5 | 92.8 | 90 | 110 | | | |

Sample ID: **2110094-10BMSD** Batch ID: **102420** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_211015A** Analysis Date: **10/15/2021 5:07:37 PM** Prep Date: **10/15/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 429 | 10.0 | 200.0 | 272.7 | 78.0 | 90 | 110 | 0.289 | 20 | S |
| Fluoride | 215 | 4.00 | 200.0 | 0 | 107 | 90 | 110 | 0.353 | 20 | |
| Sulfate | 316 | 30.0 | 200.0 | 131.5 | 92.2 | 90 | 110 | 0.334 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110096
**Project:** Luminant-OGSES-Ash Landfill-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_211015A**

| Sample ID: **2110096-07BMS** | Batch ID: **102420** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_211015A** | Analysis Date: **10/15/2021 7:31:37 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 215 | 10.0 | 200.0 | 28.21 | 93.2 | 90 | 110 | | | |
| Fluoride | 210 | 4.00 | 200.0 | 0 | 105 | 90 | 110 | | | |
| Sulfate | 298 | 30.0 | 200.0 | 121.6 | 88.1 | 90 | 110 | | | S |

| Sample ID: **2110096-07BMSD** | Batch ID: **102420** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_211015A** | Analysis Date: **10/15/2021 7:47:37 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 212 | 10.0 | 200.0 | 28.21 | 92.1 | 90 | 110 | 1.06 | 20 | |
| Fluoride | 209 | 4.00 | 200.0 | 0 | 105 | 90 | 110 | 0.627 | 20 | |
| Sulfate | 295 | 30.0 | 200.0 | 121.6 | 86.6 | 90 | 110 | 1.02 | 20 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110096
**Project:** Luminant-OGSES-Ash Landfill-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_211015A**

| Sample ID: **ICV-211015** | Batch ID: **R117539** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_211015A** | Analysis Date: **10/15/2021 11:48:32 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 26.0 | 1.00 | 25.00 | 0 | 104 | 90 | 110 | | | |
| Fluoride | 10.6 | 0.400 | 10.00 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 80.8 | 3.00 | 75.00 | 0 | 108 | 90 | 110 | | | |

| Sample ID: **CCV1-211015** | Batch ID: **R117539** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_211015A** | Analysis Date: **10/15/2021 8:51:37 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Fluoride | 4.07 | 0.400 | 4.000 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 31.4 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID: **CCV2-211015** | Batch ID: **R117539** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_211015A** | Analysis Date: **10/16/2021 12:35:37 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | | | |
| Fluoride | 4.16 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 31.6 | 3.00 | 30.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID: **CCV3-211015** | Batch ID: **R117539** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_211015A** | Analysis Date: **10/16/2021 3:31:37 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.4 | 1.00 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Fluoride | 4.17 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 32.1 | 3.00 | 30.00 | 0 | 107 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110096
**Project:** Luminant-OGSES-Ash Landfill-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_211014C**

The QC data in batch 102408 applies to the following samples: 2110096-01B, 2110096-02B, 2110096-03B, 2110096-04B, 2110096-05B, 2110096-06B, 2110096-07B

| Sample ID: **MB-102408** | Batch ID: **102408** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_211014C** | Analysis Date: **10/14/2021 4:30:00 PM** | Prep Date: **10/14/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-102408** | Batch ID: **102408** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_211014C** | Analysis Date: **10/14/2021 4:30:00 PM** | Prep Date: **10/14/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 744 | 10.0 | 745.6 | 0 | 99.8 | 90 | 113 | | | |

| Sample ID: **2110088-01A-DUP** | Batch ID: **102408** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_211014C** | Analysis Date: **10/14/2021 4:30:00 PM** | Prep Date: **10/14/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 962 | 10.0 | 0 | 972.0 | | | | 1.03 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110096
**Project:** Luminant-OGSES-Ash Landfill-CCR

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Boron | 0.0100 | 0.0300 |
| Calcium | 0.100 | 0.300 |

| **TestNo: M2540C** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

**ATTACHMENT 2**

**ALTERNATE SOURCE DEMONSTRATION REPORT**

## ALTERNATE SOURCE DEMONSTRATION SUMMARY

## OAK GROVE STEAM ELECTRIC STATION – ASH LANDFILL 1

### Introduction

This Alternate Source Demonstration Summary was prepared to document that a source other than the Ash Landfill 1 (the Site) caused the statistically significant increases (SSIs) over background levels observed during the 2020 Coal Combustion Residual (CCR) Detection Monitoring Program sampling events as required by 40 CFR 257.94(e)(2) (the "CCR Rule").

### Ash Landfill 1 CCR Monitoring Well Network

A Site Plan showing Ash Landfill 1 and vicinity is shown on Figure 1. The CCR groundwater monitoring well system at the Ash Landfill 1 consists of six monitoring wells (MW-02, MW-05, MW-07, MW-08R, MW-09, and AL-10) that are each screened in the uppermost aquifer at the Site. The uppermost aquifer at the Site occurs under unconfined conditions within the shallow sand units at the Site (PBW, 2017a). Groundwater elevations have consistently been highest west of the Ash Landfill 1 and lowest east of the Ash Landfill 1 during the background and detection monitoring period, with a groundwater flow direction from west to east. Based on the observed groundwater potentiometric surface at the Site, the location of each CCR monitoring well relative to the Ash Landfill 1 is as follows:

| Upgradient/Background Wells | Downgradient Wells |
|---|---|
| MW-02<br>AL-10 | MW-05<br>MW-07<br>MW-08R<br>MW-09 |

### 2020 Semi-Annual Detection Monitoring Results and Discussion

Detection Monitoring Program groundwater data collected from the Ash Landfill 1 CCR monitoring well network from 2017 through 2020 are summarized in Table 1. Detection Monitoring Program groundwater samples were collected on a semi-annual basis from the Site CCR monitoring well network in 2020 in accordance with 40 CFR 257.94. Golder collected the first semi-annual 2020 Detection Monitoring Program groundwater samples in May 2020 and the second semi-annual Detection Monitoring Program groundwater samples in September 2020.

Based on the 2020 semi-annual groundwater sample results, SSIs were identified for boron in downgradient wells MW-05 and MW-07 (maximum boron concentration of 0.302 mg/L) and sulfate in downgradient well MW-07 and MW-09 (maximum sulfate concentration of 123 mg/L). Boron sample concentrations also exceeded background prediction limits in upgradient wells MW-02 and AL-10 and sulfate sample concentrations exceeded background prediction limits in upgradient well AL-10 in 2020. Based on the generally similar concentrations of boron and sulfate in upgradient and downgradient wells and the elevated concentrations of boron and sulfate in upgradient wells above background prediction limits, the SSIs identified in 2020 in downgradient wells are attributed to natural variation in groundwater quality related to the heterogeneity of the uppermost aquifer at the Site rather than a release from the Ash Landfill 1.

**Conclusion**

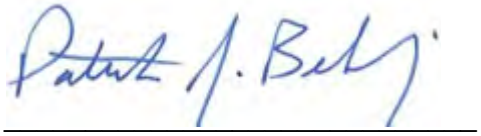
SSIs or potential SSIs were observed in downgradient wells MW-05, MW-07, and MW-09 and upgradient well MW-02 and AL-10 during the 2020 Detection Monitoring Program sampling events at Ash Landfill 1. However, all SSIs are attributed to natural variation in groundwater quality due to the heterogeneity of the groundwater system and are not considered evidence of a release from the CCR unit. In accordance with Section 257.94(e)(2), Luminant should continue the Detection Monitoring Program. Initiation of an Assessment Monitoring Program is not required at this time.

**References**

Pastor, Behling & Wheeler, LLC (PBW), 2017a. Coal Combustion Residual Rule, Groundwater Monitoring System Certification, Oak Grove Steam Electric Station, Ash Landfill 1, Robertson County, Texas. October 16, 2017.

**PROFESSIONAL CERTIFICATION**

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the alternative source demonstration at the referenced facility meets the requirements of Section 257.94(e)(2) of the CCR Rule.



Patrick J. Behling, P.E.
Principal Engineer
GOLDER ASSOCIATES INC.

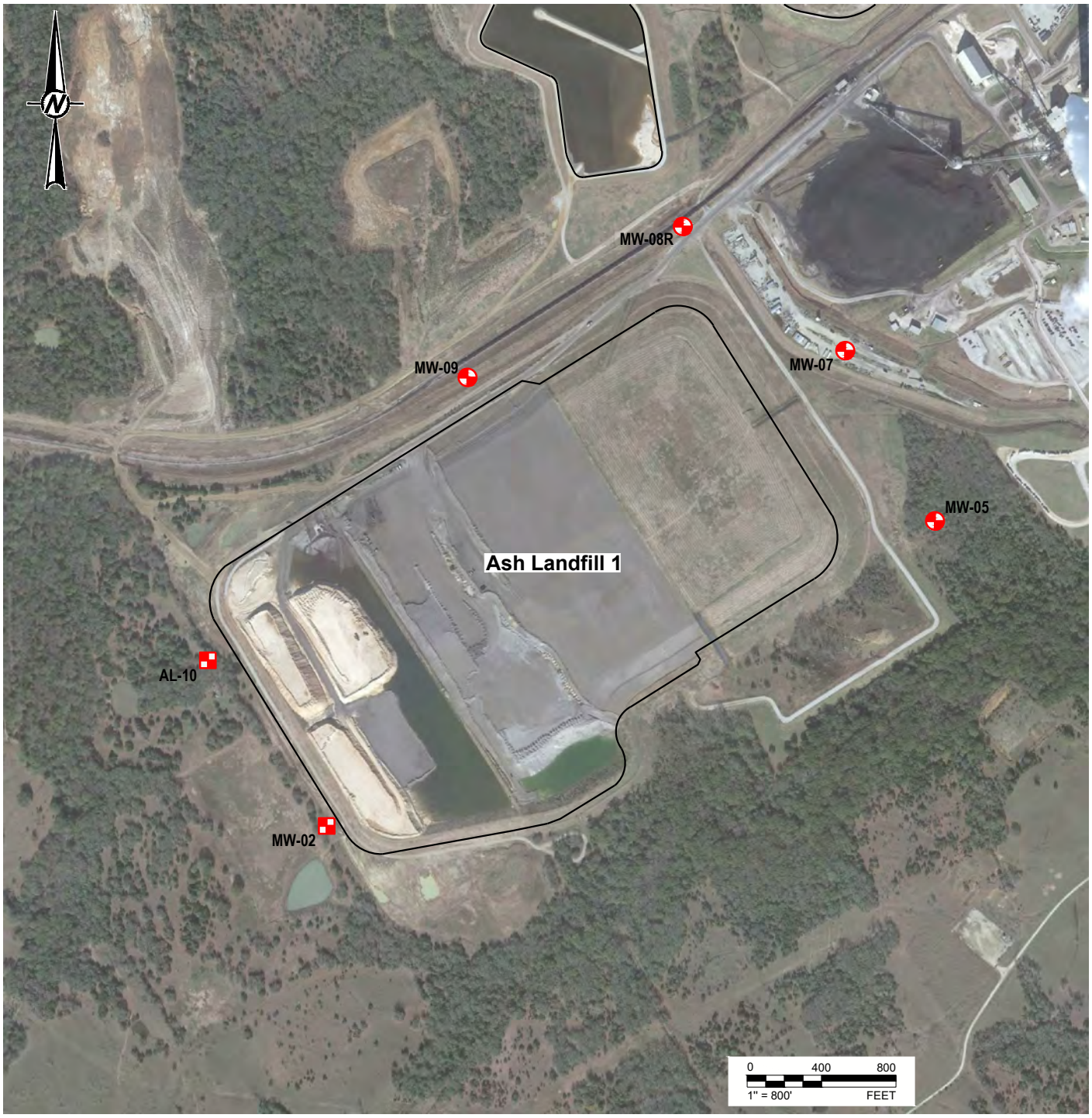
**TABLE 1**
**CCR Groundwater Detection Monitoring Data Summary**
**Oak Grove Steam Electric Station**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | F (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| **Prediction Limit** | | 0.124 | 74.9 | 353 | 0.4 | 6.31 7.09 | 97.4 | 948 |
| **Upgradient Wells** | | | | | | | | |
| AL-10 | 11/04/15 | 0.0682 | 34.5 | 149 | 0.149 J | 6.86 | 72.6 | 590 |
| | 12/18/15 | 0.0539 | 37.5 | 81 | 0.15 J | 6.45 | 20.6 | 414 |
| | 02/10/16 | 0.0637 | 48.6 | 108 | 0.197 J | 6.75 | 34.9 | 599 |
| | 04/15/16 | 0.0573 | 44.8 | 86 | 0.133 | 6.51 | 23.6 | 549 |
| | 06/16/16 | 0.0915 | 34.7 | 66.7 | 0.155 J | 6.44 | 23.5 | 436 |
| | 08/25/16 | 0.105 | 87.5 | 444 | <0.1 | 6.61 | 96.3 | 1,120 |
| | 10/04/16 | 0.0756 | 35.1 | 57.3 | 0.278 J | 6.92 | 20.1 | 507 |
| | 12/22/16 | 0.0759 | 32.5 | 57.2 | 0.195 J | 6.78 | 21.5 | 527 |
| | 10/02/17 | 0.0973 | 27 | 50.6 | 0.120 J | 6.85 | 12.2 | 398 |
| | 06/04/18 | 0.0875 | 21.9 | 62.1 | 0.183 J | 6.67 | 11.6 | 362 |
| | 09/06/18 | 0.113 | 21.9 | 56.7 | 0.260 J | 6.66 | 11.8 | 371 |
| | 05/17/19 | 0.114 | 16.8 | 67.9 | 0.262 J | 6.64 | 12.4 | 340 |
| | 08/20/19 | 0.115 | 18.8 | 66.2 | 0.363 J | 6.87 | 11.8 | 333 |
| | 05/07/20 | 0.128 | 18.8 | 52.2 | <0.100 | 6.78 | 11.1 | 317 |
| | 9/9/2020 | 0.139 | 16.8 | 49.2 | 0.208 J | 6.86 | 10.6 | 301 |
| MW-02 | 11/04/15 | 0.064 | 32.5 | 138 | 0.135 J | 6.92 | 71.4 | 539 |
| | 12/18/15 | 0.0476 | 29 | 61.7 | 0.118 J | 6.83 | 15.9 | 308 |
| | 02/10/16 | 0.0853 | 25.4 | 83.5 | 0.229 J | 6.63 | 34 | 320 |
| | 04/15/16 | 0.0597 | 39.6 | 68 | 0.102 | 6.51 | 18.1 | 440 |
| | 06/16/16 | 0.106 | 26.5 | 87.8 | 0.161 J | 6.89 | 34.8 | 343 |
| | 08/25/16 | 0.0492 | 12.9 | 21.9 | 0.164 J | 6.58 | 22.4 | 163 |
| | 10/04/16 | 0.113 | 61.4 | 222 | 0.185 J | 6.69 | 97.4 | 667 |
| | 12/21/16 | 0.11 | 47.8 | 185 | 0.293 J | 6.78 | 83.4 | 590 |
| | 10/02/17 | 0.0567 | 22.2 | 42.4 | <0.100 | 6.68 | 9.67 | 310 |
| | 06/04/18 | 0.144 | 82.4 | 275 | 0.139 J | 6.28 | 121 | 740 |
| | 09/06/18 | 0.148 | 70.9 | 259 | 0.221 J | 6.02 | 116 | 872 |
| | 05/17/19 | 0.0981 | 20 | 67.6 | 0.321 J | 6.63 | 31.1 | 306 |
| | 08/20/19 | 0.0875 | 19.9 | 53.8 | 0.558 | 6.59 | 20.1 | 260 |
| | 5/7/2020 | 0.0996 | 11.5 | 2.87 | <0.100 | 6.63 | 6.14 | 106 |
| | 9/9/2020 | 0.166 | 55.6 | 210 | 0.287 J | 6.76 | 99.2 | 592 |
| **Downgradient Wells** | | | | | | | | |
| MW-04 | 9/9/2020 | 0.0838 | -- | -- | -- | | 30.2 | |
| MW-05 | 11/04/15 | 0.0628 | 15.4 | 64.8 | 0.272 J | 7.11 | 13.6 | 285 |
| | 12/18/15 | 0.0621 | 13 | 60.2 | 0.476 | 6.52 | 10.5 | 232 |
| | 02/10/16 | 0.0447 | 14 | 59.7 | 0.397 J | 6.67 | 11.9 | 235 |
| | 04/15/16 | 0.0458 | 14.3 | 55.4 | 0.284 | 6.42 | 10.7 | 288 |
| | 06/15/16 | 0.058 | 14.2 | 60.4 | 0.306 J | 6.61 | 11.8 | 269 |
| | 08/24/16 | 0.0877 | 13.1 | 63 | 0.262 J | 6.75 | 11.8 | 287 |
| | 10/04/16 | 0.059 | 15.4 | 57.9 | 0.477 | 6.87 | 10.9 | 253 |
| | 12/22/16 | 0.0759 | 61.4 | 264 | 0.446 | 6.63 | 55.6 | 778 |
| | 10/02/17 | 0.0665 | 17.5 | 58.6 | 0.295 J | 6.89 | 10.4 | 246 |
| | 06/05/18 | 0.0739 | 16.8 | 60 | 0.391 J | 6.43 | 12.1 | 253 |
| | 09/07/18 | 0.077 | 15.8 | 63.3 | 0.392 J | 6.11 | 10.6 | 249 |
| | 05/17/19 | 0.0686 | 13.5 | 66.4 | 0.462 | 6.57 | 11.2 | 257 |
| | 08/20/19 | 0.079 | 16 | 66.7 | 0.514 | 6.78 | 10.8 | 263 |
| | 05/07/20 | 0.0985 | 18 | 71.8 | 0.344 J | 6.68 | 10.6 | 264 |
| | 09/09/20 | 0.201 | 20.5 | 79.8 | 0.372 J | 6.81 | 66.5 | 407 |

**TABLE 1**
**CCR Groundwater Detection Monitoring Data Summary**
**Oak Grove Steam Electric Station**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | F (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| **Prediction Limit** | | 0.124 | 74.9 | 353 | 0.4 | 6.31 7.09 | 97.4 | 948 |
| MW-07 | 11/03/15 | 0.0483 | 8.57 | 20.2 | 0.289 J | 6.42 | 11.5 | 276 |
| | 12/17/15 | 0.0539 | 8.75 | 17.7 | 0.319 J | 6.86 | 14.7 | 243 |
| | 02/09/16 | 0.0547 | 13.3 | 28.9 | 0.276 J | 7.18 | 25.3 | 283 |
| | 04/15/16 | 0.0567 | 10 | 20.9 | 0.187 | 6.71 | 16 | 341 |
| | 06/15/16 | 0.0639 | 10.5 | 22.9 | 0.226 J | 6.75 | 23.2 | 294 |
| | 08/24/16 | 0.0691 | 9.58 | 20.4 | 0.159 J | 6.89 | 21.8 | 290 |
| | 10/04/16 | 0.0549 | 10.3 | 15.6 | 0.277 J | 6.82 | 17.1 | 256 |
| | 12/22/16 | 0.054 | 12.5 | 22.9 | 0.229 J | 6.29 | 34.7 | 262 |
| | 10/02/17 | 0.0733 | 13.9 | 15.8 | 0.178 J | 6.59 | 38.4 | 298 |
| | 06/05/18 | 0.105 | 17.5 | 15.7 | 0.169 J | 5.98 | 61.1 | 316 |
| | 09/07/18 | 0.151 | 19.7 | 21.5 | 0.250 J | 6.18 | 80.3 | 357 |
| | 11/06/18 | 0.154 | -- | -- | -- | -- | -- | -- |
| | 05/17/19 | 0.132 | 17.1 | 20.2 | 0.244 J | 6.83 | 84.1 | 355 |
| | 08/19/19 | 0.215 | 22.8 | 19.7 | 0.367 J | 6.77 | 100 | 385 |
| | 05/07/20 | 0.302 | 29.7 | 22.4 | 0.234 J | 6.84 | 123 | 432 |
| | 9/9/2020 | 0.297 | 26.9 | 24.7 | 0.302 J | 6.58 | 121 | 413 |
| MW-08 | 11/04/15 | 0.0631 | 120 | 599 | 0.17 J | 6.81 | 138 | 2,070 |
| | 12/18/15 | 0.0604 | 70.4 | 488 | 0.158 J | 6.78 | 49.8 | 1,140 |
| | 02/09/16 | 0.0695 | 140 | 612 | 0.175 J | 6.42 | 170 | 1,530 |
| | 04/15/16 | 0.0726 | 133 | 566 | <0.1 | 6.61 | 139 | 1,680 |
| | 06/16/16 | 0.0677 | 76.6 | 520 | <0.1 | 6.76 | 83.6 | 1,090 |
| | 8/2016 | Destroyed | | | | | | |
| MW-08R | 12/22/16 | 0.0702 | 32.4 | 166 | 0.355 J | 6.93 | 39.7 | 617 |
| | 03/21/17 | 0.0662 | 117 | 563 | 0.2 J | 5.83 | 98.3 | 1,220 |
| | 04/20/17 | 0.0696 | 115 | 560 | 0.149 J | 5.91 | 94.9 | 1,190 |
| | 10/02/17 | 0.061 | 13.1 | 14.4 | <0.100 | 6.63 | 28.7 | 243 |
| | 06/05/18 | 0.082 | 18.9 | 53.9 | 0.138 J | 6.37 | 9.66 | 302 |
| | 09/07/18 | 0.0921 | 106 | 504 | 0.242 J | 5.84 | 96.9 | 1,550 |
| | 11/06/18 | -- | 15.7 | 19 | -- | -- | -- | 268 |
| | 05/17/19 | 0.102 | 16.7 | 69.8 | 0.269 J | 6.54 | 12.4 | 326 |
| | 08/20/19 | 0.096 | 24.9 | 48 | 0.501 | 6.84 | 30.7 | 255 |
| | 05/07/20 | 0.122 | 19 | 51.8 | 0.117 J | 6.83 | 11.1 | 320 |
| | 9/9/2020 | 0.0977 | 15.8 | 55.5 | 0.344 J | 6.68 | 19.0 | 256 |
| MW-09 | 11/03/15 | 0.0722 | 36.4 | 155 | 0.149 J | 6.45 | 74.9 | 583 |
| | 12/18/15 | 0.077 | 40.3 | 157 | 0.266 J | 6.48 | 83.1 | 528 |
| | 02/09/16 | 0.072 | 38.4 | 158 | 0.152 J | 6.16 | 80 | 445 |
| | 04/15/16 | 0.0734 | 42.2 | 151 | <0.1 | 6.41 | 80.9 | 568 |
| | 06/15/16 | 0.0778 | 43.1 | 174 | <0.1 | 6.52 | 98.7 | 574 |
| | 08/25/16 | 0.0829 | 45.6 | 195 | <0.1 | 6.76 | 116 | 715 |
| | 10/04/16 | 0.0803 | 47.8 | 179 | 0.256 J | 6.64 | 108 | 648 |
| | 12/22/16 | 0.0776 | 42.6 | 290 | 0.159 J | 6.87 | 116 | 791 |
| | 10/02/17 | 0.106 | 58.2 | 140 | <0.100 | 6.76 | 95.3 | 433 |
| | 06/04/18 | 0.091 | 21.7 | 6.48 | 0.162 J | 6.28 | 6.08 | 135 |
| | 09/06/18 | 0.0999 | 49.8 | 186 | 0.134 J | 5.61 | 104 | 704 |
| | 11/06/18 | -- | -- | -- | -- | -- | 58.6 | -- |
| | 05/17/19 | 0.12 | 17.2 | 366 | 0.541 | 6.72 | 53.2 | 935 |
| | 08/20/19 | 0.117 | 26 | 61.2 | 0.359 J | 6.96 | 22.3 | 331 |
| | 05/07/20 | 0.0988 | 20.2 | 45.1 | 0.234 J | 6.68 | 17.3 | 212 |
| | 9/9/2020 | 0.123 | 48.5 | 156 | 0.152 J | 6.72 | 99.6 | 468 |

Notes:
1. Abbreviations: mg/L - milligrams per liter; TDS - total dissolved solids; s.u. - standard units.
2. J - concentration is below method quantitation limit; result is an estimate.




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- UPGRADIENT CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**DETAILED SITE PLAN - ASH LANDFILL**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 19122262 | 0 | 1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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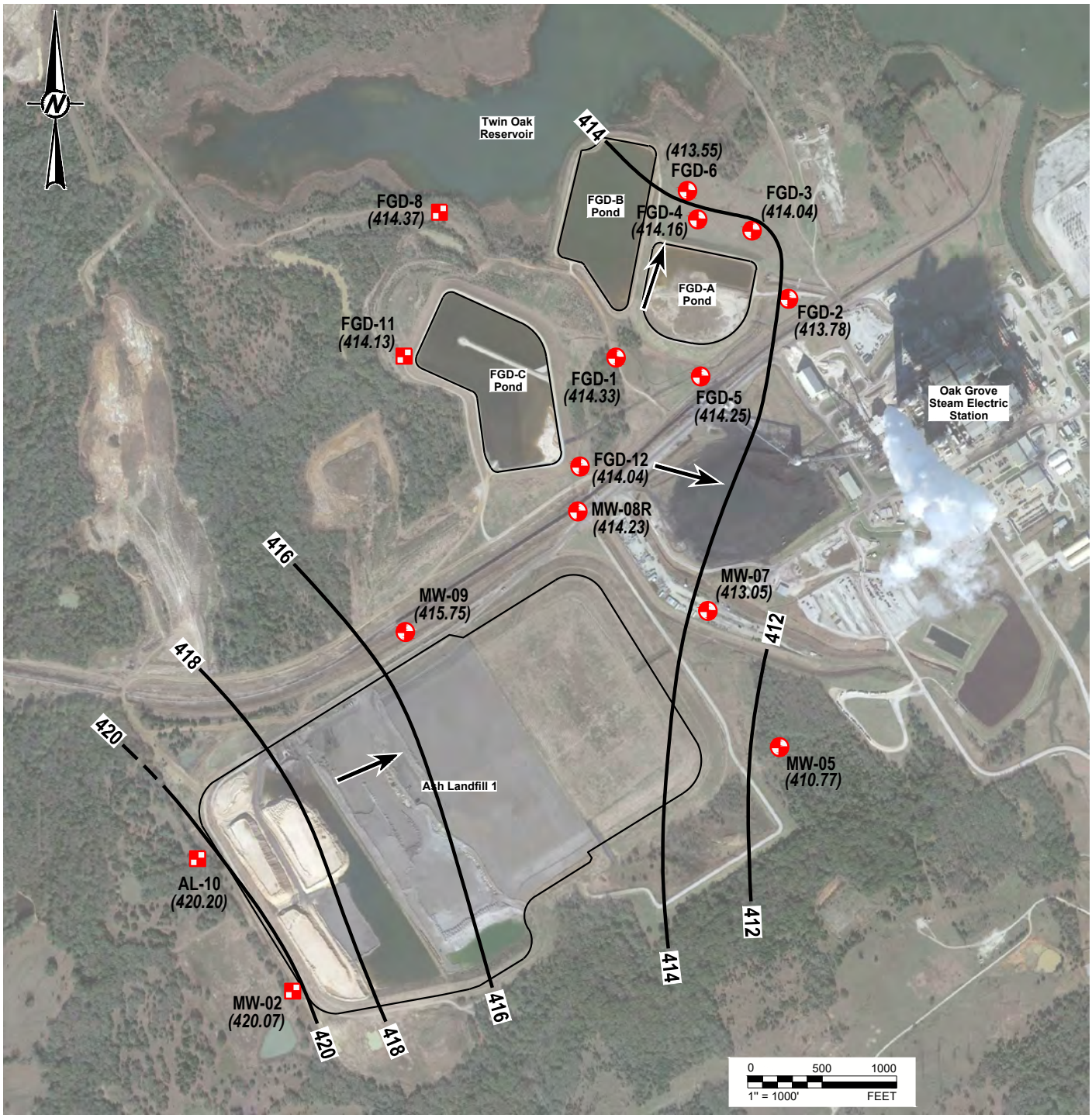
Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (Ash Landfill).dwg

**ATTACHMENT 3**

**2021 GROUNDWATER POTENTIOMETRIC SURFACE MAPS**




**LEGEND**

- CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL
- (410.06) GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
- 400 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 2 FT)
- INFERRED GROUNDWATER FLOW DIRECTION

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
11/16/2022

**REFERENCE(S)**
BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**ASH LANDFILL AND FGD PONDS POTENTIOMETRIC SURFACE MAP JUNE 16, 2021**

CONSULTANT
WSP GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2022-11-11 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 31404097.007 | 0 | 1 |

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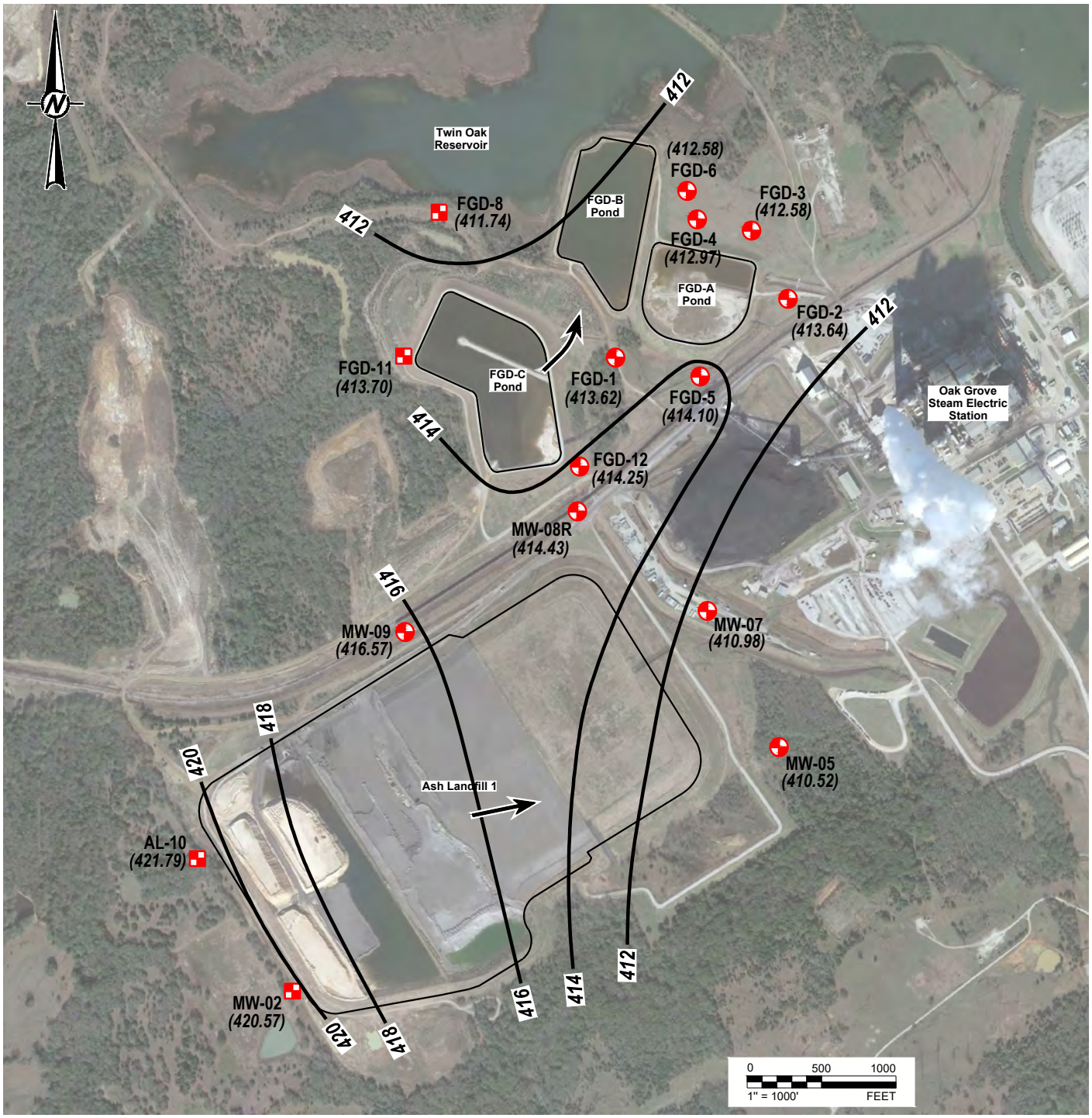


**LEGEND**

- CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL
- (410.06) GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
- 400 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 2 FT)
- INFERRED GROUNDWATER FLOW DIRECTION

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
11/16/2022

**REFERENCE(S)**
BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**ASH LANDFILL AND FGD PONDS POTENTIOMETRIC SURFACE MAP OCTOBER 11, 2021**

CONSULTANT
WSP GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2022-11-11 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 31404097.007
REV. 0
FIGURE 2

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# 2020 Annual Groundwater Monitoring and Corrective Action Report

*Oak Grove Steam Electric Station FGD Ponds - Robertson County, Texas*

Prepared for:

**Oak Grove Management Company LLC**

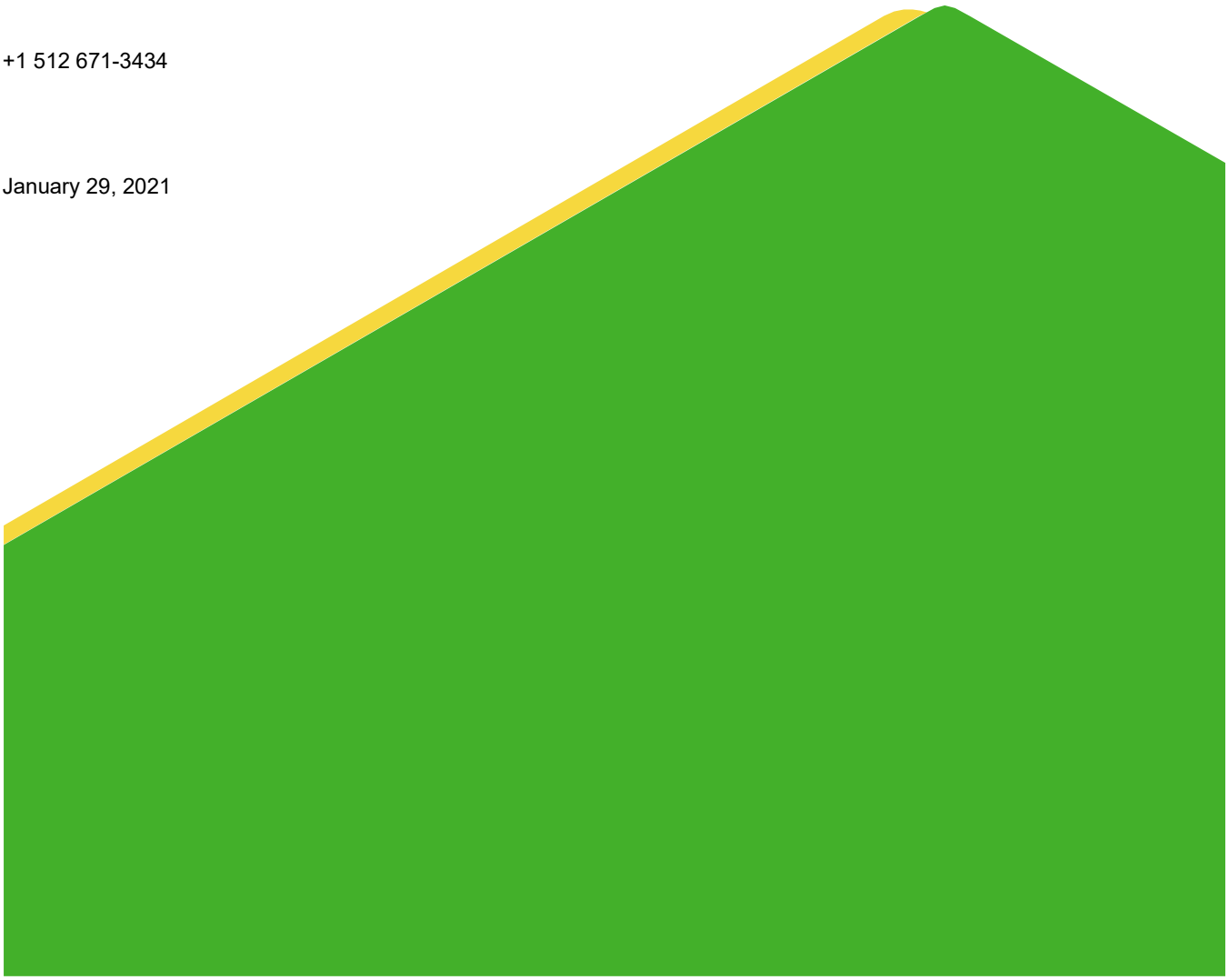
Prepared by:

**Golder Associates Inc.**

2201 Double Creek Dr, Suite 4004, Round Rock, Texas, USA 78664

+1 512 671-3434

January 29, 2021



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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACM | Assessment of Corrective Measures |
| ASD | Alternate Source Demonstration |
| CCR | Coal Combustion Residuals |
| CFR | Code of Federal Regulations |
| GWPS | Groundwater Protection Standard |
| MCL | Maximum Concentration Level |
| mg/L | Milligrams per Liter |
| NA | Not Applicable |
| OGSES | Oak Grove Steam Electric Station |
| SSI | Statistically Significant Increase |
| SSL | Statistically Significant Level |
| USEPA | United States Environmental Protection Agency |

# EXECUTIVE SUMMARY

Golder Associates, Inc. (Golder) has prepared this report on behalf of Oak Grove Management Company LLC (Luminant) to satisfy the 2020 annual groundwater monitoring and corrective action reporting requirements of the Coal Combustion Residuals (CCR) Rule (40 CFR 257, Subpart D) for the FGD Ponds (the "CCR units") at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas. The CCR units and CCR monitoring well network are shown on Figure 1.

At the beginning and end of the 2020 reporting period, the CCR units were operating under an Assessment Monitoring Program as described in 40 CFR § 257.95. The Assessment Monitoring Program was established on July 16, 2018. Concentrations of Appendix IV constituents at statistically significant levels (SSLs) above groundwater protection standards (GWPSs) were identified in January 2019 for cobalt and lithium at the FGD Ponds.

An Alternate Source Demonstration (ASD) for lithium was completed in October 2020, which indicated that the lithium SSLs were caused by a source other than the CCR units. In addition, Assessment Monitoring Program data from 2019 and 2020 were incorporated into an updated statistical analysis of cobalt concentrations to evaluate if cobalt concentrations remained at SSLs relative to the GWPS as indicated in January 2019. The updated statistical analyses indicated that cobalt is no longer present at SSLs above the GWPS downgradient of the FGD Ponds.

An Assessment of Corrective Measures (ACM) was initiated on April 8, 2019 and was completed on September 5, 2019 in accordance with 40 CFR § 257.96 to address the cobalt and lithium SSLs identified in January 2019. A public meeting was held on October 29, 2019, pursuant to 40 CFR § 257.96(e), to discuss the results of the ACM. As described above, subsequent to preparation of the ACM, an ASD was completed for lithium in October 2020 and cobalt was found to no longer be present at SSLs above the GWPS based on additional groundwater sample data collected as part of the Assessment Monitoring Program; however, Luminant continues to evaluate remedies pursuant to the remedy selection process under 40 CFR § 257.97.

# 1.0 INTRODUCTION

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the United States Environmental Protection Agency (USEPA) to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. For existing CCR landfills and surface impoundments, the CCR Rule requires that the owner or operator prepare an annual groundwater monitoring and corrective action report to document the status of the groundwater monitoring and corrective action program for the CCR unit for the previous calendar year. Per 40 CFR 257.90(e) of the CCR Rule, the report should contain the following information, to the extent available:

(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

(4) A narrative discussion of any transition between monitoring programs (*e.g.,* the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

(6) A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:

(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(iii) If it was determined that there was a statistically significant increase over background for one or more constituents listed in Appendix III to this part pursuant to § 257.94(e):

(A) Identify those constituents listed in Appendix III to this part and the names of the monitoring wells associated with such an increase; and

(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.

(iv) If it was determined that there was a SSL above the groundwater protection standard for one or more constituents listed in Appendix IV to this part pursuant to § 257.95(g) include all of the following:

(A) Identify those constituents listed in Appendix IV to this part and the names of the monitoring wells associated with such an increase;

(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;

(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and

(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.

(v) Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection; and

(vi) Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.

## 2.0 MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

Golder collected the initial Detection Monitoring Program groundwater samples from the FGD Ponds CCR monitoring well network in October 2017. The evaluation of those data was completed in 2018 using procedures described in the Statistical Analysis Plan (PBW, 2017) to identify statistically significant increases (SSIs) of Appendix III parameters over background concentrations. The Detection Monitoring Program sampling dates and parameters are summarized in the following table:

**Detection Monitoring Program Summary**

| Sampling Dates | Parameters | SSIs | Assessment Monitoring Program Established |
|---|---|---|---|
| October 3, 2017 | Appendix III | Yes | July 16, 2018 |

Alternate source evaluations were inconclusive for one or more of the SSIs. Consequently, an Assessment Monitoring Program was initiated and established for the FGD Pond CCR units in 2018 in accordance with 40 CFR § 257.94(e)(2). Golder collected the initial Assessment Monitoring Program groundwater samples in June 2018. Subsequent Assessment Monitoring Program sampling events have been conducted on a semi-annual basis, as required by the CCR Rule.

The statistical background prediction limits used to assess Appendix III data and the GWPSs used to assess Appendix IV data are summarized in Tables 1 and 2, respectively. Appendix III and Appendix IV analytical data are summarized in Tables 3 and 4, respectively. The initial assessment monitoring event was conducted in June 2018 and a subsequent semi-annual assessment monitoring event was conducted in September 2018 in accordance with §257.95(a) and §257.95(d). Using the Appendix IV data collected during the assessment monitoring period through September 2018, SSLs above GWPSs were initially identified in January 2019 for cobalt and lithium. Notification of these SSLs was placed in the operating record on February 6, 2019 and was subsequently placed on the public website in accordance with 40 CFR§ 257.107(d). An ACM was initiated on April 8, 2019 pursuant to §257.95(g). A justification letter for a 60-day extension due to site-specific circumstances that delayed work on the ACM was certified on July 3, 2019 in accordance with 40 CFR §257.96(a). A copy of the extension justification letter was provided in the 2019 Annual Groundwater Monitoring and Corrective Action Report. The ACM was completed in September 2019 (Golder 2019) for the parameters detected at SSLs above GWPSs during the 2018 Assessment Monitoring period (cobalt and lithium), pursuant to 40 CFR § 257.96.

Additional semi-annual Assessment Monitoring events were conducted in 2019 and 2020. Statistical analysis of

the 2019 and 2020 data was performed in accordance with the Statistical Analysis Plan for CCR Groundwater Monitoring (PBW 2017) and the USEPA Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities-Unified Guidance (USEPA 2009). The statistical analysis included an evaluation of confidence intervals for each of the Appendix IV parameter data sets to evaluate whether constituent concentrations were present at concentrations above GWPSs. There were no Appendix IV parameters identified at SSLs above GWPSs during the 2019 Assessment Monitoring period; however, an SSL for lithium was identified at one well (FGD-5) during both 2020 sampling events. An ASD was completed in October 2020, which indicated that a source other than the CCR units caused the lithium SSLs. A copy of the ASD is presented in Attachment 1 of this report as required by 40 CFR 257.94(e)(2).

The following table provides a summary of the Assessment Monitoring Program sampling events:

**Assessment Monitoring Program Summary**

| Sampling Dates | Analytical Data Receipt Date | Parameters Collected | SSL(s) | SSL(s) Determination Date | Alternate Source Demonstration | Corrective Measures Assessment Initiated | Corrective Measures Assessment Completed |
|---|---|---|---|---|---|---|---|
| June 4-5, 2018 | July 11, 2018 | Appendix III Appendix IV | NA | NA | NA | NA | NA |
| September 5-6, 2018 | October 11, 2018 | Appendix III Appendix IV | Co and Li | January 7, 2019 | No | April 8, 2019 | September 5, 2019 |
| May 16, 2019 | June 5, 2019 | Appendix III Appendix IV | None | NA | NA | NA | NA |
| August 19, 2019 | September 25, 2019 | Appendix III Appendix IV | None | NA | NA | NA | NA |
| May 6-11, 2020 | June 12, 2020 | Appendix III Appendix IV | Li | July 22, 2020 | October 20, 2020 | NA | NA |
| September 10-15, 2020 | October 12, 2020 | Appendix III Appendix IV | Li | December 7, 2020 | Previous ASD applies | NA | NA |

Notes:
NA: Not Applicable

## 3.0 KEY ACTIONS COMPLETED IN 2020

Assessment Monitoring Program groundwater monitoring events were conducted in May and September 2020. The number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and the analytical results for the groundwater samples are summarized in Table 3 (Appendix III parameters) and Table 4 (Appendix IV parameters). A map showing the CCR units and monitoring wells is provided as Figure 1.

As noted in Section 2.0, an ASD was completed in accordance with 40 CFR 257.94(e)(2) for the lithium SSLs observed in samples from monitoring well FGD-5 in 2020. The ASD indicated that a source other than the CCR units caused the lithium SSLs. A copy of the ASD is presented in Attachment 1.

# 4.0 PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the CCR groundwater monitoring program in 2020.

## 5.0 KEY ACTIVITIES PLANNED FOR 2021

The following key activities are planned for 2021:

- Continue the Assessment Monitoring Program in accordance with 40 CFR § 257.95.

- Complete statistical evaluation of Appendix IV analytical data from the downgradient wells and compare results to GWPSs to determine whether an SSL has occurred.

- If an SSL is identified, notification will be prepared as required under 40 CFR § 257.95(g) and will placed in the operating record per 40 CFR § 257.105(h)(8), and will be subsequently placed on the public website per 40 CFR § 257.107(d). Potential alternate sources (i.e., a source other than the CCR unit caused the SSL or that the SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality) will be evaluated. If an alternate source is identified to be the cause of the SSL, a written demonstration will be completed within 90 days of SSL detection and included in the Annual Groundwater Monitoring and Corrective Action Report (note: the ASD for lithium included in Attachment 1 will apply to similar lithium SSLs identified in the future at monitoring well FGD-5).

- If an alternate source is not identified to be the cause of the SSL, the applicable requirements of 40 CFR §§ 257.94 through 257.98 (e.g., assessment of corrective measures) will be met, including associated recordkeeping/notifications required by 40 CFR §§ 257.105 through 257.108.

- Further evaluation of a remedy for cobalt, which historically was identified but currently is not present at SSLs above the GWPS, is ongoing.

# 6.0 REFERENCES

Golder, 2019. CCR Assessment of Corrective Measures, Oak Grove Steam Electric Station – FGD Ponds, Robertson County, Texas. September.

Pastor, Behling & Wheeler, LLC, 2017. Coal Combustion Residual Rule Statistical Analysis Plan, Oak Grove Steam Electric Station, FGD Pond Area, Robertson County, Texas.

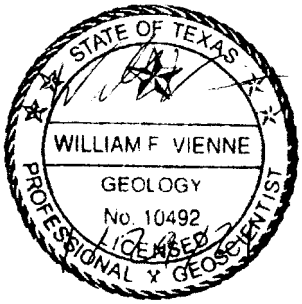
USEPA, 2009. Unified Guidance Document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, EPA 530-R-09-007, March 2009.

# Signature Page

**Golder Associates Inc.**

Patrick J. Behling
*Principal Engineer*

William F. Vienne
*Senior Hydrogeologist*

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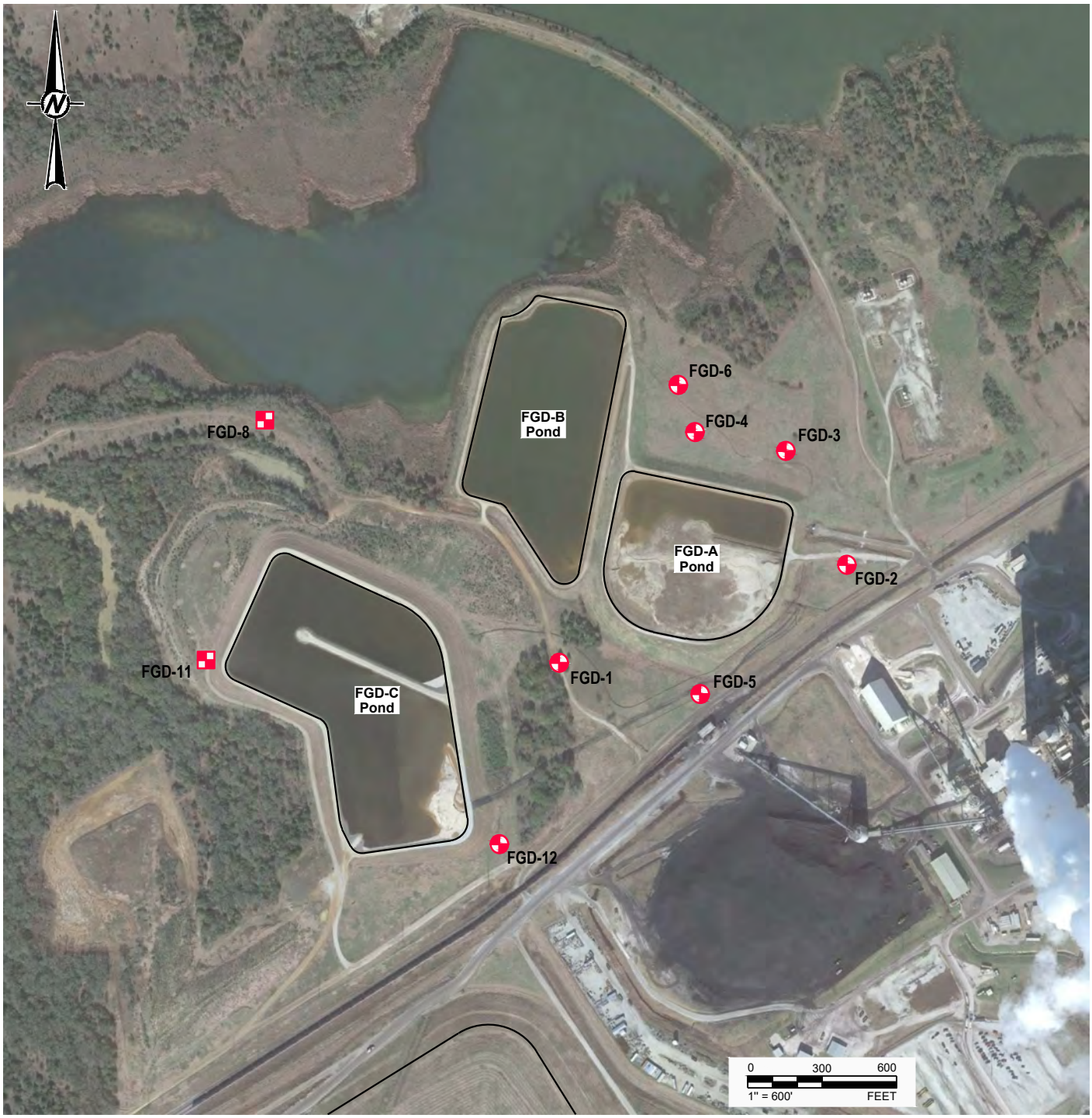
# FIGURES




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL

**REFERENCE(S)**
BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**DETAILED SITE PLAN - FGD POND AREA**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 19122262 | 0 | 1 |



Last Edited By: adiamond Date: 2020-01-23 Time:9:34:07 AM | Printed By: adiamond Date: 2020-01-23 Time:9:34:57 AM
Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (FGD Pond Area).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

# TABLES

**Table 1**
**Statistical Background Values**
**OGSES FGD Ponds**

| Parameter | Statistical Background Value |
|---|---|
| Boron (mg/L) | 0.141 |
| Calcium (mg/L) | 471 |
| Chloride (mg/L) | 6,340 |
| Fluoride (mg/L) | 0.781 |
| field pH (s.u.) | 6.10<br>7.23 |
| Sulfate (mg/L) | 409 |
| Total Dissolved Solids (mg/L) | 13,000 |

**Table 2**
**Groundwater Protection Standards**
**OGSES FGD Ponds**

| Parameter | Groundwater Protection Standard |
|---|---|
| Antimony (mg/L) | 0.006 |
| Arsenic (mg/L) | 0.0146 |
| Barium (mg/L) | 2 |
| Beryllium (mg/L) | 0.004 |
| Cadmium (mg/L) | 0.005 |
| Chromium (mg/L) | 0.1 |
| Cobalt (mg/L) | 0.0158 |
| Fluoride (mg/L) | 4 |
| Lead (mg/L) | 0.015 |
| Lithium (mg/L) | 0.149 |
| Mercury (mg/L) | 0.002 |
| Molybdenum (mg/L) | 0.1 |
| Selenium (mg/L) | 0.05 |
| Thallium (mg/L) | 0.002 |
| Radium 226+228 (pCi/L) | 11.2 |

**TABLE 3**
**APPENDIX III ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | Fl (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| **Upgradient Wells** | | | | | | | | |
| FGD-8 | 11/04/15 | 0.0843 | 69.2 | 271 | 0.173 J | 6.92 | 24.4 | 803 |
| | 12/17/15 | 0.0791 | 65.2 | 248 | 0.361 J | 6.67 | 50.1 | 721 |
| | 02/09/16 | 0.0721 | 296 | 1,910 | 0.331 J | 6.14 | 110 | 5,100 |
| | 04/14/16 | 0.0805 | 323 | 1920 | 0.218 | 6.39 | 68 | 6,210 |
| | 06/14/16 | 0.0869 | 336 | 2070 | <0.100 | 6.57 | 476 | 6,130 |
| | 08/24/16 | 0.119 | 21.1 | 107 | 0.186 J | 6.92 | 41.6 | 400 |
| | 10/05/16 | 0.0794 | 394 | 1,890 | 0.413 | 6.68 | 184 | 4,470 |
| | 12/23/16 | 0.069 | 340 | 1,990 | <0.100 | 6.83 | 144 | 4,330 |
| | 10/03/17 | 0.1 | 378 | 1,140 | <0.100 | 6.83 | 9.72 | 2,550 |
| | 06/05/18 | 0.0826 | 409 | 2,180 | <0.100 | 6.12 | 538 | 4,450 |
| | 09/06/18 | 0.635 | 395 | 2,330 | 0.362 J | 5.93 | 670 | 4,910 |
| | 05/16/19 | 0.0687 | 314 | 2,040 | <0.100 | 6.67 | 173 | 3,970 |
| | 08/19/19 | 0.0756 | 427 | 2,260 | <0.100 | 6.89 | 452 | 4,600 |
| | 05/11/20 | 0.129 | 381 | 2,240 | <0.100 | 6.69 | 188 | 4,090 |
| | 9/9/2020 | 0.101 | 329 | 2,220 | <0.100 | 6.87 | 58.9 | 3,890 |
| FGD-11 | 11/04/15 | 0.048 | 9.57 | 15 | <0.100 | 6.58 | 9.96 | 145 |
| | 12/17/15 | 0.0544 | 10.7 | 9.85 | 0.13 J | 6.74 | 11 | 115 |
| | 02/09/16 | 0.0912 | 71.5 | 438 | 0.548 | 6.9 | 37.5 | 1,160 |
| | 04/14/16 | 0.0963 | 72.5 | 393 | 0.671 | 6.34 | 32.9 | 1,120 |
| | 06/15/16 | 0.0979 | 55.1 | 356 | 0.331 J | 6.57 | 32.4 | 900 |
| | 08/25/16 | 0.103 | 154 | 759 | 0.128 J | 6.76 | 68.8 | 1,960 |
| | 10/04/16 | 0.127 | 181 | 894 | 0.579 | 6.78 | 71.8 | 2,130 |
| | 12/22/16 | 0.125 | 201 | 1,150 | 0.127 J | 6.85 | 89.5 | 2,870 |
| | 10/03/17 | 0.155 | 254 | 1,830 | <0.100 | 6.85 | 142 | 4,010 |
| | 06/05/18 | 0.162 | 170 | 954 | 0.836 | 6.28 | 82.2 | 2,240 |
| | 09/06/18 | 0.149 | 194 | 1,140 | 1.09 | 6.43 | 93.9 | 2,770 |
| | 05/16/19 | 0.108 | 85 | 566 | 0.38 J | 6.83 | 50.9 | 1,350 |
| | 08/19/19 | 0.12 | 92.5 | 535 | 0.63 | 6.71 | 44.7 | 1,430 |
| | 5/11/2020 | 0.166 | 103 | 560 | 0.365 J | 7 | 43.3 | 1,300 |
| | 9/9/2020 | 0.242 | 101 | 573 | 0.575 | 6.79 | 44.0 | 1,320 |
| **Downgradient Wells** | | | | | | | | |
| FGD-1 | 11/03/15 | 0.065 | 11 | 36.4 | 0.363 J | 6.31 | 32 | 245 |
| | 12/17/15 | 0.0706 | 10.6 | 37.7 | 0.384 J | 6.33 | 33.3 | 224 |
| | 02/09/16 | 0.0539 | 11.4 | 38.9 | 0.383 J | 6.81 | 36.3 | 235 |
| | 04/14/16 | 0.0867 | 12.2 | 38.6 | 0.229 | 6.24 | 35.7 | 77 |
| | 06/15/16 | 0.066 | 12 | 39 | 0.302 J | 6.75 | 41.2 | 258 |
| | 08/24/16 | 0.0601 | 13.5 | 42.1 | 0.225 J | 6.58 | 46.6 | 193 |
| | 10/05/16 | 0.0629 | 14.2 | 38.7 | 0.483 | 6.78 | 44.2 | 266 |
| | 12/22/16 | 0.058 | 13.7 | 42.6 | 0.326 J | 5.79 | 49.3 | 271 |
| | 10/03/17 | 0.0973 | 18.5 | 40 | 0.276 J | 6.91 | 64.7 | 239 |
| | 06/05/18 | 0.0686 | 18.3 | 44.7 | 0.206 J | 5.58 | 68.6 | 277 |
| | 09/06/18 | 0.0738 | 19.9 | 52.5 | 0.228 J | 5.78 | 80.8 | 281 |
| | 05/15/19 | 0.0803 | 19.5 | 62.4 | 0.362 J | 6.63 | 78.7 | 320 |
| | 08/19/19 | 0.0864 | 26.1 | 69.3 | 0.486 | 6.49 | 80.9 | 328 |
| | 05/11/20 | 0.121 | 37.8 | 146 | 0.231 J | 6.95 | 79.5 | 448 |
| | 9/9/2020 | 0.0871 | 36.0 | 320 | 0.215 J | 6.73 | 158 | 875 |
| FGD-2 | 11/03/15 | 0.1 | 77.1 | 460 | 0.224 J | 6.47 | 147 | 1,370 |
| | 12/17/15 | 0.0636 | 24.8 | 133 | 0.347 J | 6.77 | 53.2 | 515 |
| | 02/09/16 | 0.0885 | 44.6 | 250 | 0.315 J | 7.06 | 98.9 | 750 |
| | 04/14/16 | 0.136 | 53.8 | 285 | 0.192 | 6.54 | 103 | 924 |
| | 06/14/16 | 0.0729 | 26.8 | 138 | 0.122 J | 6.73 | 62.2 | 564 |
| | 08/24/16 | 0.219 | 79.9 | 421 | <0.100 | 6.75 | 158 | 1,060 |
| | 10/05/16 | 0.182 | 58.3 | 310 | 0.243 J | 6.76 | 114 | 910 |
| | 12/22/16 | 0.251 | 95.3 | 570 | <0.100 | 6.70 | 174 | 1,450 |
| | 10/03/17 | 0.362 | 151 | 813 | <0.100 | 6.81 | 222 | 1,920 |
| | 06/05/18 | 0.352 | 91.6 | 465 | 0.185 J | 6.06 | 148 | 1,190 |
| | 09/06/18 | 0.35 | 154 | 902 | 0.32 J | 6.11 | 196 | 1,860 |
| | 05/16/19 | 0.105 | 38.9 | 260 | 0.383 J | 6.86 | 70.7 | 729 |
| | 08/19/19 | 0.192 | 167 | 863 | 0.413 | 6.88 | 218 | 1,890 |
| | 05/11/20 | 0.605 | 217 | 1,150 | <0.100 | 6.61 | 286 | 2,300 |
| | 9/9/2020 | 0.567 | 193 | 1,030 | <0.100 | 6.57 | 301 | 2,150 |

**TABLE 3**
**APPENDIX III ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | Fl (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| FGD-3 | 11/03/15 | 0.343 | 108 | 439 | 0.505 | 6.51 | 479 | 1,950 |
| | 12/17/15 | 0.255 | 109 | 399 | <0.100 | 6.64 | 478 | 1,640 |
| | 02/09/16 | 0.214 | 91.4 | 326 | 0.74 | 6.76 | 474 | 1,610 |
| | 04/14/16 | 0.231 | 98.1 | 314 | 0.69 | 6.59 | 396 | 1,980 |
| | 06/14/16 | 0.207 | 80.1 | 267 | 0.173 J | 6.59 | 338 | 1,440 |
| | 08/24/16 | 0.112 | 90.4 | 279 | 0.463 | 6.89 | 357 | 1,490 |
| | 10/05/16 | 0.212 | 88.1 | 264 | 0.723 | 6.85 | 324 | 1,370 |
| | 12/22/16 | 0.196 | 82.6 | 290 | 1.32 | 6.07 | 392 | 1,490 |
| | 10/03/17 | 0.244 | 97 | 245 | 0.457 | 6.75 | 317 | 1,190 |
| | 06/05/18 | 0.199 | 82.7 | 234 | 1.06 | 5.99 | 319 | 1,260 |
| | 09/05/18 | 0.0379 | 73.9 | 227 | 1.03 | 6.21 | 306 | 1,260 |
| | 05/16/19 | 0.117 | 60.1 | 117 | 0.776 | 6.73 | 182 | 1,100 |
| | 08/19/19 | 0.134 | 51.1 | 84.9 | 0.874 | 6.72 | 150 | 882 |
| | 05/06/20 | 0.152 | 42.3 | 70.2 | 0.8 | 6.62 | 129 | 777 |
| | 9/9/2020 | 0.130 | 36.8 | 58.5 | 0.772 | 6.82 | 122 | 709 |
| FGD-4 | 11/03/15 | 0.0694 | 46.1 | 200 | 0.294 J | 6.71 | 37.8 | 679 |
| | 12/17/15 | 0.0777 | 47.8 | 211 | 0.295 J | 6.44 | 38.2 | 647 |
| | 02/09/16 | 0.0581 | 45.3 | 195 | 0.32 J | 6.85 | 45 | 653 |
| | 04/14/16 | 0.0726 | 50.3 | 182 | 0.323 | 6.59 | 55.4 | 726 |
| | 06/14/16 | 0.0728 | 47.5 | 210 | <0.100 | 6.68 | 37.9 | 689 |
| | 08/24/16 | 0.343 | 52.5 | 208 | 0.148 J | 6.74 | 53.3 | 704 |
| | 10/05/16 | 0.0672 | 48.1 | 182 | 0.376 J | 6.85 | 56 | 672 |
| | 12/22/16 | 0.0628 | 44.5 | 181 | 0.251 J | 6.29 | 65.4 | 676 |
| | 10/03/17 | 0.225 | 54.9 | 182 | 0.219 J | 6.82 | 69.8 | 659 |
| | 06/05/18 | 0.0839 | 49.4 | 200 | 0.297 J | 6.15 | 46.6 | 648 |
| | 09/05/18 | 0.108 | 40.9 | 193 | 0.353 J | 6.29 | 55.8 | 672 |
| | 05/16/19 | 0.0733 | 41.7 | 205 | 0.327 J | 6.57 | 41.7 | 651 |
| | 08/19/19 | 0.085 | 42.5 | 188 | 0.67 | 6.69 | 5.4 | 681 |
| | 05/11/20 | 0.145 | 40.6 | 198 | 0.3 J | 6.62 | 52.9 | 702 |
| | 9/15/2020 | 0.109 | 33.6 | 197 | <0.100 | 6.87 | 50.1 | 674 |
| FGD-5 | 11/04/15 | 0.0719 | 30.2 | 230 | 0.334 J | 6.92 | 54.7 | 1,040 |
| | 12/17/15 | 0.0798 | 32.5 | 254 | 0.333 J | 6.74 | 56.1 | 845 |
| | 02/09/16 | 0.0926 | 89.5 | 356 | 0.495 | 6.6 | 62.8 | 942 |
| | 04/14/16 | 0.107 | 101 | 359 | 0.491 | 6.71 | 50.8 | 1,510 |
| | 06/15/16 | 0.11 | 88.9 | 368 | 0.284 J | 6.73 | 55.1 | 735 |
| | 08/24/16 | 0.0394 | 102 | 372 | 0.168 J | 6.89 | 58.8 | 770 |
| | 10/05/16 | 0.0995 | 99.9 | 344 | 0.38 J | 6.92 | 57.3 | 1,260 |
| | 12/22/16 | 0.0982 | 90.6 | 301 | 0.291 J | 6.06 | 65.5 | 893 |
| | 10/03/17 | 0.211 | 100 | 309 | 0.211 J | 6.76 | 60.2 | 826 |
| | 06/05/18 | 0.11 | 100 | 303 | 0.511 | 6.13 | 61.2 | 795 |
| | 09/06/18 | 0.215 | 93.1 | 317 | 0.548 | 6.17 | 64.8 | 840 |
| | 05/16/19 | 0.108 | 77.7 | 287 | 0.579 | 6.46 | 67.2 | 801 |
| | 08/19/19 | 0.114 | 90.7 | 283 | 0.863 | 6.76 | 70.7 | 816 |
| | 05/11/20 | 0.165 | 100 | 307 | 0.413 | 6.82 | 83.8 | 836 |
| | 9/10/2020 | 0.154 | 96.6 | 310 | 0.617 | 6.84 | 95.9 | 845 |
| FGD-6 | 11/03/15 | 0.0968 | 79.3 | 355 | 0.227 J | 6.92 | 33.8 | 1,070 |
| | 12/17/15 | 0.103 | 89.9 | 342 | 0.469 | 6.52 | 65.9 | 940 |
| | 02/09/16 | 0.0791 | 31.8 | 252 | 0.354 J | 7.12 | 59.5 | 940 |
| | 04/14/16 | 0.0936 | 36.4 | 259 | 0.442 | 6.71 | 57.9 | 1,140 |
| | 06/14/16 | 0.0955 | 33.9 | 237 | <0.100 | 6.48 | 49.8 | 813 |
| | 08/24/16 | 0.0355 | 35.6 | 285 | 0.147 J | 6.95 | 64.7 | 750 |
| | 10/05/16 | 0.102 | 35.3 | 275 | 0.364 J | 6.94 | 60.2 | 1,010 |
| | 12/22/16 | 0.0847 | 35.6 | 286 | 0.204 J | 6.34 | 64.4 | 905 |
| | 10/03/17 | 0.139 | 40.4 | 255 | 0.143 J | 6.64 | 58.4 | 855 |
| | 06/05/18 | 0.0948 | 36.3 | 246 | 0.361 J | 6.35 | 51.7 | 895 |
| | 09/05/18 | 0.0824 | 30.4 | 230 | 0.405 | 6.4 | 51.4 | 833 |
| | 05/16/19 | 0.116 | 20.3 | 170 | 0.669 | 6.85 | 51.3 | 710 |
| | 09/19/19 | 0.102 | 23.6 | 158 | 0.741 | 6.72 | 60.3 | 754 |
| | 05/06/20 | 0.109 | 27.4 | 189 | 0.292 | 6.75 | 70.7 | 746 |
| | 9/15/2020 | 0.112 | 20.2 | 144 | 0.354 J | 6.77 | 89.6 | 688 |

**TABLE 3**
**APPENDIX III ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | Fl (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| FGD-12 | 11/04/15 | 0.0651 | 16.6 | 19.4 | <0.100 | 6.68 | 20 | 217 |
| | 12/17/15 | 0.0671 | 13.2 | 15.5 | 0.159 J | 6.47 | 16.6 | 161 |
| | 2/9/2016 | 0.065 | 11.1 | 13.5 | 0.157 J | 6.99 | 14.1 | 179 |
| | 04/14/16 | 0.0753 | 14.7 | 25.4 | 0.109 | 6.47 | 15.8 | 163 |
| | 06/15/16 | 0.0711 | 11.2 | 19.5 | 0.101 J | 6.52 | 13.4 | 253 |
| | 08/25/16 | 0.0858 | 52.8 | 296 | <0.100 | 6.86 | 33.8 | 817 |
| | 10/04/16 | 0.0682 | 12.5 | 17.8 | 0.129 J | 6.74 | 10.5 | 142 |
| | 12/23/16 | 0.0512 | 260 | 1,250 | 0.112 J | 6.95 | 174 | 3,270 |
| | 10/03/17 | 0.0731 | 10.4 | 10 | 0.154 J | 6.76 | 10.8 | 134 |
| | 06/05/18 | 0.0812 | 8.74 | 12 | 0.137 J | 6.37 | 13.7 | 196 |
| | 09/06/18 | 0.0698 | 6.78 | 14 | <0.100 | 5.6 | 13.1 | 134 |
| | 05/16/19 | 0.0723 | 6.79 | 16 | <0.100 | 6.52 | 15 | 140 |
| | 08/19/19 | 0.0794 | 10.5 | 16 | 0.145 J | 6.71 | 17.1 | 209 |
| | 05/11/20 | 0.149 | 15.6 | 19.3 | <0.100 | 6.59 | 19.9 | 198 |
| | 9/9/2020 | 0.120 | 9.34 | 13.0 | <0.100 | 6.82 | 14.1 | 166 |

Notes:
1. Abbreviations: mg/L - milligrams per liter; TDS - total dissolved solids; s.u. - standard units.
2. J - Concentration is below method quantitation limit; result is an estimate.

**TABLE 4**
**APPENDIX IV ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | F (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Tl (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Upgradient Wells** | | | | | | | | | | | | | | | | | | |
| FGD-8 | 11/04/15 | <0.0008 | <0.002 | 0.119 | <0.0003 | <0.0003 | 0.00542 | <0.003 | 0.173 J | <0.0003 | 0.149 | <0.00008 | 0.0261 | <0.002 | <0.0005 | 0.671 | 1.38 | 2.05 |
| | 12/17/15 | <0.0008 | <0.002 | 0.179 | <0.0003 | <0.0003 | 0.00373 J | 0.00646 | 0.361 J | <0.0003 | 0.116 | <0.00008 | 0.00404 J | <0.002 | <0.0005 | <0.609 | 1.32 | 1.93 |
| | 02/09/16 | <0.0008 | 0.0115 | 0.892 | <0.0003 | <0.0003 | 0.00234 J | 0.00609 | 0.331 J | 0.000406 J | 0.0104 | <0.00008 | <0.002 | 0.00231 J | <0.0005 | 1.77 | 3.55 | 5.32 |
| | 04/14/16 | <0.0008 | 0.0146 | 0.965 | <0.0003 | <0.0003 | 0.00202 J | 0.00876 | 0.218 J | 0.0016 | 0.016 | <0.00008 | <0.002 | 0.00211 J | <0.0005 | 0.973 | 8.34 | 9.31 |
| | 06/14/16 | <0.0008 | 0.00639 | 0.792 | <0.0003 | <0.0003 | <0.002 | 0.0158 | <0.100 | 0.00137 | 0.015 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.93 | 2.30 | 4.23 |
| | 08/24/16 | <0.0008 | <0.002 | 0.102 | 0.000417 J | <0.0003 | 0.0107 | 0.015 | 0.186 J | 0.00381 | 0.0265 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.778 | <0.491 | 1.27 |
| | 10/05/16 | <0.0008 | 0.00661 | 0.753 | <0.0003 | <0.0003 | 0.00672 | 0.00899 | 0.413 | 0.000908 J | 0.0224 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.35 | 5.96 | 7.31 |
| | 12/23/16 | <0.0008 | 0.0119 | 0.894 | <0.0003 | <0.0003 | 0.00259 J | 0.00745 | <0.100 | 0.00228 | 0.0185 | <0.00008 | <0.002 | 0.00217 J | <0.0005 | 2.17 | 3.70 | 5.87 |
| | 06/05/18 | <0.0008 | 0.00839 | 0.834 | <0.0003 | <0.0003 | <0.002 | 0.0193 | <0.100 | 0.00039 J | 0.0128 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.5 | 5.13 | 6.63 |
| | 09/06/18 | NA | 0.0137 | 0.635 | <0.0003 | <0.0003 | <0.002 | 0.0243 | 0.362 J | <0.0003 | 0.009 J | NA | <0.002 | 0.0025 J | <0.0005 | 0.349 | 1.4 | 1.75 |
| | 05/16/19 | <0.0008 | 0.0126 | 0.864 | <0.0003 | <0.0003 | 0.003 J | 0.0146 | <0.100 | <0.00194 | 0.009 J | <0.00008 | <0.002 | 0.0027 J | <0.0005 | 3.14 | 5.27 | 8.41 |
| | 08/19/19 | <0.0008 | 0.00645 | 0.608 | <0.0003 | <0.0003 | <0.002 | 0.0135 | <0.100 | 0.00134 | 0.0144 | <0.00008 | <0.002 | 0.00252 | <0.0005 | 1.79 | 6.82 | 8.61 |
| | 05/11/20 | <0.000800 | 0.00663 | 0.732 | <0.000300 | <0.000300 | <0.00200 | 0.0084 | <0.100 | 0.000415 J | 0.0152 | <0.0000800 | <0.00200 | 0.0021 J | <0.000500 | 2.07 | 6.58 | 8.65 |
| | 9/15/2020 | NA | 0.00796 | 0.777 | <0.000300 | NA | 0.00287 J | 0.00379 J | <0.100 | 0.00107 | 0.00864 J | NA | <0.00200 | <0.00200 | <0.000500 | 2.5 | 6.2 | 8.7 |
| FGD-11 | 11/04/15 | <0.0008 | <0.002 | 0.0527 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | 0.000727 J | 0.0144 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.928 | <1.41 | 2.34 |
| | 12/17/15 | <0.0008 | <0.002 | 0.0676 | 0.000303 J | <0.0003 | <0.002 | <0.003 | 0.13 J | 0.000987 J | 0.016 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.786 | <1.63 | 2.42 |
| | 02/09/16 | <0.0008 | <0.002 | 0.271 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.548 | <0.0003 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.39 | 2.64 | 4.03 |
| | 04/14/16 | <0.0008 | <0.002 | 0.26 | <0.0003 | <0.0003 | 0.00222 J | <0.003 | 0.671 | 0.0012 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.69 | 2.43 | 4.12 |
| | 06/15/16 | <0.0008 | <0.002 | 0.216 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.331 J | 0.000407 J | 0.0126 | <0.00008 | 0.00238 J | <0.002 | <0.0005 | 2.34 | 2.06 | 4.40 |
| | 08/25/16 | <0.0008 | <0.002 | 0.439 | <0.0003 | <0.0003 | 0.00465 J | <0.003 | 0.128 J | 0.00179 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 4.23 | 3.58 | 7.81 |
| | 10/04/16 | <0.0008 | <0.002 | 0.55 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.579 | 0.000618 J | 0.0124 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.73 | 2.53 | 4.26 |
| | 12/22/16 | <0.0008 | <0.002 | 0.734 | <0.0003 | <0.0003 | 0.00258 J | <0.003 | 0.127 J | 0.000635 J | 0.0124 | <0.00008 | <0.002 | <0.002 | <0.0005 | 3.94 | 5.09 | 9.03 |
| | 06/05/18 | <0.0008 | <0.002 | 0.520 | <0.0003 | <0.0003 | 0.0372 | 0.007 | 0.836 | 0.00891 J | 0.0102 | <0.00008 | 0.00266 J | <0.002 | <0.0005 | 4.64 | 4.22 | 8.86 |
| | 09/06/18 | NA | <0.002 | 0.702 | <0.0003 | <0.0003 | 0.0039 J | <0.003 | 1.09 | <0.0003 | 0.0121 | NA | <0.002 | <0.002 | <0.0005 | 6.24 | 6.47 | 12.71 |
| | 05/16/19 | <0.0008 | <0.002 | 0.347 | <0.0003 | <0.0003 | 0.028 | <0.003 | 0.38 J | 0.000576 J | 0.0145 | <0.00008 | 0.00358 J | <0.002 | <0.0005 | 2.39 | 2.75 | 5.14 |
| | 08/19/19 | <0.0008 | <0.002 | 0.310 | <0.0003 | <0.0003 | 0.00391 J | <0.003 | 0.63 | <0.0003 | 0.0136 | <0.00008 | 0.00238 J | <0.002 | <0.0005 | 1.39 | 2.55 | 3.95 |
| | 05/11/20 | <0.000800 | <0.00200 | 0.347 | <0.000300 | <0.000300 | 0.0146 | <0.00300 | 0.365 J | 0.000658 J | 0.0132 | <0.0000800 | <0.00200 | <0.00200 | <0.000500 | 2.39 | 4.00 | 6.39 |
| | 9/10/2020 | NA | <0.00200 | 0.330 | <0.000300 | NA | 0.0158 | <0.00300 | 0.575 | 0.000706 J | 0.0121 | NA | <0.00200 | <0.00200 | <0.000500 | 3.35 | 4.69 | 8.04 |
| **Downgradient Wells** | | | | | | | | | | | | | | | | | | |
| FGD-1 | 11/03/15 | <0.0008 | <0.002 | 0.0311 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.363 J | <0.0003 | 0.034 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.718 | <1.40 | 2.12 |
| | 12/17/15 | <0.0008 | <0.002 | 0.0263 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.384 J | <0.0003 | 0.0306 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.919 | <1.43 | 2.35 |
| | 02/09/16 | <0.0008 | <0.002 | 0.0315 | <0.0003 | <0.0003 | 0.00437 J | 0.0033 J | 0.383 J | 0.000379 J | 0.0314 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.318 | 1.42 | 1.74 |
| | 04/14/16 | <0.0008 | <0.002 | 0.0296 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.229 J | <0.0003 | 0.0338 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.439 | <1.28 | <1.719 |
| | 06/15/16 | <0.0008 | <0.002 | 0.0276 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.302 J | <0.0003 | 0.0321 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.258 | 1.66 | 1.92 |
| | 08/24/16 | <0.0008 | <0.002 | 0.0294 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.225 J | <0.0003 | 0.033 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.188 | 2.24 | 2.43 |
| | 10/05/16 | <0.0008 | <0.002 | 0.0319 | <0.0003 | <0.0003 | <0.002 | 0.00447 J | 0.483 | <0.0003 | 0.0331 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.430 | 0.507 | 0.94 |
| | 12/22/16 | <0.0008 | <0.002 | 0.0418 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.326 J | <0.0003 | 0.0385 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.273 | <0.645 | <0.918 |
| | 06/05/18 | <0.0008 | <0.002 | 0.0422 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.206 J | <0.0003 | 0.0426 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.194 | <0.7680 | 0.962 |
| | 09/06/18 | NA | <0.002 | 0.0417 | <0.0003 | <0.0003 | <0.002 | 0.0033 J | 0.228 J | <0.0003 | 0.0436 | NA | <0.002 | <0.002 | 0.0005 | 0.209 | <0.53 | 0.739 |
| | 05/16/19 | <0.0008 | <0.002 | 0.0485 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.362 J | <0.0003 | 0.0442 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.33 | <0.59 | 0.923 |
| | 08/19/19 | <0.0008 | <0.002 | 0.0538 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.486 | <0.0003 | 0.0441 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.489 | 1.09 | 1.57 |
| | 05/11/20 | <0.000800 | <0.00200 | 0.131 | <0.000300 | <0.000300 | <0.00200 | 0.0495 | 0.231 J | <0.000300 | 0.0548 | <0.0000800 | <0.00200 | <0.00200 | <0.000500 | 1.08 | 0.808 | 1.89 |
| | 9/15/2020 | NA | <0.00200 | 0.162 | <0.000300 | NA | <0.00200 | <0.00300 | 0.215 J | 0.000342 J | 0.0233 | NA | <0.00200 | <0.00200 | <0.000500 | 0.664 | 1.66 | 2.32 |

**TABLE 4**
**APPENDIX IV ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | F (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Tl (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-2 | 11/03/15 | <0.0008 | <0.002 | 0.146 | <0.0003 | <0.0003 | 0.00244 J | <0.003 | 0.224 J | <0.0003 | 0.0224 | <0.00008 | <0.002 | 0.0203 | <0.0005 | <0.249 | 1.97 | 2.22 |
| | 12/17/15 | <0.0008 | <0.002 | 0.103 | <0.0003 | <0.0003 | 0.00386 J | <0.003 | 0.347 J | 0.00145 | 0.0183 | <0.00008 | <0.002 | 0.0127 | <0.0005 | 1.030 | <1.24 | 2.27 |
| | 02/09/16 | <0.0008 | <0.002 | 0.133 | <0.0003 | <0.0003 | 0.00426 J | <0.003 | 0.315 J | <0.0003 | 0.0221 | <0.00008 | <0.002 | 0.0181 | <0.0005 | 0.669 | 1.81 | 2.48 |
| | 04/14/16 | <0.0008 | <0.002 | 0.129 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.192 J | <0.0003 | 0.0196 | <0.00008 | <0.002 | 0.0166 | <0.0005 | 0.198 | <2.03 | 2.23 |
| | 06/14/16 | <0.0008 | <0.002 | 0.091 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.122 J | <0.0003 | 0.0243 | <0.00008 | <0.002 | 0.0189 | <0.0005 | 0.275 | 1.66 | 1.94 |
| | 08/24/16 | <0.0008 | <0.002 | 0.144 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | 0.019 | <0.00008 | <0.002 | 0.0185 | <0.0005 | 2.47 | 0.769 | 3.24 |
| | 10/05/16 | <0.0008 | <0.002 | 0.129 | <0.0003 | <0.0003 | 0.00549 | <0.003 | 0.243 J | 0.000693 J | 0.0199 | <0.00008 | <0.002 | 0.0176 | <0.0005 | 0.716 | 1.70 | 2.42 |
| | 12/22/16 | <0.0008 | <0.002 | 0.158 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | 0.0217 | <0.00008 | <0.002 | 0.022 | <0.0005 | 0.345 | 1.79 | 2.14 |
| | 06/05/18 | <0.0008 | <0.002 | 0.108 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.185 J | <0.0003 | 0.0226 | <0.00008 | <0.002 | 0.0185 | <0.0005 | 0.505 | 1.12 | 1.63 |
| | 09/06/18 | NA | <0.002 | 0.125 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.32 J | <0.0003 | 0.0253 | NA | <0.002 | 0.0204 | <0.0005 | 0.641 | 0.822 | 1.46 |
| | 05/16/19 | <0.0008 | <0.002 | 0.0993 | <0.0003 | <0.0003 | 0.003 J | <0.003 | 0.383 J | <0.0003 | 0.0228 | 0.00008 | <0.002 | 0.0214 | <0.0005 | 0.648 | 0.588 | 1.24 |
| | 08/19/19 | <0.0008 | <0.002 | 0.181 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.413 | <0.0003 | 0.0257 | <0.00008 | <0.002 | 0.0249 | <0.0005 | 0.456 | 2.8 | 3.26 |
| | 05/11/20 | <0.000800 | <0.00200 | 0.108 | <0.000300 | <0.000300 | 0.00234 J | <0.00300 | <0.100 | <0.000300 | 0.028 | <0.0000800 | <0.00200 | 0.0208 | <0.000500 | 0.677 | 2.08 | 2.76 |
| | 9/10/2020 | NA | <0.00200 | 0.104 | <0.000300 | NA | 0.00239 J | <0.00300 | <0.100 | <0.000300 | 0.0250 | NA | <0.00200 | 0.0217 | <0.000500 | 0.744 | 0.29 | 1.03 |
| FGD-3 | 11/03/15 | <0.0008 | 0.00226 J | 0.0417 | <0.0003 | 0.00492 | <0.002 | 0.0436 | 0.505 | <0.0003 | 0.176 | <0.00008 | <0.002 | 0.0881 | 0.0017 | 0.930 | 3.18 | 4.11 |
| | 12/17/15 | <0.0008 | 0.00215 J | 0.0371 | 0.000475 J | 0.00372 | <0.002 | 0.0399 | <0.1 | <0.0003 | 0.14 | <0.00008 | <0.002 | 0.0798 | 0.0016 | 1.70 | 2.66 | 4.36 |
| | 02/09/16 | <0.0008 | 0.00206 J | 0.0407 | <0.0003 | 0.00343 | <0.002 | 0.0417 | 0.74 | 0.000438 J | 0.13 | <0.00008 | <0.002 | 0.0907 | 0.0015 J | 1.04 | 3.37 | 4.41 |
| | 04/14/16 | <0.0008 | 0.00218 J | 0.0371 | <0.0003 | 0.00212 | <0.002 | 0.0326 | 0.69 | <0.0003 | 0.119 | <0.00008 | <0.002 | 0.064 | 0.00137 J | <0.276 | <1.35 | <1.626 |
| | 06/14/16 | <0.0008 | 0.00205 J | 0.0392 | <0.0003 | 0.00156 | <0.002 | 0.0261 | 0.173 J | <0.0003 | 0.107 | <0.00008 | <0.002 | 0.0447 | 0.00126 J | 0.754 | 1.56 | 2.31 |
| | 08/24/16 | <0.0008 | 0.00221 J | 0.0387 | <0.0003 | 0.00146 | <0.002 | 0.0232 | 0.463 | <0.0003 | 0.0974 | <0.00008 | <0.002 | 0.0272 | 0.00123 J | 0.416 | 2.60 | 3.02 |
| | 10/05/16 | <0.0008 | 0.00225 J | 0.039 | <0.0003 | 0.00152 | <0.002 | 0.0226 | 0.723 | <0.0003 | 0.113 | <0.00008 | <0.002 | 0.0276 | 0.00114 J | 0.455 | 2.44 | 2.90 |
| | 12/22/16 | <0.0008 | 0.00226 J | 0.0437 | <0.0003 | 0.00173 | <0.002 | 0.0266 | 1.32 | <0.0003 | 0.11 | <0.00008 | <0.002 | 0.0245 | 0.00124 J | <0.352 | 2.46 | 2.81 |
| | 06/05/18 | <0.0008 | 0.00236 J | 0.0391 | <0.0003 | 0.00152 | <0.002 | 0.0207 | 1.06 | <0.0003 | 0.0975 | <0.00008 | 0.00212 J | 0.0192 | 0.000985 J | 0.528 | 2.19 | 2.72 |
| | 09/05/18 | NA | 0.00208 J | 0.0379 | <0.0003 | 0.00146 | <0.002 | 0.0192 | 1.03 | <0.0003 | 0.0955 | NA | 0.0021 J | 0.0213 | 0.000925 J | <0.323 | 0.704 | 1.03 |
| | 05/16/19 | <0.0008 | 0.0023 J | 0.051 | <0.0003 | <0.0003 | <0.002 | 0.0052 | 0.776 | <0.0003 | 0.057 | <0.00008 | 0.0031 J | 0.0423 | 0.0006 J | <0.403 | <0.638 | <1.041 |
| | 08/19/19 | <0.0008 | 0.00248 J | 0.0365 | <0.0003 | <0.0003 | <0.002 | 0.00364 J | 0.874 | <0.0003 | 0.0546 | <0.00008 | 0.00231 J | 0.0245 | 0.000588 J | 0.523 | 0.858 | 1.38 |
| | 05/06/20 | <0.000800 | 0.00209 J | 0.0353 | <0.000300 | <0.000300 | 0.0117 | 0.00332 J | 0.8 | <0.000300 | 0.0498 | <0.0000800 | 0.00284 J | 0.00993 | 0.000556 J | 0.394 | 0.463 | 0.857 |
| | 9/15/2020 | NA | 0.00225 J | 0.0326 | <0.000300 | NA | <0.00200 | <0.00300 | 0.772 | <0.000300 | 0.0416 | NA | 0.00245 J | 0.00646 | 0.000534 J | 0.257 | 0.484 | 0.711 |
| FGD-4 | 11/03/15 | <0.0008 | <0.002 | 0.126 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.294 J | <0.0003 | 0.0433 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.01 | <1.39 | 2.40 |
| | 12/17/15 | <0.0008 | <0.002 | 0.105 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.295 J | <0.0003 | 0.0436 | 0.000229 | 0.00211 J | 0.00214 J | <0.0005 | <0.361 | <1.73 | <2.091 |
| | 02/09/16 | <0.0008 | <0.002 | 0.113 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.32 J | <0.0003 | 0.0419 | 0.000288 | <0.002 | <0.002 | <0.0005 | <0.332 | <1.11 | <1.442 |
| | 04/14/16 | <0.0008 | <0.002 | 0.12 | <0.0003 | <0.0003 | 0.00208 J | <0.003 | 0.323 J | 0.0271 | 0.0357 | 0.000232 | <0.002 | <0.002 | <0.0005 | 0.560 | <1.21 | 1.77 |
| | 06/14/16 | <0.0008 | <0.002 | 0.128 | <0.0003 | 0.000561 J | <0.002 | <0.003 | <0.1 | <0.0003 | 0.0477 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.437 | <0.975 | 1.41 |
| | 08/24/16 | <0.0008 | <0.002 | 0.111 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.148 J | 0.000578 J | 0.0383 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.199 | 0.625 | 0.82 |
| | 10/05/16 | <0.0008 | <0.002 | 0.106 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.376 J | 0.000489 J | 0.0353 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.308 | 1.30 | 1.61 |
| | 12/22/16 | <0.0008 | <0.002 | 0.114 | <0.0003 | <0.0003 | 0.0023 J | <0.003 | 0.251 J | <0.0003 | 0.0273 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.227 | <0.667 | 0.89 |
| | 06/04/18 | <0.0008 | <0.002 | 0.119 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.297 J | <0.0003 | 0.0265 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.261 | <0.923 | 1.184 |
| | 09/05/18 | NA | <0.002 | 0.108 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.353 J | <0.0003 | 0.0199 | NA | <0.002 | <0.002 | <0.0005 | <0.39 | 0.673 | 1.063 |
| | 05/16/19 | <0.0008 | <0.002 | 0.117 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.327 J | <0.0003 | 0.0325 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.627 | 0.745 | 1.372 |
| | 08/19/19 | <0.0008 | <0.002 | 0.1 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.67 | <0.0003 | 0.019 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.39 | 1.58 | 1.97 |
| | 05/11/20 | <0.000800 | <0.00200 | 0.104 | <0.000300 | <0.000300 | <0.00200 | <0.00300 | 0.3 J | <0.000300 | 0.0166 | <0.0000800 | <0.00200 | <0.00200 | <0.000500 | 0.15 | 1.2 | 1.35 |
| | 9/15/2020 | NA | <0.00200 | 0.0899 | <0.000300 | NA | <0.00200 | <0.00300 | <0.100 | <0.000300 | 0.0140 | NA | <0.00200 | <0.00200 | <0.000500 | 0.498 | -0.0258 | 0.498 |

**TABLE 4**
**APPENDIX IV ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | F (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Tl (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-5 | 11/04/15 | <0.0008 | <0.002 | 0.13 | <0.0003 | 0.000557 J | 0.0121 | <0.003 | 0.227 J | <0.0003 | 0.17 | <0.00008 | 0.0445 | <0.002 | <0.0005 | 0.449 | 1.52 | 1.97 |
| | 12/17/15 | <0.0008 | <0.002 | 0.237 | <0.0003 | 0.000593 J | 0.0391 | 0.0164 | 0.469 | 0.000369 J | 0.156 | <0.00008 | 0.0203 | <0.002 | <0.0005 | 1.23 | 3.63 | 4.86 |
| | 02/09/16 | <0.0008 | <0.002 | 0.261 | <0.0003 | <0.0003 | <0.002 | 0.00441 J | 0.495 | <0.0003 | 0.158 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.99 | 1.50 | 3.49 |
| | 04/14/16 | <0.0008 | <0.002 | 0.224 | <0.0003 | 0.000392 J | 0.00477 J | <0.003 | 0.491 | <0.0003 | 0.164 | <0.00008 | 0.0183 | <0.002 | <0.0005 | 0.951 | <1.24 | 2.19 |
| | 06/15/16 | <0.0008 | <0.002 | 0.174 | <0.0003 | <0.0003 | 0.00599 | <0.003 | 0.284 J | <0.0003 | 0.162 | <0.00008 | 0.0144 | <0.002 | <0.0005 | 0.429 | 1.25 | 1.68 |
| | 08/24/16 | <0.0008 | <0.002 | 0.173 | <0.0003 | <0.0003 | 0.0189 | <0.003 | 0.168 J | 0.00045 J | 0.145 | <0.00008 | 0.00814 | <0.002 | <0.0005 | 0.398 | <0.643 | 1.04 |
| | 10/05/16 | <0.0008 | <0.002 | 0.229 | <0.0003 | <0.0003 | 0.00304 J | <0.003 | 0.38 J | <0.0003 | 0.153 | <0.00008 | 0.00355 J | <0.002 | <0.0005 | 0.877 | 1.16 | 2.04 |
| | 12/22/16 | <0.0008 | <0.002 | 0.261 | <0.0003 | <0.0003 | <0.002 | 0.00471 J | 0.291 J | <0.0003 | 0.152 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.579 | <0.76 | 1.34 |
| | 06/05/18 | <0.0008 | <0.002 | 0.136 | <0.0003 | <0.0003 | 0.00935 | <0.003 | 0.511 | <0.0003 | 0.154 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.705 | <0.765 | 1.47 |
| | 09/06/18 | NA | <0.002 | 0.215 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.548 | <0.0003 | 0.155 | NA | <0.002 | <0.002 | <0.0005 | 0.535 | 1.31 | 1.845 |
| | 05/16/19 | <0.0008 | <0.002 | 0.0926 | <0.0003 | <0.0003 | 0.024 | <0.003 | 0.579 | <0.0003 | 0.145 | <0.00008 | 0.003 J | <0.002 | <0.0005 | 0.342 | <0.506 | 0.848 |
| | 08/19/19 | <0.0008 | <0.002 | 0.106 | <0.0003 | <0.0003 | 0.0103 | <0.003 | 0.863 | <0.0003 | 0.152 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.551 | 0.659 | 1.21 |
| | 05/11/20 | <0.000800 | <0.00200 | 0.0959 | <0.000300 | <0.000300 | 0.0374 | <0.00300 | 0.413 | <0.000300 | 0.156 | <0.0000800 | 0.00561 | <0.00200 | <0.000500 | 0.0983 | 5.18 | 5.28 |
| | 9/10/2020 | NA | <0.00200 | 0.0929 | <0.000300 | NA | 0.0307 | <0.00300 | 0.617 | <0.000300 | 0.150 | NA | 0.00362 J | <0.00200 | <0.000500 | 0.132 | -0.0787 | 0.132 |
| FGD-6 | 11/03/15 | <0.0008 | <0.002 | 0.124 | <0.0003 | <0.0003 | 0.00253 J | <0.003 | 0.334 J | <0.0003 | 0.0112 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.470 | <1.70 | 2.17 |
| | 12/17/15 | <0.0008 | <0.002 | 0.135 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.333 J | <0.0003 | 0.00964 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.03 | <2.13 | 3.16 |
| | 02/09/16 | <0.0008 | <0.002 | 0.132 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.354 J | <0.0003 | 0.0105 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.801 | <1.71 | 2.51 |
| | 04/14/16 | <0.0008 | <0.002 | 0.122 | <0.0003 | <0.0003 | 0.0568 | <0.003 | 0.442 | <0.0003 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.484 | 2.08 | 2.56 |
| | 06/14/16 | <0.0008 | <0.002 | 0.16 | 0.000309 J | 0.000404 J | <0.002 | 0.00657 | <0.1 | 0.00132 | 0.0092 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.31 | 2.16 | 3.47 |
| | 08/24/16 | <0.0008 | 0.00725 | 0.127 | <0.0003 | <0.0003 | 0.00334 J | 0.00399 J | 0.147 J | 0.000656 J | 0.00885 J | <0.00008 | 0.00244 J | <0.002 | <0.0005 | 0.465 | 0.896 | 1.36 |
| | 10/05/16 | <0.0008 | 0.00536 | 0.117 | <0.0003 | <0.0003 | 0.00427 J | 0.00414 J | 0.364 J | <0.0003 | 0.00985 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.489 | 1.69 | 2.18 |
| | 12/22/16 | <0.0008 | 0.00458 J | 0.129 | <0.0003 | <0.0003 | <0.002 | 0.00352 J | 0.204 J | <0.0003 | 0.0102 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.349 | 0.917 | 1.27 |
| | 06/04/18 | <0.0008 | 0.0021 J | 0.0854 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.361 J | <0.0003 | 0.0098 J | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.277 | <0.964 | <1.241 |
| | 09/05/18 | NA | <0.002 | 0.0824 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.405 | <0.0003 | 0.0094 J | NA | <0.002 | <0.002 | <0.0005 | <0.336 | <0.677 | <1.013 |
| | 05/16/19 | <0.0008 | 0.0294 | 0.107 | <0.0003 | <0.0003 | <0.002 | 0.0132 | 0.669 | <0.0003 | 0.0068 J | <0.00008 | 0.0077 | <0.002 | <0.0005 | 1.43 | 1.67 | 3.1 |
| | 08/19/19 | <0.0008 | 0.0146 | 0.0903 | <0.0003 | <0.0003 | <0.002 | 0.00493 J | 0.741 | <0.0003 | 0.0082 J | <0.00008 | 0.00332 J | <0.002 | <0.0005 | 0.385 | 2.55 | 2.93 |
| | 05/11/20 | <0.000800 | 0.00286 J | 0.0814 | <0.000300 | <0.000300 | <0.00200 | <0.00300 | 0.292 J | <0.000300 | 0.00877 J | <0.0000800 | 0.00205 J | <0.00200 | <0.000500 | 0.513 | 0.845 | 1.36 |
| | 9/15/2020 | NA | 0.00651 | 0.0695 | <0.000300 | NA | <0.00200 | 0.00615 | 0.354 J | <0.000300 | 0.00669 J | NA | <0.00200 | <0.00200 | <0.000500 | 0.485 | 1.08 | 1.57 |
| FGD-12 | 11/04/15 | <0.0008 | <0.002 | 0.0884 | <0.0003 | <0.0003 | 0.0124 | <0.003 | <0.1 | 0.000678 J | 0.0234 | <0.00008 | 0.00221 J | <0.002 | <0.0005 | 1.07 | <1.55 | 2.62 |
| | 12/17/15 | <0.0008 | <0.002 | 0.0781 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.159 J | 0.000775 J | 0.022 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.32 | <2.57 | 3.89 |
| | 2/9/2016 | <0.0008 | <0.002 | 0.0664 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.157 J | 0.000339 J | 0.0211 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.771 | <1.53 | 2.30 |
| | 04/14/16 | <0.0008 | <0.002 | 0.104 | <0.0003 | <0.0003 | 0.00425 J | <0.003 | 0.109 J | 0.00371 | 0.0255 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.560 | 1.46 | 2.02 |
| | 06/15/16 | <0.0008 | <0.002 | 0.107 | 0.00039 J | <0.0003 | 0.00269 J | 0.00323 J | 0.101 J | 0.00513 | 0.0192 | 0.000134 J | <0.002 | <0.002 | <0.0005 | 2.01 | 2.06 | 4.07 |
| | 08/25/16 | <0.0008 | 0.00451 J | 0.262 | 0.000629 J | <0.0003 | 0.0135 | 0.00412 J | <0.1 | 0.00842 | 0.0204 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.59 | 1.84 | 3.43 |
| | 10/04/16 | <0.0008 | 0.00402 J | 0.122 | 0.00062 J | <0.0003 | 0.0133 | 0.00395 J | 0.129 J | 0.0084 | 0.0259 | <0.00008 | <0.002 | 0.00292 J | <0.0005 | 1.41 | <0.76 | 2.17 |
| | 12/23/16 | <0.0008 | 0.00938 | 0.557 | <0.0003 | <0.0003 | 0.00435 J | 0.00609 | 0.112 J | 0.00216 | 0.0755 | <0.00008 | <0.002 | 0.00786 | <0.0005 | 1.89 | 3.54 | 5.43 |
| | 06/05/18 | <0.0008 | <0.002 | 0.0777 | 0.00031 | <0.0003 | 0.00578 | <0.003 | 0.137 J | 0.0029 | 0.0213 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.68 | <0.526 | 2.206 |
| | 09/06/18 | NA | <0.002 | 0.0517 | <0.0003 | <0.0003 | 0.0024 J | <0.003 | <0.10 | 0.0005 J | 0.0188 | NA | <0.002 | <0.002 | <0.0005 | <0.304 | <0.5450 | <0.849 |
| | 05/16/19 | 0.0008 | <0.002 | 0.0474 | <0.0003 | <0.0003 | 0.0030 J | <0.003 | <0.10 | 0.0003 J | 0.0221 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.385 | 1.43 | 1.82 |
| | 08/19/19 | <0.0008 | <0.002 | 0.0631 | <0.0003 | <0.0003 | 0.00218 J | <0.003 | 0.145 J | 0.00139 | 0.0251 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.12 | 3.52 | 4.64 |
| | 05/11/20 | <0.000800 | 0.0116 | 0.23 | 0.00166 | <0.000300 | 0.037 | 0.00883 | <0.100 | 0.0249 | 0.0371 | <0.0000800 | <0.00200 | 0.00678 | 0.000651 | 5.96 | 10.7 | 16.6 |
| | 9/10/2020 | NA | 0.00252 J | 0.0922 | 0.000375 J | NA | 0.00723 | <0.00300 | <0.100 | 0.00402 | 0.0235 | NA | <0.00200 | 0.00254 J | <0.000500 | 2.59 | 6.72 | 9.31 |

Notes:

1. Abbreviations: mg/l - milligrams per liter; pCi/L - picocuries per liter.
2. ^ - Sum of Ra 226 and Ra 228 concentrations. Non-detect isotope results were assigned a value equal to the minimum detectable concentration.
3. J - Concentration is below method quantitation limit; result is an estimate.
4. NA - not analyzed. Groundwater sample analyses for the second semi-annual sampling events were in some instances limited to Appendix IV parameters detected during the preceding first semi-annual sampling event in accordance with 40 CFR § 257.95(d)(1).

## ATTACHMENT 1

## ALTERNATE SOURCE DEMONSTRATION REPORT

# Alternate Source Demonstration

*Oak Grove Steam Electric Station*

*FGD Ponds - Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

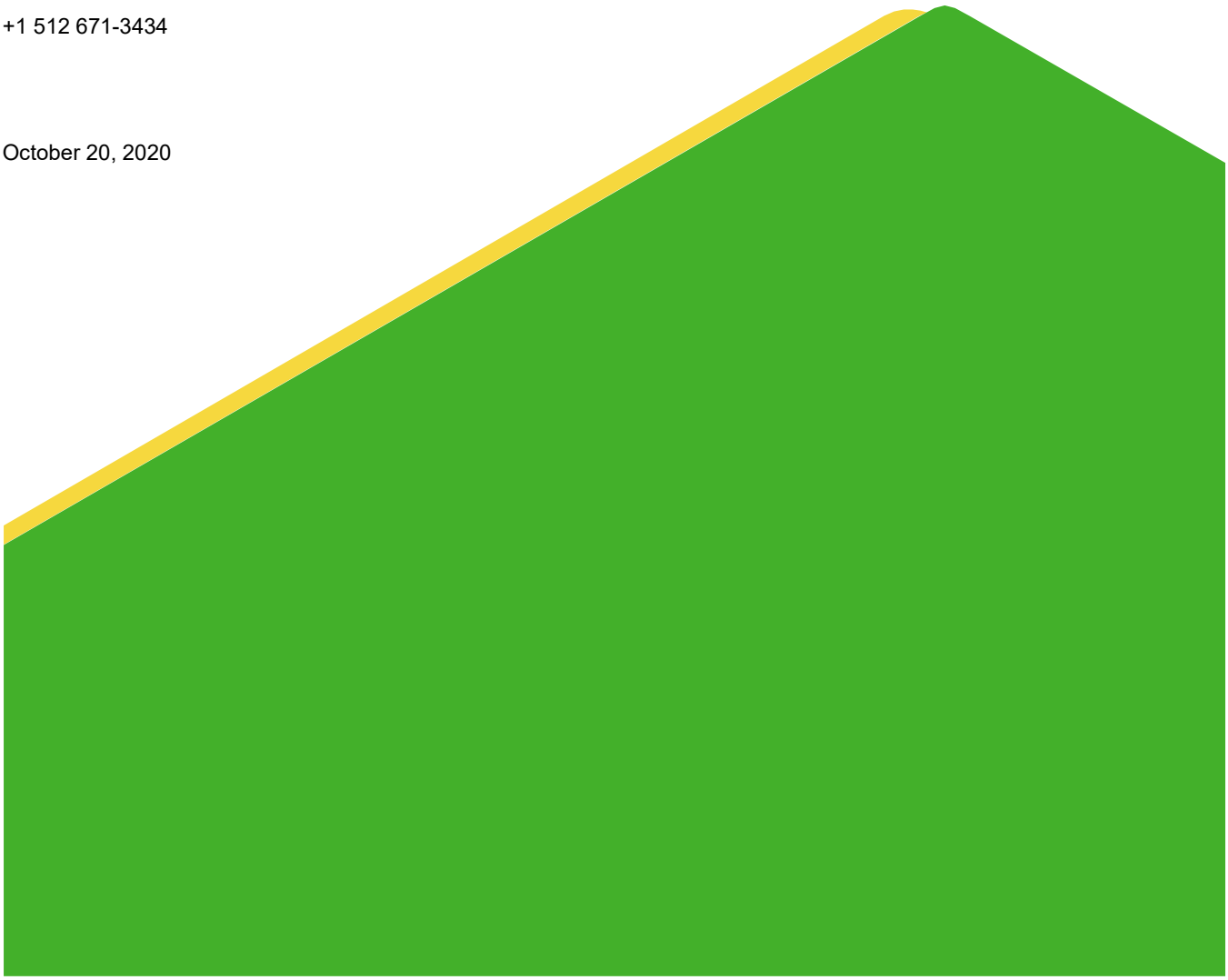
Submitted by:

**Golder Associates Inc.**

2201 Double Creek Dr, Suite 4004, Round Rock, Texas, USA 78664

+1 512 671-3434

October 20, 2020



# Executive Summary

In accordance with the United States Environmental Protection Agency (US EPA) Coal Combustion Residual (CCR) Rule (40 C.F.R. Part 257 Subpart D; 80 Fed. Reg. 21302 (April 17, 2015) (CCR Rule or The Rule), this Alternate Source Demonstration (ASD) was prepared to document that a source other than the FGD Ponds at the Oak Grove Steam Electric Station (the Site) caused a Statistically Significant Level (SSL) of lithium identified in monitoring well FGD-5 during the first semi-annual assessment monitoring event in 2020.

The following lines of evidence support the conclusion that the SSL of lithium in groundwater samples collected from FGD-5 of the FGD Ponds (FDG Pond A, FDG Pond B and FDG Pond C) monitoring well network is not caused by a release of CCR porewater/leachate, but instead results from an alternate source:

- The range of lithium concentrations in samples collected from FGD-5 (0.145 to 0.170 mg/L) is similar to that of samples in upgradient wells FGD-8 and FGD-11 (max 0.149 mg/L since 2015). The groundwater at FGD-5 is of the sodium-chloride type, which is the same type as the upgradient wells (FGD-8 and FGD-11), whereas samples from the FGD ponds indicate water of a magnesium-chloride dominant water type, indicating different water types for the groundwater system and FGD ponds.
- Concentrations of CCR tracers boron, chloride and sulfate, and ratios of boron to lithium differ significantly between FGD pond water and groundwater in the vicinity of FGD-5. Therefore, lithium in groundwater at FGD-5 cannot have originated from CCR porewater as selective dilution of lithium cannot occur.
- FGD-5 is downgradient from FGD Pond C and cross-gradient (and at times upgradient) from FGD Pond A and B. FGD Pond C has only been in operation since 2016. However, lithium concentrations in groundwater at FGD-5 have remained consistent since 2015 (0.145 to 0.170 mg/L). Therefore, lithium concentrations were already elevated in groundwater at FGD-5 prior to ash additions to FGD Pond C, which is the only FGD pond upgradient of FGD-5. Since FGD-5 is not directly downgradient from FGD Ponds A or B, it would not receive porewater from these ponds unless diluted with natural groundwater flowing to FGD-5 from upgradient areas. In groundwater samples collected from FGD-5, concentrations of CCR tracers (boron, sulfate and chloride) that are elevated in FGD Pond A and B water are similar to concentrations in background wells FGD-8 and FGD-11. Furthermore, lithium SSLs have not been observed in CCR monitoring wells directly downgradient of FGD Pond A or B (e.g., FGD-2, FGD-3, FGD-4 and FGD-6), or CCR monitoring wells FGD-1 and FGD-12, which are downgradient and more proximal to FGD Pond C than FGD-5. Thus, it is highly unlikely that lithium measured in FGD-5 groundwater originates from a release from any of the FGD ponds.
- Lithium is naturally occurring in soils at the Site. Sequential extraction of lithium from soil samples indicate total lithium concentrations ranging from 9 to 20 mg/kg, with the majority (76 to 97%) of lithium present in the non-environmentally available acid/sulfide and residual/refractory fractions.

In accordance with §257.95(g)(3), this ASD demonstrates that a source other than the FGD Ponds caused the SSL of lithium identified at monitoring well FGD-5.

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**EXHIBITS**

Exhibit 1: Site Location Map
Exhibit 2: Potentiometric Surface Map, May 2020

**APPENDICES**

Appendix A: Sequential Extraction Results

# Certification

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the alternative source demonstration at the referenced facility meets the requirements of 40 C.F.R. § 257.94(e)(2) of the CCR Rule.

**Golder Associates Inc.**

Patrick J. Behling, P.E.
Principal Engineer

Roberta Russell, P.G.
Senior Geologist

# 1.0 INTRODUCTION

In accordance with the United States Environmental Protection Agency (US EPA) Coal Combustion Residual (CCR) Rule (40 C.F.R. Part 257 Subpart D; 80 Fed. Reg. 21302 (April 17, 2015) (CCR Rule or The Rule), this Alternate Source Demonstration (ASD) was prepared to document that a source other than the FGD Ponds at the Oak Grove Steam Electric Station (the Site) caused a Statistically Significant Level (SSL) of lithium identified in monitoring well FGD-5 during the first semi-annual assessment monitoring event in 2020. This document satisfies the requirements of § 257.95(g)(3)(ii) which allows the owner or operator to demonstrate that a source other than the CCR Unit has caused an SSL and that the SSL was the result of an alternate source or resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

As documented by this report, the SSL for lithium at the FGD Pond monitoring well FGD-5 is attributed to naturally occurring sources in subsurface aquifer materials and is not caused by the CCR unit.

# 2.0 SITE DESCRIPTION AND BACKGROUND

Oak Grove Management Company LLC owns OGSES located approximately 10 miles north of Franklin, Robertson County, Texas (Exhibit 1). The OGSES consists of two 800-megawatt power generation units which burn lignite and coal. CCR, including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operations. Currently, CCRs generated at the OGSES are managed by Luminant in part within the FGD Pond Area (PBW, 2017a).

The FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the “FGD Ponds”) are located approximately 2,500 feet northwest of the power generation units at the Site (Exhibit 1). FGD-A Pond and FGD-B Pond were placed in service during approximately 2007. Use of FGD-C Pond began in 2016 (PBW, 2017a).

## 2.1 FGD Pond Area Monitoring Network

The monitoring well network for the FGD Pond Area consists of 9 monitoring wells (FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, FGD-8, FGD-11 and FGD-12) screened within the uppermost groundwater-bearing unit. Two wells, FGD-8 and FGD-11, are considered background monitoring wells. Monitoring well locations are shown on Exhibit 1.

## 2.2 Geologic and Hydrogeologic Setting

The FGD Ponds are located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1970). Previous boring investigations indicate the geology in the FGD Pond Area primarily consists of an upper zone of relatively thick, interbedded sand and clay strata and a lower zone of interbedded silty to clayey sand and well sorted sand. The uppermost groundwater-bearing unit at the Site occurs in the lower zone of interbedded silty to clayey sand (PBW, 2017a).

# 3.0 STATISTICAL ANALYSIS METHODS

The following sections summarize the assessment monitoring at the FGD Pond Area, present the statistical analysis method for evaluation of assessment monitoring constituents (i.e., Appendix IV parameters) as they pertain to this ASD, discuss the test methods used for soil samples, and describe the geochemical evaluation.

During assessment monitoring, concentrations of Appendix IV constituents are compared to an applicable Groundwater Protection Standard (GWPS). As specified in 40 C.F.R. § 257.95(h), the GWPS is the higher of the

Maximum Contaminant Level (MCL) or the background concentration. For lithium, the GWPS is the background concentration of 0.15 mg/L, which is calculated as the upper prediction limit (UPL) of data collected from upgradient wells during the background period, prior to the start of the detection and assessment monitoring period.

Statistical analysis of the data was performed in accordance with the Statistical Analysis Plan for CCR Groundwater Monitoring (PBW, 2017b) and the USEPA Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities-Unified Guidance (USEPA, 2009). The statistical analysis included an evaluation of confidence intervals for each of the Appendix IV parameter data sets for each well to evaluate whether constituent concentrations were present at concentrations above GWPSs.

Figure 1 shows the lithium concentrations in FGD-5 since 2015 compared to the GWPS. The calculated lower and upper confidence limits for lithium based on sample data collected from FGD-5 are 0.152 mg/L and 0.156 mg/L, respectively. An SSL was indicated at FGD-5 because the lower confidence limit based on the lithium data set from FGD-5 exceeded the GWPS of 0.152 mg/L. As indicated on Figure 1, lithium concentrations exceeded the GWPS in FGD-5 during two sampling events conducted in 2015, prior to the completion of FGD Pond C (in 2016), which is the only FGD pond that is directly upgradient of FGD-5. Furthermore, the highest sample concentration (0.170 mg/L) in FGD-5 occurred in November 2015, prior to the completion of FGD-C.

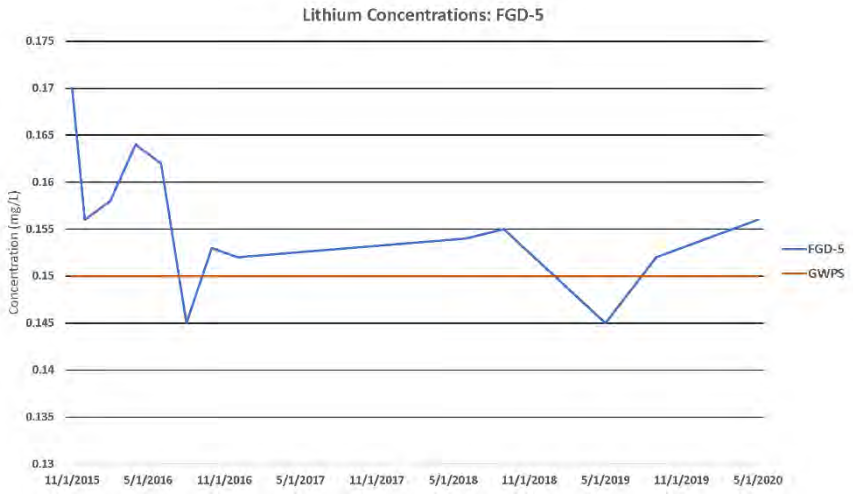


**Figure 1: Lithium concentrations in groundwater samples collected from FGD-5.**

## 3.1 Assessment Monitoring

Pursuant to 40 C.F.R. § 257.95(a), FGD Pond Area monitoring wells are sampled for all Appendix IV parameters. The 2015 through 2020 Appendix IV groundwater sample data were compared to the GWPS using confidence intervals.

## 3.2 Statistically Significant Levels

As stated in the Appendix IV SSL notification dated February 6, 2019, SSLs for cobalt and lithium were identified at the FGD Ponds during 2018 assessment monitoring completed in accordance with 40 C.F.R. § 257.95. No SSLs were identified for cobalt in subsequent semi-annual assessment monitoring completed during 2019 and 2020. No SSLs were identified for lithium in subsequent semi-annual assessment monitoring events in 2019;

however, an SSL notification for lithium was posted on August 21, 2020 based on the first 2020 semi-annual assessment monitoring event results.

## 3.3 Test Methods for Soil

### 3.3.1 Sequential Extraction

Chemical analysis of soils for total metals and sequential extraction analysis was conducted on three soil samples collected from FGD Pond Area within the groundwater-bearing unit (Appendix A). The sequential extraction procedure (SEP) consists of a seven-step metals extraction from solids to determine their potential environmental stability. The seven-step SEP is defined by specific extraction steps as illustrated and described (based on a modified Tessier et al. 1979 method) in Figure 2.

| SEQUENTIAL EXTRACTION PROCEDURE | | | | |
|---|---|---|---|---|
| ENVIRONMENTALLY AVAILABLE (Increasing Availability) | Step 1 | Increasing Extraction Strength | Exchangeable Fraction: | This extraction includes trace elements that are electrostatically adsorbed to overburden minerals |
| | Step 2 | | Carbonate Fraction: | This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals |
| | Step 3 | | Non-Crystalline Materials Fraction: | This extraction targets trace elements that are complexed by amorphous minerals |
| | Step 4 | | Metal Hydroxide Fraction: | This extraction targets trace elements bound to hydroxides of iron, manganese, and/or aluminum |
| | Step 5 | | Organic Fraction: | This extraction targets trace elements strongly bound via chemisorption to organic material |
| NON-ENVIRONMENTALLY AVAILABLE | Step 6 | | Acid/Sulfide Fraction: | The extraction is used to identify trace elements precipitated as sulfide minerals |
| | Step 7 | | Residual Fraction: | Trace elements remaining in the overburden after the previous extractions will be distributed between silicates, phosphates, and refractory oxide |

**Figure 2: Overview of sequential extraction procedure.**

Steps 1 through 7 represent an increasing amount of target metals that can be removed into solution from the solid phase. For instance, metals bound in the carbonate fraction are much more likely to become mobile due to changes in groundwater chemistry than metals bound in a sulfide or residual fraction. The total concentration of a metal measured from all seven steps can be compared to the concentration determined from the total metal analysis for compositional accountability. Metals extracted in Steps 1 through 5 are considered environmentally available, whereas metals extracted in Steps 6 and 7 are present in non-environmentally available fractions and are not expected to be released under conditions typically encountered in aquifers, except in the case of acidification or other excursions from typical groundwater conditions (Tessier et al., 1979).

## 4.0 ALTERNATE SOURCE DEMONSTRATION

The May 2020 SSL of lithium in groundwater at the monitoring well FGD-5 is not caused by a release of CCR porewater/leachate but instead results from an alternate source. The following lines of evidence support this conclusion:

- **The range of lithium concentrations in samples collected from FGD-5 is similar to that of samples in background wells. Additionally, the FGD pond water is a magnesium-chloride type water whereas water at FGD-5 is of the sodium-chloride type, which is the same type as background wells.**

Lithium concentrations in groundwater samples from FGD-5 range from 0.145 to 0.170 mg/L, which is similar to the upper range of concentrations in background well FGD-8 (max of 0.149 mg/L). In addition, as shown on the Piper diagram presented on Figure 3, the groundwater at FGD-5 is a sodium-chloride type, which is the same water type of the groundwater encountered within the background wells FGD-8 and FGD-11. The FGD pond water samples from FGD Pond A and FGD Pond B are the magnesium-chloride type. Because the lithium concentrations and water chemistry in groundwater samples collected from FGD-5 are similar to those encountered in background wells, it is more likely that groundwater at FGD-5 is representative of background conditions, including the presence of naturally-occurring lithium in groundwater. Groundwater and pond water ASD data are summarized in Table 1.

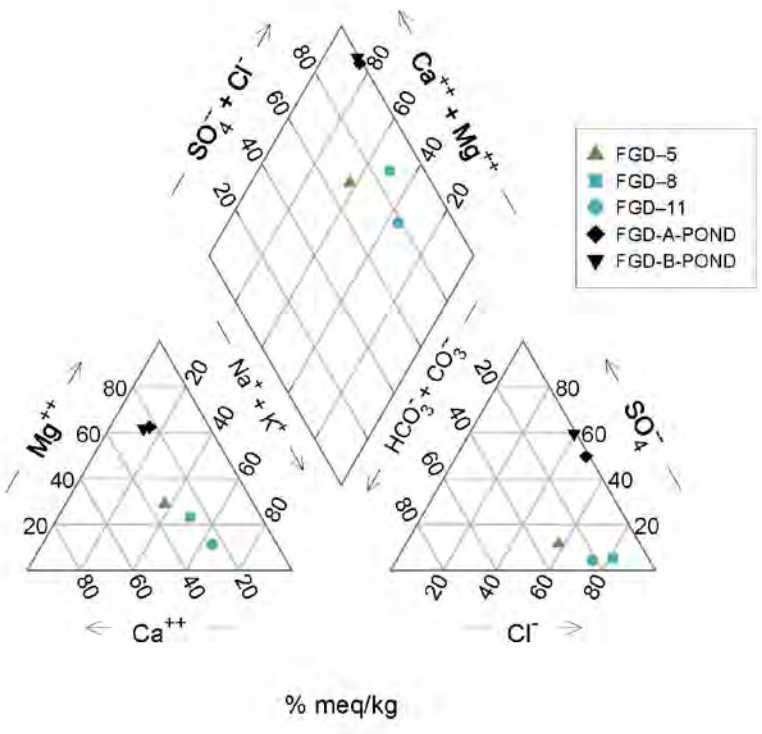


**Figure 3: Piper diagram showing water chemistry of FGD-5, FGD-8, FGD-11 and FGD-A Pond and FGD-B Pond samples.**

- **Concentrations of CCR tracers boron, chloride and sulfate, and ratios of boron to lithium differ significantly between FGD pond water and groundwater in the vicinity of FGD-5.**

Boron has been historically elevated in FGD pond samples (>72 mg/L). However, boron in groundwater samples collected from FGD-5 has never exceeded 0.2 mg/L since 2015 (when sampling started). Boron at well FGD-5 has also remained well below the maximum measured in background wells FGD-8 and FGD-11 (0.635 mg/L). Similarly, sulfate (max 83.8 mg/L) and chloride (max 307 mg/L) concentrations in FGD-5 are low compared to FGD pond samples (max of 4,680 mg/L and 3,440 mg/L, respectively). These differences are shown graphically in the ternary diagram presented in Figure 3. It should be noted that lithium concentrations in FGD pond water samples are generally similar to FGD-5. However, if lithium in groundwater at FGD-5 originated from the FGD ponds, sulfate, chloride and boron would also be expected to be comparatively higher. Additionally, the ratio of lithium to boron in FGD pond samples was approximately 1:500, while the ratio in groundwater from FGD-5 was approximately 1:1. Therefore, lithium at FGD-5 did not originate from CCR porewater as selective dilution of lithium cannot occur, assuming conservative transport.

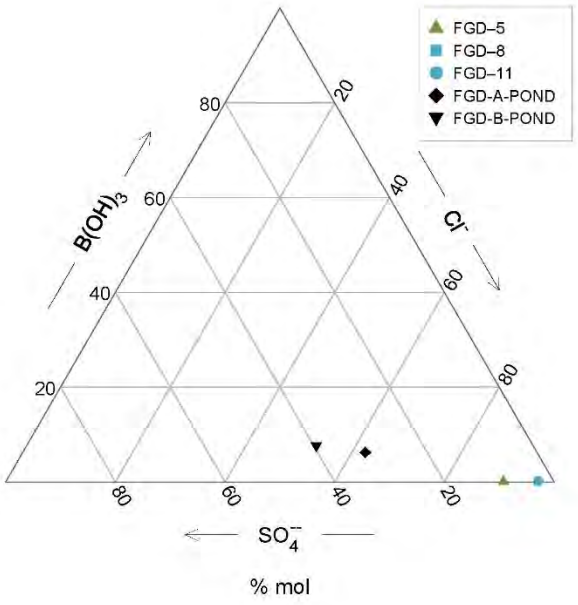


**Figure 4: Ternary diagram showing relative molar concentrations of boron, chloride and sulfate for FGD ponds, FGD-5, and background wells FGD-8 and FGD-11.**

- **FGD-5 is down-gradient from FGD Pond C, which has only been in operation since 2016. However, lithium in groundwater at FGD-5 has remained consistent since sampling began in 2015.**

Monitoring well FGD-5 is cross-gradient (and at times upgradient) to FGD Ponds A and B and directly down-gradient from FGD Pond C (Exhibit 2). FGD-5 has been sampled since 2015 and, as shown on Figure 1, lithium concentrations have remained consistently between 0.145 and 0.170 mg/L. If the lithium occurrence were due to a plume originating from FGD Pond C, its concentrations would be expected to increase. FGD Pond C was not in operation until 2016; thus, lithium concentrations were already within ranges normal for FGD-5 before CCR was placed in FGD Pond C. Since FGD-5 is cross-gradient to FGD Ponds A and B, any porewater reaching FGD-5 from FGD Ponds A or B would be significantly diluted with natural groundwater flowing to FGD-5 from upgradient areas. Furthermore, lithium SSLs have not been observed in CCR monitoring wells directly downgradient of FGD Pond A or B (e.g., FGD-2, FGD-3, FGD-4 and FGD-6), or CCR monitoring wells FGD-1 and FGD-12, which are downgradient and more proximal to FGD Pond C than FGD-5. As discussed previously, concentrations of boron,

chloride and sulfate, which are mobile constituents and elevated in FGD Pond water, are similar to concentrations in background wells FGD-8 and FGD-11. Thus, it is very unlikely that lithium measured in FGD-5 groundwater originates from FGD Ponds A or B.

- **Lithium is naturally occurring at the Site based on sequential extraction of lithium from soil.**

Total lithium concentrations in the three soil samples range from 9 to 20 mg/kg, which is within the range of naturally-occurring lithium in the Earth's crust and soils (18 to 65 mg/kg and 5 to 130 mg/kg, respectively; Smith and Huyck (1999)). Most of the lithium (between 76 and 97% of the total) is sequestered in the acid sulfide and refractory component of the soil material (SEP Steps 6 and 7). The environmentally-available fraction of lithium (which could contribute to concentrations observed at FGD-5) is less than 24% of the total, the largest of which is represented by the metal hydroxide phase.

# 5.0 ALTERNATE SOURCE DEMONSTRATION SUMMARY

The evaluation presented in this document demonstrates the statistically significant level of lithium identified in groundwater is due to the presence of naturally-occurring lithium and not caused by releases from the CCR unit. The following lines of evidence demonstrate the natural occurrence of lithium in groundwater at FGD-5:

- FGD-5 lithium concentrations are similar in range to concentrations in background wells. Additionally, the water type at FGD-5 is the same as background wells and different from FGD pond water.
- Concentrations of near-conservative CCR tracers boron, chloride and sulfate, and ratios of boron to lithium differ significantly between FGD pond water and groundwater in the vicinity of FGD-5.
- FGD-5 is located downgradient from FGD Pond C. However, lithium concentrations in FGD-5 have remained consistent since before FGD Pond C was put in operation.
- Lithium is naturally occurring at the Site based on sequential extraction of lithium from soil samples collected in the uppermost groundwater-bearing unit.

Based on these findings, the FGD Ponds are not the source for the SSL of lithium in FGD-5 samples. Instead, the SSL can be attributed to the presence of naturally-occurring lithium in subsurface aquifer materials

# 6.0 CONCLUSION

In accordance with 40 C.F.R. § 257.95(g)(3), this ASD addresses the SSL of lithium at FGD-5. Review of geochemical data indicates that the exceedance of lithium identified at FGD-5 is not the result of a release from the associated ash ponds at OGSES FGD Pond Area but can be attributed to the presence of naturally-occurring lithium in subsurface aquifer materials

# 7.0 REFERENCES


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# Table

**Table 1**
**Analytical Results**
**Groundwater and Pond Samples**
**Oak Grove Steam Electric Station FGD Pond Area**

| Sample Location | Sample Date | Calcium mg/L | Magnesium mg/L | Potassium mg/L | Sodium mg/L | Alkalinity mg/L | Chloride mg/L | Sulfate mg/L | Fluoride mg/L | Boron mg/L | Lithium mg/L | Cobalt mg/L | Iron mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-1 | 5/16/2019 | 19.5 | 11.2 | 2.11 | 49.4 | 52.8 | 62.4 | 78.7 | 0.362 J | 0.0803 | 0.0442 | 0.003 | 0.186 |
| FGD-2 | 5/16/2019 | 38.9 | 16.7 | 2.57 | 198 | 157 | 260 | 70.7 | 0.383 J | 0.105 | 0.0228 | 0.003 | 0.0799 |
| FGD-3 | 5/16/2019 | 60.1 | 33.6 | 2.5 | 277 | 533 | 117 | 182 | 0.776 | 0.117 | 0.057 | 0.0052 | 0.126 |
| FGD-4 | 5/16/2019 | 41.7 | 18.6 | 1.62 | 160 | 201 | 205 | 41.7 | 0.327 J | 0.0733 | 0.0325 | 0.003 | 0.103 |
| FGD-5 | 5/16/2019 | 77.7 | 50 | 3.46 | 123 | 237 | 287 | 67.2 | 0.579 | 0.108 | 0.145 | 0.003 | 0.03 |
| FGD-6 | 5/16/2019 | 20.3 | 6.61 | 0.706 | 225 | 262 | 170 | 51.3 | 0.669 | 0.116 | 0.0068 J | 0.0132 | 4.86 |
| FGD-8 | 5/16/2019 | 314 | 204 | 19.2 | 792 | 516 | 2040 | 173 | 0.1 | 0.0687 | 0.0086 J | 0.0146 | 263 |
| FGD-11 | 5/16/2019 | 85 | 30.6 | 4.13 | 328 | 256 | 566 | 50.9 | 0.38 J | 0.108 | 0.0145 | 0.003 | 1.28 |
| FGD-12 | 5/16/2019 | 6.79 | 2.97 | 1.55 | 20.1 | 36.6 | 15.6 | 15 | <0.100 | 0.0723 | 0.0221 | 0.003 | 0.425 |
| FGD-A-POND | 6/6/2019 | 487 | 809 | 82.1 | 270 | 58.6 | 1510 | 3260 | 17.2 | 72.1 | 0.167 | 0.003 | 0.03 |
| FGD-B-POND | 6/6/2019 | 458 | 796 | 86.9 | 287 | 68 | 1470 | 3040 | 17.5 | 73.3 | 0.172 | 0.003 | 0.03 |
| FGD-1 | 5/11/2020 | 37.8 | 17.1 | 2.56 | 82 | 67.6 | 146 | 79.5 | 0.231 J | 0.121 | 0.0548 | 0.0495 | 1.09 |
| FGD-2 | 5/11/2020 | 217 | 74.2 | 5.73 | 507 | 114 | 1150 | 286 | <0.100 | 0.605 | 0.028 | 0.003 | 0.0636 |
| FGD-3 | 5/11/2020 | 42.3 | 23.5 | 2.14 | 230 | 434 | 70.2 | 129 | 0.8 | 0.152 | 0.0498 | 0.00332 | 0.0395 |
| FGD-4 | 5/11/2020 | 40.6 | 14.7 | 1.53 | 204 | 247 | 198 | 52.9 | 0.3 J | 0.145 | 0.0166 | 0.003 | 0.12 |
| FGD-5 | 5/11/2020 | 100 | 52 | 3.64 | 125 | 232 | 307 | 83.8 | 0.413 | 0.165 | 0.156 | 0.003 | 0.0483 |
| FGD-6 | 5/11/2020 | 27.4 | 7.17 | 0.743 | 235 | 275 | 189 | 70.7 | 0.292 J | 0.109 | 0.0088 J | 0.003 | 0.582 |
| FGD-8 | 5/11/2020 | 381 | 198 | 19.9 | 801 | 518 | 2240 | 188 | 0.1 | 0.129 | 0.0152 | 0.0084 | 220 |
| FGD-11 | 5/11/2020 | 103 | 28.5 | 4.42 | 306 | 230 | 560 | 43.3 | 0.365 J | 0.166 | 0.0132 | 0.003 | 0.225 |
| FGD-12 | 5/11/2020 | 15.6 | 8.03 | 5.31 | 22.1 | 34.6 | 19.3 | 19.9 | <0.100 | 0.149 | 0.0371 | 0.00883 | 32.5 |
| FGD-A-POND | 5/11/2020 | 895 | 1490 | 195 | 563 | 134 | 3440 | 4680 | 20.6 | 104 | 0.422 | 0.00625 | 0.15 |
| FGD-B-POND | 5/11/2020 | 696 | 1020 | 106 | 351 | 68.8 | 1940 | 3930 | 15.6 | 84.4 | 0.182 | 0.003 | 0.17 |

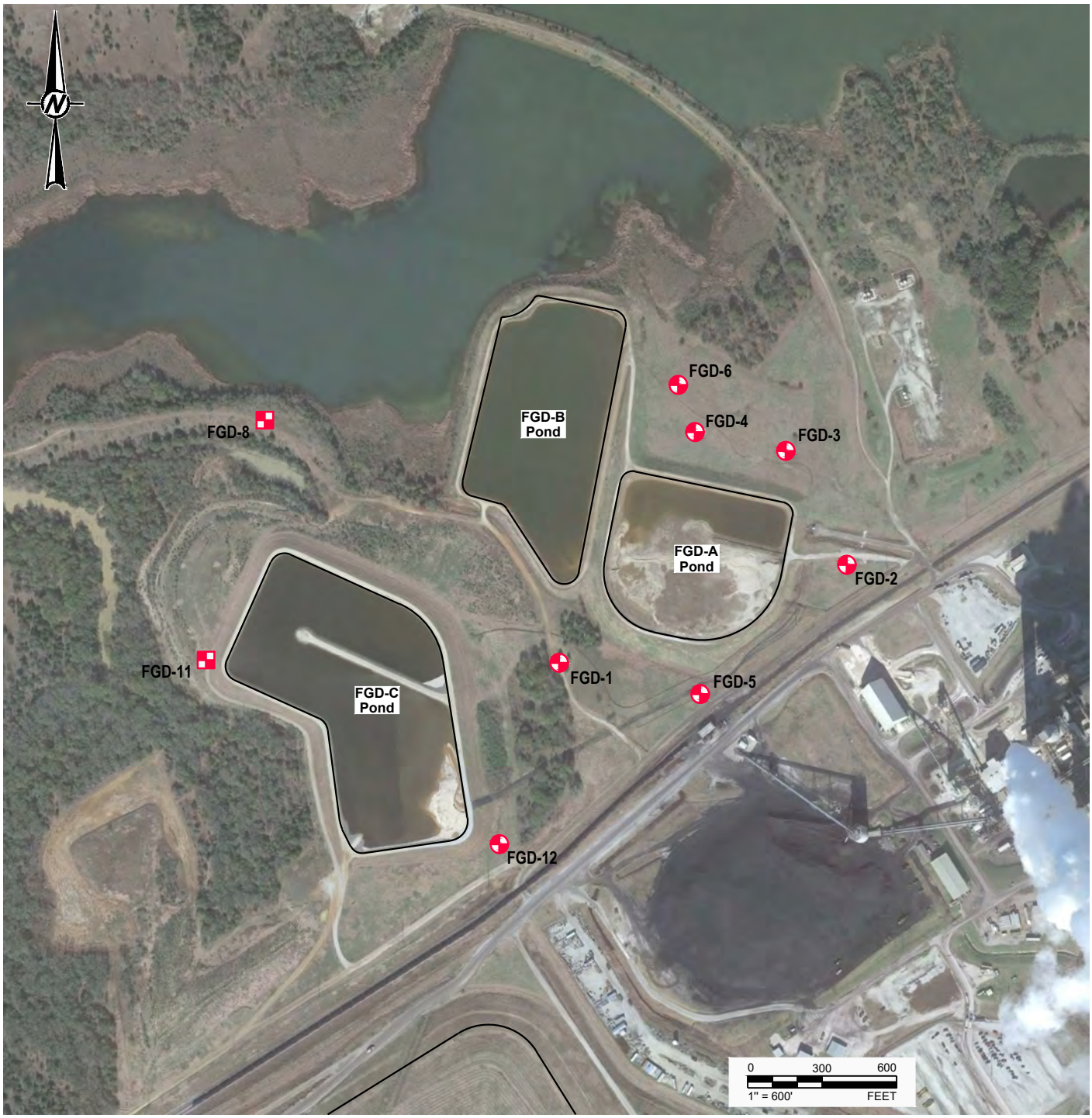
Notes:
mg/L - milligrams per liter
SU - standard units
J -estimated value

**Table 1**
**Analytical Results**
**Groundwater and Pond Samples**
**Oak Grove Steam Electric Station FGD Pond Area**

| Sample Location | Sample Date | Iron (Fe3+) mg/L | Iron (Fe2+) mg/L | Selenium mg/L | Nitrate-N mg/L | Phosphorus mg/L | pH SU | Eh mV | TDS mg/L |
|---|---|---|---|---|---|---|---|---|---|
| FGD-1 | 5/16/2019 | 0.186 | 0.05 | 0.002 | 0.1 | 0.473 | 6.63 | -32 | 320 |
| FGD-2 | 5/16/2019 | 0.0799 | 0.05 | 0.0214 | 1.54 | 0.237 | 6.86 | -91 | 729 |
| FGD-3 | 5/16/2019 | 0.126 | 0.05 | 0.0423 | 1.41 | 0.096 | 6.73 | -56 | 1100 |
| FGD-4 | 5/16/2019 | 0.103 | 0.05 | 0.002 | 0.1 | 0.251 | 6.57 | -41 | 651 |
| FGD-5 | 5/16/2019 | 0.05 | 0.05 | 0.002 | 0.859 | 0.176 | 6.46 | -31 | 801 |
| FGD-6 | 5/16/2019 | 4.86 | 0.05 | 0.002 | 0.1 | 0.714 | 6.85 | -28 | 710 |
| FGD-8 | 5/16/2019 | 61 | 202 | 0.00274 | 0.107 | 0.219 | 6.67 | -42 | 3970 |
| FGD-11 | 5/16/2019 | 1.28 | 0.05 | 0.002 | 0.1 | 0.2 | 6.83 | -48 | 1350 |
| FGD-12 | 5/16/2019 | 0.425 | 0.05 | 0.002 | 1.42 | 0.168 | 6.52 | -19 | 140 |
| FGD-A-POND | 6/6/2019 | 0.05 | 0.05 | 1.3 | 1.87 | 0.03 | 6.52 | -- | 7410 |
| FGD-B-POND | 6/6/2019 | 0.00427 | 0.05 | 1.2 | 3.24 | 0.03 | 6.57 | -- | 7240 |
| FGD-1 | 5/11/2020 | 0.732 | 0.358 | 0.002 | 0.1 | 0.37 | 6.95 | -55 | 448 |
| FGD-2 | 5/11/2020 | 0.0636 | 0.05 | 0.0208 | 2.52 | 0.052 | 6.61 | -27 | 2300 |
| FGD-3 | 5/11/2020 | 0.05 | 0.05 | 0.00993 | 0.535 | 0.053 | 6.62 | 16 | 777 |
| FGD-4 | 5/11/2020 | 0.12 | 0.05 | 0.002 | 0.1 | 0.139 | 6.62 | -46 | 702 |
| FGD-5 | 5/11/2020 | 0.05 | 0.05 | 0.002 | 0.563 | 0.03 | 6.82 | -15 | 836 |
| FGD-6 | 5/11/2020 | 0.582 | 0.05 | 0.002 | 0.129 | 0.076 | 6.75 | -17 | 746 |
| FGD-8 | 5/11/2020 | 68 | 152 | 0.0021 | 1.64 | 0.03 | 6.69 | -14 | 4090 |
| FGD-11 | 5/11/2020 | 0.225 | 0.05 | 0.002 | 0.1 | 0.064 | 6.74 | -45 | 1300 |
| FGD-12 | 5/11/2020 | 32.5 | 0.05 | 0.00678 | 1.22 | 0.056 | 6.59 | -33 | 198 |
| FGD-A-POND | 5/11/2020 | 0.15 | 0.05 | 4.71 | 6.27 | 0.03 | 6.59 | -- | 13200 |
| FGD-B-POND | 5/11/2020 | 0.17 | 0.05 | 0.681 | 2.23 | 0.03 | 6.64 | -- | 8890 |

Notes:
mg/L - milligrams per liter
SU - standard units
J -estimated value

# Exhibits




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**SITE LOCATION MAP**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 19122262 | REV. 0 | EXHIBIT 1



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Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (FGD Pond Area).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

**LEGEND**

- CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL
- CCR DELINEATION WELL
- (410.06) GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
- 400 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 1 FT)

**NOTE(S)**

1. NATURE AND EXTENT DELINEATION IS NOT NECESSARY BASED ON THE UPDATED STATISTICAL EVALUATION.

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**FGD PONDS**
**POTENTIOMETRIC SURFACE MAP**
**MAY 2020**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-09-30 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | EXHIBIT |
|---|---|---|
| 19134019 | 0 | 2 |

APPENDIX F Revision 1 November 21, 2022

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Path: \\texarkanadata\Projects - Round Rock_2019\19134019 - Luminant\PRODUCTION\1 - Oak Grove\ | File Name: FIG X - FGD Ponds POT Surface Map (May 2020).dwg

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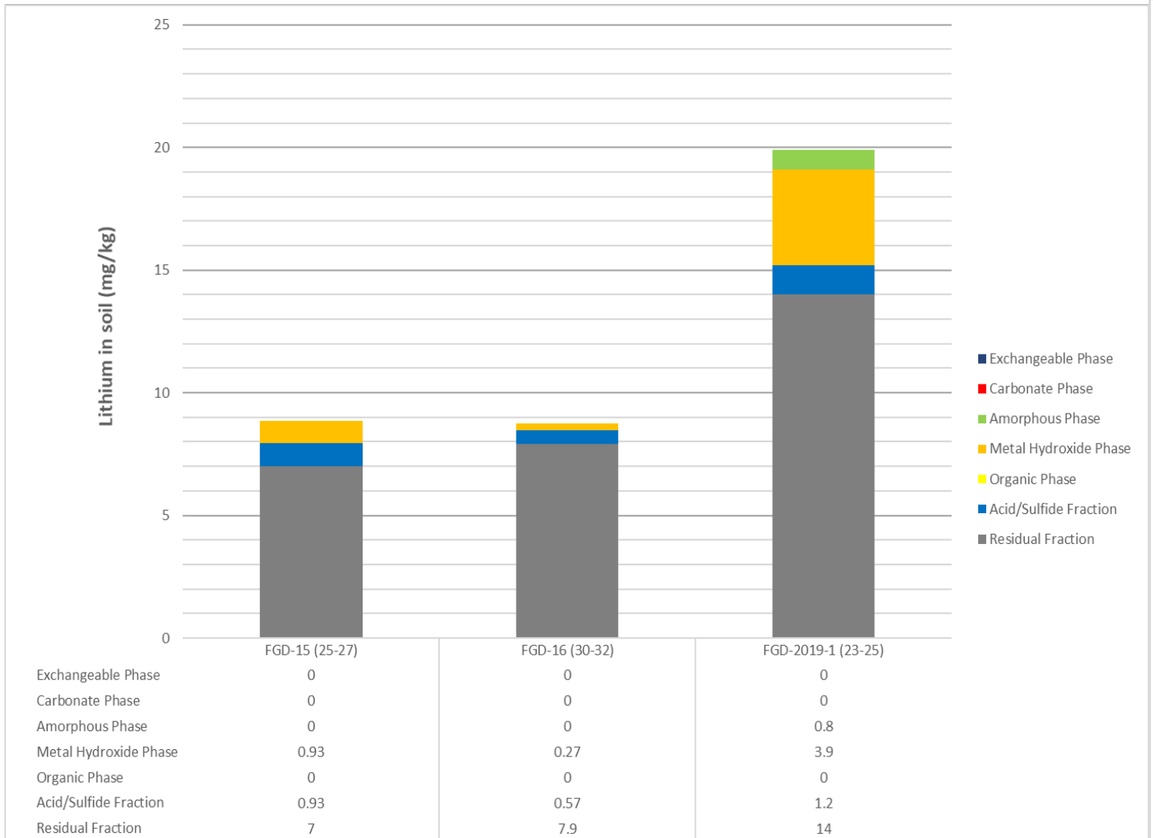
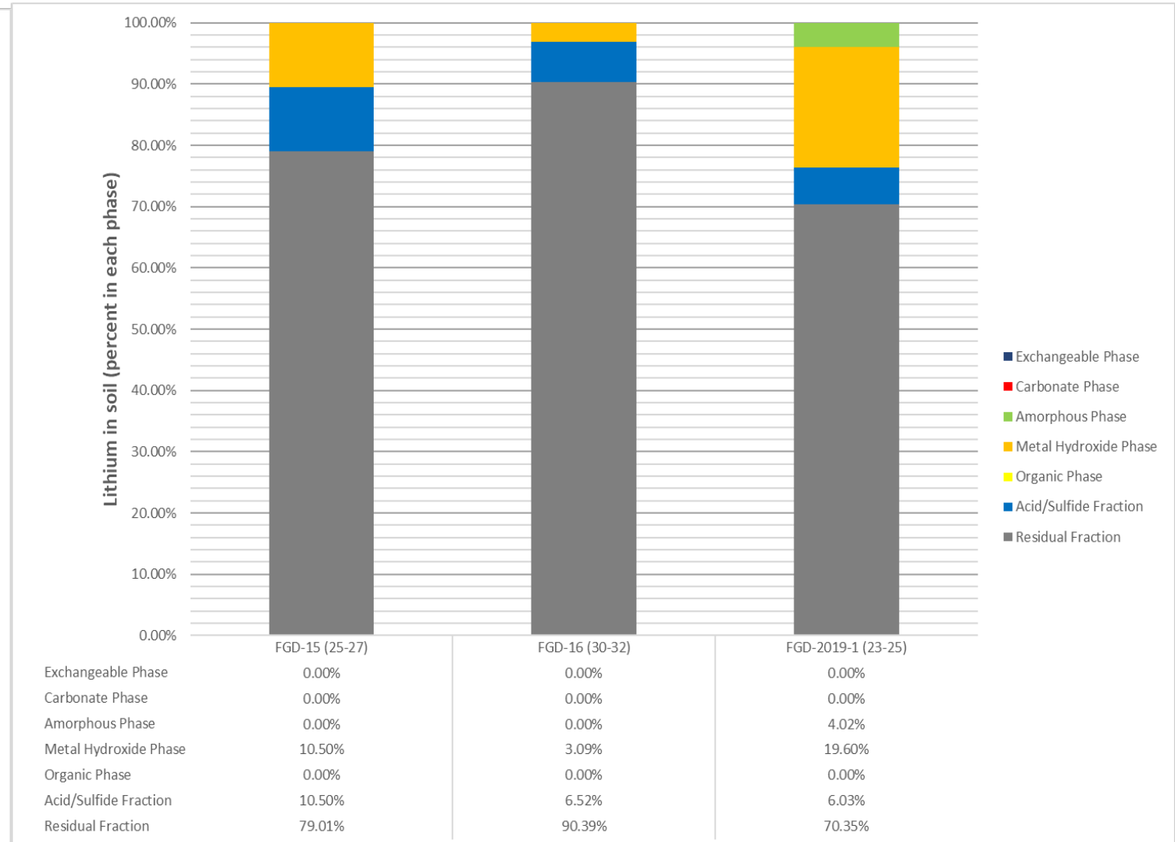
**APPENDIX A**

# Sequential Extraction Results




| | FGD-15 (25-27) | FGD-16 (30-32) | FGD-2019-1 (23-25) |
|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 |
| Carbonate Phase | 0 | 0 | 0 |
| Amorphous Phase | 0 | 0 | 0.8 |
| Metal Hydroxide Phase | 0.93 | 0.27 | 3.9 |
| Organic Phase | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 0.93 | 0.57 | 1.2 |
| Residual Fraction | 7 | 7.9 | 14 |

Borehole and depth below ground surface (Lithium in mg/kg soil)




| | FGD-15 (25-27) | FGD-16 (30-32) | FGD-2019-1 (23-25) |
|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 0.00% | 0.00% | 4.02% |
| Metal Hydroxide Phase | 10.50% | 3.09% | 19.60% |
| Organic Phase | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 10.50% | 6.52% | 6.03% |
| Residual Fraction | 79.01% | 90.39% | 70.35% |

Borehole and depth below ground surface (Lithium in percent of total)

CLIENT
LUMINANT OAK GROVE SES
FGD POND AREA

CONSULTANT
GOLDER

PROJECT
ASSESSMENT OF CORRECTIVE MEASURES
GEOCHEMICAL ASSESSMENT

TITLE
SEQUENTIAL EXTRACTION

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19134019 | 1000 | A | |

golder.com

# 2021 Annual Groundwater Monitoring and Corrective Action Report - Revision 1

*Oak Grove Steam Electric Station FGD Ponds - Robertson County, Texas*

Prepared for:

**Oak Grove Management Company LLC**

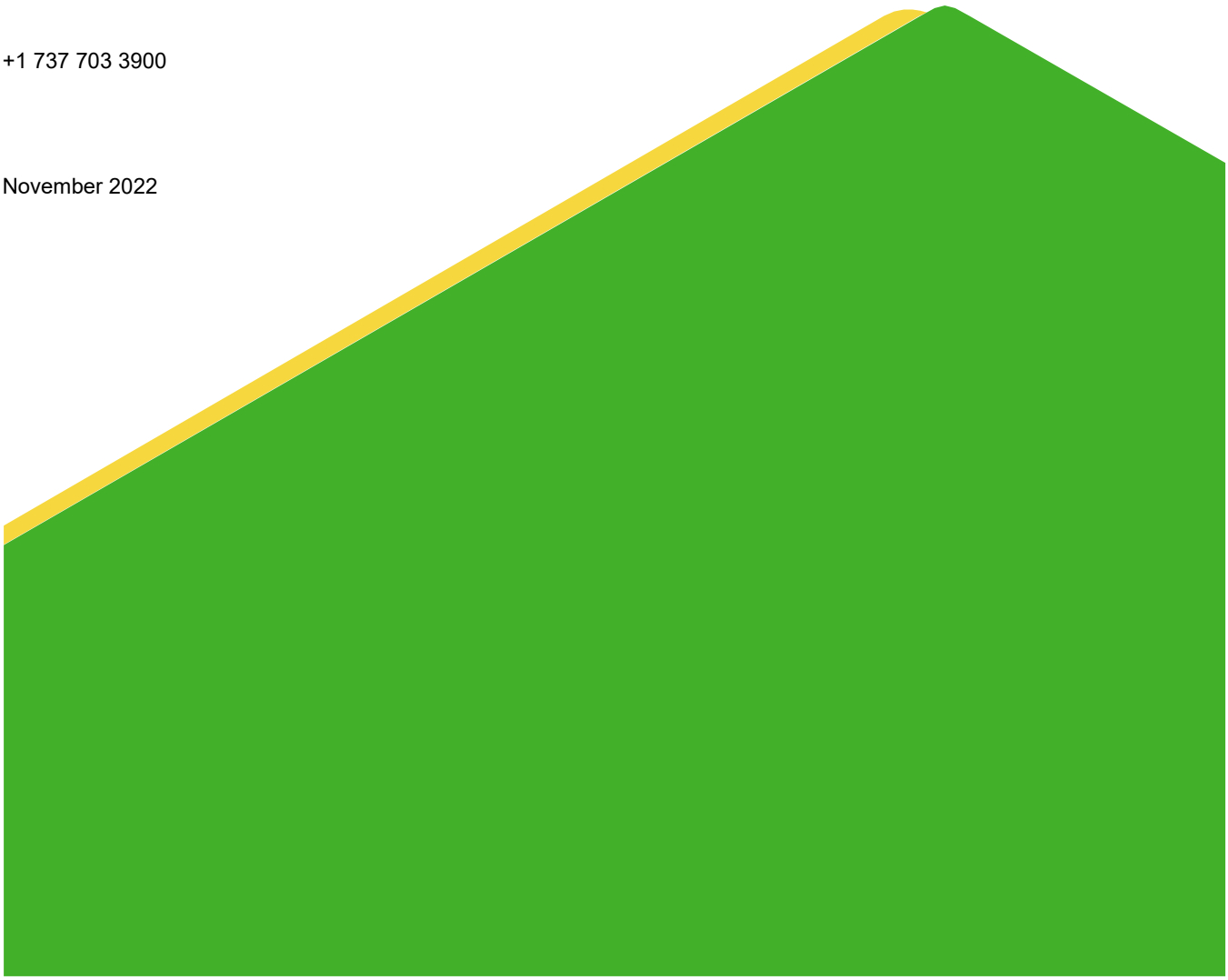
Submitted by:

**Golder Associates Inc., Member of WSP**

1601 S. Mopac Expy, Suite 325D, Austin, Texas, USA 78746

+1 737 703 3900

November 2022



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Attachment 2 Alternate Source Demonstration Report

Attachment 3 2021 Appendix IV Confidence Interval Graphs

Attachment 4 2021 Groundwater Potentiometric Surface Maps

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ASD | Alternate Source Demonstration |
| CCR | Coal Combustion Residuals |
| C.F.R. | Code of Federal Regulations |
| GWPS | Groundwater Protection Standard |
| MCL | Maximum Concentration Level |
| mg/L | Milligrams per Liter |
| MNA | Monitored Natural Attenuation |
| NA | Not Applicable |
| OGSES | Oak Grove Steam Electric Station |
| SSI | Statistically Significant Increase |
| SSL | Statistically Significant Level |
| T.A.C. | Texas Administrative Code |
| USEPA | United States Environmental Protection Agency |

# DOCUMENT REVISION RECORD

| Issue No. | Date | Details of Revisions |
|---|---|---|
| **Revision 0** | January 31, 2022 | Original Document |
| **Revision 1** | November 2022 | Added laboratory analytical reports, documentation on statistical evaluation of Appendix IV groundwater data, groundwater potentiometric surface maps, and professional seals to figures where applicable |

# EXECUTIVE SUMMARY

Golder Associates USA Inc. (Golder), Member of WSP, has prepared this report on behalf of Oak Grove Management Company LLC (Luminant) to satisfy the 2021 annual groundwater monitoring and corrective action reporting requirements of 40 C.F.R. Part 257 and 30 T.A.C. Chapter 352 for the FGD Ponds at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas. The CCR units and CCR monitoring well network are shown on Figure 1.

At the beginning and end of the 2021 reporting period, the CCR units were operating under an Assessment Monitoring Program as described in §257.95. The Assessment Monitoring Program was established on July 16, 2018. Concentrations of Appendix IV constituents at statistically significant levels (SSLs) above groundwater protection standards (GWPSs) were initially identified in January 2019 for cobalt and lithium. Notification of these SSLs was placed in the operating record on February 6, 2019 and was subsequently placed on the public website in accordance with §257.107(d). An Assessment of Corrective Measures (ACM) was initiated on April 8, 2019 pursuant to §257.95(g) and was completed on September 5, 2019. A public meeting was held on October 29, 2019 at the Pridgeon Center in Franklin, Texas to discuss the results of the ACM in accordance with § 257.96(e). The ACM evaluated various source control and groundwater response technologies to address the cobalt and lithium SSLs. An Alternate Source Demonstration (ASD) was completed in accordance with § 257.95(g)(3)(ii) in October 2020 (Golder 2020), which indicated that a source other than the FGD Ponds caused the SSLs for lithium. The ACM was updated in May 2021 (Golder 2021a) to remove lithium from the list of constituents evaluated in the ACM. In addition, updated statistical analyses for cobalt that incorporated assessment monitoring data collected from 2019 to 2021 indicate that cobalt is no longer present at SSLs above the GWPS; however, for the purposes of the ACM and remedy selection, Luminant continued to evaluate potential groundwater remedies for cobalt based on the 2018 SSL to address potential cobalt SSLs that may occur in the future.

A Remedy Selection Report (Golder 2022) was completed in January 2022 in accordance with the requirements of §257.97. Monitored natural attenuation (MNA) with source control measures was selected as the remedy to address the Appendix IV constituents observed at SSLs. A Site-specific feasibility study to evaluate MNA as a potential groundwater remedy for the Appendix IV constituents observed at SSLs was performed in accordance with guidance and best practices promulgated by the USEPA (USEPA 2007a and 2007b) and Interstate Technology and Regulatory Council (ITRC 2010). Summary reports documenting the MNA feasibility study were included as attachments to the Remedy Selection Report.

# 1.0 INTRODUCTION

The CCR Rule (40 C.F.R. 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the United States Environmental Protection Agency (USEPA) to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. TCEQ has adopted portions of the federal CCR rule at 30 TAC Chapter 352 (Texas CCR Rule), and USEPA published its final approval of the Texas CCR rule on June 28, 2021. *See* 86 Fed. Reg. 33,892 (June 28, 2021). The Texas CCR Rule became effective on July 28, 2021, and it adopts and incorporates by reference the requirements for the annual groundwater monitoring report located at § 257.90. *See* 30 TAC § 352.901. It further adopts and incorporates by reference the Federal CCR Program requirements for detection and assessment monitoring in 30 TAC §352.941 and 30 TAC §352.951, respectively. Pursuant to 30 TAC § 352.902, this report will be submitted to TCEQ for review no later than 30 days after the report has been placed in the facility's operating record. For existing CCR landfills and surface impoundments, the CCR Rule requires that the owner or operator prepare an annual groundwater monitoring and corrective action report to document the status of the groundwater monitoring and corrective action program for the CCR unit for the previous calendar year. Per §257.90(e) of the CCR Rule, the report should contain the following information, to the extent available:

(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

(4) A narrative discussion of any transition between monitoring programs (*e.g.,* the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

(6) A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:

(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95;

(iii) If it was determined that there was a statistically significant increase over background for one or more constituents listed in appendix III to this part pursuant to § 257.94(e):

(A) Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase; and

(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.

(iv) If it was determined that there was a SSL above the groundwater protection standard for one or more constituents listed in appendix IV to this part pursuant to § 257.95(g) include all of the following:

(A) Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase;

(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;

(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and

(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.

(v) Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection; and

(vi) Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.

## 2.0 MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

Golder collected the initial Detection Monitoring Program groundwater samples from the FGD Ponds CCR monitoring well network in October 2017. The evaluation of those data was completed in 2018 using procedures described in the Statistical Analysis Plan (PBW, 2017) to identify statistically significant increases (SSIs) of Appendix III parameters over background concentrations. The Detection Monitoring Program sampling dates and parameters are summarized in the following table:

**Detection Monitoring Program Summary**

| Sampling Dates | Parameters | SSIs | Assessment Monitoring Program Established |
|---|---|---|---|
| October 3, 2017 | Appendix III | Yes | July 16, 2018 |

Alternate source evaluations were inconclusive for one or more of the SSIs. Consequently, an Assessment Monitoring Program was initiated and established for the FGD Pond CCR units in 2018 in accordance with §257.94(e)(2). Golder collected the initial Assessment Monitoring Program groundwater samples in June 2018. Subsequent Assessment Monitoring Program sampling events have been conducted on a semi-annual basis, as required by the CCR Rule.

The statistical background prediction limits used to assess Appendix III data and the GWPSs used to assess Appendix IV data are summarized in Tables 1 and 2, respectively. Appendix III and Appendix IV analytical data are summarized in Tables 3 and 4, respectively, and the laboratory analytical reports are provided in Attachment 1. The initial assessment monitoring event was conducted in June 2018 and a subsequent semi-annual assessment monitoring event was conducted in September 2018 in accordance with §257.95(a) and §257.95(d). Using the Appendix IV data collected during the assessment monitoring period through September 2018, SSLs above GWPSs were initially identified in January 2019 for cobalt and lithium. Notification of these SSLs was placed in the operating record on February 6, 2019 and was subsequently placed on the public website in accordance with §257.107(d). An ACM was initiated on April 8, 2019 pursuant to §257.95(g). A justification letter for a 60-day extension due to site-specific circumstances that delayed work on the ACM was certified on July 3, 2019 in accordance with §257.96(a). A copy of the extension justification letter was provided in the 2019 Annual Groundwater Monitoring and Corrective Action Report. The ACM was completed in September 2019 (Golder 2019) for the parameters detected at SSLs above GWPSs during the 2018 Assessment Monitoring period (cobalt and lithium), pursuant to §257.96.

Additional semi-annual Assessment Monitoring events were conducted in 2019 through 2021. Statistical analysis of the 2019 through 2021 data was performed in accordance with the USEPA Statistical Analysis of Groundwater

Monitoring Data at RCRA Facilities-Unified Guidance (USEPA 2009). The statistical analysis included an evaluation of confidence intervals for each of the Appendix IV parameter data sets to evaluate whether constituent concentrations were present at concentrations above GWPSs. There were no Appendix IV parameters identified at SSLs above GWPSs during the 2019 Assessment Monitoring period; however, an SSL for lithium was identified at one well (FGD-5) during the 2020 and 2021 sampling events. An Alternate Source Demonstration (ASD) was completed in October 2020, which indicated that a source other than the CCR units caused the lithium SSLs at FGD-5. A copy of the ASD is presented in Attachment 2 of this report as required by §257.94(e)(2). Assessment monitoring data collected from 2019 to 2021 indicate that cobalt is no longer present at SSLs above the GWPS. Graphical representations of the statistical analysis performed on the 2021 data are provided in Attachment 3. The following table provides a summary of the Assessment Monitoring Program sampling events:

**Assessment Monitoring Program Summary**

| Sampling Dates | Analytical Data Receipt Date | Parameters Collected | SSL(s) | SSL(s) Determination Date | Alternate Source Demonstration | Corrective Measures Assessment Initiated |
|---|---|---|---|---|---|---|
| June 4-5, 2018 | July 11, 2018 | Appendix III Appendix IV | NA | NA | NA | NA |
| September 5-6, 2018 | October 11, 2018 | Appendix III Appendix IV | Co and Li | January 7, 2019 | No | April 8, 2019 |
| May 16, 2019 | June 5, 2019 | Appendix III Appendix IV | None | NA | NA | NA |
| August 19, 2019 | September 25, 2019 | Appendix III Appendix IV | None | NA | NA | NA |
| May 6-11, 2020 | June 12, 2020 | Appendix III Appendix IV | Li | July 22, 2020 | October 20, 2020 | NA |
| September 10-15, 2020 | October 12, 2020 | Appendix III Appendix IV | Li | December 7, 2020 | Previous ASD applies | NA |
| June 16-17, 2021 | July 22, 2021 | Appendix III Appendix IV | Li | July 22, 2021 | Previous ASD applies | NA |
| October 11-12, 2021 | November 19, 2021 | Appendix III Appendix IV | Li | January 10, 2022 | Previous ASD applies | NA |

Notes:
NA: Not Applicable

# 3.0 KEY ACTIONS COMPLETED IN 2021

Assessment Monitoring Program groundwater monitoring events were conducted in June and October 2021. The number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and the analytical results for the groundwater samples are summarized in Table 3 (Appendix III parameters) and Table 4 (Appendix IV parameters). A map showing the CCR units and monitoring wells is provided as Figure 1. No wells were installed or decommissioned in 2021.

Water elevations measured in the CCR wells during the semi-annual groundwater sampling events were used to develop groundwater potentiometric surface maps, which are presented in Attachment 4. The inferred direction of groundwater flow was generally to the northeast during both semi-annual ground sampling events in 2021.

Lithium SSLs were observed in samples from monitoring well FGD-5 in 2021 like in previous years. An ASD has been completed which indicates that a source other than the CCR units is responsible for the lithium SSLs at FGD-5. A copy of the ASD is presented in Attachment 2.

Updated statistical analyses for cobalt that incorporated assessment monitoring data collected through 2021 indicate that cobalt is no longer present at SSLs above the GWPS; however, for the purposes of the ACM and remedy selection, Luminant continued to evaluate potential groundwater remedies for cobalt based on the 2018 SSL to address potential cobalt SSLs that may occur in the future. A Remedy Selection Report (Golder 2022) was completed in January 2022 in accordance with the requirements of §257.97. MNA with source control measures was selected as the remedy to address the Appendix IV constituents observed at SSLs. A Site-specific feasibility study to evaluate MNA as a potential groundwater remedy for the Appendix IV constituents observed at SSLs was performed in accordance with guidance and best practices promulgated by the USEPA (USEPA 2007a and 2007b) and ITRC (ITRC 2010). Summary reports documenting the MNA feasibility study were included as attachments to the Remedy Selection Report.

As previously noted, cobalt is not currently present at SSLs at the FGD Ponds; therefore, implementation of an MNA program or other remedy option is not currently necessary. Cobalt concentrations in groundwater will continue to be monitored in accordance with the CCR rule to confirm that cobalt concentrations remain below the GWPS. An MNA program will be implemented to address cobalt SSLs or SSLs for other constituents if they are identified in future.

# 4.0 PROBLEMS ENCOUNTERED AND ACTIONS TO RESOLVE THE PROBLEMS

No problems were encountered with the CCR groundwater monitoring program in 2021.

# 5.0 KEY ACTIVITIES PLANNED FOR 2022

The following key activities are planned for 2022:

- Luminant submitted a registration application to TCEQ under the Texas CCR Rule for the Oak Grove FGD Ponds on January 24, 2022.

- Continue the Assessment Monitoring Program in accordance with applicable provisions of §257.95 and 30 T.A.C. §352.951.

# 6.0 REFERENCES

Golder, 2019. CCR Assessment of Corrective Measures, Oak Grove Steam Electric Station – FGD Ponds, Robertson County, Texas. September.

Golder, 2021. CCR Assessment of Corrective Measures, Revision 1, Oak Grove Steam Electric Station – FGD Ponds, Robertson County, Texas. May.

Golder, 2022. Remedy Selection Report, Oak Grove Steam Electric Station – FGD Ponds, Robertson County, Texas. January 18.

Interstate Technology and Regulatory Council (ITRC), 2010. A Decision Framework for Applying Monitored Natural Attenuation Processes to Metals and Radionuclides in Groundwater. Technical/Regulatory Guidance, December 2010.

Pastor, Behling & Wheeler, LLC, 2017. Coal Combustion Residual Rule Statistical Analysis Plan, Oak Grove Steam Electric Station, FGD Pond Area, Robertson County, Texas.

USEPA, 2007a. Monitored Natural Attenuation of Inorganic Contaminants in Ground Water. Volume 1. Technical Basis for Assessment. EPA/600/R-07/139.

USEPA, 2007b. Monitored Natural Attenuation of Inorganic Contaminants in Ground Water. Volume 2. Assessment for Non-Radionuclides Including Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Nitrate, Perchlorate, and Selenium. EPA/600/R-07/140.

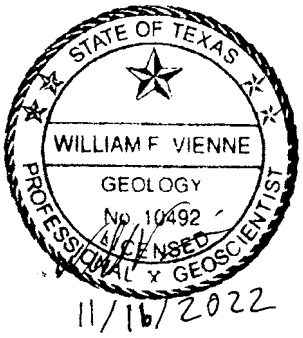
USEPA, 2009. Unified Guidance Document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, EPA 530-R-09-007, March 2009.

# Signature Page

**Golder Associates Inc.**

Patrick J. Behliong
*Principal Engineer*

William F. Vienne
*Senior Hydrogeologist*

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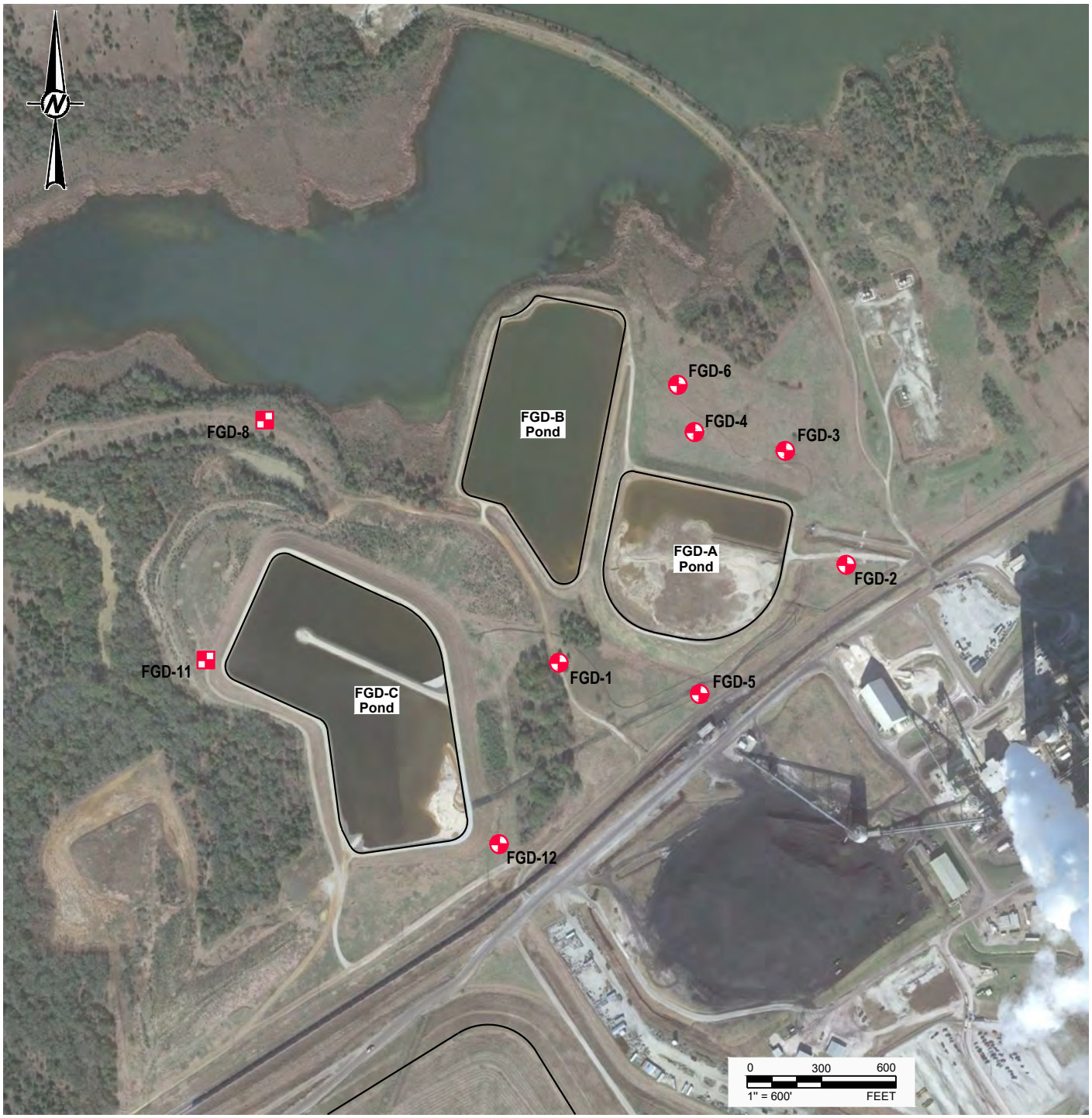
# FIGURES




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL

**REFERENCE(S)**
BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**DETAILED SITE PLAN - FGD POND AREA**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 19122262 | 0 | 1 |



Last Edited By: adiamond Date: 2020-01-23 Time:9:34:07 AM | Printed By: adiamond Date: 2020-01-23 Time:9:34:57 AM
Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (FGD Pond Area).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

# TABLES

**Table 1**
**Statistical Background Values**
**OGSES FGD Ponds**

| Parameter | Statistical Background Value |
|---|---|
| Boron (mg/L) | 0.141 |
| Calcium (mg/L) | 471 |
| Chloride (mg/L) | 6,340 |
| Fluoride (mg/L) | 0.781 |
| field pH (s.u.) | 6.10<br>7.23 |
| Sulfate (mg/L) | 409 |
| Total Dissolved Solids (mg/L) | 13,000 |

**Table 2**
**Groundwater Protection Standards**
**OGSES FGD Ponds**

| Parameter | Groundwater Protection Standard |
|---|---|
| Antimony (mg/L) | 0.006 |
| Arsenic (mg/L) | 0.0146 |
| Barium (mg/L) | 2 |
| Beryllium (mg/L) | 0.004 |
| Cadmium (mg/L) | 0.005 |
| Chromium (mg/L) | 0.1 |
| Cobalt (mg/L) | 0.0158 |
| Fluoride (mg/L) | 4 |
| Lead (mg/L) | 0.015 |
| Lithium (mg/L) | 0.149 |
| Mercury (mg/L) | 0.002 |
| Molybdenum (mg/L) | 0.1 |
| Selenium (mg/L) | 0.05 |
| Thallium (mg/L) | 0.002 |
| Radium 226+228 (pCi/L) | 11.2 |

**TABLE 3**
**APPENDIX III ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | F (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| **Upgradient Wells** | | | | | | | | |
| FGD-8 | 11/04/15 | 0.0843 | 69.2 | 271 | 0.173 J | 6.92 | 24.4 | 803 |
| | 12/17/15 | 0.0791 | 65.2 | 248 | 0.361 J | 6.67 | 50.1 | 721 |
| | 02/09/16 | 0.0721 | 296 | 1,910 | 0.331 J | 6.14 | 110 | 5,100 |
| | 04/14/16 | 0.0805 | 323 | 1,920 | 0.218 | 6.39 | 68 | 6,210 |
| | 06/14/16 | 0.0869 | 336 | 2,070 | <0.100 | 6.57 | 476 | 6,130 |
| | 08/24/16 | 0.119 | 21.1 | 107 | 0.186 J | 6.92 | 41.6 | 400 |
| | 10/05/16 | 0.0794 | 394 | 1,890 | 0.413 | 6.68 | 184 | 4,470 |
| | 12/23/16 | 0.069 | 340 | 1,990 | <0.100 | 6.83 | 144 | 4,330 |
| | 10/03/17 | 0.1 | 378 | 1,140 | <0.100 | 6.83 | 9.72 | 2,550 |
| | 06/05/18 | 0.0826 | 409 | 2,180 | <0.100 | 6.12 | 538 | 4,450 |
| | 09/06/18 | 0.635 | 395 | 2,330 | 0.362 J | 5.93 | 670 | 4,910 |
| | 05/16/19 | 0.0687 | 314 | 2,040 | <0.100 | 6.67 | 173 | 3,970 |
| | 08/19/19 | 0.0756 | 427 | 2,260 | <0.100 | 6.89 | 452 | 4,600 |
| | 05/11/20 | 0.129 | 381 | 2,240 | <0.100 | 6.69 | 188 | 4,090 |
| | 09/09/20 | 0.101 | 329 | 2,220 | <0.100 | 6.87 | 58.9 | 3,890 |
| | 06/17/21 | 0.0816 | 353 | 2,230 | <0.100 | 6.82 | 310 | 4,870 |
| | 10/11/21 | 0.0779 | 362 | 2,040 | <0.100 | 6.49 | 63.9 | 3,790 |
| FGD-11 | 11/04/15 | 0.048 | 9.57 | 15 | <0.100 | 6.58 | 9.96 | 145 |
| | 12/17/15 | 0.0544 | 10.7 | 9.85 | 0.13 J | 6.74 | 11 | 115 |
| | 02/09/16 | 0.0912 | 71.5 | 438 | 0.548 | 6.9 | 37.5 | 1,160 |
| | 04/14/16 | 0.0963 | 72.5 | 393 | 0.671 | 6.34 | 32.9 | 1,120 |
| | 06/15/16 | 0.0979 | 55.1 | 356 | 0.331 J | 6.57 | 32.4 | 900 |
| | 08/25/16 | 0.103 | 154 | 759 | 0.128 J | 6.76 | 68.8 | 1,960 |
| | 10/04/16 | 0.127 | 181 | 894 | 0.579 | 6.78 | 71.8 | 2,130 |
| | 12/22/16 | 0.125 | 201 | 1,150 | 0.127 J | 6.85 | 89.5 | 2,870 |
| | 10/03/17 | 0.155 | 254 | 1,830 | <0.100 | 6.85 | 142 | 4,010 |
| | 06/05/18 | 0.162 | 170 | 954 | 0.836 | 6.28 | 82.2 | 2,240 |
| | 09/06/18 | 0.149 | 194 | 1,140 | 1.09 | 6.43 | 93.9 | 2,770 |
| | 05/16/19 | 0.108 | 85 | 566 | 0.38 J | 6.83 | 50.9 | 1,350 |
| | 08/19/19 | 0.12 | 92.5 | 535 | 0.63 | 6.71 | 44.7 | 1,430 |
| | 05/11/20 | 0.166 | 103 | 560 | 0.365 J | 6.74 | 43.3 | 1,300 |
| | 09/09/20 | 0.242 | 101 | 573 | 0.575 | 6.79 | 44.0 | 1,320 |
| | 06/17/21 | 0.116 | 90.4 | 440 | 0.471 | 6.72 | 33.8 | 1,160 |
| | 10/11/21 | 0.124 | 81.8 | 376 | 0.453 | 6.73 | 35.2 | 1,040 |
| **Downgradient Wells** | | | | | | | | |
| FGD-1 | 11/03/15 | 0.065 | 11 | 36.4 | 0.363 J | 6.31 | 32 | 245 |
| | 12/17/15 | 0.0706 | 10.6 | 37.7 | 0.384 J | 6.33 | 33.3 | 224 |
| | 02/09/16 | 0.0539 | 11.4 | 38.9 | 0.383 J | 6.81 | 36.3 | 235 |
| | 04/14/16 | 0.0867 | 12.2 | 38.6 | 0.229 | 6.24 | 35.7 | 77 |
| | 06/15/16 | 0.066 | 12 | 39 | 0.302 J | 6.75 | 41.2 | 258 |
| | 08/24/16 | 0.0601 | 13.5 | 42.1 | 0.225 J | 6.58 | 46.6 | 193 |
| | 10/05/16 | 0.0629 | 14.2 | 38.7 | 0.483 | 6.78 | 44.2 | 266 |
| | 12/22/16 | 0.058 | 13.7 | 42.6 | 0.326 J | 5.79 | 49.3 | 271 |
| | 10/03/17 | 0.0973 | 18.5 | 40 | 0.276 J | 6.91 | 64.7 | 239 |
| | 06/05/18 | 0.0686 | 18.3 | 44.7 | 0.206 J | 5.58 | 68.6 | 277 |
| | 09/06/18 | 0.0738 | 19.9 | 52.5 | 0.228 J | 5.78 | 80.8 | 281 |
| | 05/15/19 | 0.0803 | 19.5 | 62.4 | 0.362 J | 6.63 | 78.7 | 320 |
| | 08/19/19 | 0.0864 | 26.1 | 69.3 | 0.486 | 6.49 | 80.9 | 328 |
| | 05/11/20 | 0.121 | 37.8 | 146 | 0.231 J | 6.95 | 79.5 | 448 |
| | 09/09/20 | 0.0871 | 36.0 | 320 | 0.215 J | 6.73 | 158 | 875 |
| | 06/17/21 | 0.0843 | 35.7 | 299 | 0.356 J | 6.89 | 140 | 935 |
| | 6/17/21 DUP | 0.0808 | 35.7 | 304 | 0.352 J | 6.79 | 143 | 960 |
| | 10/12/21 | 0.103 | 31.9 | 244 | 0.295 J | 6.72 | 133 | 897 |

**TABLE 3**
**APPENDIX III ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | F (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| FGD-2 | 11/03/15 | 0.1 | 77.1 | 460 | 0.224 J | 6.47 | 147 | 1,370 |
| | 12/17/15 | 0.0636 | 24.8 | 133 | 0.347 J | 6.77 | 53.2 | 515 |
| | 02/09/16 | 0.0885 | 44.6 | 250 | 0.315 J | 7.06 | 98.9 | 750 |
| | 04/14/16 | 0.136 | 53.8 | 285 | 0.192 | 6.54 | 103 | 924 |
| | 06/14/16 | 0.0729 | 26.8 | 138 | 0.122 J | 6.73 | 62.2 | 564 |
| | 08/24/16 | 0.219 | 79.9 | 421 | <0.100 | 6.75 | 158 | 1,060 |
| | 10/05/16 | 0.182 | 58.3 | 310 | 0.243 J | 6.76 | 114 | 910 |
| | 12/22/16 | 0.251 | 95.3 | 570 | <0.100 | 6.70 | 174 | 1,450 |
| | 10/03/17 | 0.362 | 151 | 813 | <0.100 | 6.81 | 222 | 1,920 |
| | 06/05/18 | 0.352 | 91.6 | 465 | 0.185 J | 6.1 | 148 | 1,190 |
| | 09/06/18 | 0.35 | 154 | 902 | 0.32 J | 6.11 | 196 | 1,860 |
| | 05/16/19 | 0.105 | 38.9 | 260 | 0.383 J | 6.86 | 70.7 | 729 |
| | 08/19/19 | 0.192 | 167 | 863 | 0.413 | 6.88 | 218 | 1,890 |
| | 05/11/20 | 0.605 | 217 | 1,150 | <0.100 | 6.61 | 286 | 2,300 |
| | 09/09/20 | 0.567 | 193 | 1,030 | <0.100 | 6.57 | 301 | 2,150 |
| | 06/17/21 | 0.195 | 76.4 | 422 | <0.100 | 6.84 | 133 | 1,030 |
| | 10/12/21 | 0.473 | 245 | 950 | <0.100 | 6.57 | 467 | 2,630 |
| | 10/21/21 DUP | 0.492 | 249 | 921 | <0.100 | 6.57 | 477 | 2,460 |
| FGD-3 | 11/03/15 | 0.343 | 108 | 439 | 0.505 | 6.51 | 479 | 1,950 |
| | 12/17/15 | 0.255 | 109 | 399 | <0.100 | 6.64 | 478 | 1,640 |
| | 02/09/16 | 0.214 | 91.4 | 326 | 0.74 | 6.76 | 474 | 1,610 |
| | 04/14/16 | 0.231 | 98.1 | 314 | 0.69 | 6.59 | 396 | 1,980 |
| | 06/14/16 | 0.207 | 80.1 | 267 | 0.173 J | 6.59 | 338 | 1,440 |
| | 08/24/16 | 0.112 | 90.4 | 279 | 0.463 | 6.89 | 357 | 1,490 |
| | 10/05/16 | 0.212 | 88.1 | 264 | 0.723 | 6.85 | 324 | 1,370 |
| | 12/22/16 | 0.196 | 82.6 | 290 | 1.32 | 6.1 | 392 | 1,490 |
| | 10/03/17 | 0.244 | 97 | 245 | 0.457 | 6.75 | 317 | 1,190 |
| | 06/05/18 | 0.199 | 82.7 | 234 | 1.06 | 5.99 | 319 | 1,260 |
| | 09/05/18 | 0.0379 | 73.9 | 227 | 1.03 | 6.21 | 306 | 1,260 |
| | 05/16/19 | 0.117 | 60.1 | 117 | 0.776 | 6.73 | 182 | 1,100 |
| | 08/19/19 | 0.134 | 51.1 | 84.9 | 0.874 | 6.72 | 150 | 882 |
| | 05/06/20 | 0.152 | 42.3 | 70.2 | 0.8 | 6.62 | 129 | 777 |
| | 09/09/20 | 0.130 | 36.8 | 58.5 | 0.772 | 6.82 | 122 | 709 |
| | 06/16/21 | 0.121 | 39 | 64.1 | 1.2 | 6.87 | 130 | 741 |
| | 10/11/21 | 0.0956 | 35.3 | 42.5 | 1.08 | 6.69 | 105 | 671 |
| FGD-4 | 11/03/15 | 0.0694 | 46.1 | 200 | 0.294 J | 6.71 | 37.8 | 679 |
| | 12/17/15 | 0.0777 | 47.8 | 211 | 0.295 J | 6.44 | 38.2 | 647 |
| | 02/09/16 | 0.0581 | 45.3 | 195 | 0.32 J | 6.85 | 45 | 653 |
| | 04/14/16 | 0.0726 | 50.3 | 182 | 0.323 | 6.59 | 55.4 | 726 |
| | 06/14/16 | 0.0728 | 47.5 | 210 | <0.100 | 6.68 | 37.9 | 689 |
| | 08/24/16 | 0.343 | 52.5 | 208 | 0.148 J | 6.74 | 53.3 | 704 |
| | 10/05/16 | 0.0672 | 48.1 | 182 | 0.376 J | 6.85 | 56 | 672 |
| | 12/22/16 | 0.0628 | 44.5 | 181 | 0.251 J | 6.29 | 65.4 | 676 |
| | 10/03/17 | 0.225 | 54.9 | 182 | 0.219 J | 6.82 | 69.8 | 659 |
| | 06/05/18 | 0.0839 | 49.4 | 200 | 0.297 J | 6.15 | 46.6 | 648 |
| | 09/05/18 | 0.108 | 40.9 | 193 | 0.353 J | 6.29 | 55.8 | 672 |
| | 05/16/19 | 0.0733 | 41.7 | 205 | 0.327 J | 6.57 | 41.7 | 651 |
| | 08/19/19 | 0.085 | 42.5 | 188 | 0.67 | 6.69 | 5.4 | 681 |
| | 05/11/20 | 0.145 | 40.6 | 198 | 0.3 J | 6.62 | 52.9 | 702 |
| | 09/15/20 | 0.109 | 33.6 | 197 | <0.100 | 6.87 | 50.1 | 674 |
| | 06/16/21 | 0.0932 | 36.6 | 198 | 0.517 | 6.92 | 45.9 | 654 |
| | 10/11/21 | 0.0801 | 32.9 | 185 | 0.398 | 6.69 | 47.6 | 670 |

**TABLE 3**
**APPENDIX III ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | B (mg/L) | Ca (mg/L) | Cl (mg/L) | F (mg/L) | pH (s.u.) | $SO_4$ (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|
| FGD-5 | 11/04/15 | 0.0719 | 30.2 | 230 | 0.334 J | 6.92 | 54.7 | 1,040 |
| | 12/17/15 | 0.0798 | 32.5 | 254 | 0.333 J | 6.74 | 56.1 | 845 |
| | 02/09/16 | 0.0926 | 89.5 | 356 | 0.495 | 6.6 | 62.8 | 942 |
| | 04/14/16 | 0.107 | 101 | 359 | 0.491 | 6.71 | 50.8 | 1,510 |
| | 06/15/16 | 0.11 | 88.9 | 368 | 0.284 J | 6.73 | 55.1 | 735 |
| | 08/24/16 | 0.0394 | 102 | 372 | 0.168 J | 6.89 | 58.8 | 770 |
| | 10/05/16 | 0.0995 | 99.9 | 344 | 0.38 J | 6.92 | 57.3 | 1,260 |
| | 12/22/16 | 0.0982 | 90.6 | 301 | 0.291 J | 6.1 | 65.5 | 893 |
| | 10/03/17 | 0.211 | 100 | 309 | 0.211 J | 6.76 | 60.2 | 826 |
| | 06/05/18 | 0.11 | 100 | 303 | 0.511 | 6.13 | 61.2 | 795 |
| | 09/06/18 | 0.215 | 93.1 | 317 | 0.548 | 6.17 | 64.8 | 840 |
| | 05/16/19 | 0.108 | 77.7 | 287 | 0.579 | 6.46 | 67.2 | 801 |
| | 08/19/19 | 0.114 | 90.7 | 283 | 0.863 | 6.76 | 70.7 | 816 |
| | 05/11/20 | 0.165 | 100 | 307 | 0.413 | 6.82 | 83.8 | 836 |
| | 09/10/20 | 0.154 | 96.6 | 310 | 0.617 | 6.84 | 95.9 | 845 |
| | 06/17/21 | 0.116 | 103 | 308 | 0.593 | 6.84 | 107 | 795 |
| | 10/11/21 | 0.0957 | 114 | 290 | 0.459 | 6.53 | 107 | 898 |
| FGD-6 | 11/03/15 | 0.0968 | 79.3 | 355 | 0.227 J | 6.92 | 33.8 | 1,070 |
| | 12/17/15 | 0.103 | 89.9 | 342 | 0.469 | 6.52 | 65.9 | 940 |
| | 02/09/16 | 0.0791 | 31.8 | 252 | 0.354 J | 7.12 | 59.5 | 940 |
| | 04/14/16 | 0.0936 | 36.4 | 259 | 0.442 | 6.71 | 57.9 | 1,140 |
| | 06/14/16 | 0.0955 | 33.9 | 237 | <0.100 | 6.48 | 49.8 | 813 |
| | 08/24/16 | 0.0355 | 35.6 | 285 | 0.147 J | 6.95 | 64.7 | 750 |
| | 10/05/16 | 0.102 | 35.3 | 275 | 0.364 J | 6.94 | 60.2 | 1,010 |
| | 12/22/16 | 0.0847 | 35.6 | 286 | 0.204 J | 6.34 | 64.4 | 905 |
| | 10/03/17 | 0.139 | 40.4 | 255 | 0.143 J | 6.64 | 58.4 | 855 |
| | 06/05/18 | 0.0948 | 36.3 | 246 | 0.361 J | 6.35 | 51.7 | 895 |
| | 09/05/18 | 0.0824 | 30.4 | 230 | 0.405 | 6.4 | 51.4 | 833 |
| | 05/16/19 | 0.116 | 20.3 | 170 | 0.669 | 6.85 | 51.3 | 710 |
| | 08/19/19 | 0.102 | 23.6 | 158 | 0.741 | 6.72 | 60.3 | 754 |
| | 05/06/20 | 0.109 | 27.4 | 189 | 0.292 | 6.75 | 70.7 | 746 |
| | 09/15/20 | 0.112 | 20.2 | 144 | 0.354 J | 6.77 | 89.6 | 688 |
| | 06/16/21 | 0.0854 | 29 | 222 | 0.452 | 6.80 | 76.3 | 799 |
| | 10/11/21 | 0.105 | 19.1 | 130 | 0.616 | 6.57 | 73.2 | 656 |
| FGD-12 | 11/04/15 | 0.0651 | 16.6 | 19.4 | <0.100 | 6.68 | 20 | 217 |
| | 12/17/15 | 0.0671 | 13.2 | 15.5 | 0.159 J | 6.47 | 16.6 | 161 |
| | 02/09/16 | 0.065 | 11.1 | 13.5 | 0.157 J | 6.99 | 14.1 | 179 |
| | 04/14/16 | 0.0753 | 14.7 | 25.4 | 0.109 | 6.47 | 15.8 | 163 |
| | 06/15/16 | 0.0711 | 11.2 | 19.5 | 0.101 J | 6.52 | 13.4 | 253 |
| | 08/25/16 | 0.0858 | 52.8 | 296 | <0.100 | 6.86 | 33.8 | 817 |
| | 10/04/16 | 0.0682 | 12.5 | 17.8 | 0.129 J | 6.74 | 10.5 | 142 |
| | 12/23/16 | 0.0512 | 260 | 1,250 | 0.112 J | 6.95 | 174 | 3,270 |
| | 10/03/17 | 0.0731 | 10.4 | 10 | 0.154 J | 6.76 | 10.8 | 134 |
| | 06/05/18 | 0.0812 | 8.74 | 12 | 0.137 J | 6.37 | 13.7 | 196 |
| | 09/06/18 | 0.0698 | 6.78 | 14 | <0.100 | 5.60 | 13.1 | 134 |
| | 05/16/19 | 0.0723 | 6.79 | 16 | <0.100 | 6.52 | 15 | 140 |
| | 08/19/19 | 0.0794 | 10.5 | 16 | 0.145 J | 6.71 | 17.1 | 209 |
| | 05/11/20 | 0.149 | 15.6 | 19.3 | <0.100 | 6.59 | 19.9 | 198 |
| | 09/09/20 | 0.120 | 9.34 | 13.0 | <0.100 | 6.82 | 14.1 | 166 |
| | 06/17/21 | 0.102 | 12.3 | 16.1 | <0.100 | 6.97 | 18.3 | 202 |
| | 10/12/21 | 0.0759 | 8.69 | 12.5 | 0.101 J | 6.53 | 18.1 | 195 |

Notes:
1. Abbreviations: mg/L - milligrams per liter; TDS - total dissolved solids; s.u. - standard units.
2. J - Concentration is below method quantitation limit; result is an estimate.

**TABLE 4**
**APPENDIX IV ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | F (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Tl (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Upgradient Wells** | | | | | | | | | | | | | | | | | | |
| FGD-8 | 11/04/15 | <0.0008 | <0.002 | 0.119 | <0.0003 | <0.0003 | 0.00542 | <0.003 | 0.173 J | <0.0003 | 0.149 | <0.00008 | 0.0261 | <0.002 | <0.0005 | 0.671 | 1.38 | 2.05 |
| | 12/17/15 | <0.0008 | <0.002 | 0.179 | <0.0003 | <0.0003 | 0.00373 J | 0.00646 | 0.361 J | <0.0003 | 0.116 | <0.00008 | 0.00404 J | <0.002 | <0.0005 | <0.609 | 1.32 | 1.93 |
| | 02/09/16 | <0.0008 | 0.0115 | 0.892 | <0.0003 | <0.0003 | 0.00234 J | 0.00609 | 0.331 J | 0.000406 J | 0.0104 | <0.00008 | <0.002 | 0.00231 J | <0.0005 | 1.77 | 3.55 | 5.32 |
| | 04/14/16 | <0.0008 | 0.0146 | 0.965 | <0.0003 | <0.0003 | 0.00202 J | 0.00876 | 0.218 J | 0.0016 | 0.016 | <0.00008 | <0.002 | 0.00211 J | <0.0005 | 0.973 | 8.34 | 9.31 |
| | 06/14/16 | <0.0008 | 0.00639 | 0.792 | <0.0003 | <0.0003 | <0.002 | 0.0158 | <0.100 | 0.00137 | 0.015 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.93 | 2.30 | 4.23 |
| | 08/24/16 | <0.0008 | <0.002 | 0.102 | 0.000417 J | <0.0003 | 0.0107 | 0.015 | 0.186 J | 0.00381 | 0.0265 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.778 | <0.491 | 1.27 |
| | 10/05/16 | <0.0008 | 0.00661 | 0.753 | <0.0003 | <0.0003 | 0.00672 | 0.00899 | 0.413 | 0.000908 J | 0.0224 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.35 | 5.96 | 7.31 |
| | 12/23/16 | <0.0008 | 0.0119 | 0.894 | <0.0003 | <0.0003 | 0.00259 J | 0.00745 | <0.100 | 0.00228 | 0.0185 | <0.00008 | <0.002 | 0.00217 J | <0.0005 | 2.17 | 3.70 | 5.87 |
| | 06/05/18 | <0.0008 | 0.00839 | 0.834 | <0.0003 | <0.0003 | <0.002 | 0.0193 | <0.100 | 0.00039 J | 0.0128 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.5 | 5.13 | 6.63 |
| | 09/06/18 | NA | 0.0137 | 0.635 | <0.0003 | <0.0003 | <0.002 | 0.0243 | 0.362 J | <0.0003 | 0.009 J | NA | <0.002 | 0.0025 J | <0.0005 | 0.349 | 1.4 | 1.75 |
| | 05/16/19 | <0.0008 | 0.0126 | 0.864 | <0.0003 | <0.0003 | 0.003 J | 0.0146 | <0.100 | <0.00194 | 0.009 J | <0.00008 | <0.002 | 0.0027 J | <0.0005 | 3.14 | 5.27 | 8.41 |
| | 08/19/19 | <0.0008 | 0.00645 | 0.608 | <0.0003 | <0.0003 | <0.002 | 0.0135 | <0.100 | 0.00134 | 0.0144 | <0.00008 | <0.002 | 0.00252 | <0.0005 | 1.79 | 6.82 | 8.61 |
| | 05/11/20 | <0.000800 | 0.00663 | 0.732 | <0.000300 | <0.000300 | <0.00200 | 0.0084 | <0.100 | 0.000415 J | 0.0152 | <0.0000800 | <0.00200 | 0.0021 J | <0.000500 | 2.07 | 6.58 | 8.65 |
| | 09/15/20 | NA | 0.00796 | 0.777 | <0.000300 | NA | 0.00287 J | 0.00379 J | <0.100 | 0.00107 | 0.00864 J | NA | <0.00200 | <0.00200 | <0.000500 | 2.5 | 6.2 | 8.7 |
| | 06/17/21 | <0.0008 | 0.00749 | 1.1 | <0.0003 | <0.0003 | <0.002 | 0.0067 | <0.100 | 0.000766 J | 0.0125 | <0.00008 | <0.002 | <0.002 | <0.0005 | 2.69 | 5.14 | 7.83 |
| | 10/11/21 | <0.000800 | 0.00786 | 0.994 | <0.000300 | <0.000300 | <0.00200 | 0.00312 J | <0.100 | 0.00119 | 0.00851 J | <0.0000800 | <0.00200 | 0.00265 J | <0.000500 | 1.20 | 6.78 | 7.98 |
| FGD-11 | 11/04/15 | <0.0008 | <0.002 | 0.0527 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | 0.000727 J | 0.0144 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.928 | <1.41 | 2.34 |
| | 12/17/15 | <0.0008 | <0.002 | 0.0676 | 0.000303 J | <0.0003 | <0.002 | <0.003 | 0.13 J | 0.000987 J | 0.016 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.786 | <1.63 | 2.42 |
| | 02/09/16 | <0.0008 | <0.002 | 0.271 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.548 | <0.0003 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.39 | 2.64 | 4.03 |
| | 04/14/16 | <0.0008 | <0.002 | 0.26 | <0.0003 | <0.0003 | 0.00222 J | <0.003 | 0.671 | 0.0012 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.69 | 2.43 | 4.12 |
| | 06/15/16 | <0.0008 | <0.002 | 0.216 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.331 J | 0.000407 J | 0.0126 | <0.00008 | 0.00238 J | <0.002 | <0.0005 | 2.34 | 2.06 | 4.40 |
| | 08/25/16 | <0.0008 | <0.002 | 0.439 | <0.0003 | <0.0003 | 0.00465 J | <0.003 | 0.128 J | 0.00179 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 4.23 | 3.58 | 7.81 |
| | 10/04/16 | <0.0008 | <0.002 | 0.55 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.579 | 0.000618 J | 0.0124 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.73 | 2.53 | 4.26 |
| | 12/22/16 | <0.0008 | <0.002 | 0.734 | <0.0003 | <0.0003 | 0.00258 J | <0.003 | 0.127 J | 0.000635 J | 0.0124 | <0.00008 | <0.002 | <0.002 | <0.0005 | 3.94 | 5.09 | 9.03 |
| | 06/05/18 | <0.0008 | <0.002 | 0.520 | <0.0003 | <0.0003 | 0.0372 | 0.007 | 0.836 | 0.00891 J | 0.0102 | <0.00008 | 0.00266 J | <0.002 | <0.0005 | 4.64 | 4.22 | 8.86 |
| | 09/06/18 | NA | <0.002 | 0.702 | <0.0003 | <0.0003 | 0.0039 J | <0.003 | 1.09 | <0.0003 | 0.0121 | NA | <0.002 | <0.002 | <0.0005 | 6.24 | 6.47 | 12.71 |
| | 05/16/19 | <0.0008 | <0.002 | 0.347 | <0.0003 | <0.0003 | 0.028 | <0.003 | 0.38 J | 0.000576 J | 0.0145 | <0.00008 | 0.00358 J | <0.002 | <0.0005 | 2.39 | 2.75 | 5.14 |
| | 08/19/19 | <0.0008 | <0.002 | 0.310 | <0.0003 | <0.0003 | 0.00391 J | <0.003 | 0.63 | <0.0003 | 0.0136 | <0.00008 | 0.00238 J | <0.002 | <0.0005 | 1.39 | 2.55 | 3.95 |
| | 05/11/20 | <0.000800 | <0.00200 | 0.347 | <0.000300 | <0.000300 | 0.0146 | <0.00300 | 0.365 J | 0.000658 J | 0.0132 | <0.0000800 | <0.00200 | <0.00200 | <0.000500 | 2.39 | 4.00 | 6.39 |
| | 09/10/20 | NA | <0.00200 | 0.330 | <0.000300 | NA | 0.0158 | <0.00300 | 0.575 | 0.000706 J | 0.0121 | NA | <0.00200 | <0.00200 | <0.000500 | 3.35 | 4.69 | 8.04 |
| | 06/17/21 | <0.0008 | <0.002 | 0.3 | <0.0003 | <0.0003 | 0.00633 | <0.00300 | 0.471 | <0.0003 | 0.0149 | <0.00008 | 0.00235 J | <0.002 | <0.0005 | 2.23 | 2.29 | 4.52 |
| | 10/11/21 | <0.000800 | <0.00200 | 0.231 | <0.000300 | <0.000300 | 0.0158 | <0.00300 | 0.453 | 0.000332 | 0.0126 | <0.0000800 | 0.00276 | <0.00200 | <0.000500 | 1.11 | 3.33 | 4.45 |
| **Downgradient Wells** | | | | | | | | | | | | | | | | | | |
| FGD-1 | 11/03/15 | <0.0008 | <0.002 | 0.0311 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.363 J | <0.0003 | 0.034 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.718 | <1.40 | 2.12 |
| | 12/17/15 | <0.0008 | <0.002 | 0.0263 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.384 J | <0.0003 | 0.0306 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.919 | <1.43 | 2.35 |
| | 02/09/16 | <0.0008 | <0.002 | 0.0315 | <0.0003 | <0.0003 | 0.00437 J | 0.0033 J | 0.383 J | 0.000379 J | 0.0314 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.318 | 1.42 | 1.74 |
| | 04/14/16 | <0.0008 | <0.002 | 0.0296 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.229 J | <0.0003 | 0.0338 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.439 | <1.28 | <1.719 |
| | 06/15/16 | <0.0008 | <0.002 | 0.0276 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.302 J | <0.0003 | 0.0321 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.258 | 1.66 | 1.92 |
| | 08/24/16 | <0.0008 | <0.002 | 0.0294 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.225 J | <0.0003 | 0.033 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.188 | 2.24 | 2.43 |
| | 10/05/16 | <0.0008 | <0.002 | 0.0319 | <0.0003 | <0.0003 | <0.002 | 0.00447 J | 0.483 | <0.0003 | 0.0331 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.430 | 0.507 | 0.94 |
| | 12/22/16 | <0.0008 | <0.002 | 0.0418 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.326 J | <0.0003 | 0.0385 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.273 | <0.645 | <0.918 |
| | 06/05/18 | <0.0008 | <0.002 | 0.0422 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.206 J | <0.0003 | 0.0426 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.194 | <0.7680 | 0.962 |
| | 09/06/18 | NA | <0.002 | 0.0417 | <0.0003 | <0.0003 | <0.002 | 0.0033 J | 0.228 J | <0.0003 | 0.0436 | NA | <0.002 | <0.002 | 0.0005 | 0.209 | <0.53 | 0.739 |
| | 05/16/19 | <0.0008 | <0.002 | 0.0485 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.362 J | <0.0003 | 0.0442 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.33 | <0.59 | 0.923 |
| | 08/19/19 | <0.0008 | <0.002 | 0.0538 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.486 | <0.0003 | 0.0441 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.489 | 1.09 | 1.57 |
| | 05/11/20 | <0.000800 | <0.00200 | 0.131 | <0.000300 | <0.000300 | <0.00200 | 0.0495 | 0.231 J | <0.000300 | 0.0548 | <0.0000800 | <0.00200 | <0.00200 | <0.000500 | 1.08 | 0.808 | 1.89 |
| | 09/15/20 | NA | <0.00200 | 0.162 | <0.000300 | NA | <0.00200 | <0.00300 | 0.215 J | 0.000342 J | 0.0233 | NA | <0.00200 | <0.00200 | <0.000500 | 0.664 | 1.66 | 2.32 |
| | 06/17/21 | <0.0008 | <0.002 | 0.174 | <0.0003 | <0.0003 | <0.002 | 0.00441 J | 0.356 J | <0.0003 | 0.0225 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.712 | 1.64 | 2.36 |
| | 6/17/21 DUP | <0.0008 | <0.002 | 0.168 | <0.0003 | <0.0003 | <0.002 | 0.00423 J | 0.352 J | <0.0003 | 0.0221 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.609 | 1.90 | 2.51 |
| | 10/12/21 | <0.000800 | <0.00200 | 0.132 | <0.000300 | <0.000300 | <0.00200 | <0.00300 | 0.295 J | <0.000300 | 0.0182 | <0.0000800 | <0.00200 | <0.00200 | <0.000500 | 0.362 | 1.85 | 2.21 |

**TABLE 4**
**APPENDIX IV ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | F (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Tl (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-2 | 11/03/15 | <0.0008 | <0.002 | 0.146 | <0.0003 | <0.0003 | 0.00244 J | <0.003 | 0.224 J | <0.0003 | 0.0224 | <0.00008 | <0.002 | 0.0203 | <0.0005 | <0.249 | 1.97 | 2.22 |
| | 12/17/15 | <0.0008 | <0.002 | 0.103 | <0.0003 | <0.0003 | 0.00386 J | <0.003 | 0.347 J | 0.00145 | 0.0183 | <0.00008 | <0.002 | 0.0127 | <0.0005 | 1.030 | <1.24 | 2.27 |
| | 02/09/16 | <0.0008 | <0.002 | 0.133 | <0.0003 | <0.0003 | 0.00426 J | <0.003 | 0.315 J | <0.0003 | 0.0221 | <0.00008 | <0.002 | 0.0181 | <0.0005 | 0.669 | 1.81 | 2.48 |
| | 04/14/16 | <0.0008 | <0.002 | 0.129 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.192 J | <0.0003 | 0.0196 | <0.00008 | <0.002 | 0.0166 | <0.0005 | 0.198 | <2.03 | 2.23 |
| | 06/14/16 | <0.0008 | <0.002 | 0.091 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.122 J | <0.0003 | 0.0243 | <0.00008 | <0.002 | 0.0189 | <0.0005 | 0.275 | 1.66 | 1.94 |
| | 08/24/16 | <0.0008 | <0.002 | 0.144 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | 0.019 | <0.00008 | <0.002 | 0.0185 | <0.0005 | 2.47 | 0.769 | 3.24 |
| | 10/05/16 | <0.0008 | <0.002 | 0.129 | <0.0003 | <0.0003 | 0.00549 | <0.003 | 0.243 J | 0.000693 J | 0.0199 | <0.00008 | <0.002 | 0.0176 | <0.0005 | 0.716 | 1.70 | 2.42 |
| | 12/22/16 | <0.0008 | <0.002 | 0.158 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | 0.0217 | <0.00008 | <0.002 | 0.022 | <0.0005 | 0.345 | 1.79 | 2.14 |
| | 06/05/18 | <0.0008 | <0.002 | 0.108 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.185 J | <0.0003 | 0.0226 | <0.00008 | <0.002 | 0.0185 | <0.0005 | 0.505 | 1.12 | 1.63 |
| | 09/06/18 | NA | <0.002 | 0.125 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.32 J | <0.0003 | 0.0253 | NA | <0.002 | 0.0204 | <0.0005 | 0.641 | 0.822 | 1.46 |
| | 05/16/19 | <0.0008 | <0.002 | 0.0993 | <0.0003 | <0.0003 | 0.003 J | <0.003 | 0.383 J | <0.0003 | 0.0228 | 0.00008 | <0.002 | 0.0214 | <0.0005 | 0.648 | 0.588 | 1.24 |
| | 08/19/19 | <0.0008 | <0.002 | 0.181 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.413 | <0.0003 | 0.0257 | <0.00008 | <0.002 | 0.0249 | <0.0005 | 0.456 | 2.8 | 3.26 |
| | 05/11/20 | <0.000800 | <0.00200 | 0.108 | <0.000300 | <0.000300 | 0.00234 J | <0.00300 | <0.100 | <0.000300 | 0.028 | <0.0000800 | <0.00200 | 0.0208 | <0.000500 | 0.677 | 2.08 | 2.76 |
| | 09/10/20 | NA | <0.00200 | 0.104 | <0.000300 | NA | 0.00239 J | <0.00300 | <0.100 | <0.000300 | 0.0250 | NA | <0.00200 | 0.0217 | <0.000500 | 0.744 | 0.29 | 1.03 |
| | 06/17/21 | <0.0008 | <0.002 | 0.108 | <0.0003 | <0.0003 | <0.002 | <0.00300 | <0.100 | <0.0003 | 0.023 | <0.00008 | <0.002 | 0.0233 | <0.0005 | 0.440 | 0.774 | 1.21 |
| | 10/12/21 | <0.000800 | <0.00200 | 0.0823 | <0.000300 | <0.000300 | <0.00200 | <0.00300 | <0.100 | <0.000300 | 0.0259 | <0.0000800 | <0.00200 | 0.0185 | <0.000500 | 593 | 0.922 | 1.52 |
| | 10/12/21 | <0.0008 | <0.002 | 0.0814 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.100 | <0.0003 | 0.0263 | <0.00008 | <0.002 | 0.0194 | <0.0005 | 0.324 | 1.50 | 1.82 |
| FGD-3 | 11/03/15 | <0.0008 | 0.00226 J | 0.0417 | <0.0003 | 0.00492 | <0.002 | 0.0436 | 0.505 | <0.0003 | 0.176 | <0.00008 | <0.002 | 0.0881 | 0.0017 | 0.930 | 3.18 | 4.11 |
| | 12/17/15 | <0.0008 | 0.00215 J | 0.0371 | 0.000475 J | 0.00372 | <0.002 | 0.0399 | <0.1 | <0.0003 | 0.14 | <0.00008 | <0.002 | 0.0798 | 0.0016 | 1.70 | 2.66 | 4.36 |
| | 02/09/16 | <0.0008 | 0.00206 J | 0.0407 | <0.0003 | 0.00343 | <0.002 | 0.0417 | 0.74 | 0.000438 J | 0.13 | <0.00008 | <0.002 | 0.0907 | 0.0015 J | 1.04 | 3.37 | 4.41 |
| | 04/14/16 | <0.0008 | 0.00218 J | 0.0371 | <0.0003 | 0.00212 | <0.002 | 0.0326 | 0.69 | <0.0003 | 0.119 | <0.00008 | <0.002 | 0.064 | 0.00137 J | <0.276 | <1.35 | <1.626 |
| | 06/14/16 | <0.0008 | 0.00205 J | 0.0392 | <0.0003 | 0.00156 | <0.002 | 0.0261 | 0.173 J | <0.0003 | 0.107 | <0.00008 | <0.002 | 0.0447 | 0.00126 J | 0.754 | 1.56 | 2.31 |
| | 08/24/16 | <0.0008 | 0.00221 J | 0.0387 | <0.0003 | 0.00146 | <0.002 | 0.0232 | 0.463 | <0.0003 | 0.0974 | <0.00008 | <0.002 | 0.0272 | 0.00123 J | 0.416 | 2.60 | 3.02 |
| | 10/05/16 | <0.0008 | 0.00225 J | 0.039 | <0.0003 | 0.00152 | <0.002 | 0.0226 | 0.723 | <0.0003 | 0.113 | <0.00008 | <0.002 | 0.0276 | 0.00114 J | 0.455 | 2.44 | 2.90 |
| | 12/22/16 | <0.0008 | 0.00226 J | 0.0437 | <0.0003 | 0.00173 | <0.002 | 0.0266 | 1.32 | <0.0003 | 0.11 | <0.00008 | <0.002 | 0.0245 | 0.00124 J | <0.352 | 2.46 | 2.81 |
| | 06/05/18 | <0.0008 | 0.00236 J | 0.0391 | <0.0003 | 0.00152 | <0.002 | 0.0207 | 1.06 | <0.0003 | 0.0975 | <0.00008 | 0.00212 J | 0.0192 | 0.000985 J | 0.528 | 2.19 | 2.72 |
| | 09/05/18 | NA | 0.00208 J | 0.0379 | <0.0003 | 0.00146 | <0.002 | 0.0192 | 1.03 | <0.0003 | 0.0955 | NA | 0.0021 J | 0.0213 | 0.000925 J | <0.323 | 0.704 | 1.03 |
| | 05/16/19 | <0.0008 | 0.0023 J | 0.051 | <0.0003 | <0.0003 | <0.002 | 0.0052 | 0.776 | <0.0003 | 0.057 | <0.00008 | 0.0031 J | 0.0423 | 0.0006 J | <0.403 | <0.638 | <1.041 |
| | 08/19/19 | <0.0008 | 0.00248 J | 0.0365 | <0.0003 | <0.0003 | <0.002 | 0.00364 J | 0.874 | <0.0003 | 0.0546 | <0.00008 | 0.00231 J | 0.0245 | 0.000588 J | 0.523 | 0.858 | 1.38 |
| | 05/06/20 | <0.000800 | 0.00209 J | 0.0353 | <0.000300 | <0.000300 | 0.0117 | 0.00332 J | 0.8 | <0.000300 | 0.0498 | <0.0000800 | 0.00284 J | 0.00993 | 0.000556 J | 0.394 | 0.463 | 0.857 |
| | 09/15/20 | NA | 0.00225 J | 0.0326 | <0.000300 | NA | <0.00200 | <0.00300 | 0.772 | <0.000300 | 0.0416 | NA | 0.00245 J | 0.00646 | 0.000534 J | 0.257 | 0.484 | 0.711 |
| | 06/16/21 | <0.0008 | 0.00217 | 0.0343 J | <0.0003 | <0.0003 | <0.002 | 0.00624 | 1.2 | 0.000491 J | 0.0426 | 0.000094 J | 0.00336 J | 0.00752 | 0.000528 J | 0.246 | 0.808 | 1.05 |
| | 10/11/21 | <0.000800 | <0.00200 | 0.0322 | <0.000300 | <0.000300 | <0.00200 | <0.00300 | 1.08 | 0.000494 J | 0.0296 | <0.0000800 | 0.00370 J | 0.00748 | <0.000500 | 0.223 J | 1.02 | 1.25 |
| FGD-4 | 11/03/15 | <0.0008 | <0.002 | 0.126 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.294 J | <0.0003 | 0.0433 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.01 | <1.39 | 2.40 |
| | 12/17/15 | <0.0008 | <0.002 | 0.105 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.295 J | <0.0003 | 0.0436 | 0.000229 | 0.00211 J | 0.00214 J | <0.0005 | <0.361 | <1.73 | <2.091 |
| | 02/09/16 | <0.0008 | <0.002 | 0.113 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.32 J | <0.0003 | 0.0419 | 0.000288 | <0.002 | <0.002 | <0.0005 | <0.332 | <1.11 | <1.442 |
| | 04/14/16 | <0.0008 | <0.002 | 0.12 | <0.0003 | <0.0003 | 0.00208 J | <0.003 | 0.323 J | 0.0271 | 0.0357 | 0.000232 | <0.002 | <0.002 | <0.0005 | 0.560 | <1.21 | 1.77 |
| | 06/14/16 | <0.0008 | <0.002 | 0.128 | <0.0003 | 0.000561 J | <0.002 | <0.003 | <0.1 | <0.0003 | 0.0477 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.437 | <0.975 | 1.41 |
| | 08/24/16 | <0.0008 | <0.002 | 0.111 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.148 J | 0.000578 J | 0.0383 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.199 | 0.625 | 0.82 |
| | 10/05/16 | <0.0008 | <0.002 | 0.106 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.376 J | 0.000489 J | 0.0353 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.308 | 1.30 | 1.61 |
| | 12/22/16 | <0.0008 | <0.002 | 0.114 | <0.0003 | <0.0003 | 0.0023 J | <0.003 | 0.251 J | <0.0003 | 0.0273 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.227 | <0.667 | 0.89 |
| | 06/04/18 | <0.0008 | <0.002 | 0.119 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.297 J | <0.0003 | 0.0265 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.261 | <0.923 | 1.184 |
| | 09/05/18 | NA | <0.002 | 0.108 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.353 J | <0.0003 | 0.0199 | NA | <0.002 | <0.002 | <0.0005 | <0.39 | 0.673 | 1.063 |
| | 05/16/19 | <0.0008 | <0.002 | 0.117 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.327 J | <0.0003 | 0.0325 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.627 | 0.745 | 1.372 |
| | 08/19/19 | <0.0008 | <0.002 | 0.1 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.67 | <0.0003 | 0.019 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.39 | 1.58 | 1.97 |
| | 05/11/20 | <0.000800 | <0.00200 | 0.104 | <0.000300 | <0.000300 | <0.00200 | <0.00300 | 0.3 J | <0.000300 | 0.0166 | <0.0000800 | <0.00200 | <0.00200 | <0.000500 | 0.15 | 1.2 | 1.35 |
| | 09/15/20 | NA | <0.00200 | 0.0899 | <0.000300 | NA | <0.00200 | <0.00300 | <0.100 | <0.000300 | 0.0140 | NA | <0.00200 | <0.00200 | <0.000500 | 0.498 | <1.27 | 0.498 |
| | 06/16/21 | <0.0008 | <0.002 | 0.103 | <0.0003 | <0.0003 | <0.002 | <0.00300 | 0.517 | <0.0003 | 0.0137 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.283 | 0.000 U | 0.283 U |
| | 10/11/21 | <0.000800 | <0.00200 | 0.0796 | <0.000300 | <0.000300 | <0.00200 | <0.00300 | 0.398 | <0.000300 | 0.00984 J | <0.0000800 | <0.00200 | <0.00200 | <0.000500 | 0.169 J | 1.27 | 1.44 |

**TABLE 4**
**APPENDIX IV ANALYTICAL DATA**
**OGSES FGD PONDS**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | F (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Tl (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-5 | 11/04/15 | <0.0008 | <0.002 | 0.13 | <0.0003 | 0.000557 J | 0.0121 | <0.003 | 0.334 J | <0.0003 | 0.17 | <0.00008 | 0.0445 | <0.002 | <0.0005 | 0.449 | 1.52 | 1.97 |
| | 12/17/15 | <0.0008 | <0.002 | 0.237 | <0.0003 | 0.000593 J | 0.0391 | 0.0164 | 0.333 J | 0.000369 J | 0.156 | <0.00008 | 0.0203 | <0.002 | <0.0005 | 1.23 | 3.63 | 4.86 |
| | 02/09/16 | <0.0008 | <0.002 | 0.261 | <0.0003 | <0.0003 | <0.002 | 0.00441 J | 0.495 | <0.0003 | 0.158 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.99 | 1.50 | 3.49 |
| | 04/14/16 | <0.0008 | <0.002 | 0.224 | <0.0003 | 0.000392 J | 0.00477 J | <0.003 | 0.491 | <0.0003 | 0.164 | <0.00008 | 0.0183 | <0.002 | <0.0005 | 0.951 | <1.24 | 2.19 |
| | 06/15/16 | <0.0008 | <0.002 | 0.174 | <0.0003 | <0.0003 | 0.00599 | <0.003 | 0.284 J | <0.0003 | 0.162 | <0.00008 | 0.0144 | <0.002 | <0.0005 | 0.429 | 1.25 | 1.68 |
| | 08/24/16 | <0.0008 | <0.002 | 0.173 | <0.0003 | <0.0003 | 0.0189 | <0.003 | 0.168 J | 0.00045 J | 0.145 | <0.00008 | 0.00814 | <0.002 | <0.0005 | 0.398 | <0.643 | 1.04 |
| | 10/05/16 | <0.0008 | <0.002 | 0.229 | <0.0003 | <0.0003 | 0.00304 J | <0.003 | 0.38 J | <0.0003 | 0.153 | <0.00008 | 0.00355 J | <0.002 | <0.0005 | 0.877 | 1.16 | 2.04 |
| | 12/22/16 | <0.0008 | <0.002 | 0.261 | <0.0003 | <0.0003 | <0.002 | 0.00471 J | 0.291 J | <0.0003 | 0.152 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.579 | <0.76 | 1.34 |
| | 06/05/18 | <0.0008 | <0.002 | 0.136 | <0.0003 | <0.0003 | 0.00935 | <0.003 | 0.511 | <0.0003 | 0.154 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.705 | <0.765 | 1.47 |
| | 09/06/18 | NA | <0.002 | 0.215 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.548 | <0.0003 | 0.155 | NA | <0.002 | <0.002 | <0.0005 | 0.535 | 1.31 | 1.845 |
| | 05/16/19 | <0.0008 | <0.002 | 0.0926 | <0.0003 | <0.0003 | 0.024 | <0.003 | 0.579 | <0.0003 | 0.145 | <0.00008 | 0.003 J | <0.002 | <0.0005 | 0.342 | <0.506 | 0.848 |
| | 08/19/19 | <0.0008 | <0.002 | 0.106 | <0.0003 | <0.0003 | 0.0103 | <0.003 | 0.863 | <0.0003 | 0.152 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.551 | 0.659 | 1.21 |
| | 05/11/20 | <0.000800 | <0.00200 | 0.0959 | <0.000300 | <0.000300 | 0.0374 | <0.00300 | 0.413 | <0.000300 | 0.156 | <0.0000800 | 0.00561 | <0.00200 | <0.000500 | 0.0983 | 5.18 | 5.28 |
| | 09/10/20 | NA | <0.00200 | 0.0929 | <0.000300 | NA | 0.0307 | <0.00300 | 0.617 | <0.000300 | 0.150 | NA | 0.00362 J | <0.00200 | <0.000500 | 0.132 | <1.11 | 0.132 |
| | 06/17/21 | <0.0008 | <0.002 | 0.111 | <0.0003 | <0.0003 | 0.0376 | <0.00300 | 0.593 | <0.0003 | 0.147 | <0.00008 | 0.00504 | <0.002 | <0.0005 | 0.173 J | 0.546 | 0.719 J |
| | 10/11/21 | <0.000800 | <0.00200 | 0.0995 | <0.000300 | <0.000300 | 0.0549 | <0.00300 | 0.459 | <0.000300 | 0.139 | <0.0000800 | 0.00669 | <0.00200 | <0.000500 | 0.0902 U | 0.203 U | 0.293 U |
| FGD-6 | 11/03/15 | <0.0008 | <0.002 | 0.124 | <0.0003 | <0.0003 | 0.00253 J | <0.003 | 0.227 J | <0.0003 | 0.0112 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.470 | <1.70 | 2.17 |
| | 12/17/15 | <0.0008 | <0.002 | 0.135 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.469 | <0.0003 | 0.00964 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.03 | <2.13 | 3.16 |
| | 02/09/16 | <0.0008 | <0.002 | 0.132 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.354 J | <0.0003 | 0.0105 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.801 | <1.71 | 2.51 |
| | 04/14/16 | <0.0008 | <0.002 | 0.122 | <0.0003 | <0.0003 | 0.0568 | <0.003 | 0.442 | <0.0003 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.484 | 2.08 | 2.56 |
| | 06/14/16 | <0.0008 | <0.002 | 0.16 | 0.000309 J | 0.000404 J | <0.002 | 0.00657 | <0.1 | 0.00132 | 0.0092 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.31 | 2.16 | 3.47 |
| | 08/24/16 | <0.0008 | 0.00725 | 0.127 | <0.0003 | <0.0003 | 0.00334 J | 0.00399 J | 0.147 J | 0.000656 J | 0.00885 J | <0.00008 | 0.00244 J | <0.002 | <0.0005 | 0.465 | 0.896 | 1.36 |
| | 10/05/16 | <0.0008 | 0.00536 | 0.117 | <0.0003 | <0.0003 | 0.00427 J | 0.00414 J | 0.364 J | <0.0003 | 0.00985 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.489 | 1.69 | 2.18 |
| | 12/22/16 | <0.0008 | 0.00458 J | 0.129 | <0.0003 | <0.0003 | <0.002 | 0.00352 J | 0.204 J | <0.0003 | 0.0102 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.349 | 0.917 | 1.27 |
| | 06/04/18 | <0.0008 | 0.0021 J | 0.0854 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.361 J | <0.0003 | 0.0098 J | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.277 | <0.964 | <1.241 |
| | 09/05/18 | NA | <0.002 | 0.0824 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.405 | <0.0003 | 0.0094 J | NA | <0.002 | <0.002 | <0.0005 | <0.336 | <0.677 | <1.013 |
| | 05/16/19 | <0.0008 | 0.0294 | 0.107 | <0.0003 | <0.0003 | <0.002 | 0.0132 | 0.669 | <0.0003 | 0.0068 J | <0.00008 | 0.0077 | <0.002 | <0.0005 | 1.43 | 1.67 | 3.1 |
| | 08/19/19 | <0.0008 | 0.0146 | 0.0903 | <0.0003 | <0.0003 | <0.002 | 0.00493 J | 0.741 | <0.0003 | 0.0082 J | <0.00008 | 0.00332 J | <0.002 | <0.0005 | 0.385 | 2.55 | 2.93 |
| | 05/11/20 | <0.000800 | 0.00286 J | 0.0814 | <0.000300 | <0.000300 | <0.00200 | <0.00300 | 0.292 J | <0.000300 | 0.00877 J | <0.0000800 | 0.00205 J | <0.00200 | <0.000500 | 0.513 | 0.845 | 1.36 |
| | 09/15/20 | NA | 0.00651 | 0.0695 | <0.000300 | NA | <0.00200 | 0.00615 | 0.354 J | <0.000300 | 0.00669 J | NA | <0.00200 | <0.00200 | <0.000500 | 0.485 | 1.08 | 1.57 |
| | 06/16/21 | <0.0008 | 0.00232 J | 0.0769 | <0.0003 | <0.0003 | <0.002 | <0.00300 | 0.452 | <0.0003 | 0.00824 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.322 | 1.54 | 1.86 |
| | 10/11/21 | <0.000800 | 0.00696 | 0.0507 | <0.000300 | <0.000300 | <0.00200 | <0.00300 | 0.616 | <0.000300 | 0.00641 J | <0.0000800 | 0.00222 J | <0.00200 | <0.000500 | 0.0567 U | 1.39 | 1.44 |
| FGD-12 | 11/04/15 | <0.0008 | <0.002 | 0.0884 | <0.0003 | <0.0003 | 0.0124 | <0.003 | <0.1 | 0.000678 J | 0.0234 | <0.00008 | 0.00221 J | <0.002 | <0.0005 | 1.07 | <1.55 | 2.62 |
| | 12/17/15 | <0.0008 | <0.002 | 0.0781 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.159 J | 0.000775 J | 0.022 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.32 | <2.57 | 3.89 |
| | 2/9/2016 | <0.0008 | <0.002 | 0.0664 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.157 J | 0.000339 J | 0.0211 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.771 | <1.53 | 2.30 |
| | 04/14/16 | <0.0008 | <0.002 | 0.104 | <0.0003 | <0.0003 | 0.00425 J | <0.003 | 0.109 J | 0.00371 | 0.0255 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.560 | 1.46 | 2.02 |
| | 06/15/16 | <0.0008 | <0.002 | 0.107 | 0.00039 J | <0.0003 | 0.00269 J | 0.00323 J | 0.101 J | 0.00513 | 0.0192 | 0.000134 J | <0.002 | <0.002 | <0.0005 | 2.01 | 2.06 | 4.07 |
| | 08/25/16 | <0.0008 | 0.00451 J | 0.262 | 0.000629 J | <0.0003 | 0.0135 | 0.00412 J | <0.1 | 0.00842 | 0.0204 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.59 | 1.84 | 3.43 |
| | 10/04/16 | <0.0008 | 0.00402 J | 0.122 | 0.00062 J | <0.0003 | 0.0133 | 0.00395 J | 0.129 J | 0.0084 | 0.0259 | <0.00008 | <0.002 | 0.00292 J | <0.0005 | 1.41 | <0.76 | 2.17 |
| | 12/23/16 | <0.0008 | 0.00938 | 0.557 | <0.0003 | <0.0003 | 0.00435 J | 0.00609 | 0.112 J | 0.00216 | 0.0755 | <0.00008 | <0.002 | 0.00786 | <0.0005 | 1.89 | 3.54 | 5.43 |
| | 06/05/18 | <0.0008 | <0.002 | 0.0777 | 0.00031 | <0.0003 | 0.00578 | <0.003 | 0.137 J | 0.0029 | 0.0213 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.68 | <0.526 | 2.206 |
| | 09/06/18 | NA | <0.002 | 0.0517 | <0.0003 | <0.0003 | 0.0024 J | <0.003 | <0.10 | 0.0005 J | 0.0188 | NA | <0.002 | <0.002 | <0.0005 | <0.304 | <0.5450 | <0.849 |
| | 05/16/19 | 0.0008 | <0.002 | 0.0474 | <0.0003 | <0.0003 | 0.0030 J | <0.003 | <0.10 | 0.0003 J | 0.0221 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.385 | 1.43 | 1.82 |
| | 08/19/19 | <0.0008 | <0.002 | 0.0631 | <0.0003 | <0.0003 | 0.00218 J | <0.003 | 0.145 J | 0.00139 | 0.0251 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.12 | 3.52 | 4.64 |
| | 05/11/20 | <0.000800 | 0.0116 | 0.23 | 0.00166 | <0.000300 | 0.037 | 0.00883 | <0.100 | 0.0249 | 0.0371 | <0.0000800 | <0.00200 | 0.00678 | 0.000651 | 5.96 | 10.7 | 16.6 |
| | 09/10/20 | NA | 0.00252 J | 0.0922 | 0.000375 J | NA | 0.00723 | <0.00300 | <0.100 | 0.00402 | 0.0235 | NA | <0.00200 | 0.00254 J | <0.000500 | 2.59 | 6.72 | 9.31 |
| | 06/17/21 | <0.0008 | <0.002 | 0.0817 | 0.000504 J | <0.0003 | 0.00273 J | <0.00300 | <0.100 | 0.00317 | 0.0239 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.861 | 4.67 | 5.53 |
| | 10/12/21 | <0.000800 | <0.00200 | 0.0613 | <0.000300 | <0.000300 | 0.00387 J | <0.00300 | 0.101 J | 0.00255 | 0.0222 | <0.0000800 | <0.00200 | 0.00255 J | <0.000500 | 1.84 | 1.94 | 3.78 |

Notes:

1. Abbreviations: mg/l - milligrams per liter; pCi/L - picocuries per liter.
2. ^ - Sum of Ra 226 and Ra 228 concentrations.
3. J - Concentration is below method quantitation limit; result is an estimate.
4. NA - not analyzed. Groundwater sample analyses for the second semi-annual sampling events were in some instances limited to Appendix IV parameters detected during the preceding first semi-annual sampling event in accordance with 40 CFR § 257.95(d)(1).

**ATTACHMENT 1**

**LABORATORY ANALYTICAL REPORTS**

July 22, 2021

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2106122

RE: Luminant-OGSES-CCR-FGD Ponds

Dear Will Vienne:

DHL Analytical, Inc. received 10 sample(s) on 6/18/2021 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-21-27

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DHL ANALYTICAL
2300 Double Creek Dr. Round Rock, TX 78664
Phone 512.388.8222
Web: **www.dhlanalytical.com**
Email: **login@dhlanalytical.com**

# CHAIN-OF-CUSTODY



CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX
PHONE: 512-671-3434 EMAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

**PO#:**
PROJECT LOCATION OR NAME: LUMINANT - DGSES - CCR - FGD PONDS
CLIENT PROJECT # 19122262

**LABORATORY USE ONLY**
**DHL WORKORDER #:** 210622
COLLECTOR: JOHN BRAYTON

**Authorize 5% surcharge for TRRP report?** ☐ Yes ☐ No

Lab Use Only

W=WATER L=LIQUID S=SOIL SO=SOLID SE=SEDIMENT P=PAINT SL=SLUDGE

| Field Sample I.D. | DHL Lab # | Collection Date | Collection Time | Matrix | Container Type | # of Containers | PRESERVATION: HCl | HNO3 | H2SO4 | NaOH ☐ Zn Acetate ☐ | ICE ☒ UNPRESERVED ☐ | ANALYSES | APPENDIX III | APPENDIX IV | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 01 | 6-16-21 | 1745 | W | P | 4 | | X | | | X | | X | X | |
| FGD-4 | 02 | 6-16-21 | 1835 | W | P | 4 | | X | | | X | | X | X | |
| FGD-3 | 03 | 6-16-21 | 1925 | W | P | 4 | | X | | | X | | X | X | |
| FGD-2 | 04 | 6-17-21 | 0735 | W | P | 4 | | X | | | X | | X | X | |
| FGD-5 | 05 | 6-17-21 | 0825 | W | P | 4 | | X | | | X | | X | X | |
| FGD-1 | 06 | 6-17-21 | 0915 | W | P | 4 | | X | | | X | | X | X | |
| DUP-1 | 07 | 6-17-21 | 0915 | W | P | 4 | | X | | | X | | X | X | |
| FGD-8 | 08 | 6-17-21 | 1145 | W | P | 4 | | X | | | X | | X | X | |
| FGD-11 | 09 | 6-17-21 | 1330 | W | P | 4 | | X | | | X | | X | X | |
| FGD-12 | 10 | 6-17-21 | 1425 | W | P | 4 | | X | | | X | | X | X | |

Relinquished By: (Sign) DATE/TIME 6-17-21 1900 Received by: Fed Ex
Relinquished By: (Sign) Fed Ex DATE/TIME 6/18/21 0925 Received by:
Relinquished By: (Sign) DATE/TIME Received by:

**TURN AROUND TIME (CALL FIRST FOR RUSH)**
RUSH-1 DAY☐ RUSH-2 DAY☐ RUSH-3 DAY☐
NORMAL ☒ OTHER ☐
DUE DATE _____ ☐

**LABORATORY USE ONLY**
RECEIVING TEMP (°C): 4.8/2.8/5.0 THERM #: 71
CUSTODY SEALS: ☐ BROKEN ☒ INTACT ☐ NOT USED
CARRIER: ☐ LSO ☒ FEDEX ☐ UPS ☐ COURIER ☐ OTHER ☐ HAND DELIVERED

APPENDIX I ☐ DHL DISPOSAL @ 5.00 each ☐ Return

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

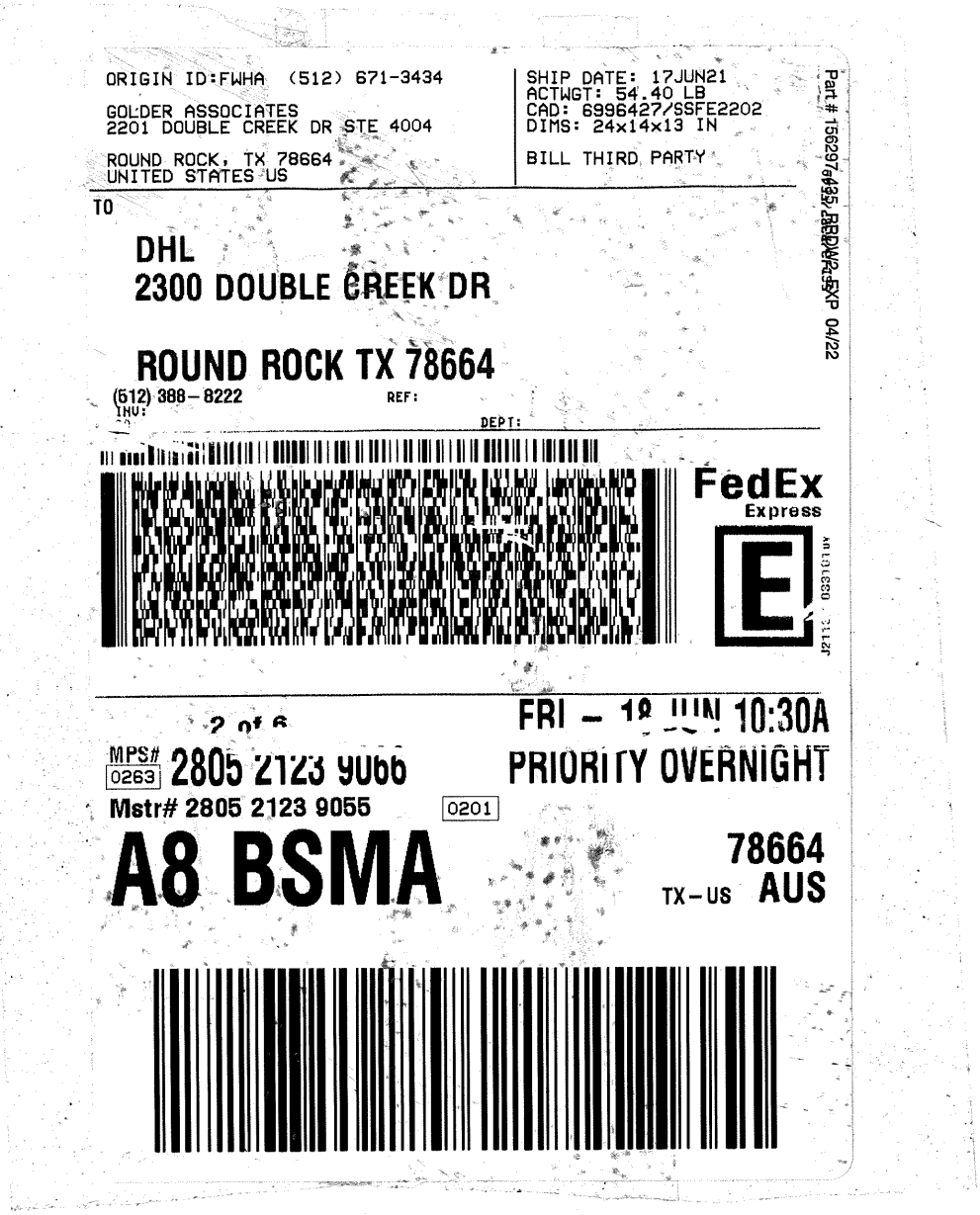
Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

---

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis



ORIGIN ID:FWHA (512) 671-3434

GOLDER ASSOCIATES
2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 17JUN21
ACTWGT: 54.40 LB
CAD: 6996427/SSFE2202
DIMS: 24x14x13 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(612) 388-8222 REF:
INV: DEPT:

Part # 156297-4935 RRD/WAYBILL EXP 04/22

FedEx
Express

2 of 6

FRI - 18 JUN 10:30A
PRIORITY OVERNIGHT

MPS# 0263 2805 2123 9066
Mstr# 2805 2123 9055 0201

A8 BSMA

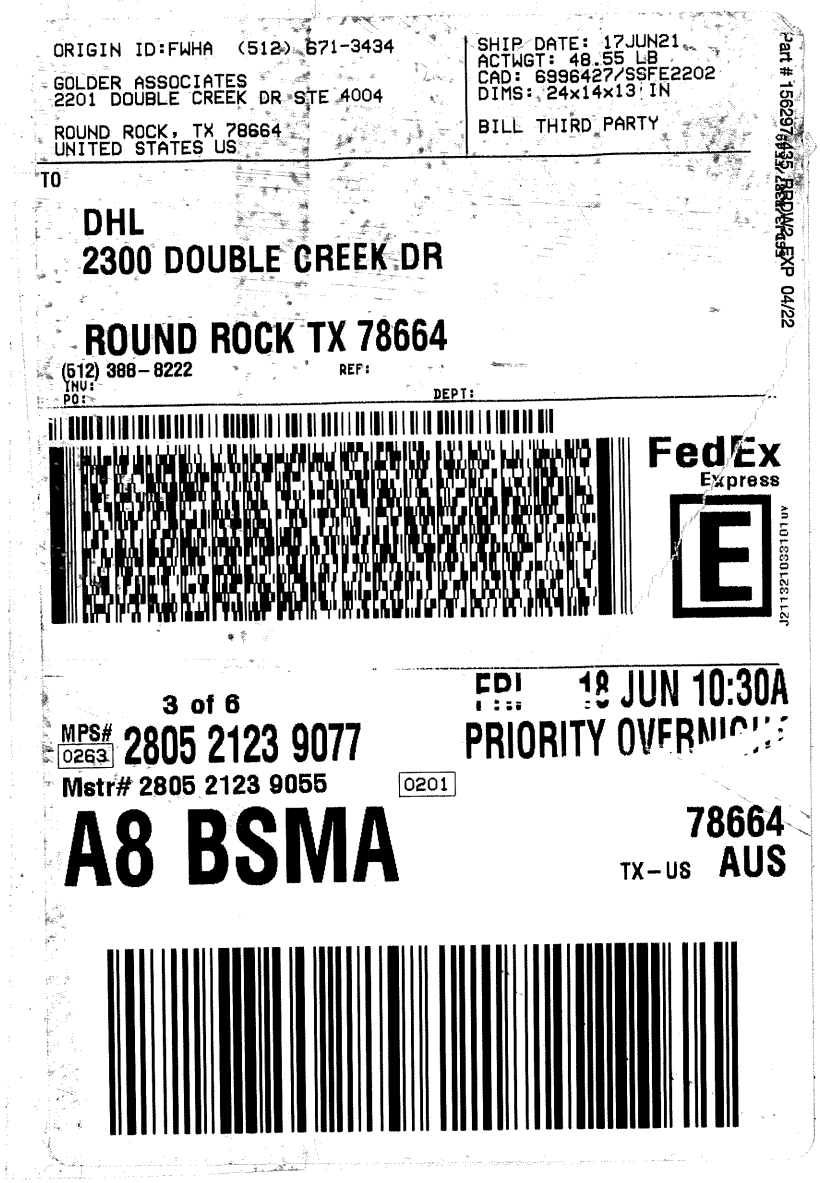
78664
TX-US AUS

CUSTODY SEAL

DATE 6-17-21

SIGNATURE

DHL ANALYTICAL



ORIGIN ID:FWHA (512) 671-3434
GOLDER ASSOCIATES
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 17JUN21
ACTWGT: 48.55 LB
CAD: 6996427/SSFE2202
DIMS: 24x14x13 IN
BILL THIRD PARTY

TO
DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx Express

3 of 6
MPS# 0263 2805 2123 9077
Mstr# 2805 2123 9055 0201
EDI 18 JUN 10:30A
PRIORITY OVERNIGHT
A8 BSMA
78664
TX-US AUS

Part # 156297-435 REV NR EXP 04/22

J271327D331GW

2

**CUSTODY SEAL**

DATE 6-17-21

SIGNATURE

DHL ANALYTICAL

ORIGIN ID:FWHA (512) 671-3434

GOLDER ASSOCIATES
2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 17JUN21
ACTWGT: 56.45 LB
CAD: 6996427/SSFE2202
DIMS: 24x14x13 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664

(512) 388-8222 REF:

INV:
PO: DEPT:

Part # 156297-9435-RRDM/PAS EXP 04/22

FedEx Express

4 of 6

MPS# 2805 2123 9088

Mstr# 2805 2123 9055

0263 0201

FRI - 18 JUN 10:30A
PRIORITY OVERNIGHT

A8 BSMA

78664
TX-US AUS

**CUSTODY SEAL**

DATE 6-17-21

SIGNATURE

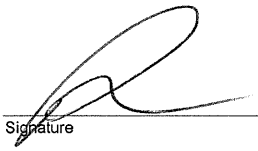
DHL ANALYTICAL

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder** Date Received: **6/18/2021**

Work Order Number **2106122** Received by: **EL**

Checklist completed by:  6/18/2021 (Signature / Date) Reviewed by (DS) 6/18/2021 (Initials / Date)

Carrier name: FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 4.8 °C/2.8°C/5.0°C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? NO | | Checked by R.A. |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action: _____

## Laboratory Name: DHL Analytical, Inc.

## Laboratory Review Checklist: Reportable Data

| | |
|---|---|
| **Project Name:** Luminant-OGSES-CCR-FGD Ponds | **LRC Date:** 7/22/21 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2106122 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | **X** | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | **X** | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | **X** | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | **X** | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | **X** | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | **X** | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | **X** | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | **X** | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | **X** | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | **X** | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | **X** | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | **X** | | |
| | | **9)** If required for the project, TICs reported? | | | **X** | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | **X** | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | **X** | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | **X** | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | **X** | | | | |
| | | **4)** Were blank concentrations < MDL? | **X** | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | **X** | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | **X** | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | **X** | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | **X** | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | **X** | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | **X** | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | **X** | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | **X** | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | **X** | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | **X** | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | **X** | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | **X** | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | **X** | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | **X** | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | **X** | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | **X** | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | **X** | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-CCR-FGD Ponds | **LRC Date:** 7/22/21 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2106122 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits?... | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | X | | | | |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 23-26, 2021. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

07/22/21
Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *22-Jul-21*

**CLIENT:** Golder
**Project:** Luminant-OGSES-CCR-FGD Ponds
**Lab Order:** 2106122

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904 and SM 7500 Ra B M. Analyzed at Pace Analytical.

Exception Report R1-01

The samples were received and log-in performed on 6/18/21. A total of 10 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Anions analysis performed on 6/21/21 the matrix spikes and matrix spike duplicate recoveries (2106122-04 MS/MSD & 2106122-08 MS/MSD) were slightly below control limits for Chloride and/or Sulfate. These are flagged accordingly in the QC summary report. The samples selected for the matrix spikes and matrix spike duplicates (2106122-04 MS/MSD & 2106122-08 MS/MSD) were from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *22-Jul-21*

**CLIENT:** Golder
**Project:** Luminant-OGSES-CCR-FGD Ponds
**Lab Order:** 2106122

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2106122-01 | FGD-6 | | 06/16/21 05:45 PM | 6/18/2021 |
| 2106122-02 | FGD-4 | | 06/16/21 06:35 PM | 6/18/2021 |
| 2106122-03 | FGD-3 | | 06/16/21 07:25 PM | 6/18/2021 |
| 2106122-04 | FGD-2 | | 06/17/21 07:35 AM | 6/18/2021 |
| 2106122-05 | FGD-5 | | 06/17/21 08:25 AM | 6/18/2021 |
| 2106122-06 | FGD-1 | | 06/17/21 09:15 AM | 6/18/2021 |
| 2106122-07 | DUP-1 | | 06/17/21 09:15 AM | 6/18/2021 |
| 2106122-08 | FGD-8 | | 06/17/21 11:45 AM | 6/18/2021 |
| 2106122-09 | FGD-11 | | 06/17/21 01:30 PM | 6/18/2021 |
| 2106122-10 | FGD-12 | | 06/17/21 02:25 PM | 6/18/2021 |

**Lab Order:** 2106122
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2106122-01A | FGD-6 | 06/16/21 05:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-6 | 06/16/21 05:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-6 | 06/16/21 05:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-6 | 06/16/21 05:45 PM | Aqueous | SW7470A | Mercury Aq Prep | 06/24/21 09:38 AM | 101016 |
| 2106122-01B | FGD-6 | 06/16/21 05:45 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-6 | 06/16/21 05:45 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-6 | 06/16/21 05:45 PM | Aqueous | M2540C | TDS Preparation | 06/18/21 09:30 AM | 100948 |
| 2106122-02A | FGD-4 | 06/16/21 06:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-4 | 06/16/21 06:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-4 | 06/16/21 06:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-4 | 06/16/21 06:35 PM | Aqueous | SW7470A | Mercury Aq Prep | 06/24/21 09:38 AM | 101016 |
| 2106122-02B | FGD-4 | 06/16/21 06:35 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-4 | 06/16/21 06:35 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-4 | 06/16/21 06:35 PM | Aqueous | M2540C | TDS Preparation | 06/18/21 09:30 AM | 100948 |
| 2106122-03A | FGD-3 | 06/16/21 07:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-3 | 06/16/21 07:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-3 | 06/16/21 07:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-3 | 06/16/21 07:25 PM | Aqueous | SW7470A | Mercury Aq Prep | 06/24/21 09:38 AM | 101016 |
| 2106122-03B | FGD-3 | 06/16/21 07:25 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-3 | 06/16/21 07:25 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-3 | 06/16/21 07:25 PM | Aqueous | M2540C | TDS Preparation | 06/18/21 09:30 AM | 100948 |
| 2106122-04A | FGD-2 | 06/17/21 07:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-2 | 06/17/21 07:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-2 | 06/17/21 07:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-2 | 06/17/21 07:35 AM | Aqueous | SW7470A | Mercury Aq Prep | 06/24/21 09:38 AM | 101016 |
| 2106122-04B | FGD-2 | 06/17/21 07:35 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-2 | 06/17/21 07:35 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-2 | 06/17/21 07:35 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |

**Lab Order:** 2106122
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2106122-04B | FGD-2 | 06/17/21 07:35 AM | Aqueous | M2540C | TDS Preparation | 06/18/21 09:30 AM | 100948 |
| 2106122-05A | FGD-5 | 06/17/21 08:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-5 | 06/17/21 08:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-5 | 06/17/21 08:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-5 | 06/17/21 08:25 AM | Aqueous | SW7470A | Mercury Aq Prep | 06/24/21 09:38 AM | 101016 |
| 2106122-05B | FGD-5 | 06/17/21 08:25 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-5 | 06/17/21 08:25 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-5 | 06/17/21 08:25 AM | Aqueous | M2540C | TDS Preparation | 06/18/21 09:30 AM | 100948 |
| 2106122-06A | FGD-1 | 06/17/21 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-1 | 06/17/21 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-1 | 06/17/21 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-1 | 06/17/21 09:15 AM | Aqueous | SW7470A | Mercury Aq Prep | 06/24/21 09:38 AM | 101016 |
| 2106122-06B | FGD-1 | 06/17/21 09:15 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-1 | 06/17/21 09:15 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-1 | 06/17/21 09:15 AM | Aqueous | M2540C | TDS Preparation | 06/18/21 09:30 AM | 100948 |
| 2106122-07A | DUP-1 | 06/17/21 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | DUP-1 | 06/17/21 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | DUP-1 | 06/17/21 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | DUP-1 | 06/17/21 09:15 AM | Aqueous | SW7470A | Mercury Aq Prep | 06/24/21 09:38 AM | 101016 |
| 2106122-07B | DUP-1 | 06/17/21 09:15 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | DUP-1 | 06/17/21 09:15 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | DUP-1 | 06/17/21 09:15 AM | Aqueous | M2540C | TDS Preparation | 06/18/21 09:30 AM | 100948 |
| 2106122-08A | FGD-8 | 06/17/21 11:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-8 | 06/17/21 11:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-8 | 06/17/21 11:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-8 | 06/17/21 11:45 AM | Aqueous | SW7470A | Mercury Aq Prep | 06/24/21 09:38 AM | 101016 |
| 2106122-08B | FGD-8 | 06/17/21 11:45 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-8 | 06/17/21 11:45 AM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |

**Lab Order:** 2106122
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2106122-08B | FGD-8 | 06/17/21 11:45 AM | Aqueous | M2540C | TDS Preparation | 06/21/21 09:12 AM | 100962 |
| 2106122-09A | FGD-11 | 06/17/21 01:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-11 | 06/17/21 01:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-11 | 06/17/21 01:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-11 | 06/17/21 01:30 PM | Aqueous | SW7470A | Mercury Aq Prep | 06/24/21 09:38 AM | 101016 |
| 2106122-09B | FGD-11 | 06/17/21 01:30 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-11 | 06/17/21 01:30 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-11 | 06/17/21 01:30 PM | Aqueous | M2540C | TDS Preparation | 06/21/21 09:12 AM | 100962 |
| 2106122-10A | FGD-12 | 06/17/21 02:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-12 | 06/17/21 02:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/22/21 09:10 AM | 100982 |
| | FGD-12 | 06/17/21 02:25 PM | Aqueous | SW7470A | Mercury Aq Prep | 06/24/21 09:38 AM | 101016 |
| 2106122-10B | FGD-12 | 06/17/21 02:25 PM | Aqueous | E300 | Anion Preparation | 06/21/21 09:53 AM | 100964 |
| | FGD-12 | 06/17/21 02:25 PM | Aqueous | M2540C | TDS Preparation | 06/21/21 09:12 AM | 100962 |

**Lab Order:** 2106122
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2106122-01A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 101016 | 1 | 06/24/21 03:53 PM | CETAC2_HG_210624D |
| | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 12:58 PM | ICP-MS4_210623A |
| | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 10 | 06/23/21 03:05 PM | ICP-MS4_210623A |
| | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 11:55 AM | ICP-MS5_210623B |
| 2106122-01B | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 07:22 PM | IC2_210621A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 12:42 AM | IC2_210621A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 100948 | 1 | 06/18/21 03:15 PM | WC_210618B |
| 2106122-02A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 101016 | 1 | 06/24/21 03:55 PM | CETAC2_HG_210624D |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 11:58 AM | ICP-MS5_210623B |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 01:00 PM | ICP-MS4_210623A |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 10 | 06/23/21 03:07 PM | ICP-MS4_210623A |
| 2106122-02B | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 07:38 PM | IC2_210621A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 12:58 AM | IC2_210621A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 100948 | 1 | 06/18/21 03:15 PM | WC_210618B |
| 2106122-03A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 101016 | 1 | 06/24/21 03:57 PM | CETAC2_HG_210624D |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 12:01 PM | ICP-MS5_210623B |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 10 | 06/23/21 03:09 PM | ICP-MS4_210623A |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 01:02 PM | ICP-MS4_210623A |
| 2106122-03B | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 02:34 AM | IC2_210621A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 07:54 PM | IC2_210621A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 100948 | 1 | 06/18/21 03:15 PM | WC_210618B |
| 2106122-04A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 101016 | 1 | 06/24/21 03:59 PM | CETAC2_HG_210624D |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 12:03 PM | ICP-MS5_210623B |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 01:04 PM | ICP-MS4_210623A |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 10 | 06/23/21 03:11 PM | ICP-MS4_210623A |
| 2106122-04B | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 02:50 AM | IC2_210621A |

**Lab Order:** 2106122
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2106122-04B | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 100964 | 100 | 06/21/21 05:46 PM | IC2_210621A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 08:10 PM | IC2_210621A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 100948 | 1 | 06/18/21 03:15 PM | WC_210618B |
| 2106122-05A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 101016 | 1 | 06/24/21 04:02 PM | CETAC2_HG_210624D |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 01:06 PM | ICP-MS4_210623A |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 10 | 06/23/21 03:13 PM | ICP-MS4_210623A |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 12:06 PM | ICP-MS5_210623B |
| 2106122-05B | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 03:06 AM | IC2_210621A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 08:26 PM | IC2_210621A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 100948 | 1 | 06/18/21 03:15 PM | WC_210618B |
| 2106122-06A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 101016 | 1 | 06/24/21 04:04 PM | CETAC2_HG_210624D |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 01:08 PM | ICP-MS4_210623A |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 10 | 06/23/21 03:15 PM | ICP-MS4_210623A |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 12:08 PM | ICP-MS5_210623B |
| 2106122-06B | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 08:42 PM | IC2_210621A |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 03:22 AM | IC2_210621A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 100948 | 1 | 06/18/21 03:15 PM | WC_210618B |
| 2106122-07A | DUP-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 101016 | 1 | 06/24/21 04:06 PM | CETAC2_HG_210624D |
| | DUP-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 10 | 06/23/21 03:17 PM | ICP-MS4_210623A |
| | DUP-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 12:11 PM | ICP-MS5_210623B |
| | DUP-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 01:10 PM | ICP-MS4_210623A |
| 2106122-07B | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 100964 | 10 | 06/21/21 08:58 PM | IC2_210621A |
| | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 03:38 AM | IC2_210621A |
| | DUP-1 | Aqueous | M2540C | Total Dissolved Solids | 100948 | 1 | 06/18/21 03:15 PM | WC_210618B |
| 2106122-08A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 101016 | 1 | 06/24/21 04:17 PM | CETAC2_HG_210624D |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 12:14 PM | ICP-MS5_210623B |

**Lab Order:** 2106122
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2106122-08A | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 50 | 06/23/21 03:19 PM | ICP-MS4_210623A |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 01:12 PM | ICP-MS4_210623A |
| 2106122-08B | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 100964 | 100 | 06/21/21 06:34 PM | IC2_210621A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 03:54 AM | IC2_210621A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 100962 | 1 | 06/21/21 02:10 PM | WC_210621B |
| 2106122-09A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 101016 | 1 | 06/24/21 04:19 PM | CETAC2_HG_210624D |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 10 | 06/23/21 03:21 PM | ICP-MS4_210623A |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 12:16 PM | ICP-MS5_210623B |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 01:14 PM | ICP-MS4_210623A |
| 2106122-09B | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 04:10 AM | IC2_210621A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 100964 | 100 | 06/21/21 10:34 PM | IC2_210621A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 100962 | 1 | 06/21/21 02:10 PM | WC_210621B |
| 2106122-10A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 101016 | 1 | 06/24/21 04:21 PM | CETAC2_HG_210624D |
| | FGD-12 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 01:27 PM | ICP-MS4_210623A |
| | FGD-12 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 100982 | 1 | 06/23/21 12:34 PM | ICP-MS5_210623B |
| 2106122-10B | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 100964 | 1 | 06/22/21 04:26 AM | IC2_210621A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 100962 | 1 | 06/21/21 02:10 PM | WC_210621B |

# DHL Analytical, Inc.

**Date:** *22-Jul-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2106122-01 |
| **Project No:** | 19122262 | **Collection Date:** | 06/16/21 05:45 PM |
| **Lab Order:** | 2106122 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/23/21 11:55 AM |
| Arsenic | 0.00232 | 0.00200 | 0.00500 | J | mg/L | 1 | 06/23/21 11:55 AM |
| Barium | 0.0769 | 0.00300 | 0.0100 | | mg/L | 1 | 06/23/21 11:55 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 11:55 AM |
| Boron | 0.0854 | 0.0100 | 0.0300 | | mg/L | 1 | 06/23/21 12:58 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 11:55 AM |
| Calcium | 29.0 | 1.00 | 3.00 | | mg/L | 10 | 06/23/21 03:05 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 11:55 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/23/21 11:55 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 11:55 AM |
| Lithium | 0.00824 | 0.00500 | 0.0100 | J | mg/L | 1 | 06/23/21 11:55 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 11:55 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 11:55 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/23/21 11:55 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/24/21 03:53 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 222 | 3.00 | 10.0 | | mg/L | 10 | 06/21/21 07:22 PM |
| Fluoride | 0.452 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 12:42 AM |
| Sulfate | 76.3 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 12:42 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 799 | 10.0 | 10.0 | | mg/L | 1 | 06/18/21 03:15 PM |

**Qualifiers:**

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- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *22-Jul-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2106122-02 |
| **Project No:** | 19122262 | **Collection Date:** | 06/16/21 06:35 PM |
| **Lab Order:** | 2106122 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/23/21 11:58 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 11:58 AM |
| Barium | 0.103 | 0.00300 | 0.0100 | | mg/L | 1 | 06/23/21 11:58 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 11:58 AM |
| Boron | 0.0932 | 0.0100 | 0.0300 | | mg/L | 1 | 06/23/21 01:00 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 11:58 AM |
| Calcium | 36.6 | 1.00 | 3.00 | | mg/L | 10 | 06/23/21 03:07 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 11:58 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/23/21 11:58 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 11:58 AM |
| Lithium | 0.0137 | 0.00500 | 0.0100 | | mg/L | 1 | 06/23/21 11:58 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 11:58 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 11:58 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/23/21 11:58 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/24/21 03:55 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 198 | 3.00 | 10.0 | | mg/L | 10 | 06/21/21 07:38 PM |
| Fluoride | 0.517 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 12:58 AM |
| Sulfate | 45.9 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 12:58 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 654 | 10.0 | 10.0 | | mg/L | 1 | 06/18/21 03:15 PM |

**Qualifiers:**

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- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *22-Jul-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2106122-03 |
| **Project No:** | 19122262 | **Collection Date:** | 06/16/21 07:25 PM |
| **Lab Order:** | 2106122 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/23/21 12:01 PM |
| Arsenic | 0.00217 | 0.00200 | 0.00500 | J | mg/L | 1 | 06/23/21 12:01 PM |
| Barium | 0.0343 | 0.00300 | 0.0100 | | mg/L | 1 | 06/23/21 12:01 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:01 PM |
| Boron | 0.121 | 0.0100 | 0.0300 | | mg/L | 1 | 06/23/21 01:02 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:01 PM |
| Calcium | 39.0 | 1.00 | 3.00 | | mg/L | 10 | 06/23/21 03:09 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:01 PM |
| Cobalt | 0.00624 | 0.00300 | 0.00500 | | mg/L | 1 | 06/23/21 12:01 PM |
| Lead | 0.000491 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/23/21 12:01 PM |
| Lithium | 0.0426 | 0.00500 | 0.0100 | | mg/L | 1 | 06/23/21 12:01 PM |
| Molybdenum | 0.00336 | 0.00200 | 0.00500 | J | mg/L | 1 | 06/23/21 12:01 PM |
| Selenium | 0.00752 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:01 PM |
| Thallium | 0.000528 | 0.000500 | 0.00150 | J | mg/L | 1 | 06/23/21 12:01 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | 0.0000940 | 0.0000800 | 0.000200 | J | mg/L | 1 | 06/24/21 03:57 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 64.1 | 3.00 | 10.0 | | mg/L | 10 | 06/21/21 07:54 PM |
| Fluoride | 1.20 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 02:34 AM |
| Sulfate | 130 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 02:34 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 741 | 10.0 | 10.0 | | mg/L | 1 | 06/18/21 03:15 PM |

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- DF- Dilution Factor
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- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
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- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *22-Jul-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2106122-04 |
| **Project No:** | 19122262 | **Collection Date:** | 06/17/21 07:35 AM |
| **Lab Order:** | 2106122 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/23/21 12:03 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:03 PM |
| Barium | 0.108 | 0.00300 | 0.0100 | | mg/L | 1 | 06/23/21 12:03 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:03 PM |
| Boron | 0.195 | 0.0100 | 0.0300 | | mg/L | 1 | 06/23/21 01:04 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:03 PM |
| Calcium | 76.4 | 1.00 | 3.00 | | mg/L | 10 | 06/23/21 03:11 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:03 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/23/21 12:03 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:03 PM |
| Lithium | 0.0230 | 0.00500 | 0.0100 | | mg/L | 1 | 06/23/21 12:03 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:03 PM |
| Selenium | 0.0233 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:03 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/23/21 12:03 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/24/21 03:59 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 422 | 3.00 | 10.0 | | mg/L | 10 | 06/21/21 08:10 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 02:50 AM |
| Sulfate | 133 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 02:50 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1030 | 50.0 | 50.0 | | mg/L | 1 | 06/18/21 03:15 PM |

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C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *22-Jul-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2106122-05 |
| **Project No:** | 19122262 | **Collection Date:** | 06/17/21 08:25 AM |
| **Lab Order:** | 2106122 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/23/21 12:06 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:06 PM |
| Barium | 0.111 | 0.00300 | 0.0100 | | mg/L | 1 | 06/23/21 12:06 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:06 PM |
| Boron | 0.116 | 0.0100 | 0.0300 | | mg/L | 1 | 06/23/21 01:06 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:06 PM |
| Calcium | 103 | 1.00 | 3.00 | | mg/L | 10 | 06/23/21 03:13 PM |
| Chromium | 0.0376 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:06 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/23/21 12:06 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:06 PM |
| Lithium | 0.147 | 0.00500 | 0.0100 | | mg/L | 1 | 06/23/21 12:06 PM |
| Molybdenum | 0.00504 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:06 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:06 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/23/21 12:06 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/24/21 04:02 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 308 | 3.00 | 10.0 | | mg/L | 10 | 06/21/21 08:26 PM |
| Fluoride | 0.593 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 03:06 AM |
| Sulfate | 107 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 03:06 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 795 | 50.0 | 50.0 | | mg/L | 1 | 06/18/21 03:15 PM |

**Qualifiers:**

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S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *22-Jul-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2106122-06 |
| **Project No:** | 19122262 | **Collection Date:** | 06/17/21 09:15 AM |
| **Lab Order:** | 2106122 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/23/21 12:08 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:08 PM |
| Barium | 0.174 | 0.00300 | 0.0100 | | mg/L | 1 | 06/23/21 12:08 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:08 PM |
| Boron | 0.0843 | 0.0100 | 0.0300 | | mg/L | 1 | 06/23/21 01:08 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:08 PM |
| Calcium | 35.7 | 1.00 | 3.00 | | mg/L | 10 | 06/23/21 03:15 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:08 PM |
| Cobalt | 0.00441 | 0.00300 | 0.00500 | J | mg/L | 1 | 06/23/21 12:08 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:08 PM |
| Lithium | 0.0225 | 0.00500 | 0.0100 | | mg/L | 1 | 06/23/21 12:08 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:08 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:08 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/23/21 12:08 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/24/21 04:04 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 299 | 3.00 | 10.0 | | mg/L | 10 | 06/21/21 08:42 PM |
| Fluoride | 0.356 | 0.100 | 0.400 | J | mg/L | 1 | 06/22/21 03:22 AM |
| Sulfate | 140 | 10.0 | 30.0 | | mg/L | 10 | 06/21/21 08:42 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 935 | 50.0 | 50.0 | | mg/L | 1 | 06/18/21 03:15 PM |

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- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
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- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *22-Jul-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | DUP-1 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2106122-07 |
| **Project No:** | 19122262 | **Collection Date:** | 06/17/21 09:15 AM |
| **Lab Order:** | 2106122 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/23/21 12:11 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:11 PM |
| Barium | 0.168 | 0.00300 | 0.0100 | | mg/L | 1 | 06/23/21 12:11 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:11 PM |
| Boron | 0.0808 | 0.0100 | 0.0300 | | mg/L | 1 | 06/23/21 01:10 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:11 PM |
| Calcium | 35.7 | 1.00 | 3.00 | | mg/L | 10 | 06/23/21 03:17 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:11 PM |
| Cobalt | 0.00423 | 0.00300 | 0.00500 | J | mg/L | 1 | 06/23/21 12:11 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:11 PM |
| Lithium | 0.0221 | 0.00500 | 0.0100 | | mg/L | 1 | 06/23/21 12:11 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:11 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:11 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/23/21 12:11 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/24/21 04:06 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 304 | 3.00 | 10.0 | | mg/L | 10 | 06/21/21 08:58 PM |
| Fluoride | 0.352 | 0.100 | 0.400 | J | mg/L | 1 | 06/22/21 03:38 AM |
| Sulfate | 143 | 10.0 | 30.0 | | mg/L | 10 | 06/21/21 08:58 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 960 | 50.0 | 50.0 | | mg/L | 1 | 06/18/21 03:15 PM |

**Qualifiers:**

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- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *22-Jul-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2106122-08 |
| **Project No:** | 19122262 | **Collection Date:** | 06/17/21 11:45 AM |
| **Lab Order:** | 2106122 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/23/21 12:14 PM |
| Arsenic | 0.00749 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:14 PM |
| Barium | 1.10 | 0.00300 | 0.0100 | | mg/L | 1 | 06/23/21 12:14 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:14 PM |
| Boron | 0.0816 | 0.0100 | 0.0300 | | mg/L | 1 | 06/23/21 01:12 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:14 PM |
| Calcium | 353 | 5.00 | 15.0 | | mg/L | 50 | 06/23/21 03:19 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:14 PM |
| Cobalt | 0.00670 | 0.00300 | 0.00500 | | mg/L | 1 | 06/23/21 12:14 PM |
| Lead | 0.000766 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/23/21 12:14 PM |
| Lithium | 0.0125 | 0.00500 | 0.0100 | | mg/L | 1 | 06/23/21 12:14 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:14 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:14 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/23/21 12:14 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/24/21 04:17 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 2230 | 30.0 | 100 | | mg/L | 100 | 06/21/21 06:34 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 03:54 AM |
| Sulfate | 310 | 100 | 300 | | mg/L | 100 | 06/21/21 06:34 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 4870 | 50.0 | 50.0 | | mg/L | 1 | 06/21/21 02:10 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *22-Jul-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2106122-09 |
| **Project No:** | 19122262 | **Collection Date:** | 06/17/21 01:30 PM |
| **Lab Order:** | 2106122 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/23/21 12:16 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:16 PM |
| Barium | 0.300 | 0.00300 | 0.0100 | | mg/L | 1 | 06/23/21 12:16 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:16 PM |
| Boron | 0.116 | 0.0100 | 0.0300 | | mg/L | 1 | 06/23/21 01:14 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:16 PM |
| Calcium | 90.4 | 1.00 | 3.00 | | mg/L | 10 | 06/23/21 03:21 PM |
| Chromium | 0.00633 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:16 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/23/21 12:16 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:16 PM |
| Lithium | 0.0149 | 0.00500 | 0.0100 | | mg/L | 1 | 06/23/21 12:16 PM |
| Molybdenum | 0.00235 | 0.00200 | 0.00500 | J | mg/L | 1 | 06/23/21 12:16 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:16 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/23/21 12:16 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/24/21 04:19 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 440 | 30.0 | 100 | | mg/L | 100 | 06/21/21 10:34 PM |
| Fluoride | 0.471 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 04:10 AM |
| Sulfate | 33.8 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 04:10 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1160 | 50.0 | 50.0 | | mg/L | 1 | 06/21/21 02:10 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *22-Jul-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2106122-10 |
| **Project No:** | 19122262 | **Collection Date:** | 06/17/21 02:25 PM |
| **Lab Order:** | 2106122 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 06/23/21 12:34 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:34 PM |
| Barium | 0.0817 | 0.00300 | 0.0100 | | mg/L | 1 | 06/23/21 12:34 PM |
| Beryllium | 0.000504 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/23/21 12:34 PM |
| Boron | 0.102 | 0.0100 | 0.0300 | | mg/L | 1 | 06/23/21 01:27 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:34 PM |
| Calcium | 12.3 | 0.100 | 0.300 | | mg/L | 1 | 06/23/21 12:34 PM |
| Chromium | 0.00273 | 0.00200 | 0.00500 | J | mg/L | 1 | 06/23/21 12:34 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/23/21 12:34 PM |
| Lead | 0.00317 | 0.000300 | 0.00100 | | mg/L | 1 | 06/23/21 12:34 PM |
| Lithium | 0.0239 | 0.00500 | 0.0100 | | mg/L | 1 | 06/23/21 12:34 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:34 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/23/21 12:34 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 06/23/21 12:34 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/24/21 04:21 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 16.1 | 0.300 | 1.00 | | mg/L | 1 | 06/22/21 04:26 AM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 06/22/21 04:26 AM |
| Sulfate | 18.3 | 1.00 | 3.00 | | mg/L | 1 | 06/22/21 04:26 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 202 | 10.0 | 10.0 | | mg/L | 1 | 06/21/21 02:10 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_210511A**

Sample ID: **DCS-100518** Batch ID: **100518** TestNo: **SW7470A** Units: **mg/L**
SampType: **DCS** Run ID: **CETAC2_HG_210511A** Analysis Date: **5/11/2021 1:32:27 PM** Prep Date: **5/10/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.000165 | 0.000200 | 0.000200 | 0 | 82.5 | 82 | 119 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_210624D**

The QC data in batch 101016 applies to the following samples: 2106122-01A, 2106122-02A, 2106122-03A, 2106122-04A, 2106122-05A, 2106122-06A, 2106122-07A, 2106122-08A, 2106122-09A, 2106122-10A

Sample ID: **MB-101016** Batch ID: **101016** TestNo: **SW7470A** Units: **mg/L**
SampType: **MBLK** Run ID: **CETAC2_HG_210624D** Analysis Date: **6/24/2021 3:32:48 PM** Prep Date: **6/24/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

Sample ID: **LCS-101016** Batch ID: **101016** TestNo: **SW7470A** Units: **mg/L**
SampType: **LCS** Run ID: **CETAC2_HG_210624D** Analysis Date: **6/24/2021 3:37:20 PM** Prep Date: **6/24/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00205 | 0.000200 | 0.00200 | 0 | 103 | 85 | 115 | | | |

Sample ID: **LCSD-101016** Batch ID: **101016** TestNo: **SW7470A** Units: **mg/L**
SampType: **LCSD** Run ID: **CETAC2_HG_210624D** Analysis Date: **6/24/2021 3:39:36 PM** Prep Date: **6/24/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00203 | 0.000200 | 0.00200 | 0 | 102 | 85 | 115 | 0.980 | 15 | |

Sample ID: **2106132-01C MS** Batch ID: **101016** TestNo: **SW7470A** Units: **mg/L**
SampType: **MS** Run ID: **CETAC2_HG_210624D** Analysis Date: **6/24/2021 3:44:08 PM** Prep Date: **6/24/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0104 | 0.00100 | 0.0100 | 0 | 104 | 80 | 120 | | | |

Sample ID: **2106132-01C MSD** Batch ID: **101016** TestNo: **SW7470A** Units: **mg/L**
SampType: **MSD** Run ID: **CETAC2_HG_210624D** Analysis Date: **6/24/2021 3:46:23 PM** Prep Date: **6/24/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0102 | 0.00100 | 0.0100 | 0 | 102 | 80 | 120 | 1.94 | 15 | |

Sample ID: **2106132-01C SD** Batch ID: **101016** TestNo: **SW7470A** Units: **mg/L**
SampType: **SD** Run ID: **CETAC2_HG_210624D** Analysis Date: **6/24/2021 3:48:39 PM** Prep Date: **6/24/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.00200 | 0.00500 | 0 | 0 | | | | 0 | 10 | |

Sample ID: **2106132-01C PDS** Batch ID: **101016** TestNo: **SW7470A** Units: **mg/L**
SampType: **PDS** Run ID: **CETAC2_HG_210624D** Analysis Date: **6/24/2021 3:50:55 PM** Prep Date: **6/24/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0122 | 0.00100 | 0.0125 | 0 | 98.0 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_210624D**

| Sample ID: **ICV-210624** | Batch ID: **R115939** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_210624D** | Analysis Date: **6/24/2021 1:57:16 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00396 | 0.000200 | 0.00400 | 0 | 99.0 | 90 | 110 | | | |

| Sample ID: **CCV2-210624** | Batch ID: **R115939** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_210624D** | Analysis Date: **6/24/2021 3:23:39 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00203 | 0.000200 | 0.00200 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **CCV3-210624** | Batch ID: **R115939** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_210624D** | Analysis Date: **6/24/2021 4:09:05 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00201 | 0.000200 | 0.00200 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **CCV4-210624** | Batch ID: **R115939** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_210624D** | Analysis Date: **6/24/2021 4:32:58 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_210428A**

| Sample ID: **DCS2-100323** | Batch ID: **100323** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS4_210428A** | Analysis Date: **4/28/2021 10:34:00 AM** | Prep Date: **4/27/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.302 | 0.300 | 0.300 | 0 | 101 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-100323** | Batch ID: **100323** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS4_210428A** | Analysis Date: **4/28/2021 10:39:00 AM** | Prep Date: **4/27/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0310 | 0.0300 | 0.0300 | 0 | 103 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_210623A**

The QC data in batch 100982 applies to the following samples: 2106122-01A, 2106122-02A, 2106122-03A, 2106122-04A, 2106122-05A, 2106122-06A, 2106122-07A, 2106122-08A, 2106122-09A, 2106122-10A

| Sample ID: **MB-100982** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 12:46:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

| Sample ID: **LCS-100982** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 12:48:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.205 | 0.0300 | 0.200 | 0 | 103 | 80 | 120 | | | |

| Sample ID: **LCSD-100982** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 12:50:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.211 | 0.0300 | 0.200 | 0 | 105 | 80 | 120 | 2.73 | 15 | |

| Sample ID: **2106129-04A SD** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 12:56:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0727 | 0.150 | 0 | 0.0683 | | | | 6.21 | 20 | |

| Sample ID: **2106129-04A PDS** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 1:16:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.262 | 0.0300 | 0.200 | 0.0683 | 96.7 | 75 | 125 | | | |

| Sample ID: **2106129-04A MS** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 1:18:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.266 | 0.0300 | 0.200 | 0.0683 | 98.9 | 75 | 125 | | | |

| Sample ID: **2106129-04A MSD** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 1:20:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.285 | 0.0300 | 0.200 | 0.0683 | 108 | 75 | 125 | 6.96 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_210623A**

| Sample ID: **ICV-210623** | Batch ID: **R115915** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 11:54:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.101 | 0.0300 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Calcium | 2.55 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **LCVL-210623** | Batch ID: **R115915** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 12:30:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0207 | 0.0300 | 0.0200 | 0 | 104 | 80 | 120 | | | |
| Calcium | 0.103 | 0.300 | 0.100 | 0 | 103 | 80 | 120 | | | |

| Sample ID: **CCV1-210623** | Batch ID: **R115915** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 1:22:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.199 | 0.0300 | 0.200 | 0 | 99.4 | 90 | 110 | | | |

| Sample ID: **CCV2-210623** | Batch ID: **R115915** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 1:46:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.211 | 0.0300 | 0.200 | 0 | 105 | 90 | 110 | | | |

| Sample ID: **CCV4-210623** | Batch ID: **R115915** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 2:55:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.83 | 0.300 | 5.00 | 0 | 96.6 | 90 | 110 | | | |

| Sample ID: **CCV5-210623** | Batch ID: **R115915** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_210623A** | Analysis Date: **6/23/2021 3:23:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.86 | 0.300 | 5.00 | 0 | 97.2 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_210428A**

| Sample ID: **DCS1-100323** | Batch ID: **100323** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS5_210428A** | Analysis Date: **4/28/2021 10:49:00 AM** | Prep Date: **4/27/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00105 | 0.00250 | 0.00100 | 0 | 105 | 70 | 130 | 0 | 0 | |
| Beryllium | 0.000505 | 0.00100 | 0.000500 | 0 | 101 | 70 | 130 | 0 | 0 | |
| Cadmium | 0.000461 | 0.00100 | 0.000500 | 0 | 92.2 | 70 | 130 | 0 | 0 | |
| Lead | 0.000474 | 0.00100 | 0.000500 | 0 | 94.8 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000452 | 0.00150 | 0.000500 | 0 | 90.4 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS2-100323** | Batch ID: **100323** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS5_210428A** | Analysis Date: **4/28/2021 10:53:00 AM** | Prep Date: **4/27/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.302 | 0.300 | 0.300 | 0 | 101 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS3-100323** | Batch ID: **100323** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS5_210428A** | Analysis Date: **4/28/2021 10:56:00 AM** | Prep Date: **4/27/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00467 | 0.00500 | 0.00500 | 0 | 93.3 | 70 | 130 | 0 | 0 | |
| Barium | 0.00472 | 0.0100 | 0.00500 | 0 | 94.4 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00490 | 0.00500 | 0.00500 | 0 | 97.9 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00473 | 0.00500 | 0.00500 | 0 | 94.5 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00495 | 0.0100 | 0.00500 | 0 | 99.0 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00482 | 0.00500 | 0.00500 | 0 | 96.4 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00498 | 0.00500 | 0.00500 | 0 | 99.5 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS5_210623B**

The QC data in batch 100982 applies to the following samples: 2106122-01A, 2106122-02A, 2106122-03A, 2106122-04A, 2106122-05A, 2106122-06A, 2106122-07A, 2106122-08A, 2106122-09A, 2106122-10A

Sample ID: **MB-100982** Batch ID: **100982** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_210623B** Analysis Date: **6/23/2021 11:39:00 AM** Prep Date: **6/22/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID: **LCS-100982** Batch ID: **100982** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_210623B** Analysis Date: **6/23/2021 11:42:00 AM** Prep Date: **6/22/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Arsenic | 0.209 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Barium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Beryllium | 0.207 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Cadmium | 0.207 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Calcium | 5.08 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | | | |
| Chromium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Cobalt | 0.210 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 98.2 | 80 | 120 | | | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Molybdenum | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Thallium | 0.198 | 0.00150 | 0.200 | 0 | 98.8 | 80 | 120 | | | |

Sample ID: **LCSD-100982** Batch ID: **100982** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_210623B** Analysis Date: **6/23/2021 11:45:00 AM** Prep Date: **6/22/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.5 | 80 | 120 | 1.54 | 15 | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 0.204 | 15 | |
| Barium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | 1.08 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_210623B**

| Sample ID: **LCSD-100982** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 11:45:00 AM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | 1.46 | 15 | |
| Cadmium | 0.208 | 0.00100 | 0.200 | 0 | 104 | 80 | 120 | 0.350 | 15 | |
| Calcium | 5.11 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | 0.488 | 15 | |
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 1.10 | 15 | |
| Cobalt | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 1.11 | 15 | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 98.1 | 80 | 120 | 0.129 | 15 | |
| Lithium | 0.203 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | 0.789 | 15 | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 1.39 | 15 | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.109 | 15 | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.7 | 80 | 120 | 0.041 | 15 | |

| Sample ID: **2106129-04A SD** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 11:53:00 AM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 20 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Barium | 0.0429 | 0.0500 | 0 | 0.0428 | | | | 0.180 | 20 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Calcium | 14.6 | 1.50 | 0 | 15.1 | | | | 3.52 | 20 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Lead | <0.00150 | 0.00500 | 0 | 0.000404 | | | | 0 | 20 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.00804 | | | | 0 | 20 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 20 | |

| Sample ID: **2106129-04A PDS** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 12:19:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.175 | 0.00250 | 0.200 | 0 | 87.7 | 75 | 125 | | | |
| Arsenic | 0.189 | 0.00500 | 0.200 | 0 | 94.5 | 75 | 125 | | | |
| Barium | 0.242 | 0.0100 | 0.200 | 0.0428 | 99.8 | 75 | 125 | | | |
| Beryllium | 0.193 | 0.00100 | 0.200 | 0 | 96.5 | 75 | 125 | | | |
| Cadmium | 0.205 | 0.00100 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Calcium | 19.4 | 0.300 | 5.00 | 15.1 | 87.3 | 75 | 125 | | | |
| Chromium | 0.209 | 0.00500 | 0.200 | 0 | 104 | 75 | 125 | | | |
| Cobalt | 0.195 | 0.00500 | 0.200 | 0 | 97.5 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_210623B**

| Sample ID: **2106129-04A PDS** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 12:19:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.196 | 0.00100 | 0.200 | 0.000404 | 98.0 | 75 | 125 | | | |
| Lithium | 0.197 | 0.0100 | 0.200 | 0.00804 | 94.5 | 75 | 125 | | | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 98.8 | 75 | 125 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.7 | 75 | 125 | | | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 98.0 | 75 | 125 | | | |

| Sample ID: **2106129-04A MS** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 12:21:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 75 | 125 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 100 | 75 | 125 | | | |
| Barium | 0.247 | 0.0100 | 0.200 | 0.0428 | 102 | 75 | 125 | | | |
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 75 | 125 | | | |
| Cadmium | 0.210 | 0.00100 | 0.200 | 0 | 105 | 75 | 125 | | | |
| Calcium | 20.0 | 0.300 | 5.00 | 15.1 | 97.6 | 75 | 125 | | | |
| Chromium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 75 | 125 | | | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 75 | 125 | | | |
| Lead | 0.198 | 0.00100 | 0.200 | 0.000404 | 98.9 | 75 | 125 | | | |
| Lithium | 0.207 | 0.0100 | 0.200 | 0.00804 | 99.4 | 75 | 125 | | | |
| Molybdenum | 0.206 | 0.00500 | 0.200 | 0 | 103 | 75 | 125 | | | |
| Selenium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Thallium | 0.198 | 0.00150 | 0.200 | 0 | 99.2 | 75 | 125 | | | |

| Sample ID: **2106129-04A MSD** | Batch ID: **100982** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 12:24:00 PM** | Prep Date: **6/22/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 102 | 75 | 125 | 1.33 | 15 | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 100 | 75 | 125 | 0.135 | 15 | |
| Barium | 0.250 | 0.0100 | 0.200 | 0.0428 | 104 | 75 | 125 | 1.20 | 15 | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 99.8 | 75 | 125 | 0.707 | 15 | |
| Cadmium | 0.211 | 0.00100 | 0.200 | 0 | 105 | 75 | 125 | 0.533 | 15 | |
| Calcium | 19.6 | 0.300 | 5.00 | 15.1 | 91.4 | 75 | 125 | 1.58 | 15 | |
| Chromium | 0.209 | 0.00500 | 0.200 | 0 | 104 | 75 | 125 | 1.00 | 15 | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | 1.28 | 15 | |
| Lead | 0.201 | 0.00100 | 0.200 | 0.000404 | 100 | 75 | 125 | 1.44 | 15 | |
| Lithium | 0.210 | 0.0100 | 0.200 | 0.00804 | 101 | 75 | 125 | 1.35 | 15 | |
| Molybdenum | 0.208 | 0.00500 | 0.200 | 0 | 104 | 75 | 125 | 1.25 | 15 | |
| Selenium | 0.207 | 0.00500 | 0.200 | 0 | 104 | 75 | 125 | 1.93 | 15 | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 75 | 125 | 1.72 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_210623B**

| Sample ID: **ICV-210623** | Batch ID: **R115914** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 10:44:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.0990 | 0.00250 | 0.100 | 0 | 99.0 | 90 | 110 | | | |
| Arsenic | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Beryllium | 0.0978 | 0.00100 | 0.100 | 0 | 97.8 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.58 | 0.300 | 2.50 | 0 | 103 | 90 | 110 | | | |
| Chromium | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Cobalt | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.0978 | 0.00100 | 0.100 | 0 | 97.8 | 90 | 110 | | | |
| Lithium | 0.0956 | 0.0100 | 0.100 | 0 | 95.6 | 90 | 110 | | | |
| Molybdenum | 0.0992 | 0.00500 | 0.100 | 0 | 99.2 | 90 | 110 | | | |
| Selenium | 0.0989 | 0.00500 | 0.100 | 0 | 98.9 | 90 | 110 | | | |
| Thallium | 0.0972 | 0.00150 | 0.100 | 0 | 97.2 | 90 | 110 | | | |

| Sample ID: **LCVL-210623** | Batch ID: **R115914** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 10:50:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00197 | 0.00250 | 0.00200 | 0 | 98.7 | 80 | 120 | | | |
| Arsenic | 0.00491 | 0.00500 | 0.00500 | 0 | 98.2 | 80 | 120 | | | |
| Barium | 0.00505 | 0.0100 | 0.00500 | 0 | 101 | 80 | 120 | | | |
| Beryllium | 0.00110 | 0.00100 | 0.00100 | 0 | 110 | 80 | 120 | | | |
| Cadmium | 0.000937 | 0.00100 | 0.00100 | 0 | 93.7 | 80 | 120 | | | |
| Calcium | 0.113 | 0.300 | 0.100 | 0 | 113 | 80 | 120 | | | |
| Chromium | 0.00500 | 0.00500 | 0.00500 | 0 | 100 | 80 | 120 | | | |
| Cobalt | 0.00476 | 0.00500 | 0.00500 | 0 | 95.2 | 80 | 120 | | | |
| Lead | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 80 | 120 | | | |
| Lithium | 0.00989 | 0.0100 | 0.0100 | 0 | 98.9 | 80 | 120 | | | |
| Molybdenum | 0.00513 | 0.00500 | 0.00500 | 0 | 103 | 80 | 120 | | | |
| Selenium | 0.00489 | 0.00500 | 0.00500 | 0 | 97.8 | 80 | 120 | | | |
| Thallium | 0.000979 | 0.00150 | 0.00100 | 0 | 97.9 | 80 | 120 | | | |

| Sample ID: **CCV1-210623** | Batch ID: **R115914** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 11:30:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.7 | 90 | 110 | | | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.6 | 90 | 110 | | | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.6 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_210623B**

| Sample ID: **CCV1-210623** | Batch ID: **R115914** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 11:30:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.18 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.195 | 0.00100 | 0.200 | 0 | 97.4 | 90 | 110 | | | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.3 | 90 | 110 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.4 | 90 | 110 | | | |

| Sample ID: **CCV2-210623** | Batch ID: **R115914** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 12:27:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Beryllium | 0.193 | 0.00100 | 0.200 | 0 | 96.5 | 90 | 110 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 5.04 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.195 | 0.00100 | 0.200 | 0 | 97.5 | 90 | 110 | | | |
| Lithium | 0.196 | 0.0100 | 0.200 | 0 | 98.2 | 90 | 110 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Selenium | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Thallium | 0.194 | 0.00150 | 0.200 | 0 | 97.2 | 90 | 110 | | | |

| Sample ID: **CCV3-210623** | Batch ID: **R115914** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 12:58:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.6 | 90 | 110 | | | |
| Arsenic | 0.196 | 0.00500 | 0.200 | 0 | 98.1 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Beryllium | 0.188 | 0.00100 | 0.200 | 0 | 94.0 | 90 | 110 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Calcium | 5.20 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.198 | 0.00500 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Lead | 0.195 | 0.00100 | 0.200 | 0 | 97.3 | 90 | 110 | | | |
| Lithium | 0.190 | 0.0100 | 0.200 | 0 | 95.1 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_210623B**

| Sample ID: **CCV3-210623** | Batch ID: **R115914** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_210623B** | Analysis Date: **6/23/2021 12:58:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Selenium | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_210527A**

Sample ID: **DCS3-100738** Batch ID: **100738** TestNo: **E300** Units: **mg/L**
SampType: **DCS3** Run ID: **IC2_210527A** Analysis Date: **5/27/2021 4:13:05 PM** Prep Date: **5/27/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 1.25 | 1.00 | 1.000 | 0 | 125 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.408 | 0.400 | 0.4000 | 0 | 102 | 70 | 130 | 0 | 0 | |
| Sulfate | 3.03 | 3.00 | 3.000 | 0 | 101 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_210621A**

The QC data in batch 100964 applies to the following samples: 2106122-01B, 2106122-02B, 2106122-03B, 2106122-04B, 2106122-05B, 2106122-06B, 2106122-07B, 2106122-08B, 2106122-09B, 2106122-10B

Sample ID: **MB-100964** Batch ID: **100964** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_210621A** Analysis Date: **6/21/2021 12:06:40 PM** Prep Date: **6/21/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-100964** Batch ID: **100964** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_210621A** Analysis Date: **6/21/2021 12:22:40 PM** Prep Date: **6/21/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.89 | 1.00 | 10.00 | 0 | 98.9 | 90 | 110 | | | |
| Fluoride | 3.72 | 0.400 | 4.000 | 0 | 93.0 | 90 | 110 | | | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | | | |

Sample ID: **LCSD-100964** Batch ID: **100964** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_210621A** Analysis Date: **6/21/2021 12:38:40 PM** Prep Date: **6/21/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.89 | 1.00 | 10.00 | 0 | 98.9 | 90 | 110 | 0.056 | 20 | |
| Fluoride | 3.71 | 0.400 | 4.000 | 0 | 92.7 | 90 | 110 | 0.260 | 20 | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.6 | 90 | 110 | 0.114 | 20 | |

Sample ID: **2106122-04BMS** Batch ID: **100964** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_210621A** Analysis Date: **6/21/2021 6:02:58 PM** Prep Date: **6/21/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2380 | 100 | 2000 | 416.3 | 98.3 | 90 | 110 | | | |
| Fluoride | 1960 | 40.0 | 2000 | 0 | 97.9 | 90 | 110 | | | |
| Sulfate | 1810 | 300 | 2000 | 145.8 | 83.2 | 90 | 110 | | | S |

Sample ID: **2106122-04BMSD** Batch ID: **100964** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_210621A** Analysis Date: **6/21/2021 6:18:58 PM** Prep Date: **6/21/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2370 | 100 | 2000 | 416.3 | 97.9 | 90 | 110 | 0.307 | 20 | |
| Fluoride | 1960 | 40.0 | 2000 | 0 | 97.8 | 90 | 110 | 0.024 | 20 | |
| Sulfate | 1810 | 300 | 2000 | 145.8 | 83.4 | 90 | 110 | 0.233 | 20 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_210621A**

| Sample ID: **2106122-08BMS** | Batch ID: **100964** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_210621A** | Analysis Date: **6/21/2021 6:50:58 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3950 | 100 | 2000 | 2228 | 86.0 | 90 | 110 | | | S |
| Fluoride | 1930 | 40.0 | 2000 | 0 | 96.6 | 90 | 110 | | | |
| Sulfate | 1960 | 300 | 2000 | 310.0 | 82.3 | 90 | 110 | | | S |

| Sample ID: **2106122-08BMSD** | Batch ID: **100964** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_210621A** | Analysis Date: **6/21/2021 7:06:58 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3990 | 100 | 2000 | 2228 | 88.3 | 90 | 110 | 1.17 | 20 | S |
| Fluoride | 1960 | 40.0 | 2000 | 0 | 97.8 | 90 | 110 | 1.31 | 20 | |
| Sulfate | 1980 | 300 | 2000 | 310.0 | 83.7 | 90 | 110 | 1.35 | 20 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_210621A**

| Sample ID: **ICV-210621** | Batch ID: **R115881** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_210621A** | Analysis Date: **6/21/2021 11:34:40 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.2 | 1.00 | 25.00 | 0 | 101 | 90 | 110 | | | |
| Fluoride | 9.67 | 0.400 | 10.00 | 0 | 96.7 | 90 | 110 | | | |
| Sulfate | 76.5 | 3.00 | 75.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **CCV1-210621** | Batch ID: **R115881** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_210621A** | Analysis Date: **6/21/2021 10:02:58 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.75 | 1.00 | 10.00 | 0 | 97.5 | 90 | 110 | | | |
| Fluoride | 3.83 | 0.400 | 4.000 | 0 | 95.8 | 90 | 110 | | | |
| Sulfate | 28.9 | 3.00 | 30.00 | 0 | 96.4 | 90 | 110 | | | |

| Sample ID: **CCV2-210621** | Batch ID: **R115881** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_210621A** | Analysis Date: **6/22/2021 2:02:58 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.97 | 1.00 | 10.00 | 0 | 99.7 | 90 | 110 | | | |
| Fluoride | 3.94 | 0.400 | 4.000 | 0 | 98.6 | 90 | 110 | | | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 98.2 | 90 | 110 | | | |

| Sample ID: **CCV3-210621** | Batch ID: **R115881** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_210621A** | Analysis Date: **6/22/2021 6:02:58 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.97 | 1.00 | 10.00 | 0 | 99.7 | 90 | 110 | | | |
| Fluoride | 3.96 | 0.400 | 4.000 | 0 | 99.1 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.2 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_210618B**

The QC data in batch 100948 applies to the following samples: 2106122-01B, 2106122-02B, 2106122-03B, 2106122-04B, 2106122-05B, 2106122-06B, 2106122-07B

| Sample ID: **MB-100948** | Batch ID: **100948** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_210618B** | Analysis Date: **6/18/2021 3:15:00 PM** | Prep Date: **6/18/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-100948** | Batch ID: **100948** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_210618B** | Analysis Date: **6/18/2021 3:15:00 PM** | Prep Date: **6/18/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 754 | 10.0 | 745.6 | 0 | 101 | 90 | 113 | | | |

| Sample ID: **2106110-02B-DUP** | Batch ID: **100948** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_210618B** | Analysis Date: **6/18/2021 3:15:00 PM** | Prep Date: **6/18/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1680 | 50.0 | 0 | 1695 | | | | 0.889 | 5 | |

| Sample ID: **2106110-03B-DUP** | Batch ID: **100948** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_210618B** | Analysis Date: **6/18/2021 3:15:00 PM** | Prep Date: **6/18/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 2270 | 50.0 | 0 | 2250 | | | | 0.664 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_210621B**

The QC data in batch 100962 applies to the following samples: 2106122-08B, 2106122-09B, 2106122-10B

| Sample ID: **MB-100962** | Batch ID: **100962** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_210621B** | Analysis Date: **6/21/2021 2:10:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-100962** | Batch ID: **100962** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_210621B** | Analysis Date: **6/21/2021 2:10:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 774 | 10.0 | 745.6 | 0 | 104 | 90 | 113 | | | |

| Sample ID: **2106122-08B-DUP** | Batch ID: **100962** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_210621B** | Analysis Date: **6/21/2021 2:10:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 4810 | 50.0 | 0 | 4870 | | | | 1.34 | 5 | |

| Sample ID: **2106122-09B-DUP** | Batch ID: **100962** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_210621B** | Analysis Date: **6/21/2021 2:10:00 PM** | Prep Date: **6/21/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1140 | 50.0 | 0 | 1155 | | | | 1.75 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2106122
**Project:** Luminant-OGSES-CCR-FGD Ponds

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Antimony | 0.000800 | 0.00250 |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Cadmium | 0.000300 | 0.00100 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Molybdenum | 0.00200 | 0.00500 |
| Selenium | 0.00200 | 0.00500 |
| Thallium | 0.000500 | 0.00150 |

| **TestNo: SW7470A** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Mercury | 0.0000800 | 0.000200 |

| **TestNo: M2540C** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

# ANALYTICAL REPORT

July 22, 2021



## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1370027 |
| Samples Received: | 06/23/2021 |
| Project Number: | 2106122 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

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## FGD-6 L1370027-01 Non-Potable Water

Collected by | Collected date/time 06/16/21 17:45 | Received date/time 06/23/21 10:00

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1704947 | 1 | 07/15/21 14:30 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1694790 | 1 | 07/19/21 10:54 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1694790 | 1 | 07/19/21 10:54 | 07/19/21 21:34 | RGT | Mt. Juliet, TN |

## FGD-4 L1370027-02 Non-Potable Water

Collected by | Collected date/time 06/16/21 18:35 | Received date/time 06/23/21 10:00

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1704947 | 1 | 07/15/21 14:30 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1694790 | 1 | 07/19/21 10:54 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1694790 | 1 | 07/19/21 10:54 | 07/19/21 21:34 | RGT | Mt. Juliet, TN |

## FGD-3 L1370027-03 Non-Potable Water

Collected by | Collected date/time 06/16/21 19:25 | Received date/time 06/23/21 10:00

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1704947 | 1 | 07/15/21 14:30 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1694790 | 1 | 07/19/21 10:54 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1694790 | 1 | 07/19/21 10:54 | 07/19/21 21:34 | RGT | Mt. Juliet, TN |

## FGD-2 L1370027-04 Non-Potable Water

Collected by | Collected date/time 06/17/21 07:35 | Received date/time 06/23/21 10:00

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1704947 | 1 | 07/15/21 14:30 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1694790 | 1 | 07/19/21 10:54 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1694790 | 1 | 07/19/21 10:54 | 07/19/21 21:34 | RGT | Mt. Juliet, TN |

## FGD-5 L1370027-05 Non-Potable Water

Collected by | Collected date/time 06/17/21 08:25 | Received date/time 06/23/21 10:00

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1704947 | 1 | 07/15/21 14:30 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1694790 | 1 | 07/19/21 10:54 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1694790 | 1 | 07/19/21 10:54 | 07/19/21 21:34 | RGT | Mt. Juliet, TN |

## FGD-1 L1370027-06 Non-Potable Water

Collected by | Collected date/time 06/17/21 09:15 | Received date/time 06/23/21 10:00

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1704947 | 1 | 07/15/21 14:30 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1694790 | 1 | 07/19/21 10:54 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1694790 | 1 | 07/19/21 10:54 | 07/19/21 21:34 | RGT | Mt. Juliet, TN |

## DUP-1 L1370027-07 Non-Potable Water

Collected by | Collected date/time 06/17/21 09:15 | Received date/time 06/23/21 10:00

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1704947 | 1 | 07/15/21 14:30 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1694790 | 1 | 07/19/21 10:54 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1694790 | 1 | 07/19/21 10:54 | 07/19/21 21:34 | RGT | Mt. Juliet, TN |

## FGD-8 L1370027-08 Non-Potable Water

Collected by | Collected date/time 06/17/21 11:45 | Received date/time 06/23/21 10:00

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1704947 | 1 | 07/15/21 14:30 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1694790 | 1 | 07/19/21 10:54 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1694790 | 1 | 07/19/21 10:54 | 07/19/21 21:34 | RGT | Mt. Juliet, TN |

## FGD-11 L1370027-09 Non-Potable Water

Collected by | Collected date/time 06/17/21 13:30 | Received date/time 06/23/21 10:00

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1704947 | 1 | 07/15/21 14:30 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1694790 | 1 | 07/19/21 10:54 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1694790 | 1 | 07/19/21 10:54 | 07/19/21 21:34 | RGT | Mt. Juliet, TN |

## FGD-12 L1370027-10 Non-Potable Water

Collected by | Collected date/time 06/17/21 14:45 | Received date/time 06/23/21 10:00

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1704947 | 1 | 07/15/21 14:30 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1694790 | 1 | 07/19/21 10:54 | 07/20/21 15:40 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1694790 | 1 | 07/19/21 10:54 | 07/19/21 21:34 | RGT | Mt. Juliet, TN |

# CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 1.54 | | 0.426 | 0.776 | 07/20/2021 15:40 | WG1704947 |
| *(T) Barium* | *102* | | | *62.0-143* | *07/20/2021 15:40* | WG1704947 |
| *(T) Yttrium* | *98.1* | | | *79.0-136* | *07/20/2021 15:40* | WG1704947 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 1.86 | | 0.622 | 0.939 | 07/20/2021 15:40 | WG1694790 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.322 | | 0.196 | 0.163 | 07/19/2021 21:34 | WG1694790 |
| *(T) Barium-133* | *100* | | | *30.0-143* | *07/19/2021 21:34* | WG1694790 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.000 | U | 0.391 | 0.749 | 07/20/2021 15:40 | WG1704947 |
| *(T) Barium* | *109* | | | *62.0-143* | *07/20/2021 15:40* | WG1704947 |
| *(T) Yttrium* | *94.0* | | | *79.0-136* | *07/20/2021 15:40* | WG1704947 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.283 | U | 0.596 | 0.944 | 07/20/2021 15:40 | WG1694790 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.283 | | 0.205 | 0.195 | 07/19/2021 21:34 | WG1694790 |
| *(T) Barium-133* | *101* | | | *30.0-143* | *07/19/2021 21:34* | WG1694790 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.808 | | 0.354 | 0.656 | 07/20/2021 15:40 | WG1704947 |
| *(T) Barium* | *101* | | | *62.0-143* | *07/20/2021 15:40* | WG1704947 |
| *(T) Yttrium* | *94.5* | | | *79.0-136* | *07/20/2021 15:40* | WG1704947 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 1.05 | | 0.558 | 0.891 | 07/20/2021 15:40 | WG1694790 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.246 | | 0.204 | 0.235 | 07/19/2021 21:34 | WG1694790 |
| *(T) Barium-133* | *96.8* | | | *30.0-143* | *07/19/2021 21:34* | WG1694790 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.774 | | 0.312 | 0.577 | 07/20/2021 15:40 | WG1704947 |
| *(T) Barium* | *109* | | | *62.0-143* | *07/20/2021 15:40* | WG1704947 |
| *(T) Yttrium* | *109* | | | *79.0-136* | *07/20/2021 15:40* | WG1704947 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.21 | | 0.590 | 0.866 | 07/20/2021 15:40 | WG1694790 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.440 | | 0.278 | 0.289 | 07/19/2021 21:34 | WG1694790 |
| *(T) Barium-133* | *97.4* | | | *30.0-143* | *07/19/2021 21:34* | WG1694790 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.546 | | 0.285 | 0.531 | 07/20/2021 15:40 | WG1704947 |
| *(T) Barium* | *102* | | | *62.0-143* | *07/20/2021 15:40* | WG1704947 |
| *(T) Yttrium* | *102* | | | *79.0-136* | *07/20/2021 15:40* | WG1704947 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 0.719 | J | 0.499 | 0.832 | 07/20/2021 15:40 | WG1694790 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.173 | J | 0.214 | 0.301 | 07/19/2021 21:34 | WG1694790 |
| *(T) Barium-133* | *103* | | | *30.0-143* | *07/19/2021 21:34* | WG1694790 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 1.64 | | 0.292 | 0.505 | 07/20/2021 15:40 | WG1704947 |
| *(T) Barium* | *105* | | | *62.0-143* | *07/20/2021 15:40* | WG1704947 |
| *(T) Yttrium* | *99.3* | | | *79.0-136* | *07/20/2021 15:40* | WG1704947 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 2.36 | | 0.628 | 0.804 | 07/20/2021 15:40 | WG1694790 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.712 | | 0.336 | 0.299 | 07/19/2021 21:34 | WG1694790 |
| *(T) Barium-133* | *97.8* | | | *30.0-143* | *07/19/2021 21:34* | WG1694790 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 1.90 | | 0.353 | 0.617 | 07/20/2021 15:40 | WG1704947 |
| *(T) Barium* | *104* | | | *62.0-143* | *07/20/2021 15:40* | WG1704947 |
| *(T) Yttrium* | *95.1* | | | *79.0-136* | *07/20/2021 15:40* | WG1704947 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 2.51 | | 0.640 | 0.809 | 07/20/2021 15:40 | WG1694790 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.609 | | 0.287 | 0.192 | 07/19/2021 21:34 | WG1694790 |
| *(T) Barium-133* | *102* | | | *30.0-143* | *07/19/2021 21:34* | WG1694790 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 5.14 | | 0.515 | 0.839 | 07/20/2021 15:40 | WG1704947 |
| *(T) Barium* | *110* | | | *62.0-143* | *07/20/2021 15:40* | WG1704947 |
| *(T) Yttrium* | *102* | | | *79.0-136* | *07/20/2021 15:40* | WG1704947 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 7.83 | | 1.08 | 1.07 | 07/20/2021 15:40 | WG1694790 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 2.69 | | 0.566 | 0.234 | 07/19/2021 21:34 | WG1694790 |
| *(T) Barium-133* | *100* | | | *30.0-143* | *07/19/2021 21:34* | WG1694790 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 2.29 | | 0.309 | 0.517 | 07/20/2021 15:40 | WG1704947 |
| *(T) Barium* | *111* | | | *62.0-143* | *07/20/2021 15:40* | WG1704947 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *07/20/2021 15:40* | WG1704947 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 4.52 | | 0.848 | 0.694 | 07/20/2021 15:40 | WG1694790 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 2.23 | | 0.539 | 0.177 | 07/19/2021 21:34 | WG1694790 |
| *(T) Barium-133* | *97.6* | | | *30.0-143* | *07/19/2021 21:34* | WG1694790 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 4.67 | | 0.516 | 0.849 | 07/20/2021 15:40 | WG1704947 |
| *(T) Barium* | *109* | | | *62.0-143* | *07/20/2021 15:40* | WG1704947 |
| *(T) Yttrium* | *99.8* | | | *79.0-136* | *07/20/2021 15:40* | WG1704947 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 5.53 | | 0.837 | 1.03 | 07/20/2021 15:40 | WG1694790 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.861 | | 0.321 | 0.184 | 07/19/2021 21:34 | WG1694790 |
| *(T) Barium-133* | *91.2* | | | *30.0-143* | *07/19/2021 21:34* | WG1694790 |

## Method Blank (MB)

(MB) R3682113-1 07/20/21 15:40

| Analyte | MB Result | MB Qualifier | MB MDA |
|---|---|---|---|
| | pCi/l | | pCi/l |
| Radium-228 | 0.680 | | 0.382 |
| *(T) Barium* | *107* | | |
| *(T) Yttrium* | *100* | | |

## L1371122-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1371122-01 07/20/21 15:40 • (DUP) R3682113-5 07/20/21 15:40

| Analyte | Original Result | DUP Result | Dilution | DUP RPD | DUP RER | DUP Qualifier | DUP RPD Limits | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| | pCi/l | pCi/l | | % | | | % | |
| Radium-228 | 0.163 | 0.590 | 1 | 114 | 0.480 | U | 20 | 3 |
| *(T) Barium* | *117* | *109* | | | | | | |
| *(T) Yttrium* | *107* | *102* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3682113-2 07/20/21 15:40

| Analyte | Spike Amount | LCS Result | LCS Rec. | Rec. Limits | LCS Qualifier |
|---|---|---|---|---|---|
| | pCi/l | pCi/l | % | % | |
| Radium-228 | 5.00 | 5.39 | 108 | 80.0-120 | |
| *(T) Barium* | | | *111* | | |
| *(T) Yttrium* | | | *94.8* | | |

## L1370097-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1370097-07 07/20/21 15:40 • (MS) R3682113-3 07/20/21 15:40 • (MSD) R3682113-4 07/20/21 15:40

| Analyte | Spike Amount | Original Result | MS Result | MSD Result | MS Rec. | MSD Rec. | Dilution | Rec. Limits | MS Qualifier | MSD Qualifier | RPD | MS RER | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pCi/l | pCi/l | pCi/l | pCi/l | % | % | | % | | | % | | % |
| Radium-228 | 16.7 | 0.669 | 20.1 | 18.2 | 116 | 105 | 1 | 70.0-130 | | | 9.45 | | 20 |
| *(T) Barium* | | *102* | | | *111* | *106* | | | | | | | |
| *(T) Yttrium* | | *101* | | | *95.6* | *98.7* | | | | | | | |

## Method Blank (MB)

(MB) R3682035-1 07/19/21 21:34

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-226 | 0.00700 | U | 0.0608 |
| *(T) Barium-133* | *106* | | |

## L1370437-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1370437-01 07/19/21 21:34 • (DUP) R3682035-5 07/19/21 21:34

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.168 | 0.178 | 1 | 5.97 | 0.0400 | | 20 | 3 |
| *(T) Barium-133* | *105* | *101* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3682035-2 07/19/21 21:34

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 5.02 | 4.58 | 91.3 | 80.0-120 | |
| *(T) Barium-133* | | | *98.4* | | |

## L1369269-21 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1369269-21 07/19/21 21:34 • (MS) R3682035-3 07/19/21 21:34 • (MSD) R3682035-4 07/19/21 21:34

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 20.1 | 0.305 | 18.2 | 22.0 | 89.0 | 108 | 1 | 75.0-125 | | | 19.1 | | 20 |
| *(T) Barium-133* | | *94.4* | | | *97.8* | *97.0* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| J | The identification of the analyte is acceptable; the reported value is an estimate. |
| U | Below Detectable Limits: Indicates that the analyte was not detected. |

## Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN000032021-1 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | TN00003 |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LAO000356 |
| Kentucky [1 6] | KY90010 | South Carolina | 84004002 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana | LA018 | Texas | T104704245-20-18 |
| Maine | TN00003 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN000032021-11 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 110033 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 998093910 |
| Montana | CERT0086 | Wyoming | A2LA |
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



A035

Work Order: 2106122

**Subcontractor:**

Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

L1360077

**18-Jun-21**

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ra-228 E904.0 | Ra-226 M7500 Ra B M | | | | |
| FGD-6 | Aqueous | 01C | 06/16/21 05:45 PM | 1LHDPEHNO3 | | 1 | | | | -01 |
| FGD-6 | Aqueous | 01D | 06/16/21 05:45 PM | 1LHDPEHNO3 | 1 | | | | | -01 |
| FGD-4 | Aqueous | 02C | 06/16/21 06:35 PM | 1LHDPEHNO3 | | 1 | | | | -02 |
| FGD-4 | Aqueous | 02D | 06/16/21 06:35 PM | 1LHDPEHNO3 | 1 | | | | | -02 |
| FGD-3 | Aqueous | 03C | 06/16/21 07:25 PM | 1LHDPEHNO3 | | 1 | | | | -03 |
| FGD-3 | Aqueous | 03D | 06/16/21 07:25 PM | 1LHDPEHNO3 | 1 | | | | | -03 |
| FGD-2 | Aqueous | 04C | 06/17/21 07:35 AM | 1LHDPEHNO3 | | 1 | | | | -04 |
| FGD-2 | Aqueous | 04D | 06/17/21 07:35 AM | 1LHDPEHNO3 | 1 | | | | | -04 |
| FGD-5 | Aqueous | 05C | 06/17/21 08:25 AM | 1LHDPEHNO3 | | 1 | | | | -05 |
| FGD-5 | Aqueous | 05D | 06/17/21 08:25 AM | 1LHDPEHNO3 | 1 | | | | | -05 |
| FGD-1 | Aqueous | 06C | 06/17/21 09:15 AM | 1LHDPEHNO3 | | 1 | | | | -06 |
| FGD-1 | Aqueous | 06D | 06/17/21 09:15 AM | 1LHDPEHNO3 | 1 | | | | | -06 |
| DUP-1 | Aqueous | 07C | 06/17/21 09:15 AM | 1LHDPEHNO3 | | 1 | | | | -07 |
| DUP-1 | Aqueous | 07D | 06/17/21 09:15 AM | 1LHDPEHNO3 | 1 | | | | | -07 |
| FGD-8 | Aqueous | 08C | 06/17/21 11:45 AM | 1LHDPEHNO3 | | 1 | | | | -08 |
| FGD-8 | Aqueous | 08D | 06/17/21 11:45 AM | 1LHDPEHNO3 | 1 | | | | | -08 |
| FGD-11 | Aqueous | 09C | 06/17/21 01:30 PM | 1LHDPEHNO3 | | 1 | | | | -09 |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report Ra-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

22.3+.1=22.4 ABOT

| | | Date/Time | | Date/Time |
|---|---|---|---|---|
| **Relinquished by:** | | 6/21/21 6/18/21 1800 | **Received by:** | |
| **Relinquished by:** | | 6/21/21 | **Received by:** | 6/23/21 1000 |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 2106122

**Subcontractor:**

Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

U3700271

**18-Jun-21**

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ra-228 | Ra-226 | | | | |
| | | | | | E904.0 | M7500 Ra B M | | | | |
| FGD-11 | Aqueous | 09D | 06/17/21 01:30 PM | 1LHDPEHNO3 | 1 | | | | | -09 |
| FGD-12 | Aqueous | 10C | 06/17/21 02:25 PM | 1LHDPEHNO3 | | 1 | | | | -10 |
| FGD-12 | Aqueous | 10D | 06/17/21 02:25 PM | 1LHDPEHNO3 | 1 | | | | | -10 |

Sample Receipt Checklist

| | | | |
|---|---|---|---|
| COC Seal Present/Intact: | Y N | If Applicable | |
| COC Signed/Accurate: | Y N | VOA Zero Headspace: | Y N |
| Bottles arrive intact: | Y N | Pres.Correct/Check: | Y N |
| Correct bottles used: | Y N | | |
| Sufficient volume sent: | Y N | | |
| RAD Screen <0.5 mR/hr: | Y N | | |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report Ra-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

22.3+1.1=22.4
+60+

| | Date/Time | | Date/Time |
|---|---|---|---|
| Relinquished by: | 6/21/21 6/18/21 1800 | Received by: | |
| Relinquished by: | 6/21/21 | Received by: | 6/23/21 1000 |

November 19, 2021

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2110093

RE: Luminant-OGSES-CCR-FGD Ponds

Dear Will Vienne:

DHL Analytical, Inc. received 10 sample(s) on 10/13/2021 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-21-27

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**Subcontract Report 2110093** ..... 45

DHL ANALYTICAL

2300 Double Creek Dr. Round Rock, TX 78664
Phone 512.388.8222
Web: **www.dhlanalytical.com**
Email: **login@dhlanalytical.com**

# CHAIN-OF-CUSTODY

PAGE 1 OF 1

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR #4004 ROUND ROCK TX
PHONE: 512-671-3434 EMAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 10-12-21
**PO#:**
PROJECT LOCATION OR NAME: LUMINANT - OBSES - FGD PONDS - CCR
CLIENT PROJECT # 1912226.2 COLLECTOR: JOHN BRAYTON

**LABORATORY USE ONLY**
**DHL WORKORDER #:** 2110093

**Authorize 5% surcharge for TRRP report?** ☐ Yes ☐ No

W=WATER L=LIQUID S=SOIL SO=SOLID SE=SEDIMENT P=PAINT SL=SLUDGE

| Field Sample I.D. | Lab Use Only DHL Lab # | Collection Date | Collection Time | Matrix | Container Type | # of Containers | PRESERVATION HCL | HNO3 | H2SO4 | NaOH ☐ Zn Acetate ☐ | ICE ☒ UNPRESERVED ☐ | ANALYSES | APPENDIX III | APPENDIX IV | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-8 | 01 | 10-11-21 | 1805 | W | P | 4 | | X | | | X | | X | X | |
| FGD-11 | 02 | " | 1550 | W | P | 4 | | X | | | X | | X | X | |
| FGD-5 | 03 | " | 1250 | W | P | 4 | | X | | | X | | X | X | |
| FGD-3 | 04 | " | 1140 | W | P | 4 | | X | | | X | | X | X | |
| FGD-4 | 05 | " | 1040 | W | P | 4 | | X | | | X | | X | X | |
| FGD-6 | 06 | " | 0935 | W | P | 4 | | X | | | X | | X | X | |
| FGD-1 | 07 | 10-12-21 | 0815 | W | P | 4 | | X | | | X | | X | X | |
| FGD-2 | 08 | " | 0920 | W | P | 4 | | X | | | X | | X | X | |
| DUP-1 | 09 | " | 0920 | W | P | 4 | | X | | | X | | X | X | |
| FGD-12 | 10 | " | 1025 | W | P | 4 | | X | | | X | | X | X | |

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8260] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO 8015 ☐ DRO 8015 ☐ | VOC 8260 ☐ VOC 624.1 ☐ | SVOC 8270 ☐ SVOC 625.1 ☐ | PAH 8270 ☐ HOLD PAH ☐ | PEST 8270 ☐ 625.1 ☐ O-P PEST 8270 ☐ | PCB 8082 ☐ 608.3 ☐ PCB 8270 ☐ 625.1 ☐ | HERB 8321 ☐ T PHOS ☐ AMMONIA ☐ | METALS 6020 ☐ 200.8 ☐ DISS. METALS ☐ | RCRA 8 ☐ TX11 ☐ _____ | pH☐ HEX CHROM☐ ALKALINITY☐ COD☐ | ANIONS 300 ☐ 9056 ☐ _____ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ IGN ☐ DGAS ☐ OIL&GREASE ☐ | TDS ☐ TSS ☐ % MOIST ☐ CYANIDE ☐

| Relinquished By: (Sign) | DATE/TIME | Received by: |
|---|---|---|
| | 10-13-21 1315 | |
| Relinquished By: (Sign) | DATE/TIME | Received by: |
| Relinquished By: (Sign) | DATE/TIME | Received by: |

**TURN AROUND TIME (CALL FIRST FOR RUSH)**
RUSH-1 DAY☐ RUSH-2 DAY☐ RUSH-3 DAY☐
NORMAL☒ OTHER ☐
DUE DATE _____ ☐

**LABORATORY USE ONLY**
RECEIVING TEMP (°C): 1.7/3.9/2.6 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LSO ☐ FEDEX ☐ UPS ☐ COURIER ☐ OTHER ☒ HAND DELIVERED

☐ **DHL DISPOSAL @ 5.00 each** ☐ **Return**

**DHL COC REV 3 | MAR 2021**

DHL Analytical, Inc.

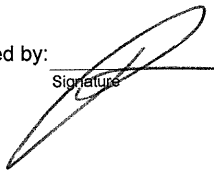
## Sample Receipt Checklist

Client Name **Golder**

Date Received: **10/13/2021**

Work Order Number **2110093**

Received by: **EL**

Checklist completed by:  Signature 10/13/2021 Date

Reviewed by SH Initials 10/13/2021 Date

Carrier name: Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 1.7 °C/3.9°C/2.6°C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? NO | | Checked by R.A. |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action: _____

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist: Reportable Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-CCR-FGD Ponds | **LRC Date:** 11/19/21 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2110093 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | **X** | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | **X** | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | **X** | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | **X** | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | **X** | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | **X** | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | **X** | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | **X** | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | **X** | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | **X** | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | **X** | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | **X** | | |
| | | **9)** If required for the project, TICs reported? | | | **X** | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | **X** | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | **X** | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | **X** | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | **X** | | | | |
| | | **4)** Were blank concentrations < MDL? | **X** | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | **X** | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | **X** | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | **X** | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | **X** | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | **X** | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | **X** | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | **X** | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | **X** | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | **X** | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | **X** | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | **X** | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | **X** | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | **X** | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | **X** | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | **X** | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | **X** | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | **X** | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-CCR-FGD Ponds | **LRC Date:** 11/19/21 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2110093 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | X | | | | |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 23-26 2021. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

11/19/21
Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *19-Nov-21*

**CLIENT:** Golder
**Project:** Luminant-OGSES-CCR-FGD Ponds
**Lab Order:** 2110093

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904/9320 and SM 7500 Ra B M. Analyzed at Pace Analytical.

Exception Report R1-01

The samples were received and log-in performed on 10/13/21. A total of 10 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Anions analysis performed on 10/14/21 (batch 102405) the matrix spikes and matrix spike duplicate recoveries (2110093-01 MS/MSD & 2110093-08 MS/MSD) were slightly below control limits for Chloride. These are flagged accordingly in the QC summary report. The samples selected for the matrix spikes and matrix spike duplicates (2110093-01 MS/MSD & 2110093-08 MS/MSD) were from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

For Anions analysis performed on 10/15/21 (batch 102421) the matrix spikes and matrix spike duplicate recoveries (2110054-13 MS/MSD & 2110118-01 MS/MSD) were slightly below control limits for Chloride. These are flagged accordingly. The samples selected for the matrix spikes and matrix spike duplicates (2110054-13 MS/MSD & 2110118-01 MS/MSD) were not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *19-Nov-21*

**CLIENT:** Golder
**Project:** Luminant-OGSES-CCR-FGD Ponds
**Lab Order:** 2110093

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2110093-01 | FGD-8 | | 10/11/21 06:05 PM | 10/13/2021 |
| 2110093-02 | FGD-11 | | 10/11/21 03:50 PM | 10/13/2021 |
| 2110093-03 | FGD-5 | | 10/11/21 12:50 PM | 10/13/2021 |
| 2110093-04 | FGD-3 | | 10/11/21 11:40 AM | 10/13/2021 |
| 2110093-05 | FGD-4 | | 10/11/21 10:40 AM | 10/13/2021 |
| 2110093-06 | FGD-6 | | 10/11/21 09:35 AM | 10/13/2021 |
| 2110093-07 | FGD-1 | | 10/12/21 08:15 AM | 10/13/2021 |
| 2110093-08 | FGD-2 | | 10/12/21 09:20 AM | 10/13/2021 |
| 2110093-09 | DUP-1 | | 10/12/21 09:20 AM | 10/13/2021 |
| 2110093-10 | FGD-12 | | 10/12/21 10:25 AM | 10/13/2021 |

**Lab Order:** 2110093
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2110093-01A | FGD-8 | 10/11/21 06:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-8 | 10/11/21 06:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-8 | 10/11/21 06:05 PM | Aqueous | SW7470A | Mercury Aq Prep | 10/15/21 09:30 AM | 102418 |
| 2110093-01B | FGD-8 | 10/11/21 06:05 PM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-8 | 10/11/21 06:05 PM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-8 | 10/11/21 06:05 PM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-8 | 10/11/21 06:05 PM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| | FGD-8 | 10/11/21 06:05 PM | Aqueous | M2540C | TDS Preparation | 10/15/21 03:22 PM | 102431 |
| 2110093-02A | FGD-11 | 10/11/21 03:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-11 | 10/11/21 03:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-11 | 10/11/21 03:50 PM | Aqueous | SW7470A | Mercury Aq Prep | 10/15/21 09:30 AM | 102418 |
| 2110093-02B | FGD-11 | 10/11/21 03:50 PM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-11 | 10/11/21 03:50 PM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-11 | 10/11/21 03:50 PM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110093-03A | FGD-5 | 10/11/21 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-5 | 10/11/21 12:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-5 | 10/11/21 12:50 PM | Aqueous | SW7470A | Mercury Aq Prep | 10/15/21 09:30 AM | 102418 |
| 2110093-03B | FGD-5 | 10/11/21 12:50 PM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-5 | 10/11/21 12:50 PM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-5 | 10/11/21 12:50 PM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110093-04A | FGD-3 | 10/11/21 11:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-3 | 10/11/21 11:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-3 | 10/11/21 11:40 AM | Aqueous | SW7470A | Mercury Aq Prep | 10/15/21 09:30 AM | 102418 |
| 2110093-04B | FGD-3 | 10/11/21 11:40 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-3 | 10/11/21 11:40 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-3 | 10/11/21 11:40 AM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110093-05A | FGD-4 | 10/11/21 10:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-4 | 10/11/21 10:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |

**Lab Order:** 2110093
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2110093-05A | FGD-4 | 10/11/21 10:40 AM | Aqueous | SW7470A | Mercury Aq Prep | 10/15/21 09:30 AM | 102418 |
| 2110093-05B | FGD-4 | 10/11/21 10:40 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-4 | 10/11/21 10:40 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-4 | 10/11/21 10:40 AM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110093-06A | FGD-6 | 10/11/21 09:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-6 | 10/11/21 09:35 AM | Aqueous | SW7470A | Mercury Aq Prep | 10/15/21 09:30 AM | 102418 |
| 2110093-06B | FGD-6 | 10/11/21 09:35 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-6 | 10/11/21 09:35 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-6 | 10/11/21 09:35 AM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110093-07A | FGD-1 | 10/12/21 08:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-1 | 10/12/21 08:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-1 | 10/12/21 08:15 AM | Aqueous | SW7470A | Mercury Aq Prep | 10/15/21 09:30 AM | 102418 |
| 2110093-07B | FGD-1 | 10/12/21 08:15 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-1 | 10/12/21 08:15 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-1 | 10/12/21 08:15 AM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110093-08A | FGD-2 | 10/12/21 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-2 | 10/12/21 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-2 | 10/12/21 09:20 AM | Aqueous | SW7470A | Mercury Aq Prep | 10/15/21 09:30 AM | 102418 |
| 2110093-08B | FGD-2 | 10/12/21 09:20 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-2 | 10/12/21 09:20 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-2 | 10/12/21 09:20 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-2 | 10/12/21 09:20 AM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110093-09A | DUP-1 | 10/12/21 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | DUP-1 | 10/12/21 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | DUP-1 | 10/12/21 09:20 AM | Aqueous | SW7470A | Mercury Aq Prep | 10/15/21 09:30 AM | 102418 |
| 2110093-09B | DUP-1 | 10/12/21 09:20 AM | Aqueous | E300 | Anion Preparation | 10/15/21 10:07 AM | 102421 |
| | DUP-1 | 10/12/21 09:20 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | DUP-1 | 10/12/21 09:20 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |

**Lab Order:** 2110093
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2110093-09B | DUP-1 | 10/12/21 09:20 AM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |
| 2110093-10A | FGD-12 | 10/12/21 10:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 10/18/21 10:13 AM | 102437 |
| | FGD-12 | 10/12/21 10:25 AM | Aqueous | SW7470A | Mercury Aq Prep | 10/15/21 09:30 AM | 102418 |
| 2110093-10B | FGD-12 | 10/12/21 10:25 AM | Aqueous | E300 | Anion Preparation | 10/14/21 09:27 AM | 102405 |
| | FGD-12 | 10/12/21 10:25 AM | Aqueous | M2540C | TDS Preparation | 10/14/21 12:19 PM | 102408 |

**Lab Order:** 2110093
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2110093-01A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 102418 | 1 | 10/15/21 03:37 PM | CETAC2_HG_211015C |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 1 | 10/19/21 11:03 AM | ICP-MS4_211019A |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 50 | 10/19/21 12:10 PM | ICP-MS4_211019A |
| 2110093-01B | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 102405 | 100 | 10/14/21 05:07 PM | IC4_211014B |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 102405 | 10 | 10/14/21 07:20 PM | IC4_211014B |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 102405 | 1 | 10/14/21 11:46 PM | IC4_211014B |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 102431 | 1 | 10/15/21 05:00 PM | WC_211015C |
| 2110093-02A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 102418 | 1 | 10/15/21 03:40 PM | CETAC2_HG_211015C |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 1 | 10/19/21 11:05 AM | ICP-MS4_211019A |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 10 | 10/19/21 12:12 PM | ICP-MS4_211019A |
| 2110093-02B | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 102405 | 100 | 10/14/21 06:04 PM | IC4_211014B |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 102405 | 1 | 10/15/21 12:05 AM | IC4_211014B |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110093-03A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 102418 | 1 | 10/15/21 03:42 PM | CETAC2_HG_211015C |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 1 | 10/19/21 11:07 AM | ICP-MS4_211019A |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 10 | 10/19/21 12:14 PM | ICP-MS4_211019A |
| 2110093-03B | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 102405 | 10 | 10/14/21 07:39 PM | IC4_211014B |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 102405 | 1 | 10/15/21 12:24 AM | IC4_211014B |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110093-04A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 102418 | 1 | 10/15/21 03:49 PM | CETAC2_HG_211015C |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 1 | 10/19/21 11:09 AM | ICP-MS4_211019A |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 10 | 10/19/21 12:16 PM | ICP-MS4_211019A |
| 2110093-04B | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 102405 | 10 | 10/14/21 07:58 PM | IC4_211014B |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 102405 | 1 | 10/15/21 12:43 AM | IC4_211014B |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |

**Lab Order:** 2110093
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2110093-05A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 102418 | 1 | 10/15/21 03:51 PM | CETAC2_HG_211015C |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 1 | 10/19/21 10:59 AM | ICP-MS4_211019A |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 10 | 10/19/21 12:06 PM | ICP-MS4_211019A |
| 2110093-05B | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 102405 | 1 | 10/15/21 01:02 AM | IC4_211014B |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 102405 | 10 | 10/14/21 08:17 PM | IC4_211014B |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110093-06A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 102418 | 1 | 10/15/21 03:53 PM | CETAC2_HG_211015C |
| | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 1 | 10/19/21 11:11 AM | ICP-MS4_211019A |
| 2110093-06B | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 102405 | 10 | 10/14/21 08:36 PM | IC4_211014B |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 102405 | 1 | 10/15/21 01:21 AM | IC4_211014B |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110093-07A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 102418 | 1 | 10/15/21 03:56 PM | CETAC2_HG_211015C |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 1 | 10/19/21 11:13 AM | ICP-MS4_211019A |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 10 | 10/19/21 12:18 PM | ICP-MS4_211019A |
| 2110093-07B | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 102405 | 10 | 10/14/21 08:55 PM | IC4_211014B |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 102405 | 1 | 10/15/21 01:40 AM | IC4_211014B |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110093-08A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 102418 | 1 | 10/15/21 03:58 PM | CETAC2_HG_211015C |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 1 | 10/19/21 11:15 AM | ICP-MS4_211019A |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 50 | 10/19/21 12:20 PM | ICP-MS4_211019A |
| 2110093-08B | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 102405 | 10 | 10/14/21 09:14 PM | IC4_211014B |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 102405 | 1 | 10/15/21 03:15 AM | IC4_211014B |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 102405 | 100 | 10/14/21 06:23 PM | IC4_211014B |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110093-09A | DUP-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 102418 | 1 | 10/15/21 04:00 PM | CETAC2_HG_211015C |
| | DUP-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 50 | 10/19/21 12:22 PM | ICP-MS4_211019A |

**Lab Order:** 2110093
**Client:** Golder
**Project:** Luminant-OGSES-CCR-FGD Pon

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2110093-09A | DUP-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 1 | 10/19/21 11:17 AM | ICP-MS4_211019A |
| 2110093-09B | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 102421 | 100 | 10/15/21 06:02 PM | IC4_211015A |
| | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 102405 | 10 | 10/14/21 10:49 PM | IC4_211014B |
| | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 102405 | 1 | 10/15/21 03:34 AM | IC4_211014B |
| | DUP-1 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |
| 2110093-10A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 102418 | 1 | 10/15/21 04:02 PM | CETAC2_HG_211015C |
| | FGD-12 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 102437 | 1 | 10/19/21 11:19 AM | ICP-MS4_211019A |
| 2110093-10B | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 102405 | 1 | 10/15/21 03:53 AM | IC4_211014B |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 102408 | 1 | 10/14/21 04:30 PM | WC_211014C |

# DHL Analytical, Inc.

**Date:** *19-Nov-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2110093-01 |
| **Project No:** | 19122262 | **Collection Date:** | 10/11/21 06:05 PM |
| **Lab Order:** | 2110093 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/19/21 11:03 AM |
| Arsenic | 0.00786 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:03 AM |
| Barium | 0.994 | 0.00300 | 0.0100 | | mg/L | 1 | 10/19/21 11:03 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:03 AM |
| Boron | 0.0779 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 11:03 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:03 AM |
| Calcium | 362 | 5.00 | 15.0 | | mg/L | 50 | 10/19/21 12:10 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:03 AM |
| Cobalt | 0.00312 | 0.00300 | 0.00500 | J | mg/L | 1 | 10/19/21 11:03 AM |
| Lead | 0.00119 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:03 AM |
| Lithium | 0.00851 | 0.00500 | 0.0100 | J | mg/L | 1 | 10/19/21 11:03 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:03 AM |
| Selenium | 0.00265 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/19/21 11:03 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/19/21 11:03 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/15/21 03:37 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 2040 | 30.0 | 100 | | mg/L | 100 | 10/14/21 05:07 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 10/14/21 11:46 PM |
| Sulfate | 63.9 | 1.00 | 3.00 | | mg/L | 1 | 10/14/21 11:46 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 3790 | 50.0 | 50.0 | | mg/L | 1 | 10/15/21 05:00 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *19-Nov-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2110093-02 |
| **Project No:** | 19122262 | **Collection Date:** | 10/11/21 03:50 PM |
| **Lab Order:** | 2110093 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/19/21 11:05 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:05 AM |
| Barium | 0.231 | 0.00300 | 0.0100 | | mg/L | 1 | 10/19/21 11:05 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:05 AM |
| Boron | 0.124 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 11:05 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:05 AM |
| Calcium | 81.8 | 1.00 | 3.00 | | mg/L | 10 | 10/19/21 12:12 PM |
| Chromium | 0.0158 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:05 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/19/21 11:05 AM |
| Lead | 0.000332 | 0.000300 | 0.00100 | J | mg/L | 1 | 10/19/21 11:05 AM |
| Lithium | 0.0126 | 0.00500 | 0.0100 | | mg/L | 1 | 10/19/21 11:05 AM |
| Molybdenum | 0.00276 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/19/21 11:05 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:05 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/19/21 11:05 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/15/21 03:40 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 376 | 30.0 | 100 | | mg/L | 100 | 10/14/21 06:04 PM |
| Fluoride | 0.453 | 0.100 | 0.400 | | mg/L | 1 | 10/15/21 12:05 AM |
| Sulfate | 35.2 | 1.00 | 3.00 | | mg/L | 1 | 10/15/21 12:05 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1040 | 50.0 | 50.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *19-Nov-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2110093-03 |
| **Project No:** | 19122262 | **Collection Date:** | 10/11/21 12:50 PM |
| **Lab Order:** | 2110093 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/19/21 11:07 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:07 AM |
| Barium | 0.0995 | 0.00300 | 0.0100 | | mg/L | 1 | 10/19/21 11:07 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:07 AM |
| Boron | 0.0957 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 11:07 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:07 AM |
| Calcium | 114 | 1.00 | 3.00 | | mg/L | 10 | 10/19/21 12:14 PM |
| Chromium | 0.0549 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:07 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/19/21 11:07 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:07 AM |
| Lithium | 0.139 | 0.00500 | 0.0100 | | mg/L | 1 | 10/19/21 11:07 AM |
| Molybdenum | 0.00669 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:07 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:07 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/19/21 11:07 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/15/21 03:42 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 290 | 3.00 | 10.0 | | mg/L | 10 | 10/14/21 07:39 PM |
| Fluoride | 0.459 | 0.100 | 0.400 | | mg/L | 1 | 10/15/21 12:24 AM |
| Sulfate | 107 | 1.00 | 3.00 | | mg/L | 1 | 10/15/21 12:24 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 898 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *19-Nov-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2110093-04 |
| **Project No:** | 19122262 | **Collection Date:** | 10/11/21 11:40 AM |
| **Lab Order:** | 2110093 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/19/21 11:09 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:09 AM |
| Barium | 0.0322 | 0.00300 | 0.0100 | | mg/L | 1 | 10/19/21 11:09 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:09 AM |
| Boron | 0.0956 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 11:09 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:09 AM |
| Calcium | 35.3 | 1.00 | 3.00 | | mg/L | 10 | 10/19/21 12:16 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:09 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/19/21 11:09 AM |
| Lead | 0.000494 | 0.000300 | 0.00100 | J | mg/L | 1 | 10/19/21 11:09 AM |
| Lithium | 0.0296 | 0.00500 | 0.0100 | | mg/L | 1 | 10/19/21 11:09 AM |
| Molybdenum | 0.00370 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/19/21 11:09 AM |
| Selenium | 0.00748 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:09 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/19/21 11:09 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/15/21 03:49 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 42.5 | 0.300 | 1.00 | | mg/L | 1 | 10/15/21 12:43 AM |
| Fluoride | 1.08 | 0.100 | 0.400 | | mg/L | 1 | 10/15/21 12:43 AM |
| Sulfate | 105 | 1.00 | 3.00 | | mg/L | 1 | 10/15/21 12:43 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 671 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *19-Nov-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2110093-05 |
| **Project No:** | 19122262 | **Collection Date:** | 10/11/21 10:40 AM |
| **Lab Order:** | 2110093 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/19/21 10:59 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 10:59 AM |
| Barium | 0.0796 | 0.00300 | 0.0100 | | mg/L | 1 | 10/19/21 10:59 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 10:59 AM |
| Boron | 0.0801 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 10:59 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 10:59 AM |
| Calcium | 32.9 | 1.00 | 3.00 | | mg/L | 10 | 10/19/21 12:06 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 10:59 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/19/21 10:59 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 10:59 AM |
| Lithium | 0.00984 | 0.00500 | 0.0100 | J | mg/L | 1 | 10/19/21 10:59 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 10:59 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 10:59 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/19/21 10:59 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/15/21 03:51 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 185 | 3.00 | 10.0 | | mg/L | 10 | 10/14/21 08:17 PM |
| Fluoride | 0.398 | 0.100 | 0.400 | J | mg/L | 1 | 10/15/21 01:02 AM |
| Sulfate | 47.6 | 1.00 | 3.00 | | mg/L | 1 | 10/15/21 01:02 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 670 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

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- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *19-Nov-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2110093-06 |
| **Project No:** | 19122262 | **Collection Date:** | 10/11/21 09:35 AM |
| **Lab Order:** | 2110093 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/19/21 11:11 AM |
| Arsenic | 0.00696 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:11 AM |
| Barium | 0.0507 | 0.00300 | 0.0100 | | mg/L | 1 | 10/19/21 11:11 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:11 AM |
| Boron | 0.105 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 11:11 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:11 AM |
| Calcium | 19.1 | 0.100 | 0.300 | | mg/L | 1 | 10/19/21 11:11 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:11 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/19/21 11:11 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:11 AM |
| Lithium | 0.00641 | 0.00500 | 0.0100 | J | mg/L | 1 | 10/19/21 11:11 AM |
| Molybdenum | 0.00222 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/19/21 11:11 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:11 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/19/21 11:11 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/15/21 03:53 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 130 | 3.00 | 10.0 | | mg/L | 10 | 10/14/21 08:36 PM |
| Fluoride | 0.616 | 0.100 | 0.400 | | mg/L | 1 | 10/15/21 01:21 AM |
| Sulfate | 73.2 | 1.00 | 3.00 | | mg/L | 1 | 10/15/21 01:21 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 656 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

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- DF- Dilution Factor
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- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *19-Nov-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2110093-07 |
| **Project No:** | 19122262 | **Collection Date:** | 10/12/21 08:15 AM |
| **Lab Order:** | 2110093 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/19/21 11:13 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:13 AM |
| Barium | 0.132 | 0.00300 | 0.0100 | | mg/L | 1 | 10/19/21 11:13 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:13 AM |
| Boron | 0.103 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 11:13 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:13 AM |
| Calcium | 31.9 | 1.00 | 3.00 | | mg/L | 10 | 10/19/21 12:18 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:13 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/19/21 11:13 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:13 AM |
| Lithium | 0.0182 | 0.00500 | 0.0100 | | mg/L | 1 | 10/19/21 11:13 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:13 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:13 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/19/21 11:13 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/15/21 03:56 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 244 | 3.00 | 10.0 | | mg/L | 10 | 10/14/21 08:55 PM |
| Fluoride | 0.295 | 0.100 | 0.400 | J | mg/L | 1 | 10/15/21 01:40 AM |
| Sulfate | 133 | 1.00 | 3.00 | | mg/L | 1 | 10/15/21 01:40 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 897 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

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- DF- Dilution Factor
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- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *19-Nov-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2110093-08 |
| **Project No:** | 19122262 | **Collection Date:** | 10/12/21 09:20 AM |
| **Lab Order:** | 2110093 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/19/21 11:15 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:15 AM |
| Barium | 0.0823 | 0.00300 | 0.0100 | | mg/L | 1 | 10/19/21 11:15 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:15 AM |
| Boron | 0.473 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 11:15 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:15 AM |
| Calcium | 245 | 5.00 | 15.0 | | mg/L | 50 | 10/19/21 12:20 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:15 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/19/21 11:15 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:15 AM |
| Lithium | 0.0259 | 0.00500 | 0.0100 | | mg/L | 1 | 10/19/21 11:15 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:15 AM |
| Selenium | 0.0185 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:15 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/19/21 11:15 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/15/21 03:58 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 950 | 30.0 | 100 | | mg/L | 100 | 10/14/21 06:23 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 10/15/21 03:15 AM |
| Sulfate | 467 | 10.0 | 30.0 | | mg/L | 10 | 10/14/21 09:14 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 2630 | 50.0 | 50.0 | | mg/L | 1 | 10/14/21 04:30 PM |

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S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *19-Nov-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | DUP-1 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2110093-09 |
| **Project No:** | 19122262 | **Collection Date:** | 10/12/21 09:20 AM |
| **Lab Order:** | 2110093 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/19/21 11:17 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:17 AM |
| Barium | 0.0814 | 0.00300 | 0.0100 | | mg/L | 1 | 10/19/21 11:17 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:17 AM |
| Boron | 0.492 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 11:17 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:17 AM |
| Calcium | 249 | 5.00 | 15.0 | | mg/L | 50 | 10/19/21 12:22 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:17 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/19/21 11:17 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:17 AM |
| Lithium | 0.0263 | 0.00500 | 0.0100 | | mg/L | 1 | 10/19/21 11:17 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:17 AM |
| Selenium | 0.0194 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:17 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/19/21 11:17 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/15/21 04:00 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 921 | 30.0 | 100 | | mg/L | 100 | 10/15/21 06:02 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 10/15/21 03:34 AM |
| Sulfate | 477 | 10.0 | 30.0 | | mg/L | 10 | 10/14/21 10:49 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 2460 | 50.0 | 50.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

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DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *19-Nov-21*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES-CCR-FGD Ponds | **Lab ID:** | 2110093-10 |
| **Project No:** | 19122262 | **Collection Date:** | 10/12/21 10:25 AM |
| **Lab Order:** | 2110093 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 10/19/21 11:19 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:19 AM |
| Barium | 0.0613 | 0.00300 | 0.0100 | | mg/L | 1 | 10/19/21 11:19 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:19 AM |
| Boron | 0.0759 | 0.0100 | 0.0300 | | mg/L | 1 | 10/19/21 11:19 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:19 AM |
| Calcium | 8.69 | 0.100 | 0.300 | | mg/L | 1 | 10/19/21 11:19 AM |
| Chromium | 0.00387 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/19/21 11:19 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 10/19/21 11:19 AM |
| Lead | 0.00255 | 0.000300 | 0.00100 | | mg/L | 1 | 10/19/21 11:19 AM |
| Lithium | 0.0222 | 0.00500 | 0.0100 | | mg/L | 1 | 10/19/21 11:19 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 10/19/21 11:19 AM |
| Selenium | 0.00255 | 0.00200 | 0.00500 | J | mg/L | 1 | 10/19/21 11:19 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 10/19/21 11:19 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **JVR** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 10/15/21 04:02 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **BM** |
| Chloride | 12.5 | 0.300 | 1.00 | | mg/L | 1 | 10/15/21 03:53 AM |
| Fluoride | 0.101 | 0.100 | 0.400 | J | mg/L | 1 | 10/15/21 03:53 AM |
| Sulfate | 18.1 | 1.00 | 3.00 | | mg/L | 1 | 10/15/21 03:53 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 195 | 10.0 | 10.0 | | mg/L | 1 | 10/14/21 04:30 PM |

**Qualifiers:**

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B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
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S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_210728C**

Sample ID: **DCS-101411** Batch ID: **101411** TestNo: **SW7470A** Units: **mg/L**
SampType: **DCS** Run ID: **CETAC2_HG_210728C** Analysis Date: **7/28/2021 1:24:11 PM** Prep Date: **7/27/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.000189 | 0.000200 | 0.000200 | 0 | 94.5 | 82 | 119 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_211015C**

The QC data in batch 102418 applies to the following samples: 2110093-01A, 2110093-02A, 2110093-03A, 2110093-04A, 2110093-05A, 2110093-06A, 2110093-07A, 2110093-08A, 2110093-09A, 2110093-10A

| Sample ID: **MB-102418** | Batch ID: **102418** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **CETAC2_HG_211015C** | Analysis Date: **10/15/2021 3:02:20 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID: **LCS-102418** | Batch ID: **102418** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **CETAC2_HG_211015C** | Analysis Date: **10/15/2021 3:06:52 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00198 | 0.000200 | 0.00200 | 0 | 99.0 | 85 | 115 | | | |

| Sample ID: **LCSD-102418** | Batch ID: **102418** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **CETAC2_HG_211015C** | Analysis Date: **10/15/2021 3:09:08 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00197 | 0.000200 | 0.00200 | 0 | 98.5 | 85 | 115 | 0.506 | 15 | |

| Sample ID: **2110085-01D MS** | Batch ID: **102418** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **CETAC2_HG_211015C** | Analysis Date: **10/15/2021 3:27:14 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0101 | 0.00100 | 0.0100 | 0 | 101 | 80 | 120 | | | |

| Sample ID: **2110085-01D MSD** | Batch ID: **102418** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **CETAC2_HG_211015C** | Analysis Date: **10/15/2021 3:29:30 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0102 | 0.00100 | 0.0100 | 0 | 102 | 80 | 120 | 0.985 | 15 | |

| Sample ID: **2110085-01D SD** | Batch ID: **102418** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **CETAC2_HG_211015C** | Analysis Date: **10/15/2021 3:31:46 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.00200 | 0.00500 | 0 | 0 | | | | 0 | 10 | |

| Sample ID: **2110085-01D PDS** | Batch ID: **102418** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **CETAC2_HG_211015C** | Analysis Date: **10/15/2021 3:34:02 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0125 | 0.00100 | 0.0125 | 0 | 99.6 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_211015C**

| Sample ID: **ICV-211015** | Batch ID: **R117542** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_211015C** | Analysis Date: **10/15/2021 2:56:35 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00403 | 0.000200 | 0.00400 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **CCV1-211015** | Batch ID: **R117542** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_211015C** | Analysis Date: **10/15/2021 3:44:40 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00198 | 0.000200 | 0.00200 | 0 | 99.0 | 90 | 110 | | | |

| Sample ID: **CCV2-211015** | Batch ID: **R117542** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_211015C** | Analysis Date: **10/15/2021 4:27:57 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00197 | 0.000200 | 0.00200 | 0 | 98.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_210803A**

| Sample ID: **DCS1-101483** | Batch ID: **101483** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS4_210803A** | Analysis Date: **8/3/2021 1:18:00 PM** | Prep Date: **8/2/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00114 | 0.00250 | 0.00100 | 0 | 114 | 70 | 130 | 0 | 0 | |
| Beryllium | 0.000608 | 0.00100 | 0.000500 | 0 | 122 | 70 | 130 | 0 | 0 | |
| Cadmium | 0.000587 | 0.00100 | 0.000500 | 0 | 117 | 70 | 130 | 0 | 0 | |
| Lead | 0.000537 | 0.00100 | 0.000500 | 0 | 107 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000524 | 0.00150 | 0.000500 | 0 | 105 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS2-101483** | Batch ID: **101483** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS4_210803A** | Analysis Date: **8/3/2021 1:21:00 PM** | Prep Date: **8/2/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.278 | 0.300 | 0.300 | 0 | 92.6 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS3-101483** | Batch ID: **101483** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS4_210803A** | Analysis Date: **8/3/2021 1:24:00 PM** | Prep Date: **8/2/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | 0 | 0 | |
| Barium | 0.00522 | 0.0100 | 0.00500 | 0 | 104 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00527 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00534 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00475 | 0.0100 | 0.00500 | 0 | 95.0 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00509 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00500 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-101483** | Batch ID: **101483** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS4_210803A** | Analysis Date: **8/3/2021 1:27:00 PM** | Prep Date: **8/2/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0315 | 0.0300 | 0.0300 | 0 | 105 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_211019A**

The QC data in batch 102437 applies to the following samples: 2110093-01A, 2110093-02A, 2110093-03A, 2110093-04A, 2110093-05A, 2110093-06A, 2110093-07A, 2110093-08A, 2110093-09A, 2110093-10A

Sample ID: **MB-102437** Batch ID: **102437** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 10:51:00 A** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID: **LCS-102437** Batch ID: **102437** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 10:53:00 A** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.195 | 0.00250 | 0.200 | 0 | 97.4 | 80 | 120 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Boron | 0.200 | 0.0300 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Calcium | 5.43 | 0.300 | 5.00 | 0 | 109 | 80 | 120 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Cobalt | 0.196 | 0.00500 | 0.200 | 0 | 98.1 | 80 | 120 | | | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.7 | 80 | 120 | | | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 80 | 120 | | | |
| Selenium | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | | | |

Sample ID: **LCSD-102437** Batch ID: **102437** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 10:55:00 A** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.194 | 0.00250 | 0.200 | 0 | 97.1 | 80 | 120 | 0.391 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_211019A**

| Sample ID: **LCSD-102437** | Batch ID: **102437** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 10:55:00 A** | Prep Date: **10/18/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.143 | 15 | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 99.8 | 80 | 120 | 0.544 | 15 | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.6 | 80 | 120 | 1.14 | 15 | |
| Boron | 0.195 | 0.0300 | 0.200 | 0 | 97.3 | 80 | 120 | 2.74 | 15 | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | 0.815 | 15 | |
| Calcium | 5.37 | 0.300 | 5.00 | 0 | 107 | 80 | 120 | 1.16 | 15 | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.356 | 15 | |
| Cobalt | 0.196 | 0.00500 | 0.200 | 0 | 98.0 | 80 | 120 | 0.026 | 15 | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.4 | 80 | 120 | 0.772 | 15 | |
| Lithium | 0.195 | 0.0100 | 0.200 | 0 | 97.7 | 80 | 120 | 4.99 | 15 | |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 80 | 120 | 1.12 | 15 | |
| Selenium | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 80 | 120 | 1.68 | 15 | |
| Thallium | 0.204 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | 0.279 | 15 | |

| Sample ID: **2110093-05A SD** | Batch ID: **102437** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 11:01:00 A** | Prep Date: **10/18/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 20 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Barium | 0.0798 | 0.0500 | 0 | 0.0796 | | | | 0.292 | 20 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Boron | 0.0762 | 0.150 | 0 | 0.0801 | | | | 4.93 | 20 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.00984 | | | | 0 | 20 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 20 | |

| Sample ID: **2110093-05A PDS** | Batch ID: **102437** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 11:21:00 A** | Prep Date: **10/18/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.186 | 0.00250 | 0.200 | 0 | 92.8 | 75 | 125 | | | |
| Arsenic | 0.196 | 0.00500 | 0.200 | 0 | 98.0 | 75 | 125 | | | |
| Barium | 0.274 | 0.0100 | 0.200 | 0.0796 | 97.4 | 75 | 125 | | | |
| Beryllium | 0.192 | 0.00100 | 0.200 | 0 | 95.9 | 75 | 125 | | | |
| Boron | 0.266 | 0.0300 | 0.200 | 0.0801 | 92.9 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

Sample ID: **2110093-05A PDS** Batch ID: **102437** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 11:21:00 A** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.6 | 75 | 125 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Cobalt | 0.192 | 0.00500 | 0.200 | 0 | 96.0 | 75 | 125 | | | |
| Lead | 0.201 | 0.00100 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Lithium | 0.198 | 0.0100 | 0.200 | 0.00984 | 94.2 | 75 | 125 | | | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 75 | 125 | | | |
| Selenium | 0.196 | 0.00500 | 0.200 | 0 | 97.8 | 75 | 125 | | | |
| Thallium | 0.205 | 0.00150 | 0.200 | 0 | 103 | 75 | 125 | | | |

Sample ID: **2110093-05A MS** Batch ID: **102437** TestNo: **SW6020B** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 11:23:00 A** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.5 | 75 | 125 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Barium | 0.284 | 0.0100 | 0.200 | 0.0796 | 102 | 75 | 125 | | | |
| Beryllium | 0.196 | 0.00100 | 0.200 | 0 | 97.9 | 75 | 125 | | | |
| Boron | 0.268 | 0.0300 | 0.200 | 0.0801 | 94.2 | 75 | 125 | | | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 99.8 | 75 | 125 | | | |
| Calcium | 37.5 | 0.300 | 5.00 | 32.6 | 97.6 | 75 | 125 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Cobalt | 0.194 | 0.00500 | 0.200 | 0 | 97.0 | 75 | 125 | | | |
| Lead | 0.203 | 0.00100 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Lithium | 0.209 | 0.0100 | 0.200 | 0.00984 | 99.3 | 75 | 125 | | | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 100 | 75 | 125 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.7 | 75 | 125 | | | |
| Thallium | 0.208 | 0.00150 | 0.200 | 0 | 104 | 75 | 125 | | | |

Sample ID: **2110093-05A MSD** Batch ID: **102437** TestNo: **SW6020B** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 11:25:00 A** Prep Date: **10/18/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.197 | 0.00250 | 0.200 | 0 | 98.5 | 75 | 125 | 1.07 | 15 | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 100 | 75 | 125 | 1.18 | 15 | |
| Barium | 0.278 | 0.0100 | 0.200 | 0.0796 | 99.3 | 75 | 125 | 2.10 | 15 | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.6 | 75 | 125 | 0.266 | 15 | |
| Boron | 0.285 | 0.0300 | 0.200 | 0.0801 | 103 | 75 | 125 | 6.04 | 15 | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 75 | 125 | 0.267 | 15 | |
| Calcium | 36.7 | 0.300 | 5.00 | 32.6 | 81.0 | 75 | 125 | 2.23 | 15 | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 75 | 125 | 1.54 | 15 | |
| Cobalt | 0.191 | 0.00500 | 0.200 | 0 | 95.6 | 75 | 125 | 1.44 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_211019A**

| Sample ID: **2110093-05A MSD** | Batch ID: **102437** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 11:25:00 A** | Prep Date: **10/18/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.202 | 0.00100 | 0.200 | 0 | 101 | 75 | 125 | 0.354 | 15 | |
| Lithium | 0.207 | 0.0100 | 0.200 | 0.00984 | 98.5 | 75 | 125 | 0.833 | 15 | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 100 | 75 | 125 | 0.055 | 15 | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 75 | 125 | 0.334 | 15 | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 75 | 125 | 0.569 | 15 | |

| Sample ID: **2110093-05A SD** | Batch ID: **102437** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 12:08:00 P** | Prep Date: **10/18/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 33.9 | 15.0 | 0 | 32.9 | | | | 2.85 | 20 | |

| Sample ID: **2110093-05A PDS** | Batch ID: **102437** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 12:24:00 P** | Prep Date: **10/18/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 83.4 | 3.00 | 50.0 | 32.9 | 101 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_211019A**

Sample ID: **ICV-211019** Batch ID: **R117572** TestNo: **SW6020B** Units: **mg/L**
SampType: **ICV** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 10:36:00 A** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.0961 | 0.00250 | 0.100 | 0 | 96.1 | 90 | 110 | | | |
| Arsenic | 0.0964 | 0.00500 | 0.100 | 0 | 96.4 | 90 | 110 | | | |
| Barium | 0.0979 | 0.0100 | 0.100 | 0 | 97.9 | 90 | 110 | | | |
| Beryllium | 0.0964 | 0.00100 | 0.100 | 0 | 96.4 | 90 | 110 | | | |
| Boron | 0.0970 | 0.0300 | 0.100 | 0 | 97.0 | 90 | 110 | | | |
| Cadmium | 0.0978 | 0.00100 | 0.100 | 0 | 97.8 | 90 | 110 | | | |
| Calcium | 2.59 | 0.300 | 2.50 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.0967 | 0.00500 | 0.100 | 0 | 96.7 | 90 | 110 | | | |
| Lead | 0.101 | 0.00100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.0964 | 0.0100 | 0.100 | 0 | 96.4 | 90 | 110 | | | |
| Molybdenum | 0.0959 | 0.00500 | 0.100 | 0 | 95.9 | 90 | 110 | | | |
| Selenium | 0.0963 | 0.00500 | 0.100 | 0 | 96.3 | 90 | 110 | | | |
| Thallium | 0.102 | 0.00150 | 0.100 | 0 | 102 | 90 | 110 | | | |

Sample ID: **LCVL-211019** Batch ID: **R117572** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 10:45:00 A** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00182 | 0.00250 | 0.00200 | 0 | 91.2 | 80 | 120 | | | |
| Arsenic | 0.00462 | 0.00500 | 0.00500 | 0 | 92.4 | 80 | 120 | | | |
| Barium | 0.00451 | 0.0100 | 0.00500 | 0 | 90.1 | 80 | 120 | | | |
| Beryllium | 0.000894 | 0.00100 | 0.00100 | 0 | 89.4 | 80 | 120 | | | |
| Boron | 0.0174 | 0.0300 | 0.0200 | 0 | 87.1 | 80 | 120 | | | |
| Cadmium | 0.000901 | 0.00100 | 0.00100 | 0 | 90.1 | 80 | 120 | | | |
| Calcium | 0.101 | 0.300 | 0.100 | 0 | 101 | 80 | 120 | | | |
| Chromium | 0.00469 | 0.00500 | 0.00500 | 0 | 93.7 | 80 | 120 | | | |
| Cobalt | 0.00441 | 0.00500 | 0.00500 | 0 | 88.1 | 80 | 120 | | | |
| Lead | 0.000958 | 0.00100 | 0.00100 | 0 | 95.8 | 80 | 120 | | | |
| Lithium | 0.00822 | 0.0100 | 0.0100 | 0 | 82.2 | 80 | 120 | | | |
| Molybdenum | 0.00463 | 0.00500 | 0.00500 | 0 | 92.6 | 80 | 120 | | | |
| Selenium | 0.00458 | 0.00500 | 0.00500 | 0 | 91.6 | 80 | 120 | | | |
| Thallium | 0.000952 | 0.00150 | 0.00100 | 0 | 95.2 | 80 | 120 | | | |

Sample ID: **CCV1-211019** Batch ID: **R117572** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS4_211019A** Analysis Date: **10/19/2021 11:36:00 A** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.196 | 0.00250 | 0.200 | 0 | 98.2 | 90 | 110 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.4 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_211019A**

| Sample ID: **CCV1-211019** | Batch ID: **R117572** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 11:36:00 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Boron | 0.187 | 0.0300 | 0.200 | 0 | 93.5 | 90 | 110 | | | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Calcium | 5.36 | 0.300 | 5.00 | 0 | 107 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Lithium | 0.194 | 0.0100 | 0.200 | 0 | 97.1 | 90 | 110 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **CCV2-211019** | Batch ID: **R117572** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 12:02:00 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.36 | 0.300 | 5.00 | 0 | 107 | 90 | 110 | | | |

| Sample ID: **CCV3-211019** | Batch ID: **R117572** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_211019A** | Analysis Date: **10/19/2021 12:26:00 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.28 | 0.300 | 5.00 | 0 | 106 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_210930A**

| Sample ID: **DCS2-102243** | Batch ID: **102243** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **IC4_210930A** | Analysis Date: **9/30/2021 4:11:30 PM** | Prep Date: **9/30/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.505 | 1.00 | 0.5000 | 0 | 101 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.163 | 0.400 | 0.2000 | 0 | 81.3 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS3-102243** | Batch ID: **102243** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **IC4_210930A** | Analysis Date: **9/30/2021 4:30:30 PM** | Prep Date: **9/30/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 3.08 | 3.00 | 3.000 | 0 | 103 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_211014B**

The QC data in batch 102405 applies to the following samples: 2110093-01B, 2110093-02B, 2110093-03B, 2110093-04B, 2110093-05B, 2110093-06B, 2110093-07B, 2110093-08B, 2110093-09B, 2110093-10B

Sample ID: **MB-102405** Batch ID: **102405** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_211014B** Analysis Date: **10/14/2021 4:10:46 PM** Prep Date: **10/14/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-102405** Batch ID: **102405** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_211014B** Analysis Date: **10/14/2021 4:29:46 PM** Prep Date: **10/14/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.48 | 1.00 | 10.00 | 0 | 94.8 | 90 | 110 | | | |
| Fluoride | 3.86 | 0.400 | 4.000 | 0 | 96.5 | 90 | 110 | | | |
| Sulfate | 30.8 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

Sample ID: **LCSD-102405** Batch ID: **102405** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_211014B** Analysis Date: **10/14/2021 4:48:46 PM** Prep Date: **10/14/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.50 | 1.00 | 10.00 | 0 | 95.0 | 90 | 110 | 0.288 | 20 | |
| Fluoride | 3.87 | 0.400 | 4.000 | 0 | 96.8 | 90 | 110 | 0.292 | 20 | |
| Sulfate | 30.9 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | 0.348 | 20 | |

Sample ID: **2110093-01BMS** Batch ID: **102405** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_211014B** Analysis Date: **10/14/2021 5:26:46 PM** Prep Date: **10/14/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3670 | 100 | 2000 | 2035 | 81.8 | 90 | 110 | | | S |
| Fluoride | 2050 | 40.0 | 2000 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 1990 | 300 | 2000 | 0 | 99.4 | 90 | 110 | | | |

Sample ID: **2110093-01BMSD** Batch ID: **102405** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_211014B** Analysis Date: **10/14/2021 5:45:46 PM** Prep Date: **10/14/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3680 | 100 | 2000 | 2035 | 82.1 | 90 | 110 | 0.119 | 20 | S |
| Fluoride | 2050 | 40.0 | 2000 | 0 | 102 | 90 | 110 | 0.048 | 20 | |
| Sulfate | 1990 | 300 | 2000 | 0 | 99.6 | 90 | 110 | 0.158 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_211014B**

| Sample ID: **2110093-08BMS** | Batch ID: **102405** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_211014B** | Analysis Date: **10/14/2021 6:42:45 PM** | Prep Date: **10/14/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2680 | 100 | 2000 | 950.3 | 86.3 | 90 | 110 | | | S |
| Fluoride | 1920 | 40.0 | 2000 | 0 | 95.8 | 90 | 110 | | | |
| Sulfate | 2370 | 300 | 2000 | 474.0 | 94.6 | 90 | 110 | | | |

| Sample ID: **2110093-08BMSD** | Batch ID: **102405** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_211014B** | Analysis Date: **10/14/2021 7:01:45 PM** | Prep Date: **10/14/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2680 | 100 | 2000 | 950.3 | 86.4 | 90 | 110 | 0.060 | 20 | S |
| Fluoride | 1920 | 40.0 | 2000 | 0 | 96.0 | 90 | 110 | 0.197 | 20 | |
| Sulfate | 2370 | 300 | 2000 | 474.0 | 94.7 | 90 | 110 | 0.062 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_211014B**

| Sample ID: **ICV-211014** | Batch ID: **R117523** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_211014B** | Analysis Date: **10/14/2021 10:54:36 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.4 | 1.00 | 25.00 | 0 | 97.5 | 90 | 110 | | | |
| Fluoride | 9.78 | 0.400 | 10.00 | 0 | 97.8 | 90 | 110 | | | |
| Sulfate | 77.5 | 3.00 | 75.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID: **CCV1-211012** | Batch ID: **R117523** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_211014B** | Analysis Date: **10/14/2021 1:26:36 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.38 | 1.00 | 10.00 | 0 | 93.8 | 90 | 110 | | | |
| Fluoride | 3.83 | 0.400 | 4.000 | 0 | 95.9 | 90 | 110 | | | |
| Sulfate | 30.5 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **CCV2-211012** | Batch ID: **R117523** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_211014B** | Analysis Date: **10/14/2021 10:11:45 P** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.59 | 1.00 | 10.00 | 0 | 95.9 | 90 | 110 | | | |
| Fluoride | 3.90 | 0.400 | 4.000 | 0 | 97.5 | 90 | 110 | | | |
| Sulfate | 31.1 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID: **CCV3-211012** | Batch ID: **R117523** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_211014B** | Analysis Date: **10/15/2021 2:37:46 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.65 | 1.00 | 10.00 | 0 | 96.5 | 90 | 110 | | | |
| Fluoride | 3.91 | 0.400 | 4.000 | 0 | 97.8 | 90 | 110 | | | |
| Sulfate | 31.2 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID: **CCV4-211012** | Batch ID: **R117523** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_211014B** | Analysis Date: **10/15/2021 7:03:45 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.61 | 1.00 | 10.00 | 0 | 96.1 | 90 | 110 | | | |
| Fluoride | 3.92 | 0.400 | 4.000 | 0 | 98.0 | 90 | 110 | | | |
| Sulfate | 31.1 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_211015A**

The QC data in batch 102421 applies to the following samples: 2110093-09B

| Sample ID: **MB-102421** | Batch ID: **102421** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **IC4_211015A** | Analysis Date: **10/15/2021 12:34:47 P** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |

| Sample ID: **LCS-102421** | Batch ID: **102421** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **IC4_211015A** | Analysis Date: **10/15/2021 12:53:47 P** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.43 | 1.00 | 10.00 | 0 | 94.3 | 90 | 110 | | | |

| Sample ID: **LCSD-102421** | Batch ID: **102421** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **IC4_211015A** | Analysis Date: **10/15/2021 1:12:47 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.41 | 1.00 | 10.00 | 0 | 94.1 | 90 | 110 | 0.263 | 20 | |

| Sample ID: **2110054-13BMS** | Batch ID: **102421** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_211015A** | Analysis Date: **10/15/2021 5:24:28 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2200 | 100 | 2000 | 473.7 | 86.3 | 90 | 110 | | | S |

| Sample ID: **2110054-13BMSD** | Batch ID: **102421** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_211015A** | Analysis Date: **10/15/2021 5:43:28 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2200 | 100 | 2000 | 473.7 | 86.5 | 90 | 110 | 0.126 | 20 | S |

| Sample ID: **2110118-01AMS** | Batch ID: **102421** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_211015A** | Analysis Date: **10/15/2021 10:28:27 P** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 196 | 10.0 | 200.0 | 25.21 | 85.3 | 90 | 110 | | | S |

| Sample ID: **2110118-01AMSD** | Batch ID: **102421** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_211015A** | Analysis Date: **10/15/2021 10:47:27 P** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 198 | 10.0 | 200.0 | 25.21 | 86.6 | 90 | 110 | 1.37 | 20 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_211015A**

| Sample ID: **ICV-211015** | Batch ID: **R117538** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_211015A** | Analysis Date: **10/15/2021 11:56:47 A** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.2 | 1.00 | 25.00 | 0 | 96.6 | 90 | 110 | | | |

| Sample ID: **CCV1-211015** | Batch ID: **R117538** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_211015A** | Analysis Date: **10/15/2021 8:34:28 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.45 | 1.00 | 10.00 | 0 | 94.5 | 90 | 110 | | | |

| Sample ID: **CCV2-211015** | Batch ID: **R117538** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_211015A** | Analysis Date: **10/16/2021 1:38:27 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.50 | 1.00 | 10.00 | 0 | 95.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_211014C**

The QC data in batch 102408 applies to the following samples: 2110093-01B, 2110093-02B, 2110093-03B, 2110093-04B, 2110093-05B, 2110093-06B, 2110093-07B, 2110093-08B, 2110093-09B, 2110093-10B

Sample ID: **MB-102408** Batch ID: **102408** TestNo: **M2540C** Units: **mg/L**
SampType: **MBLK** Run ID: **WC_211014C** Analysis Date: **10/14/2021 4:30:00 PM** Prep Date: **10/14/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

Sample ID: **LCS-102408** Batch ID: **102408** TestNo: **M2540C** Units: **mg/L**
SampType: **LCS** Run ID: **WC_211014C** Analysis Date: **10/14/2021 4:30:00 PM** Prep Date: **10/14/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 744 | 10.0 | 745.6 | 0 | 99.8 | 90 | 113 | | | |

Sample ID: **2110088-01A-DUP** Batch ID: **102408** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_211014C** Analysis Date: **10/14/2021 4:30:00 PM** Prep Date: **10/14/2021**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 962 | 10.0 | 0 | 972.0 | | | | 1.03 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_211015C**

The QC data in batch 102431 applies to the following samples: 2110093-01B

| Sample ID: **MB-102431** | Batch ID: **102431** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_211015C** | Analysis Date: **10/15/2021 5:00:00 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-102431** | Batch ID: **102431** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_211015C** | Analysis Date: **10/15/2021 5:00:00 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 755 | 10.0 | 745.6 | 0 | 101 | 90 | 113 | | | |

| Sample ID: **LCSD-102431** | Batch ID: **102431** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **WC_211015C** | Analysis Date: **10/15/2021 5:00:00 PM** | Prep Date: **10/15/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 756 | 10.0 | 745.6 | 0 | 101 | 90 | 113 | 0.132 | 5 | |

| Sample ID: **2110093-01B-DUP** | Batch ID: **102431** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_211015C** | Analysis Date: **10/15/2021 5:00:00 PM** | Prep Date: **10/14/2021** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 3730 | 50.0 | 0 | 3790 | | | | 1.60 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2110093
**Project:** Luminant-OGSES-CCR-FGD Ponds

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Antimony | 0.000800 | 0.00250 |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Cadmium | 0.000300 | 0.00100 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Molybdenum | 0.00200 | 0.00500 |
| Selenium | 0.00200 | 0.00500 |
| Thallium | 0.000500 | 0.00150 |

| **TestNo: SW7470A** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Mercury | 0.0000800 | 0.000200 |

| **TestNo: M2540C** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

# ANALYTICAL REPORT

November 18, 2021



## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1419560 |
| Samples Received: | 10/19/2021 |
| Project Number: | 210093 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

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## FGD-8 L1419560-01 Non-Potable Water

Collected by | Collected date/time 10/11/21 18:05 | Received date/time 10/19/21 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method Calculation | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |

## FGD-11 L1419560-02 Non-Potable Water

Collected by | Collected date/time 10/11/21 15:50 | Received date/time 10/19/21 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method Calculation | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |

## FGD-5 L1419560-03 Non-Potable Water

Collected by | Collected date/time 10/11/21 12:50 | Received date/time 10/19/21 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method Calculation | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |

## FGD-3 L1419560-04 Non-Potable Water

Collected by | Collected date/time 10/11/21 11:40 | Received date/time 10/19/21 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method Calculation | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |

## FGD-4 L1419560-05 Non-Potable Water

Collected by | Collected date/time 10/11/21 10:40 | Received date/time 10/19/21 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method Calculation | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |

## FGD-6 L1419560-06 Non-Potable Water

Collected by | Collected date/time 10/11/21 09:35 | Received date/time 10/19/21 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method Calculation | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |

## FGD-1 L1419560-07 Non-Potable Water

Collected by | Collected date/time 10/11/21 08:15 | Received date/time 10/19/21 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method Calculation | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |

## FGD-2 L1419560-08 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time | |
|---|---|---|---|---|---|---|
| | | | | 10/11/21 09:20 | 10/19/21 09:45 | |
| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
| Radiochemistry by Method Calculation | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |

## DUP-1 L1419560-09 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time | |
|---|---|---|---|---|---|---|
| | | | | 10/11/21 09:20 | 10/19/21 09:45 | |
| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
| Radiochemistry by Method Calculation | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |

## FGD-12 L1419560-10 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time | |
|---|---|---|---|---|---|---|
| | | | | 10/11/21 10:25 | 10/19/21 09:45 | |
| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
| Radiochemistry by Method Calculation | WG1767288 | 1 | 11/10/21 16:27 | 11/16/21 12:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1767288 | 1 | 11/10/21 16:27 | 11/12/21 14:47 | RGT | Mt. Juliet, TN |

# CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904/9320

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 6.78 | | 0.721 | 1.16 | 11/10/2021 12:40 | WG1768040 |
| *(T) Barium* | *98.8* | | | *62.0-143* | *11/10/2021 12:40* | WG1768040 |
| *(T) Yttrium* | *109* | | | *79.0-136* | *11/10/2021 12:40* | WG1768040 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 7.98 | | 1.19 | 1.48 | 11/12/2021 14:47 | WG1767288 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 1.20 | | 0.466 | 0.319 | 11/12/2021 14:47 | WG1767288 |
| *(T) Barium-133* | *121* | | | *30.0-143* | *11/12/2021 14:47* | WG1767288 |

## Radiochemistry by Method 904/9320

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 3.33 | | 0.385 | 0.638 | 11/10/2021 12:40 | WG1768040 |
| *(T) Barium* | *104* | | | *62.0-143* | *11/10/2021 12:40* | WG1768040 |
| *(T) Yttrium* | *104* | | | *79.0-136* | *11/10/2021 12:40* | WG1768040 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 4.45 | | 0.835 | 0.919 | 11/12/2021 14:47 | WG1767288 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 1.11 | | 0.450 | 0.281 | 11/12/2021 14:47 | WG1767288 |
| *(T) Barium-133* | *124* | | | *30.0-143* | *11/12/2021 14:47* | WG1767288 |

## Radiochemistry by Method 904/9320

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.203 | U | 0.337 | 0.646 | 11/10/2021 12:40 | WG1768040 |
| *(T) Barium* | *108* | | | *62.0-143* | *11/10/2021 12:40* | WG1768040 |
| *(T) Yttrium* | *97.5* | | | *79.0-136* | *11/10/2021 12:40* | WG1768040 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.293 | U | 0.489 | 0.889 | 11/12/2021 14:47 | WG1767288 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.0902 | U | 0.152 | 0.243 | 11/12/2021 14:47 | WG1767288 |
| *(T) Barium-133* | *116* | | | *30.0-143* | *11/12/2021 14:47* | WG1767288 |

## Radiochemistry by Method 904/9320

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 1.02 | | 0.291 | 0.527 | 11/10/2021 12:40 | WG1768040 |
| *(T) Barium* | *111* | | | *62.0-143* | *11/10/2021 12:40* | WG1768040 |
| *(T) Yttrium* | *96.6* | | | *79.0-136* | *11/10/2021 12:40* | WG1768040 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.25 | | 0.517 | 0.796 | 11/12/2021 14:47 | WG1767288 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.233 | J | 0.226 | 0.269 | 11/12/2021 14:47 | WG1767288 |
| *(T) Barium-133* | *112* | | | *30.0-143* | *11/12/2021 14:47* | WG1767288 |

## Radiochemistry by Method 904/9320

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 1.27 | | 0.301 | 0.54 | 11/10/2021 12:40 | WG1768040 |
| *(T) Barium* | *101* | | | *62.0-143* | *11/10/2021 12:40* | WG1768040 |
| *(T) Yttrium* | *103* | | | *79.0-136* | *11/10/2021 12:40* | WG1768040 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.44 | | 0.494 | 0.798 | 11/12/2021 14:47 | WG1767288 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.169 | J | 0.193 | 0.258 | 11/12/2021 14:47 | WG1767288 |
| *(T) Barium-133* | *102* | | | *30.0-143* | *11/12/2021 14:47* | WG1767288 |

## Radiochemistry by Method 904/9320

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 1.39 | | 0.308 | 0.548 | 11/10/2021 12:40 | WG1768040 |
| *(T) Barium* | *105* | | | *62.0-143* | *11/10/2021 12:40* | WG1768040 |
| *(T) Yttrium* | *93.9* | | | *79.0-136* | *11/10/2021 12:40* | WG1768040 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.44 | | 0.525 | 0.904 | 11/12/2021 14:47 | WG1767288 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.0567 | U | 0.217 | 0.356 | 11/12/2021 14:47 | WG1767288 |
| *(T) Barium-133* | *102* | | | *30.0-143* | *11/12/2021 14:47* | WG1767288 |

## Radiochemistry by Method 904/9320

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 1.85 | | 0.328 | 0.572 | 11/10/2021 12:40 | WG1768040 |
| *(T) Barium* | *105* | | | *62.0-143* | *11/10/2021 12:40* | WG1768040 |
| *(T) Yttrium* | *91.8* | | | *79.0-136* | *11/10/2021 12:40* | WG1768040 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 2.21 | | 0.596 | 0.837 | 11/12/2021 14:47 | WG1767288 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.362 | | 0.268 | 0.265 | 11/12/2021 14:47 | WG1767288 |
| *(T) Barium-133* | *104* | | | *30.0-143* | *11/12/2021 14:47* | WG1767288 |

## Radiochemistry by Method 904/9320

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.922 | | 0.345 | 0.637 | 11/10/2021 12:40 | WG1768040 |
| *(T) Barium* | *94.5* | | | *62.0-143* | *11/10/2021 12:40* | WG1768040 |
| *(T) Yttrium* | *104* | | | *79.0-136* | *11/10/2021 12:40* | WG1768040 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.52 | | 0.688 | 0.99 | 11/12/2021 14:47 | WG1767288 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.593 | | 0.343 | 0.353 | 11/12/2021 14:47 | WG1767288 |
| *(T) Barium-133* | *91.9* | | | *30.0-143* | *11/12/2021 14:47* | WG1767288 |

## Radiochemistry by Method 904/9320

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 1.50 | | 0.323 | 0.576 | 11/10/2021 12:40 | WG1768040 |
| *(T) Barium* | *96.5* | | | *62.0-143* | *11/10/2021 12:40* | WG1768040 |
| *(T) Yttrium* | *103* | | | *79.0-136* | *11/10/2021 12:40* | WG1768040 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.82 | | 0.554 | 0.756 | 11/12/2021 14:47 | WG1767288 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.324 | | 0.231 | 0.18 | 11/12/2021 14:47 | WG1767288 |
| *(T) Barium-133* | *103* | | | *30.0-143* | *11/12/2021 14:47* | WG1767288 |

## Radiochemistry by Method 904/9320

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 1.94 | | 0.929 | 1.78 | 11/16/2021 12:45 | WG1768041 |
| *(T) Barium* | *105* | | | *62.0-143* | *11/16/2021 12:45* | WG1768041 |
| *(T) Yttrium* | *108* | | | *79.0-136* | *11/16/2021 12:45* | WG1768041 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 3.78 | | 1.47 | 2.05 | 11/16/2021 12:45 | WG1767288 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 1.84 | | 0.545 | 0.265 | 11/12/2021 14:47 | WG1767288 |
| *(T) Barium-133* | *104* | | | *30.0-143* | *11/12/2021 14:47* | WG1767288 |

## Method Blank (MB)

(MB) R3728770-1 11/10/21 12:40

| Analyte | MB Result | MB Qualifier | MB Uncertainty | MB MDA |
|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l |
| Radium-228 | 0.219 | U | 0.241 | 0.462 |
| *(T) Barium* | *104* | | *104* | |
| *(T) Yttrium* | *93.3* | | *93.3* | |

## L1426677-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1426677-01 11/10/21 12:40 • (DUP) R3728770-5 11/10/21 12:40

| Analyte | Original Result | Original Uncertainty | Original MDA | DUP Result | DUP Uncertainty | DUP MDA | Dilution | DUP RPD | DUP RER | DUP Qualifier | DUP RPD Limits | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pCi/l | + / - | pCi/l | pCi/l | + / - | pCi/l | | % | | | % | |
| Radium-228 | 0.925 | 0.285 | 0.519 | 1.64 | 0.848 | 0.519 | 1 | 55.8 | 0.800 | | 20 | 3 |
| *(T) Barium* | *94.6* | | | *96.7* | *96.7* | | | | | | | |
| *(T) Yttrium* | *104* | | | *99.0* | *99.0* | | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3728770-2 11/10/21 12:40

| Analyte | Spike Amount | LCS Result | LCS Rec. | Rec. Limits | LCS Qualifier |
|---|---|---|---|---|---|
| | pCi/l | pCi/l | % | % | |
| Radium-228 | 5.00 | 4.52 | 90.3 | 80.0-120 | |
| *(T) Barium* | | | *107* | | |
| *(T) Yttrium* | | | *98.5* | | |

## L1419560-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1419560-02 11/10/21 12:40 • (MS) R3728770-3 11/10/21 12:40 • (MSD) R3728770-4 11/10/21 12:40

| Analyte | Spike Amount | Original Result | MS Result | MSD Result | MS Rec. | MSD Rec. | Dilution | Rec. Limits | MS Qualifier | MSD Qualifier | RPD | MS RER | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pCi/l | pCi/l | pCi/l | pCi/l | % | % | | % | | | % | | % |
| Radium-228 | 16.7 | 3.33 | 23.6 | 20.9 | 121 | 105 | 1 | 70.0-130 | | | 12.4 | | 20 |
| *(T) Barium* | | *104* | | | *99.6* | *97.0* | | | | | | | |
| *(T) Yttrium* | | *104* | | | *93.2* | *91.4* | | | | | | | |

## Method Blank (MB)

(MB) R3731226-1 11/16/21 12:45

| Analyte | MB Result pCi/l | MB Qualifier | MB Uncertainty + / - pCi/l | MB MDA pCi/l |
|---|---|---|---|---|
| Radium-228 | 0.136 | U | 0.229 | 0.448 |
| *(T) Barium* | *99.0* | | *99.0* | |
| *(T) Yttrium* | *98.7* | | *98.7* | |

## L1420159-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1420159-01 11/16/21 12:45 • (DUP) R3731226-5 11/16/21 12:45

| Analyte | Original Result pCi/l | Original Uncertainty + / - | Original MDA pCi/l | DUP Result pCi/l | DUP Uncertainty + / - | DUP MDA pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.870 | 0.508 | 0.978 | 0.830 | 0.953 | 0.978 | 1 | 4.69 | 0.0369 | U | 20 | 3 |
| *(T) Barium* | *109* | | | *94.7* | *94.7* | | | | | | | |
| *(T) Yttrium* | *92.6* | | | *86.4* | *86.4* | | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3731226-2 11/16/21 12:45

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 4.20 | 84.1 | 80.0-120 | |
| *(T) Barium* | | | *102* | | |
| *(T) Yttrium* | | | *109* | | |

## Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) • (MS) R3731226-3 11/16/21 12:45 • (MSD) R3731226-4 11/16/21 12:45

| Analyte | Spike Amount pCi/l | Original Result | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 16.7 | | 17.0 | 20.0 | 100 | 118 | 1 | 70.0-130 | | | 16.5 | | 20 |
| *(T) Barium* | | | | | *98.9* | *111* | | | | | | | |
| *(T) Yttrium* | | | | | *100* | *103* | | | | | | | |

## Method Blank (MB)

(MB) R3730011-1 11/12/21 14:47

| Analyte | MB Result pCi/l | MB Qualifier | MB Uncertainty + / - pCi/l | MB MDA pCi/l |
|---|---|---|---|---|
| Radium-226 | 0.00833 | U | 0.0206 | 0.0428 |
| *(T) Barium-133* | *101* | | *101* | |

## L1428427-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1428427-01 11/12/21 14:47 • (DUP) R3730011-5 11/12/21 14:47

| Analyte | Original Result pCi/l | Original Uncertainty + / - | Original MDA pCi/l | DUP Result pCi/l | DUP Uncertainty + / - | DUP MDA pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.574 | 0.323 | 0.223 | 0.390 | 0.277 | 0.223 | 1 | 38.2 | 0.433 | | 20 | 3 |
| *(T) Barium-133* | *88.8* | | | *110* | *110* | | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3730011-2 11/12/21 14:47

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 5.02 | 5.01 | 99.8 | 80.0-120 | |
| *(T) Barium-133* | | | *101* | | |

## L1419560-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1419560-03 11/12/21 14:47 • (MS) R3730011-3 11/12/21 14:47 • (MSD) R3730011-4 11/12/21 14:47

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 20.1 | 0.0902 | 16.9 | 20.4 | 83.6 | 101 | 1 | 75.0-125 | | | 18.9 | | 20 |
| *(T) Barium-133* | | *116* | | | *96.9* | *101* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| J | The identification of the analyte is acceptable; the reported value is an estimate. |
| U | Below Detectable Limits: Indicates that the analyte was not detected. |

## Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN000032021-1 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | TN00003 |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LAO000356 |
| Kentucky [1 6] | KY90010 | South Carolina | 84004002 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana | LA018 | Texas | T104704245-20-18 |
| Maine | TN00003 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN000032021-11 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 110033 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 998093910 |
| Montana | CERT0086 | Wyoming | A2LA |
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX:

B087

# CHAIN-OF-CUSTODY RECORD



Work Order: 2110093

**Subcontractor:**
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

L419560
**13-Oct-21**

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ra-228 E904.0 | Ra-226 M7500 Ra B M | | | | |
| FGD-8 | Aqueous | 01C | 10/11/21 06:05 PM | 1LHDPEHNO3 | | 1 | | | | -01 |
| FGD-8 | Aqueous | 01D | 10/11/21 06:05 PM | 1LHDPEHNO3 | 1 | | | | | -01 |
| FGD-11 | Aqueous | 02C | 10/11/21 03:50 PM | 1LHDPEHNO3 | | 1 | | | | -02 |
| FGD-11 | Aqueous | 02D | 10/11/21 03:50 PM | 1LHDPEHNO3 | 1 | | | | | -02 |
| FGD-5 | Aqueous | 03C | 10/11/21 12:50 PM | 1LHDPEHNO3 | | 1 | | | | -03 |
| FGD-5 | Aqueous | 03D | 10/11/21 12:50 PM | 1LHDPEHNO3 | 1 | | | | | -03 |
| FGD-3 | Aqueous | 04C | 10/11/21 11:40 AM | 1LHDPEHNO3 | | 1 | | | | -04 |
| FGD-3 | Aqueous | 04D | 10/11/21 11:40 AM | 1LHDPEHNO3 | 1 | | | | | -04 |
| FGD-4 | Aqueous | 05C | 10/11/21 10:40 AM | 1LHDPEHNO3 | | 1 | | | | -05 |
| FGD-4 | Aqueous | 05D | 10/11/21 10:40 AM | 1LHDPEHNO3 | 1 | | | | | -05 |
| FGD-6 | Aqueous | 06C | 10/11/21 09:35 AM | 1LHDPEHNO3 | | 1 | | | | -06 |
| FGD-6 | Aqueous | 06D | 10/11/21 09:35 AM | 1LHDPEHNO3 | 1 | | | | | -06 |
| FGD-1 | Aqueous | 07C | 10/12/21 08:15 AM | 1LHDPEHNO3 | | 1 | | | | -07 |
| FGD-1 | Aqueous | 07D | 10/12/21 08:15 AM | 1LHDPEHNO3 | 1 | | | | | -07 |
| FGD-2 | Aqueous | 08C | 10/12/21 09:20 AM | 1LHDPEHNO3 | | 1 | | | | -08 |
| FGD-2 | Aqueous | 08D | 10/12/21 09:20 AM | 1LHDPEHNO3 | 1 | | | | | -08 |
| DUP-1 | Aqueous | 09C | 10/12/21 09:20 AM | 1LHDPEHNO3 | | 1 | | | | -09 |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report Ra-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: ~~Standard~~ NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | Date/Time | | Date/Time |
|---|---|---|---|
| Relinquished by: | 10/14/21 1800 | Received by: | |
| Relinquished by: | | Received by: | 10/19/21 9:45 |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX:

# CHAIN-OF-CUSTODY RECORD



Work Order: 2110093

**Subcontractor:**
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

L1419560
13-Oct-21

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ra-228 E904.0 | Ra-226 M7500 Ra B M | | | | |
| DUP-1 | Aqueous | 09D | 10/12/21 09:20 AM | 1LHDPEHNO3 | 1 | | | | | -09 |
| FGD-12 | Aqueous | 10C | 10/12/21 10:25 AM | 1LHDPEHNO3 | | 1 | | | | -10 |
| FGD-12 | Aqueous | 10D | 10/12/21 10:25 AM | 1LHDPEHNO3 | 1 | | | | | -10 |

Sample Receipt Checklist

| | | | |
|---|---|---|---|
| COC Seal Present/Intact: | Y N | If Applicable | |
| COC Signed/Accurate: | Y N | VOA Zero Headspace: | Y N |
| Bottles arrive intact: | Y N | Pres.Correct/Check: | Y N |
| Correct bottles used: | Y N | | |
| Sufficient volume sent: | Y N | | |
| RAD Screen <0.5 mR/hr: | Y N | | |

General Comments:
Please analyze these samples with Normal Turnaround Time.
Report Ra-226, Ra-228 & Combined per Specs
Quality Control Package Needed: ~~Standard~~ TNELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | | 10/14/21 1800 | **Received by:** | | |
| **Relinquished by:** | | | **Received by:** | | 10/19/21 9:45 |

**ATTACHMENT 2**

**ALTERNATE SOURCE DEMONSTRATION REPORT**

# Alternate Source Demonstration

*Oak Grove Steam Electric Station*

*FGD Ponds - Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

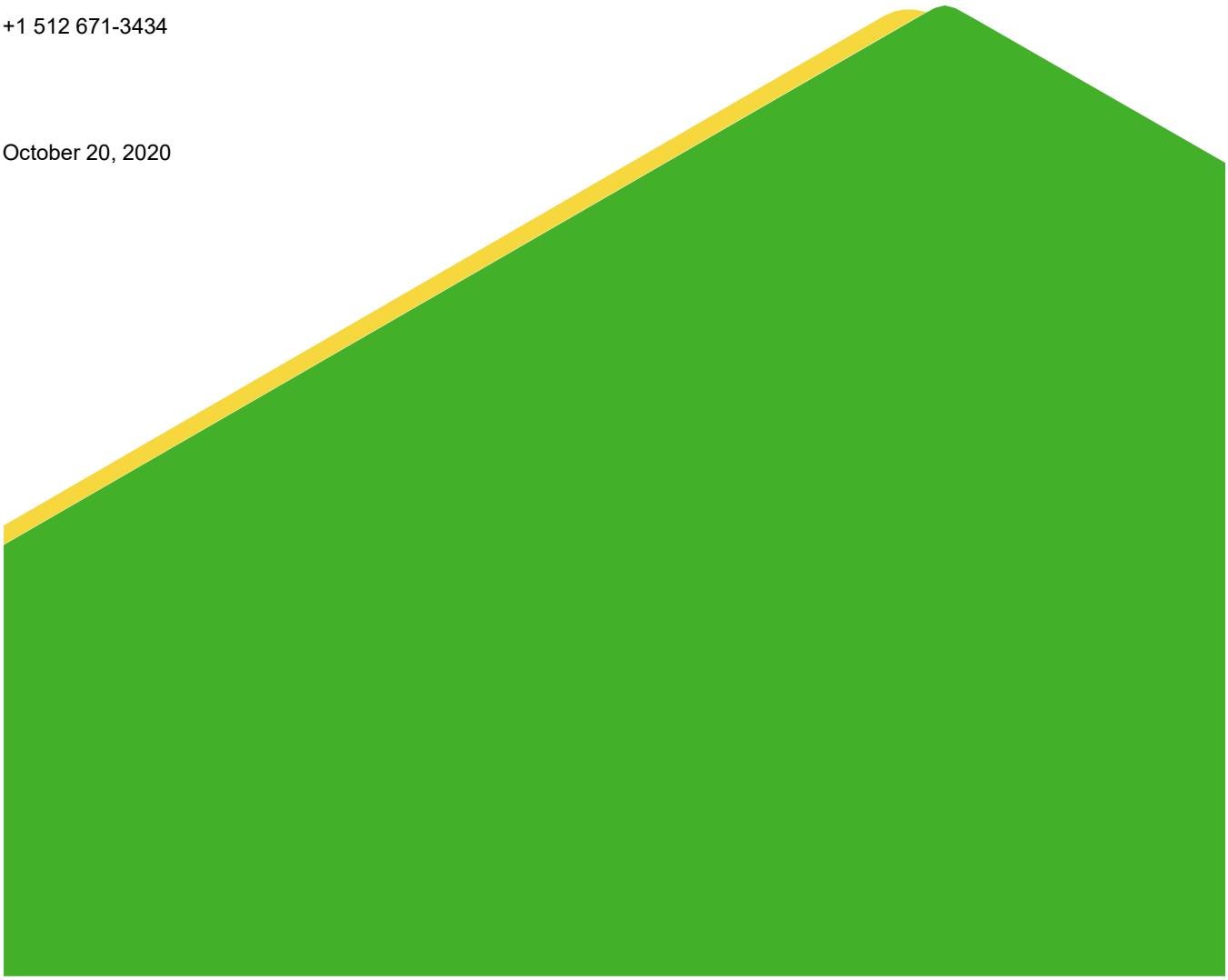
Submitted by:

**Golder Associates Inc.**

2201 Double Creek Dr, Suite 4004, Round Rock, Texas, USA 78664

+1 512 671-3434

October 20, 2020



# Executive Summary

In accordance with the United States Environmental Protection Agency (US EPA) Coal Combustion Residual (CCR) Rule (40 C.F.R. Part 257 Subpart D; 80 Fed. Reg. 21302 (April 17, 2015) (CCR Rule or The Rule), this Alternate Source Demonstration (ASD) was prepared to document that a source other than the FGD Ponds at the Oak Grove Steam Electric Station (the Site) caused a Statistically Significant Level (SSL) of lithium identified in monitoring well FGD-5 during the first semi-annual assessment monitoring event in 2020.

The following lines of evidence support the conclusion that the SSL of lithium in groundwater samples collected from FGD-5 of the FGD Ponds (FDG Pond A, FDG Pond B and FDG Pond C) monitoring well network is not caused by a release of CCR porewater/leachate, but instead results from an alternate source:

- The range of lithium concentrations in samples collected from FGD-5 (0.145 to 0.170 mg/L) is similar to that of samples in upgradient wells FGD-8 and FGD-11 (max 0.149 mg/L since 2015). The groundwater at FGD-5 is of the sodium-chloride type, which is the same type as the upgradient wells (FGD-8 and FGD-11), whereas samples from the FGD ponds indicate water of a magnesium-chloride dominant water type, indicating different water types for the groundwater system and FGD ponds.
- Concentrations of CCR tracers boron, chloride and sulfate, and ratios of boron to lithium differ significantly between FGD pond water and groundwater in the vicinity of FGD-5. Therefore, lithium in groundwater at FGD-5 cannot have originated from CCR porewater as selective dilution of lithium cannot occur.
- FGD-5 is downgradient from FGD Pond C and cross-gradient (and at times upgradient) from FGD Pond A and B. FGD Pond C has only been in operation since 2016. However, lithium concentrations in groundwater at FGD-5 have remained consistent since 2015 (0.145 to 0.170 mg/L). Therefore, lithium concentrations were already elevated in groundwater at FGD-5 prior to ash additions to FGD Pond C, which is the only FGD pond upgradient of FGD-5. Since FGD-5 is not directly downgradient from FGD Ponds A or B, it would not receive porewater from these ponds unless diluted with natural groundwater flowing to FGD-5 from upgradient areas. In groundwater samples collected from FGD-5, concentrations of CCR tracers (boron, sulfate and chloride) that are elevated in FGD Pond A and B water are similar to concentrations in background wells FGD-8 and FGD-11. Furthermore, lithium SSLs have not been observed in CCR monitoring wells directly downgradient of FGD Pond A or B (e.g., FGD-2, FGD-3, FGD-4 and FGD-6), or CCR monitoring wells FGD-1 and FGD-12, which are downgradient and more proximal to FGD Pond C than FGD-5. Thus, it is highly unlikely that lithium measured in FGD-5 groundwater originates from a release from any of the FGD ponds.
- Lithium is naturally occurring in soils at the Site. Sequential extraction of lithium from soil samples indicate total lithium concentrations ranging from 9 to 20 mg/kg, with the majority (76 to 97%) of lithium present in the non-environmentally available acid/sulfide and residual/refractory fractions.

In accordance with §257.95(g)(3), this ASD demonstrates that a source other than the FGD Ponds caused the SSL of lithium identified at monitoring well FGD-5.

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**APPENDICES**

Appendix A: Sequential Extraction Results

# Certification

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the alternative source demonstration at the referenced facility meets the requirements of 40 C.F.R. § 257.94(e)(2) of the CCR Rule.

**Golder Associates Inc.**

Patrick J. Behling, P.E.
Principal Engineer

Roberta Russell, P.G.
Senior Geologist

# 1.0 INTRODUCTION

In accordance with the United States Environmental Protection Agency (US EPA) Coal Combustion Residual (CCR) Rule (40 C.F.R. Part 257 Subpart D; 80 Fed. Reg. 21302 (April 17, 2015) (CCR Rule or The Rule), this Alternate Source Demonstration (ASD) was prepared to document that a source other than the FGD Ponds at the Oak Grove Steam Electric Station (the Site) caused a Statistically Significant Level (SSL) of lithium identified in monitoring well FGD-5 during the first semi-annual assessment monitoring event in 2020. This document satisfies the requirements of § 257.95(g)(3)(ii) which allows the owner or operator to demonstrate that a source other than the CCR Unit has caused an SSL and that the SSL was the result of an alternate source or resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

As documented by this report, the SSL for lithium at the FGD Pond monitoring well FGD-5 is attributed to naturally occurring sources in subsurface aquifer materials and is not caused by the CCR unit.

# 2.0 SITE DESCRIPTION AND BACKGROUND

Oak Grove Management Company LLC owns OGSES located approximately 10 miles north of Franklin, Robertson County, Texas (Exhibit 1). The OGSES consists of two 800-megawatt power generation units which burn lignite and coal. CCR, including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operations. Currently, CCRs generated at the OGSES are managed by Luminant in part within the FGD Pond Area (PBW, 2017a).

The FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the “FGD Ponds”) are located approximately 2,500 feet northwest of the power generation units at the Site (Exhibit 1). FGD-A Pond and FGD-B Pond were placed in service during approximately 2007. Use of FGD-C Pond began in 2016 (PBW, 2017a).

## 2.1 FGD Pond Area Monitoring Network

The monitoring well network for the FGD Pond Area consists of 9 monitoring wells (FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, FGD-8, FGD-11 and FGD-12) screened within the uppermost groundwater-bearing unit. Two wells, FGD-8 and FGD-11, are considered background monitoring wells. Monitoring well locations are shown on Exhibit 1.

## 2.2 Geologic and Hydrogeologic Setting

The FGD Ponds are located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1970). Previous boring investigations indicate the geology in the FGD Pond Area primarily consists of an upper zone of relatively thick, interbedded sand and clay strata and a lower zone of interbedded silty to clayey sand and well sorted sand. The uppermost groundwater-bearing unit at the Site occurs in the lower zone of interbedded silty to clayey sand (PBW, 2017a).

# 3.0 STATISTICAL ANALYSIS METHODS

The following sections summarize the assessment monitoring at the FGD Pond Area, present the statistical analysis method for evaluation of assessment monitoring constituents (i.e., Appendix IV parameters) as they pertain to this ASD, discuss the test methods used for soil samples, and describe the geochemical evaluation.

During assessment monitoring, concentrations of Appendix IV constituents are compared to an applicable Groundwater Protection Standard (GWPS). As specified in 40 C.F.R. § 257.95(h), the GWPS is the higher of the

Maximum Contaminant Level (MCL) or the background concentration. For lithium, the GWPS is the background concentration of 0.15 mg/L, which is calculated as the upper prediction limit (UPL) of data collected from upgradient wells during the background period, prior to the start of the detection and assessment monitoring period.

Statistical analysis of the data was performed in accordance with the Statistical Analysis Plan for CCR Groundwater Monitoring (PBW, 2017b) and the USEPA Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities-Unified Guidance (USEPA, 2009). The statistical analysis included an evaluation of confidence intervals for each of the Appendix IV parameter data sets for each well to evaluate whether constituent concentrations were present at concentrations above GWPSs.

Figure 1 shows the lithium concentrations in FGD-5 since 2015 compared to the GWPS. The calculated lower and upper confidence limits for lithium based on sample data collected from FGD-5 are 0.152 mg/L and 0.156 mg/L, respectively. An SSL was indicated at FGD-5 because the lower confidence limit based on the lithium data set from FGD-5 exceeded the GWPS of 0.152 mg/L. As indicated on Figure 1, lithium concentrations exceeded the GWPS in FGD-5 during two sampling events conducted in 2015, prior to the completion of FGD Pond C (in 2016), which is the only FGD pond that is directly upgradient of FGD-5. Furthermore, the highest sample concentration (0.170 mg/L) in FGD-5 occurred in November 2015, prior to the completion of FGD-C.

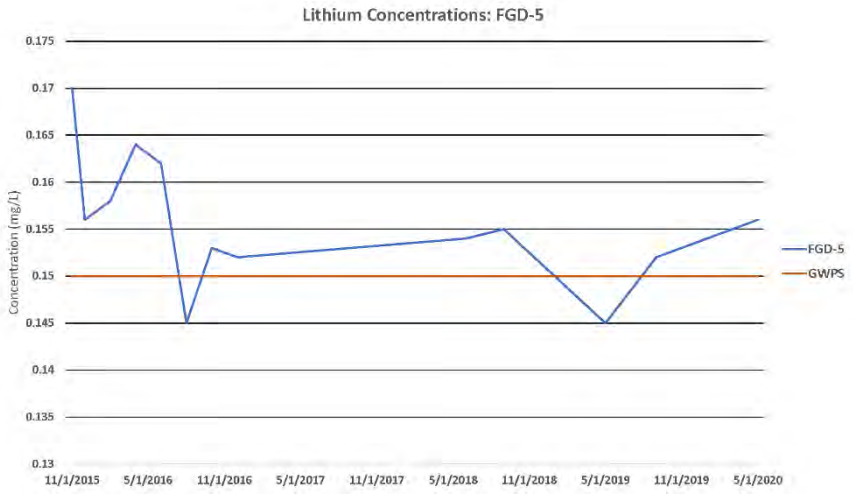


**Figure 1: Lithium concentrations in groundwater samples collected from FGD-5.**

## 3.1 Assessment Monitoring

Pursuant to 40 C.F.R. § 257.95(a), FGD Pond Area monitoring wells are sampled for all Appendix IV parameters. The 2015 through 2020 Appendix IV groundwater sample data were compared to the GWPS using confidence intervals.

## 3.2 Statistically Significant Levels

As stated in the Appendix IV SSL notification dated February 6, 2019, SSLs for cobalt and lithium were identified at the FGD Ponds during 2018 assessment monitoring completed in accordance with 40 C.F.R. § 257.95. No SSLs were identified for cobalt in subsequent semi-annual assessment monitoring completed during 2019 and 2020. No SSLs were identified for lithium in subsequent semi-annual assessment monitoring events in 2019;

however, an SSL notification for lithium was posted on August 21, 2020 based on the first 2020 semi-annual assessment monitoring event results.

## 3.3 Test Methods for Soil

### 3.3.1 Sequential Extraction

Chemical analysis of soils for total metals and sequential extraction analysis was conducted on three soil samples collected from FGD Pond Area within the groundwater-bearing unit (Appendix A). The sequential extraction procedure (SEP) consists of a seven-step metals extraction from solids to determine their potential environmental stability. The seven-step SEP is defined by specific extraction steps as illustrated and described (based on a modified Tessier et al. 1979 method) in Figure 2.

| SEQUENTIAL EXTRACTION PROCEDURE | | | | |
|---|---|---|---|---|
| ENVIRONMENTALLY AVAILABLE (Increasing Availability) | Step 1 | Increasing Extraction Strength | Exchangeable Fraction: | This extraction includes trace elements that are electrostatically adsorbed to overburden minerals |
| | Step 2 | | Carbonate Fraction: | This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals |
| | Step 3 | | Non-Crystalline Materials Fraction: | This extraction targets trace elements that are complexed by amorphous minerals |
| | Step 4 | | Metal Hydroxide Fraction: | This extraction targets trace elements bound to hydroxides of iron, manganese, and/or aluminum |
| | Step 5 | | Organic Fraction: | This extraction targets trace elements strongly bound via chemisorption to organic material |
| NON-ENVIRONMENTALLY AVAILABLE | Step 6 | | Acid/Sulfide Fraction: | The extraction is used to identify trace elements precipitated as sulfide minerals |
| | Step 7 | | Residual Fraction: | Trace elements remaining in the overburden after the previous extractions will be distributed between silicates, phosphates, and refractory oxide |

**Figure 2: Overview of sequential extraction procedure.**

Steps 1 through 7 represent an increasing amount of target metals that can be removed into solution from the solid phase. For instance, metals bound in the carbonate fraction are much more likely to become mobile due to changes in groundwater chemistry than metals bound in a sulfide or residual fraction. The total concentration of a metal measured from all seven steps can be compared to the concentration determined from the total metal analysis for compositional accountability. Metals extracted in Steps 1 through 5 are considered environmentally available, whereas metals extracted in Steps 6 and 7 are present in non-environmentally available fractions and are not expected to be released under conditions typically encountered in aquifers, except in the case of acidification or other excursions from typical groundwater conditions (Tessier et al., 1979).

## 4.0 ALTERNATE SOURCE DEMONSTRATION

The May 2020 SSL of lithium in groundwater at the monitoring well FGD-5 is not caused by a release of CCR porewater/leachate but instead results from an alternate source. The following lines of evidence support this conclusion:

- **The range of lithium concentrations in samples collected from FGD-5 is similar to that of samples in background wells. Additionally, the FGD pond water is a magnesium-chloride type water whereas water at FGD-5 is of the sodium-chloride type, which is the same type as background wells.**

Lithium concentrations in groundwater samples from FGD-5 range from 0.145 to 0.170 mg/L, which is similar to the upper range of concentrations in background well FGD-8 (max of 0.149 mg/L). In addition, as shown on the Piper diagram presented on Figure 3, the groundwater at FGD-5 is a sodium-chloride type, which is the same water type of the groundwater encountered within the background wells FGD-8 and FGD-11. The FGD pond water samples from FGD Pond A and FGD Pond B are the magnesium-chloride type. Because the lithium concentrations and water chemistry in groundwater samples collected from FGD-5 are similar to those encountered in background wells, it is more likely that groundwater at FGD-5 is representative of background conditions, including the presence of naturally-occurring lithium in groundwater. Groundwater and pond water ASD data are summarized in Table 1.

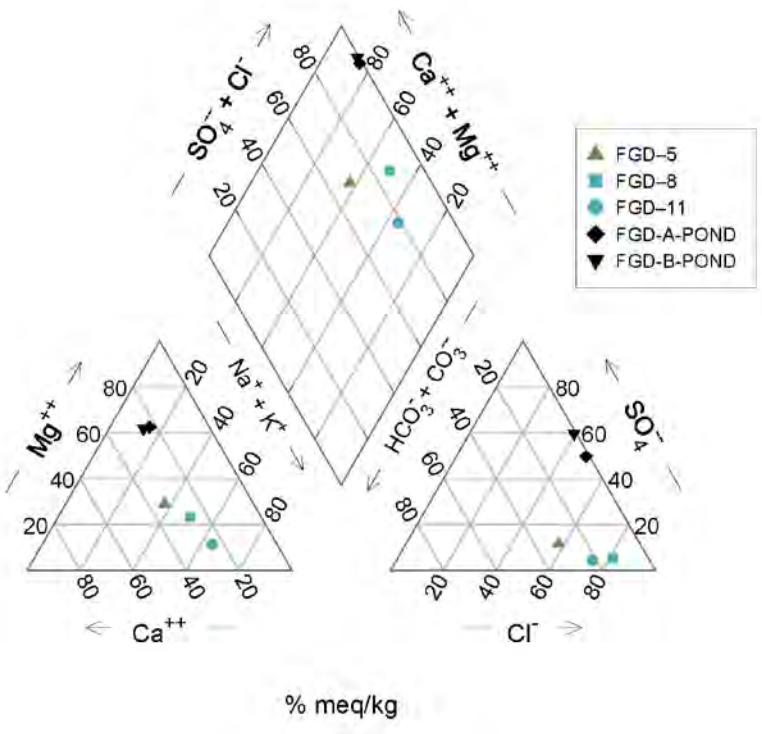


**Figure 3: Piper diagram showing water chemistry of FGD-5, FGD-8, FGD-11 and FGD-A Pond and FGD-B Pond samples.**

- **Concentrations of CCR tracers boron, chloride and sulfate, and ratios of boron to lithium differ significantly between FGD pond water and groundwater in the vicinity of FGD-5.**

Boron has been historically elevated in FGD pond samples (>72 mg/L). However, boron in groundwater samples collected from FGD-5 has never exceeded 0.2 mg/L since 2015 (when sampling started). Boron at well FGD-5 has also remained well below the maximum measured in background wells FGD-8 and FGD-11 (0.635 mg/L). Similarly, sulfate (max 83.8 mg/L) and chloride (max 307 mg/L) concentrations in FGD-5 are low compared to FGD pond samples (max of 4,680 mg/L and 3,440 mg/L, respectively). These differences are shown graphically in the ternary diagram presented in Figure 3. It should be noted that lithium concentrations in FGD pond water samples are generally similar to FGD-5. However, if lithium in groundwater at FGD-5 originated from the FGD ponds, sulfate, chloride and boron would also be expected to be comparatively higher. Additionally, the ratio of lithium to boron in FGD pond samples was approximately 1:500, while the ratio in groundwater from FGD-5 was approximately 1:1. Therefore, lithium at FGD-5 did not originate from CCR porewater as selective dilution of lithium cannot occur, assuming conservative transport.

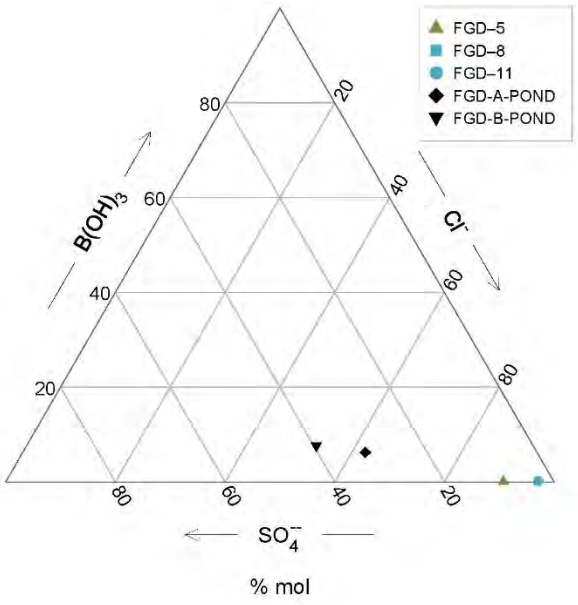


**Figure 4: Ternary diagram showing relative molar concentrations of boron, chloride and sulfate for FGD ponds, FGD-5, and background wells FGD-8 and FGD-11.**

- **FGD-5 is down-gradient from FGD Pond C, which has only been in operation since 2016. However, lithium in groundwater at FGD-5 has remained consistent since sampling began in 2015.**

Monitoring well FGD-5 is cross-gradient (and at times upgradient) to FGD Ponds A and B and directly down-gradient from FGD Pond C (Exhibit 2). FGD-5 has been sampled since 2015 and, as shown on Figure 1, lithium concentrations have remained consistently between 0.145 and 0.170 mg/L. If the lithium occurrence were due to a plume originating from FGD Pond C, its concentrations would be expected to increase. FGD Pond C was not in operation until 2016; thus, lithium concentrations were already within ranges normal for FGD-5 before CCR was placed in FGD Pond C. Since FGD-5 is cross-gradient to FGD Ponds A and B, any porewater reaching FGD-5 from FGD Ponds A or B would be significantly diluted with natural groundwater flowing to FGD-5 from upgradient areas. Furthermore, lithium SSLs have not been observed in CCR monitoring wells directly downgradient of FGD Pond A or B (e.g., FGD-2, FGD-3, FGD-4 and FGD-6), or CCR monitoring wells FGD-1 and FGD-12, which are downgradient and more proximal to FGD Pond C than FGD-5. As discussed previously, concentrations of boron,

chloride and sulfate, which are mobile constituents and elevated in FGD Pond water, are similar to concentrations in background wells FGD-8 and FGD-11. Thus, it is very unlikely that lithium measured in FGD-5 groundwater originates from FGD Ponds A or B.

- **Lithium is naturally occurring at the Site based on sequential extraction of lithium from soil.**

Total lithium concentrations in the three soil samples range from 9 to 20 mg/kg, which is within the range of naturally-occurring lithium in the Earth's crust and soils (18 to 65 mg/kg and 5 to 130 mg/kg, respectively; Smith and Huyck (1999)). Most of the lithium (between 76 and 97% of the total) is sequestered in the acid sulfide and refractory component of the soil material (SEP Steps 6 and 7). The environmentally-available fraction of lithium (which could contribute to concentrations observed at FGD-5) is less than 24% of the total, the largest of which is represented by the metal hydroxide phase.

# 5.0 ALTERNATE SOURCE DEMONSTRATION SUMMARY

The evaluation presented in this document demonstrates the statistically significant level of lithium identified in groundwater is due to the presence of naturally-occurring lithium and not caused by releases from the CCR unit. The following lines of evidence demonstrate the natural occurrence of lithium in groundwater at FGD-5:

- FGD-5 lithium concentrations are similar in range to concentrations in background wells. Additionally, the water type at FGD-5 is the same as background wells and different from FGD pond water.
- Concentrations of near-conservative CCR tracers boron, chloride and sulfate, and ratios of boron to lithium differ significantly between FGD pond water and groundwater in the vicinity of FGD-5.
- FGD-5 is located downgradient from FGD Pond C. However, lithium concentrations in FGD-5 have remained consistent since before FGD Pond C was put in operation.
- Lithium is naturally occurring at the Site based on sequential extraction of lithium from soil samples collected in the uppermost groundwater-bearing unit.

Based on these findings, the FGD Ponds are not the source for the SSL of lithium in FGD-5 samples. Instead, the SSL can be attributed to the presence of naturally-occurring lithium in subsurface aquifer materials

# 6.0 CONCLUSION

In accordance with 40 C.F.R. § 257.95(g)(3), this ASD addresses the SSL of lithium at FGD-5. Review of geochemical data indicates that the exceedance of lithium identified at FGD-5 is not the result of a release from the associated ash ponds at OGSES FGD Pond Area but can be attributed to the presence of naturally-occurring lithium in subsurface aquifer materials

# 7.0 REFERENCES


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# Table

**Table 1**
**Analytical Results**
**Groundwater and Pond Samples**
**Oak Grove Steam Electric Station FGD Pond Area**

| Sample Location | Sample Date | Calcium mg/L | Magnesium mg/L | Potassium mg/L | Sodium mg/L | Alkalinity mg/L | Chloride mg/L | Sulfate mg/L | Fluoride mg/L | Boron mg/L | Lithium mg/L | Cobalt mg/L | Iron mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-1 | 5/16/2019 | 19.5 | 11.2 | 2.11 | 49.4 | 52.8 | 62.4 | 78.7 | 0.362 J | 0.0803 | 0.0442 | 0.003 | 0.186 |
| FGD-2 | 5/16/2019 | 38.9 | 16.7 | 2.57 | 198 | 157 | 260 | 70.7 | 0.383 J | 0.105 | 0.0228 | 0.003 | 0.0799 |
| FGD-3 | 5/16/2019 | 60.1 | 33.6 | 2.5 | 277 | 533 | 117 | 182 | 0.776 | 0.117 | 0.057 | 0.0052 | 0.126 |
| FGD-4 | 5/16/2019 | 41.7 | 18.6 | 1.62 | 160 | 201 | 205 | 41.7 | 0.327 J | 0.0733 | 0.0325 | 0.003 | 0.103 |
| FGD-5 | 5/16/2019 | 77.7 | 50 | 3.46 | 123 | 237 | 287 | 67.2 | 0.579 | 0.108 | 0.145 | 0.003 | 0.03 |
| FGD-6 | 5/16/2019 | 20.3 | 6.61 | 0.706 | 225 | 262 | 170 | 51.3 | 0.669 | 0.116 | 0.0068 J | 0.0132 | 4.86 |
| FGD-8 | 5/16/2019 | 314 | 204 | 19.2 | 792 | 516 | 2040 | 173 | 0.1 | 0.0687 | 0.0086 J | 0.0146 | 263 |
| FGD-11 | 5/16/2019 | 85 | 30.6 | 4.13 | 328 | 256 | 566 | 50.9 | 0.38 J | 0.108 | 0.0145 | 0.003 | 1.28 |
| FGD-12 | 5/16/2019 | 6.79 | 2.97 | 1.55 | 20.1 | 36.6 | 15.6 | 15 | <0.100 | 0.0723 | 0.0221 | 0.003 | 0.425 |
| FGD-A-POND | 6/6/2019 | 487 | 809 | 82.1 | 270 | 58.6 | 1510 | 3260 | 17.2 | 72.1 | 0.167 | 0.003 | 0.03 |
| FGD-B-POND | 6/6/2019 | 458 | 796 | 86.9 | 287 | 68 | 1470 | 3040 | 17.5 | 73.3 | 0.172 | 0.003 | 0.03 |
| FGD-1 | 5/11/2020 | 37.8 | 17.1 | 2.56 | 82 | 67.6 | 146 | 79.5 | 0.231 J | 0.121 | 0.0548 | 0.0495 | 1.09 |
| FGD-2 | 5/11/2020 | 217 | 74.2 | 5.73 | 507 | 114 | 1150 | 286 | <0.100 | 0.605 | 0.028 | 0.003 | 0.0636 |
| FGD-3 | 5/11/2020 | 42.3 | 23.5 | 2.14 | 230 | 434 | 70.2 | 129 | 0.8 | 0.152 | 0.0498 | 0.00332 | 0.0395 |
| FGD-4 | 5/11/2020 | 40.6 | 14.7 | 1.53 | 204 | 247 | 198 | 52.9 | 0.3 J | 0.145 | 0.0166 | 0.003 | 0.12 |
| FGD-5 | 5/11/2020 | 100 | 52 | 3.64 | 125 | 232 | 307 | 83.8 | 0.413 | 0.165 | 0.156 | 0.003 | 0.0483 |
| FGD-6 | 5/11/2020 | 27.4 | 7.17 | 0.743 | 235 | 275 | 189 | 70.7 | 0.292 J | 0.109 | 0.0088 J | 0.003 | 0.582 |
| FGD-8 | 5/11/2020 | 381 | 198 | 19.9 | 801 | 518 | 2240 | 188 | 0.1 | 0.129 | 0.0152 | 0.0084 | 220 |
| FGD-11 | 5/11/2020 | 103 | 28.5 | 4.42 | 306 | 230 | 560 | 43.3 | 0.365 J | 0.166 | 0.0132 | 0.003 | 0.225 |
| FGD-12 | 5/11/2020 | 15.6 | 8.03 | 5.31 | 22.1 | 34.6 | 19.3 | 19.9 | <0.100 | 0.149 | 0.0371 | 0.00883 | 32.5 |
| FGD-A-POND | 5/11/2020 | 895 | 1490 | 195 | 563 | 134 | 3440 | 4680 | 20.6 | 104 | 0.422 | 0.00625 | 0.15 |
| FGD-B-POND | 5/11/2020 | 696 | 1020 | 106 | 351 | 68.8 | 1940 | 3930 | 15.6 | 84.4 | 0.182 | 0.003 | 0.17 |

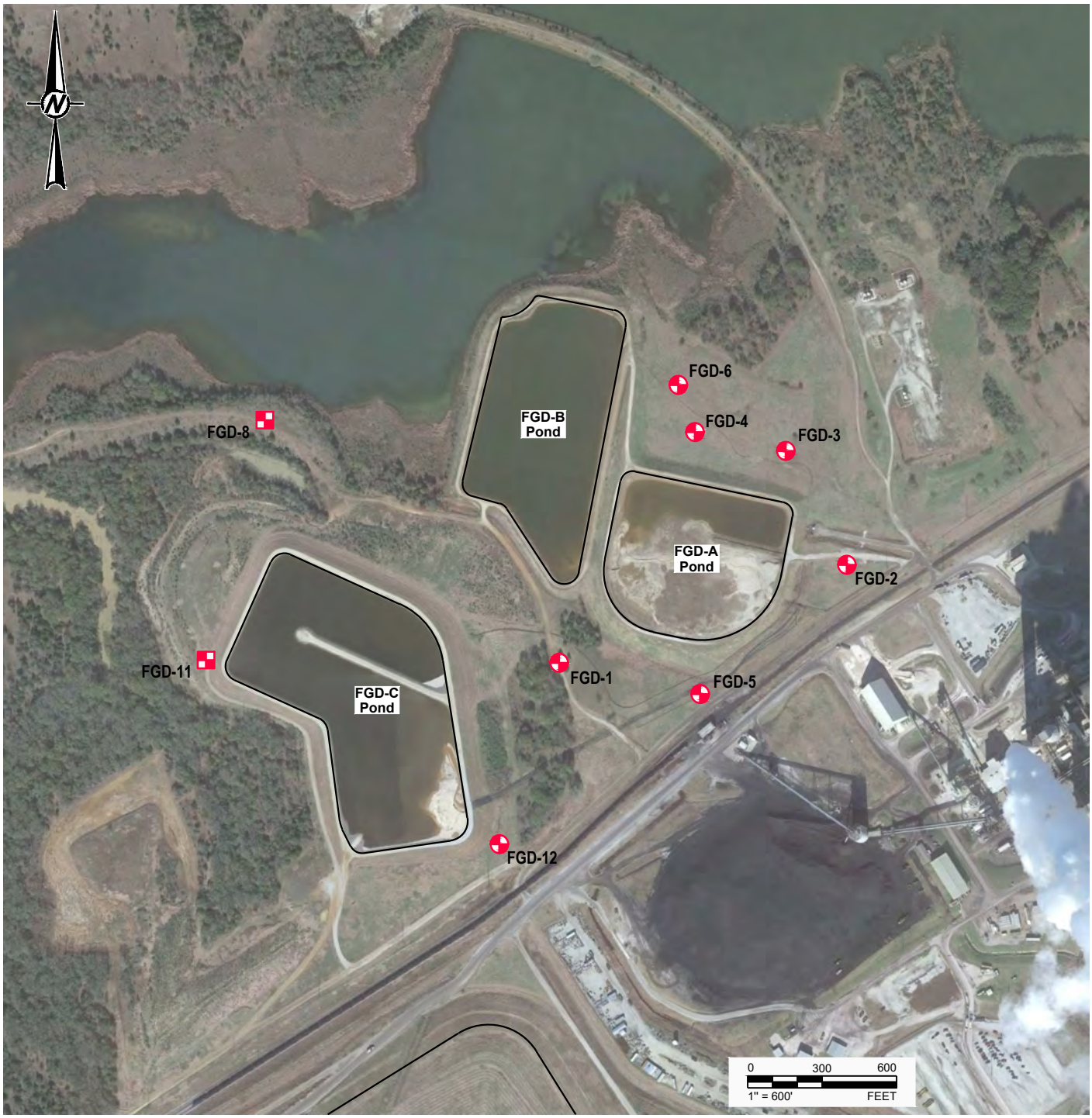
Notes:
mg/L - milligrams per liter
SU - standard units
J -estimated value

**Table 1**
**Analytical Results**
**Groundwater and Pond Samples**
**Oak Grove Steam Electric Station FGD Pond Area**

| Sample Location | Sample Date | Iron (Fe3+) mg/L | Iron (Fe2+) mg/L | Selenium mg/L | Nitrate-N mg/L | Phosphorus mg/L | pH SU | Eh mV | TDS mg/L |
|---|---|---|---|---|---|---|---|---|---|
| FGD-1 | 5/16/2019 | 0.186 | 0.05 | 0.002 | 0.1 | 0.473 | 6.63 | -32 | 320 |
| FGD-2 | 5/16/2019 | 0.0799 | 0.05 | 0.0214 | 1.54 | 0.237 | 6.86 | -91 | 729 |
| FGD-3 | 5/16/2019 | 0.126 | 0.05 | 0.0423 | 1.41 | 0.096 | 6.73 | -56 | 1100 |
| FGD-4 | 5/16/2019 | 0.103 | 0.05 | 0.002 | 0.1 | 0.251 | 6.57 | -41 | 651 |
| FGD-5 | 5/16/2019 | 0.05 | 0.05 | 0.002 | 0.859 | 0.176 | 6.46 | -31 | 801 |
| FGD-6 | 5/16/2019 | 4.86 | 0.05 | 0.002 | 0.1 | 0.714 | 6.85 | -28 | 710 |
| FGD-8 | 5/16/2019 | 61 | 202 | 0.00274 | 0.107 | 0.219 | 6.67 | -42 | 3970 |
| FGD-11 | 5/16/2019 | 1.28 | 0.05 | 0.002 | 0.1 | 0.2 | 6.83 | -48 | 1350 |
| FGD-12 | 5/16/2019 | 0.425 | 0.05 | 0.002 | 1.42 | 0.168 | 6.52 | -19 | 140 |
| FGD-A-POND | 6/6/2019 | 0.05 | 0.05 | 1.3 | 1.87 | 0.03 | 6.52 | -- | 7410 |
| FGD-B-POND | 6/6/2019 | 0.00427 | 0.05 | 1.2 | 3.24 | 0.03 | 6.57 | -- | 7240 |
| FGD-1 | 5/11/2020 | 0.732 | 0.358 | 0.002 | 0.1 | 0.37 | 6.95 | -55 | 448 |
| FGD-2 | 5/11/2020 | 0.0636 | 0.05 | 0.0208 | 2.52 | 0.052 | 6.61 | -27 | 2300 |
| FGD-3 | 5/11/2020 | 0.05 | 0.05 | 0.00993 | 0.535 | 0.053 | 6.62 | 16 | 777 |
| FGD-4 | 5/11/2020 | 0.12 | 0.05 | 0.002 | 0.1 | 0.139 | 6.62 | -46 | 702 |
| FGD-5 | 5/11/2020 | 0.05 | 0.05 | 0.002 | 0.563 | 0.03 | 6.82 | -15 | 836 |
| FGD-6 | 5/11/2020 | 0.582 | 0.05 | 0.002 | 0.129 | 0.076 | 6.75 | -17 | 746 |
| FGD-8 | 5/11/2020 | 68 | 152 | 0.0021 | 1.64 | 0.03 | 6.69 | -14 | 4090 |
| FGD-11 | 5/11/2020 | 0.225 | 0.05 | 0.002 | 0.1 | 0.064 | 6.74 | -45 | 1300 |
| FGD-12 | 5/11/2020 | 32.5 | 0.05 | 0.00678 | 1.22 | 0.056 | 6.59 | -33 | 198 |
| FGD-A-POND | 5/11/2020 | 0.15 | 0.05 | 4.71 | 6.27 | 0.03 | 6.59 | -- | 13200 |
| FGD-B-POND | 5/11/2020 | 0.17 | 0.05 | 0.681 | 2.23 | 0.03 | 6.64 | -- | 8890 |

Notes:
mg/L - milligrams per liter
SU - standard units
J -estimated value

# Exhibits




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

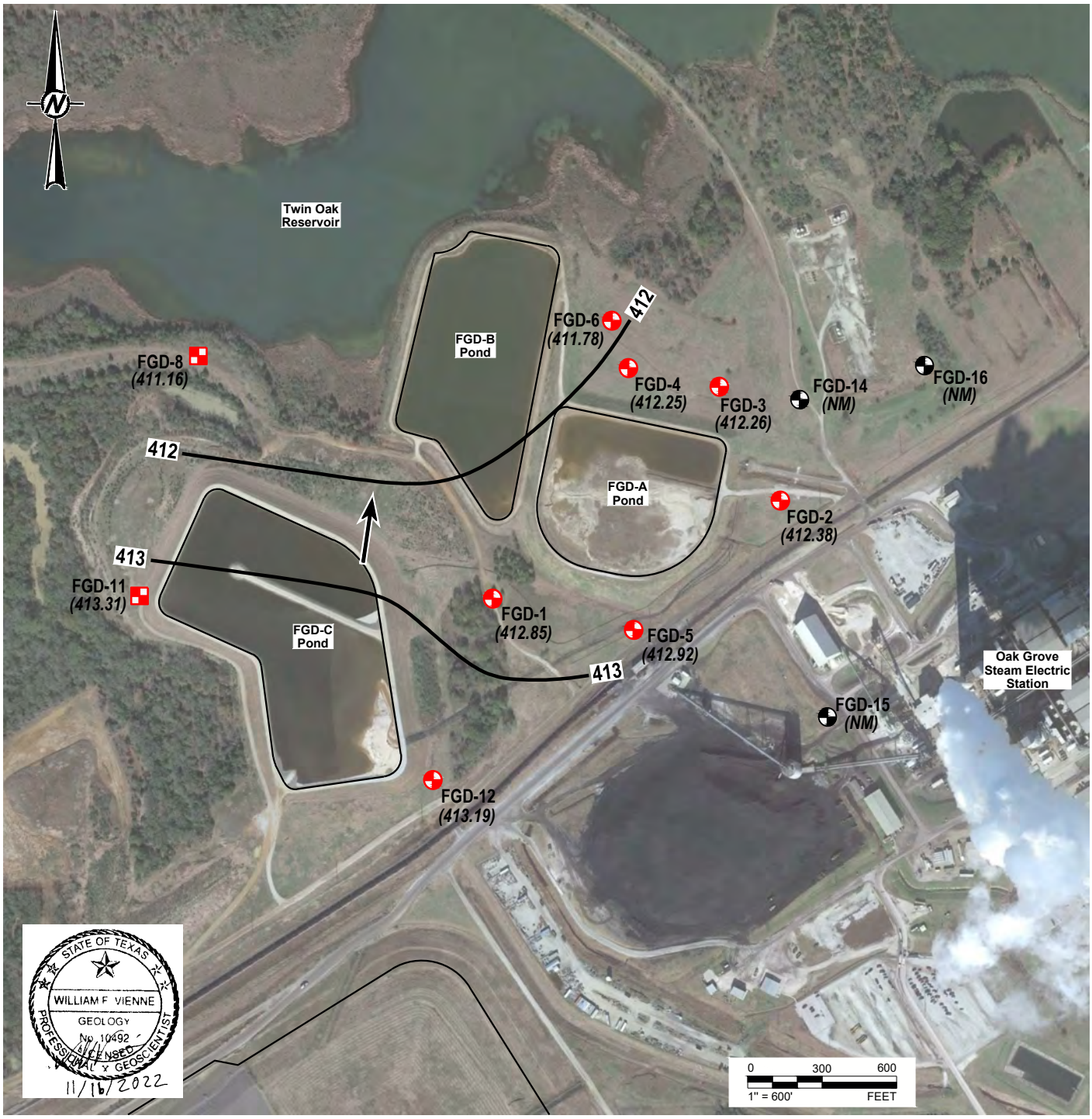
TITLE
**SITE LOCATION MAP**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | EXHIBIT |
|---|---|---|
| 19122262 | 0 | 1 |

Last Edited By: adiamond Date: 2020-01-23 Time:9:34:07 AM | Printed By: adiamond Date: 2020-01-23 Time:9:34:57 AM
Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (FGD Pond Area).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
11/16/2022

**LEGEND**

- CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL
- CCR DELINEATION WELL
- (410.06) GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
- 400 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 1 FT)
- INFERRED GROUNDWATER FLOW DIRECTION

**NOTE(S)**

1. NATURE AND EXTENT DELINEATION IS NOT NECESSARY BASED ON THE UPDATED STATISTICAL EVALUATION.

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**FGD PONDS**
**POTENTIOMETRIC SURFACE MAP**
**MAY 2020**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-09-30 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 19134019 | REV. 0 | EXHIBIT 2

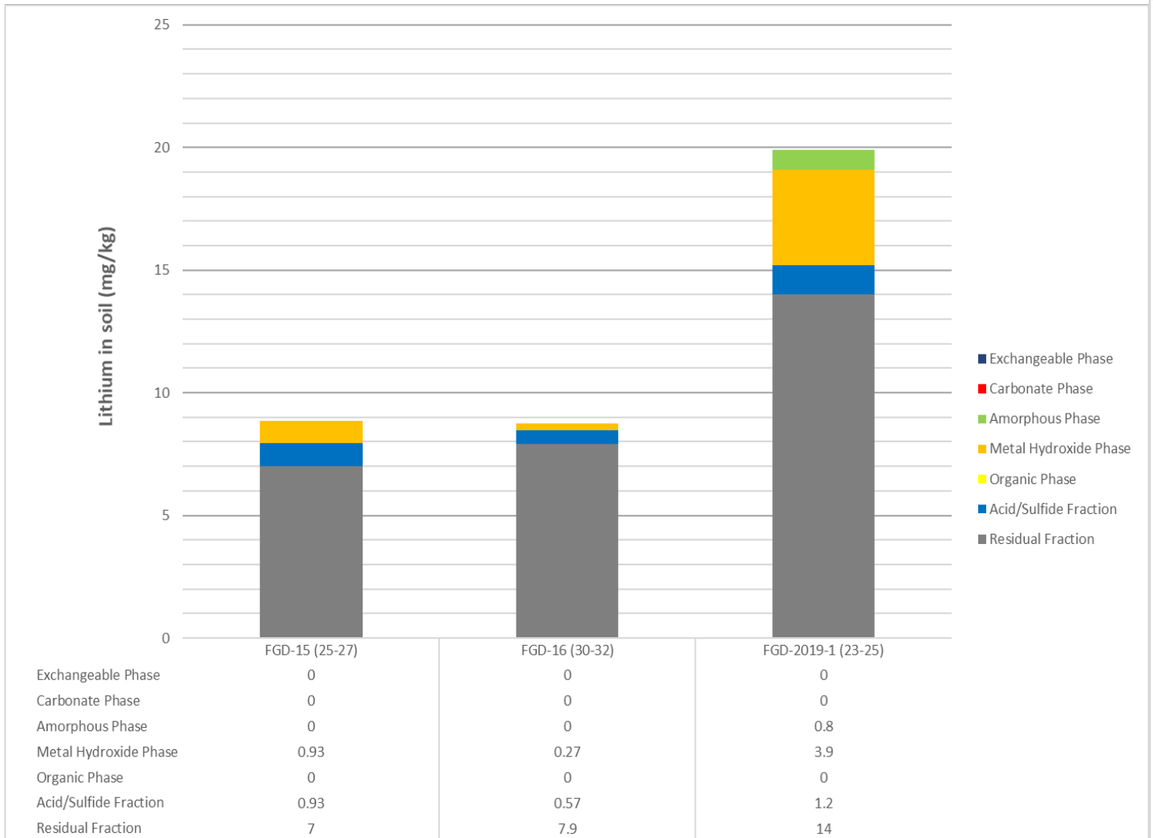
APPENDIX F Revision 1 November 21, 2022

Last Edited By: adiamond Date: 2020-09-30 Time:1:50:53 PM | Printed By: adiamond Date: 2020-09-30 Time:1:51:28 PM
Path: \\texarkanadata\Projects - Round Rock_2019\19134019 - Luminant\PRODUCTION\1 - Oak Grove\ | File Name: FIG X - FGD Ponds POT Surface Map (May 2020).dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in

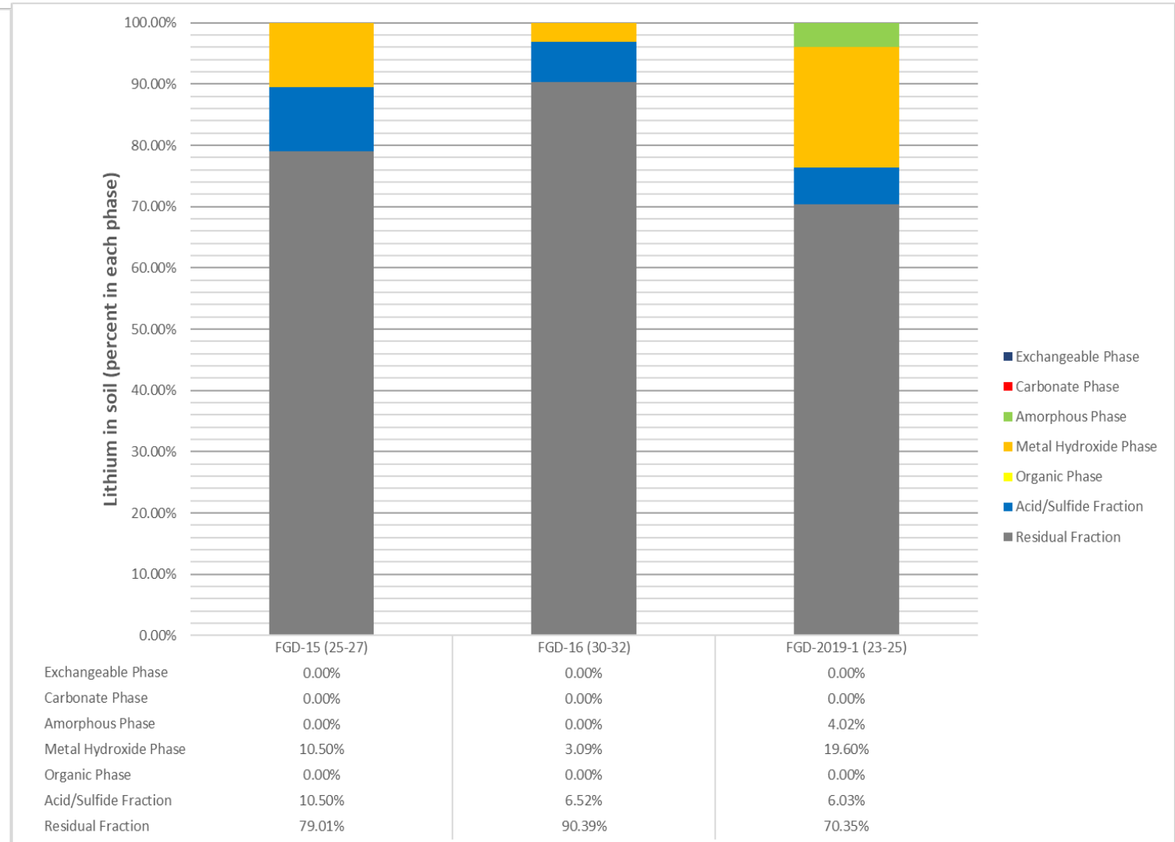
**APPENDIX A**

# Sequential Extraction Results




| | FGD-15 (25-27) | FGD-16 (30-32) | FGD-2019-1 (23-25) |
|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 |
| Carbonate Phase | 0 | 0 | 0 |
| Amorphous Phase | 0 | 0 | 0.8 |
| Metal Hydroxide Phase | 0.93 | 0.27 | 3.9 |
| Organic Phase | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 0.93 | 0.57 | 1.2 |
| Residual Fraction | 7 | 7.9 | 14 |

Borehole and depth below ground surface (Lithium in mg/kg soil)




| | FGD-15 (25-27) | FGD-16 (30-32) | FGD-2019-1 (23-25) |
|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 0.00% | 0.00% | 4.02% |
| Metal Hydroxide Phase | 10.50% | 3.09% | 19.60% |
| Organic Phase | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 10.50% | 6.52% | 6.03% |
| Residual Fraction | 79.01% | 90.39% | 70.35% |

Borehole and depth below ground surface (Lithium in percent of total)

CLIENT
LUMINANT OAK GROVE SES
FGD POND AREA

CONSULTANT
GOLDER

PROJECT
ASSESSMENT OF CORRECTIVE MEASURES
GEOCHEMICAL ASSESSMENT

TITLE
SEQUENTIAL EXTRACTION

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19134019 | 1000 | A | |

**ATTACHMENT 3**

**2021 APPENDIX IV CONFIDENCE INTERVAL GRAPHS**

**EXPLANATION**

95% Upper confidence limit

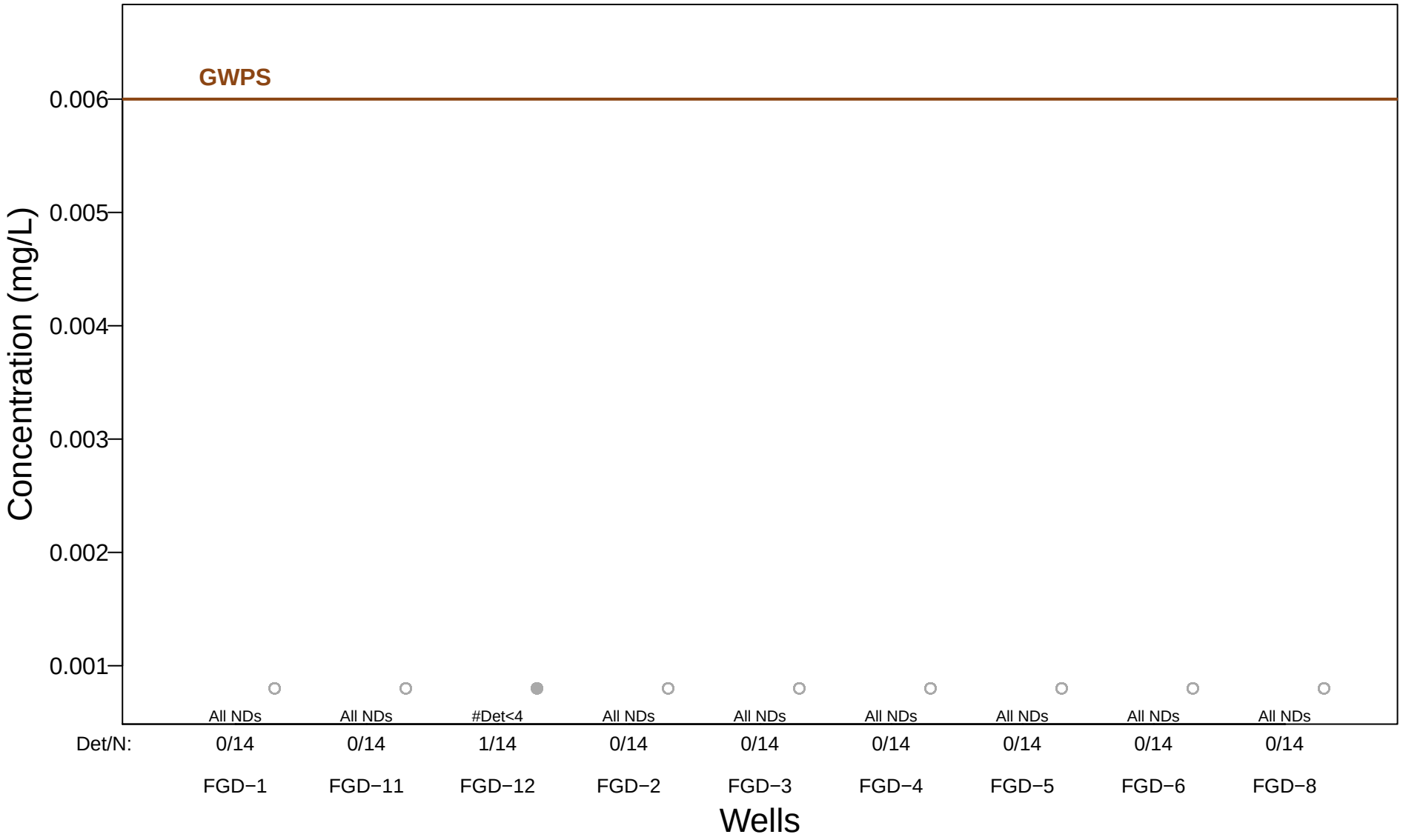
95% Lower confidence limit

Detected sample concentration

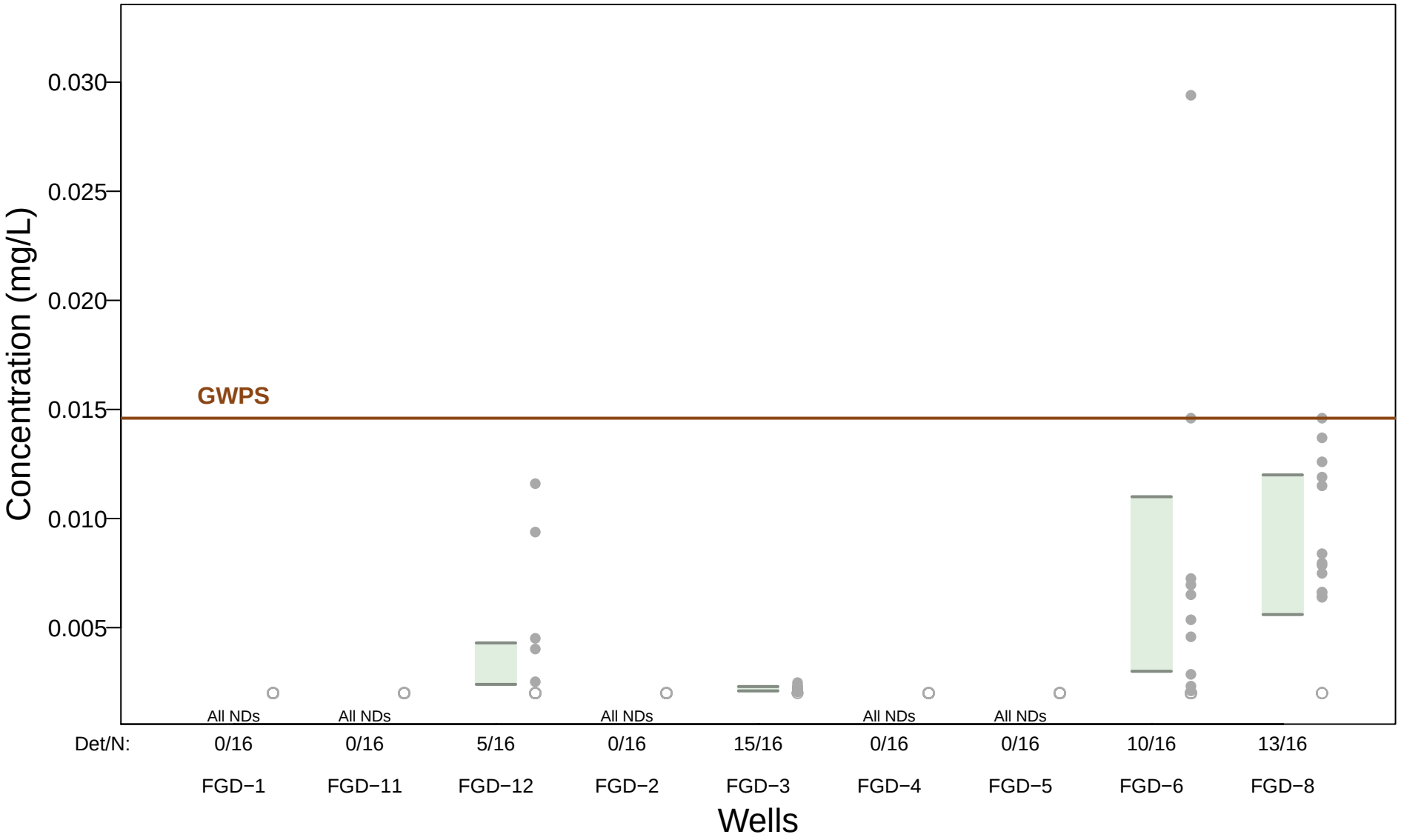
Non-detect sample result (concentration set to laboratory reporting limit)

Note: An SSL is indicated if the lower confidence interval exceeds the GWPS.

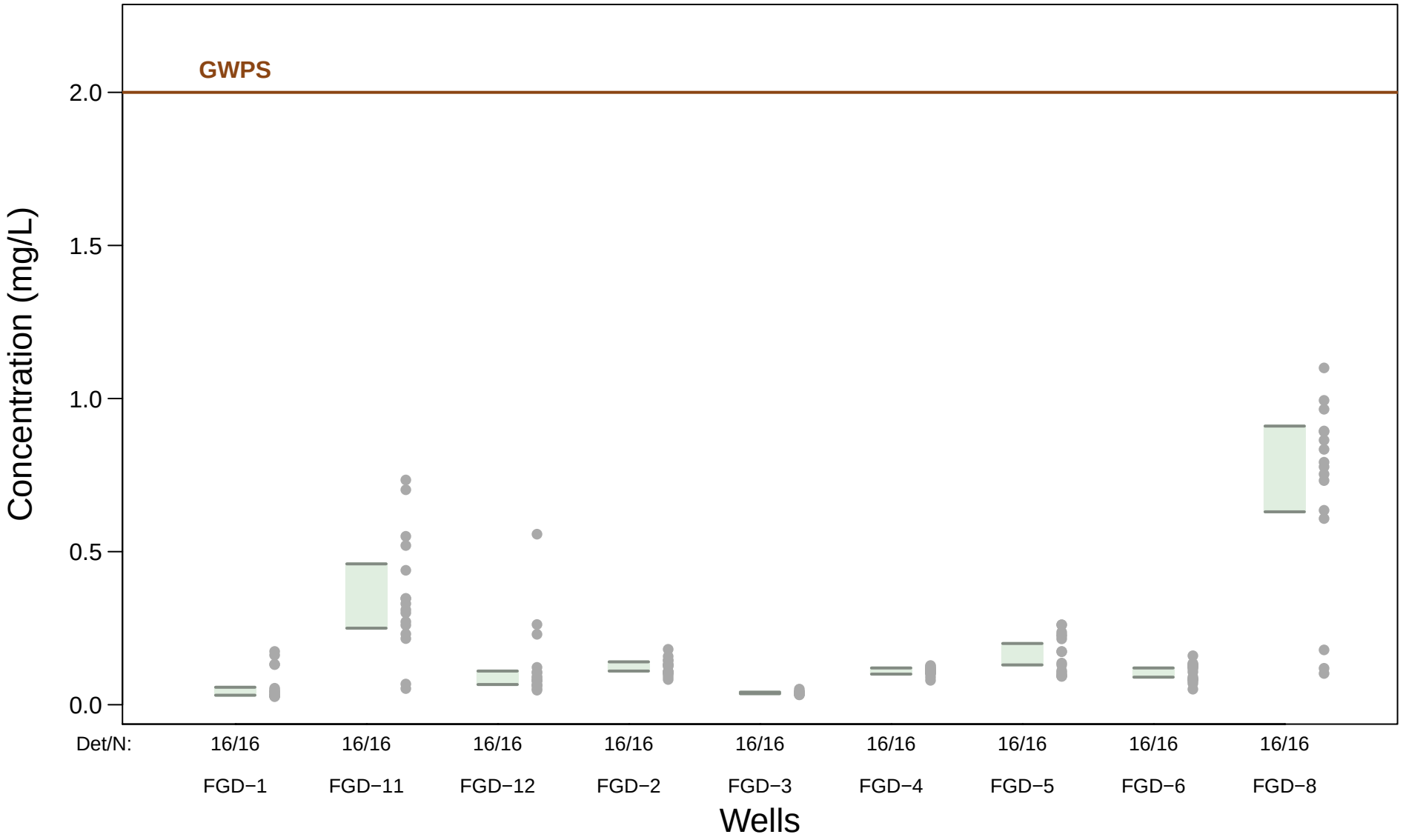
# Antimony – 95% Confidence Intervals



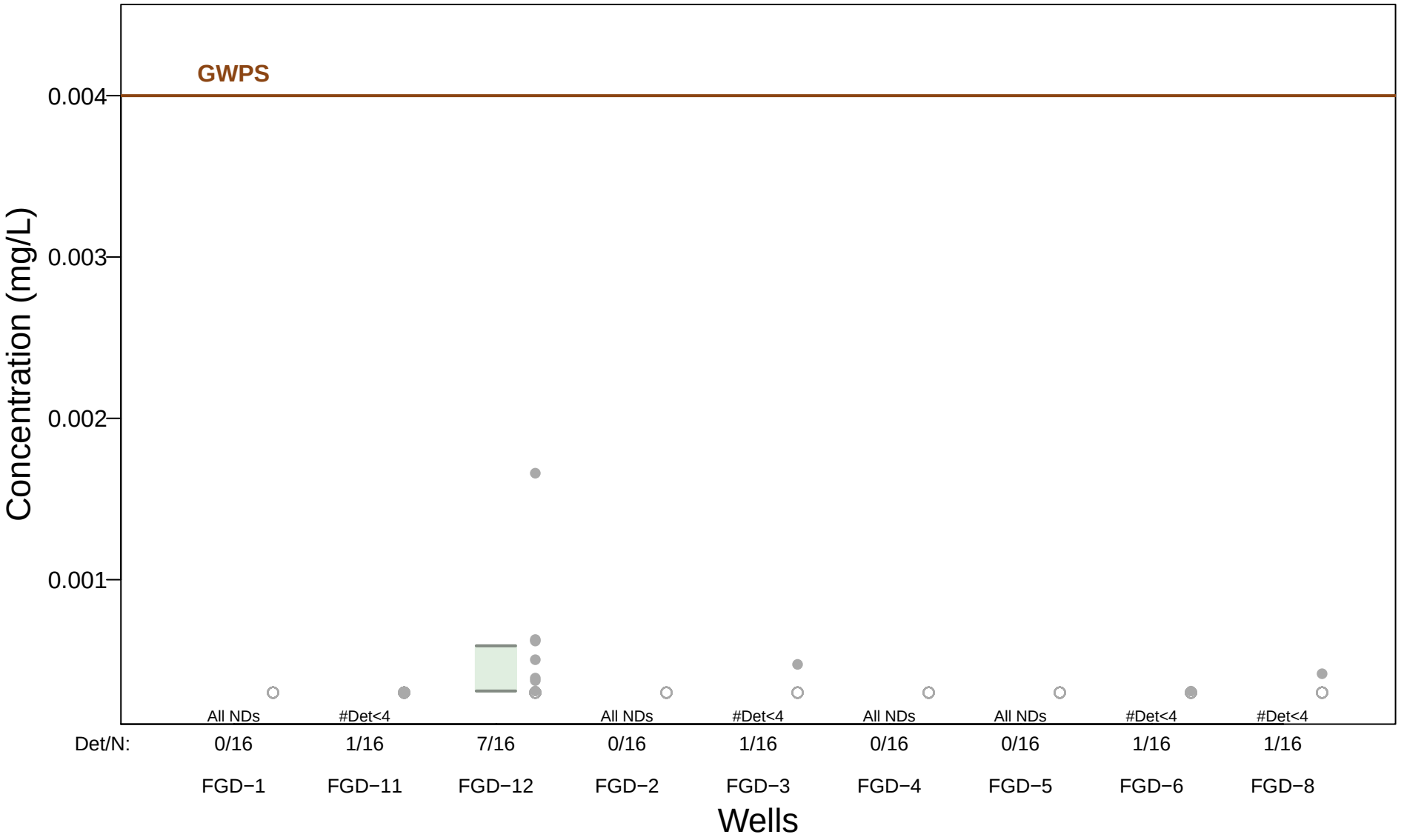
# Arsenic – 95% Confidence Intervals



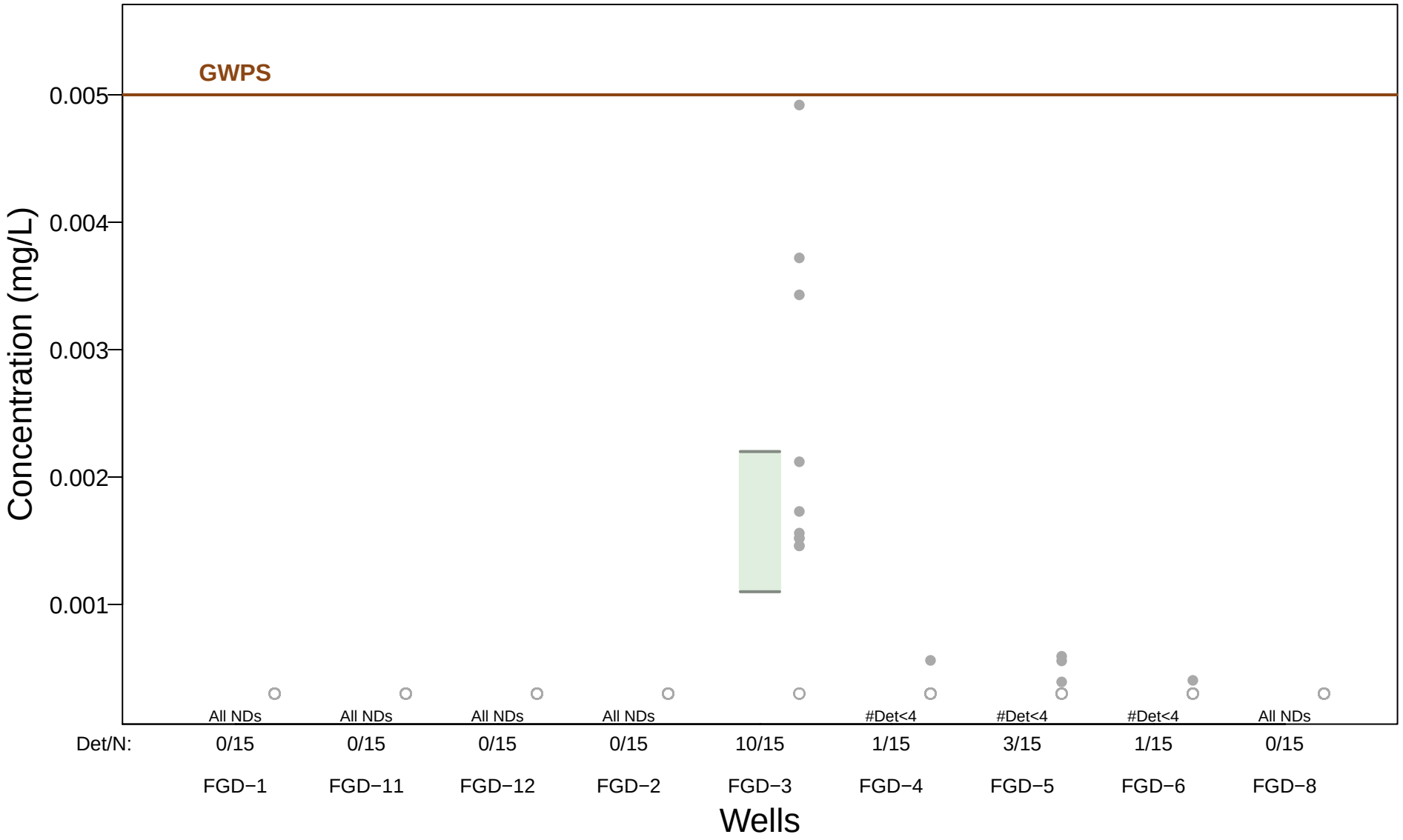
# Barium – 95% Confidence Intervals



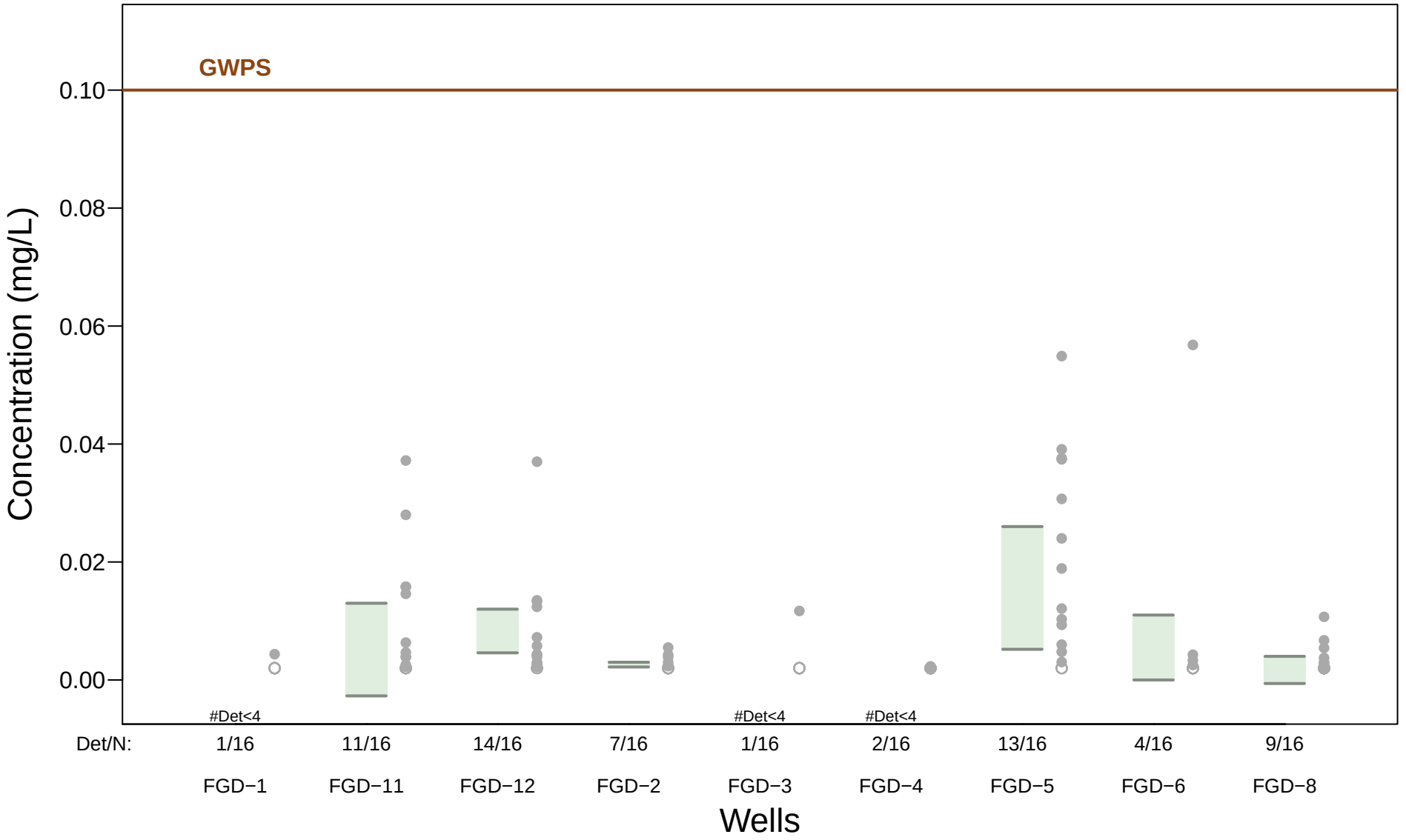
# Beryllium – 95% Confidence Intervals



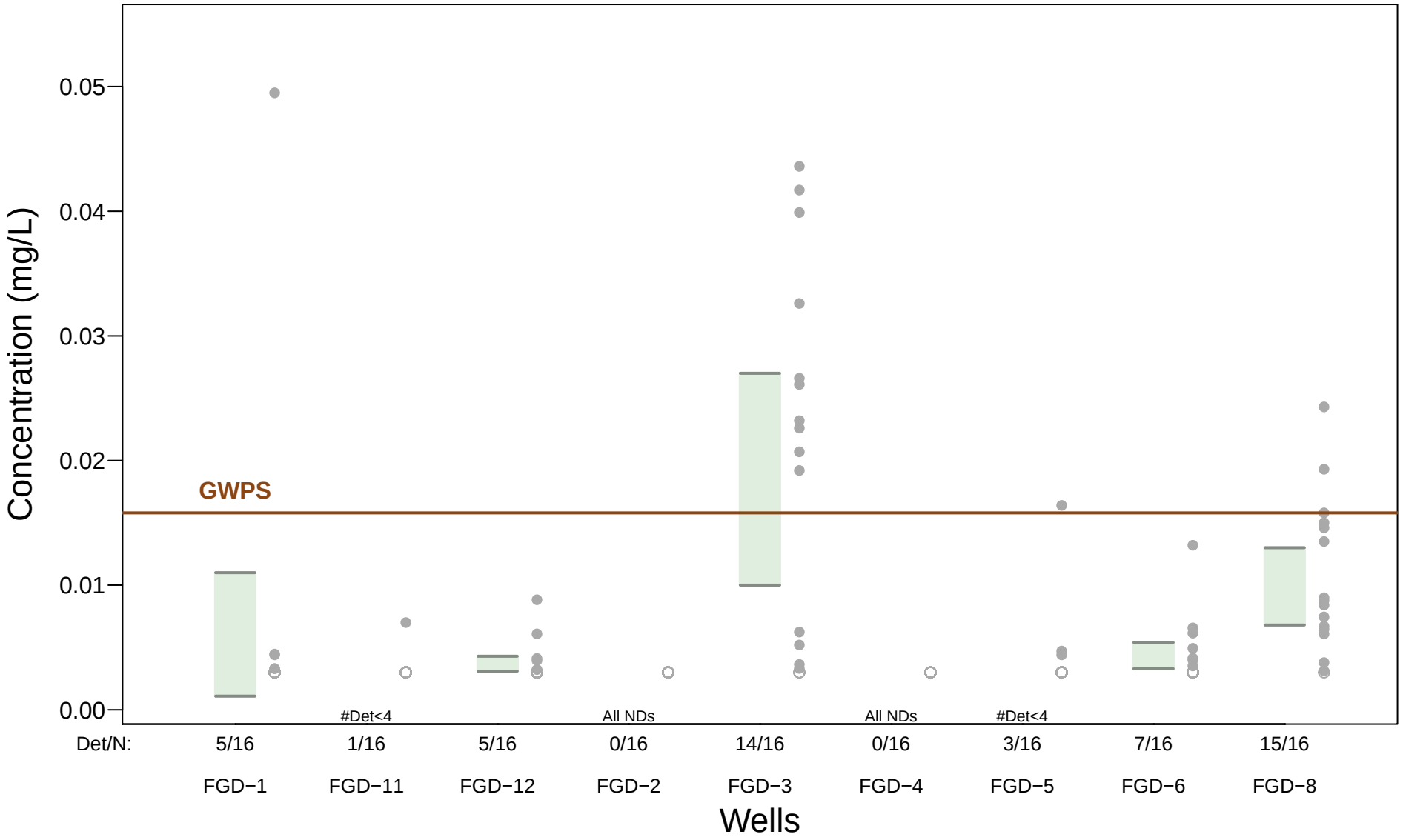
# Cadmium – 95% Confidence Intervals



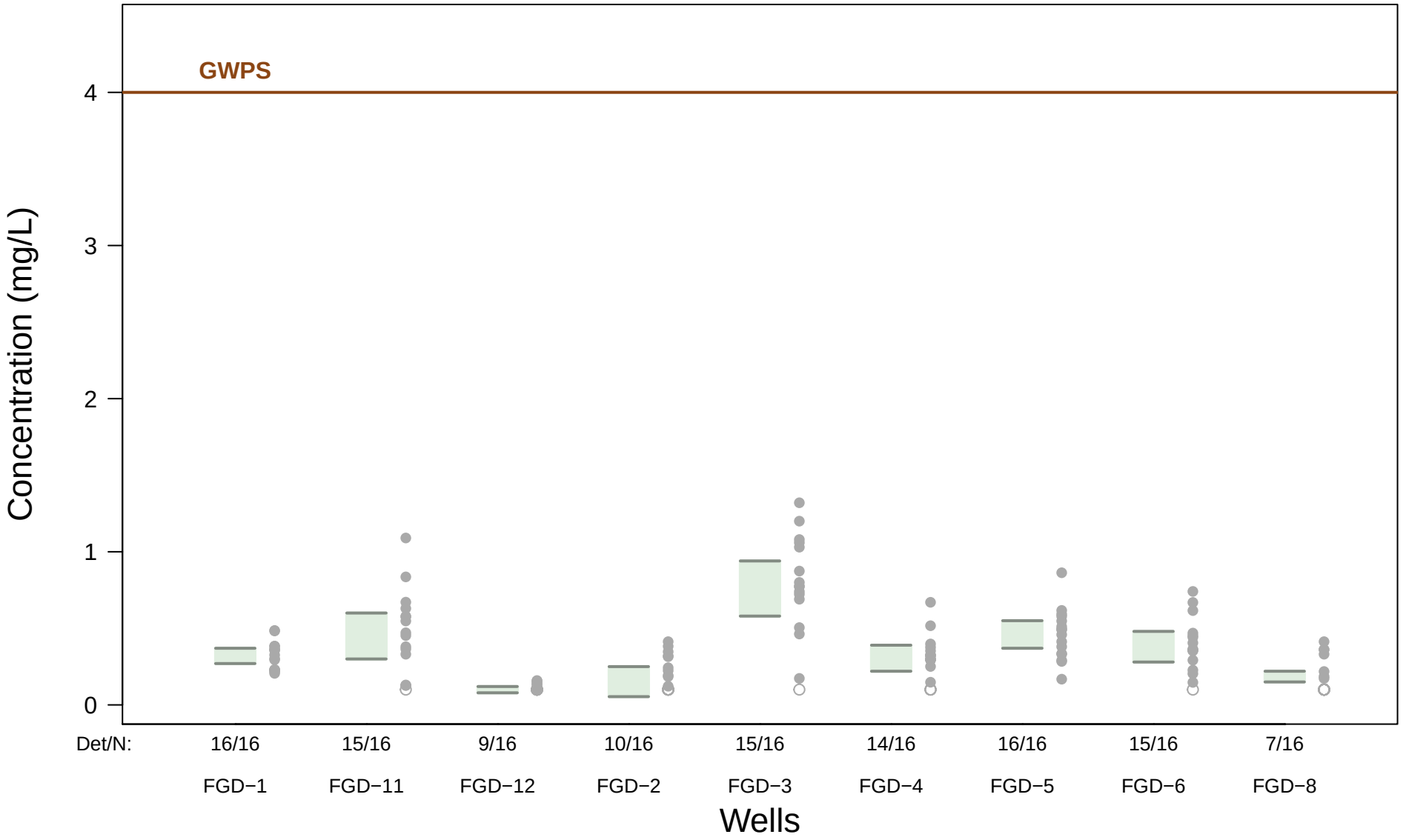
# Chromium – 95% Confidence Intervals



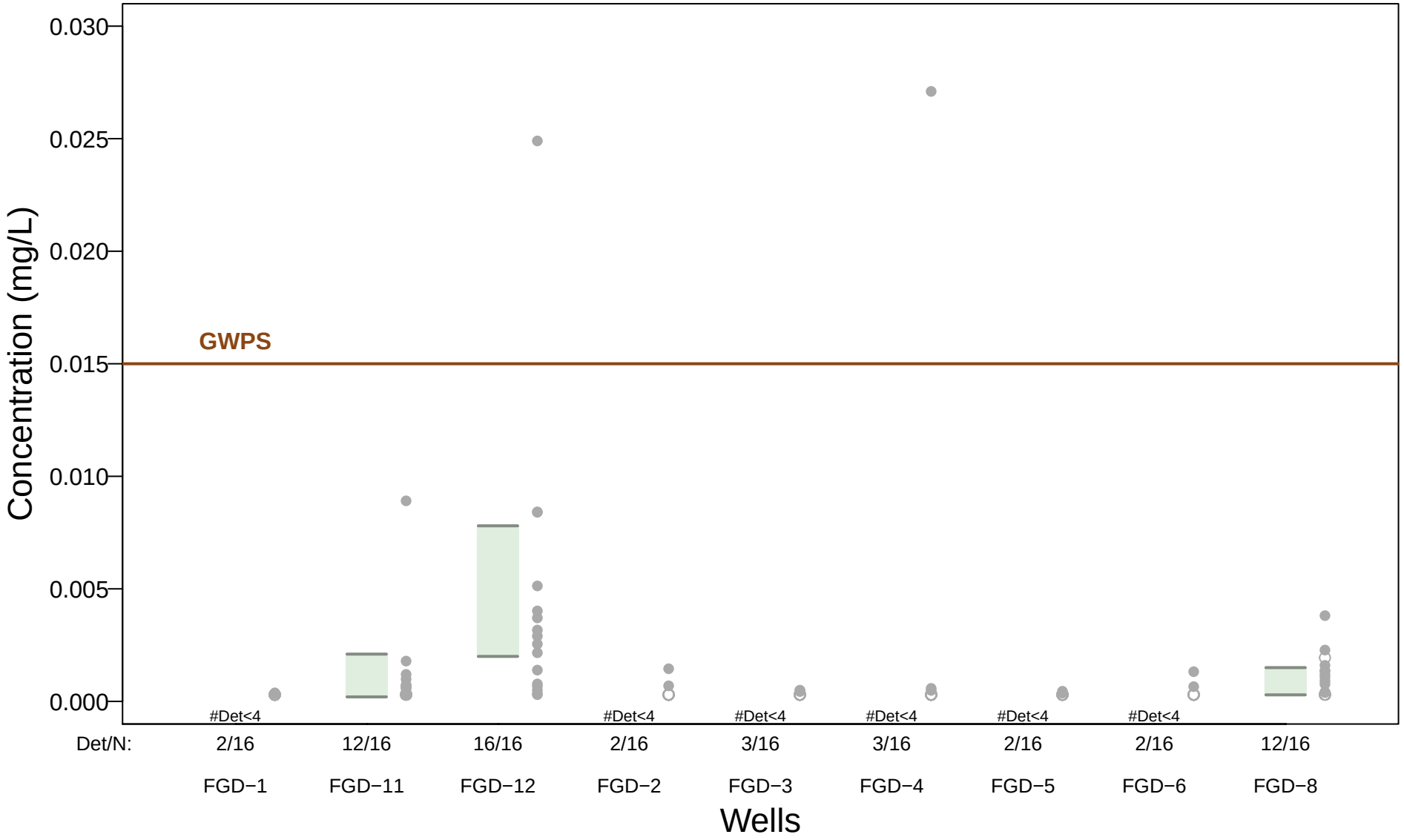
# Cobalt – 95% Confidence Intervals



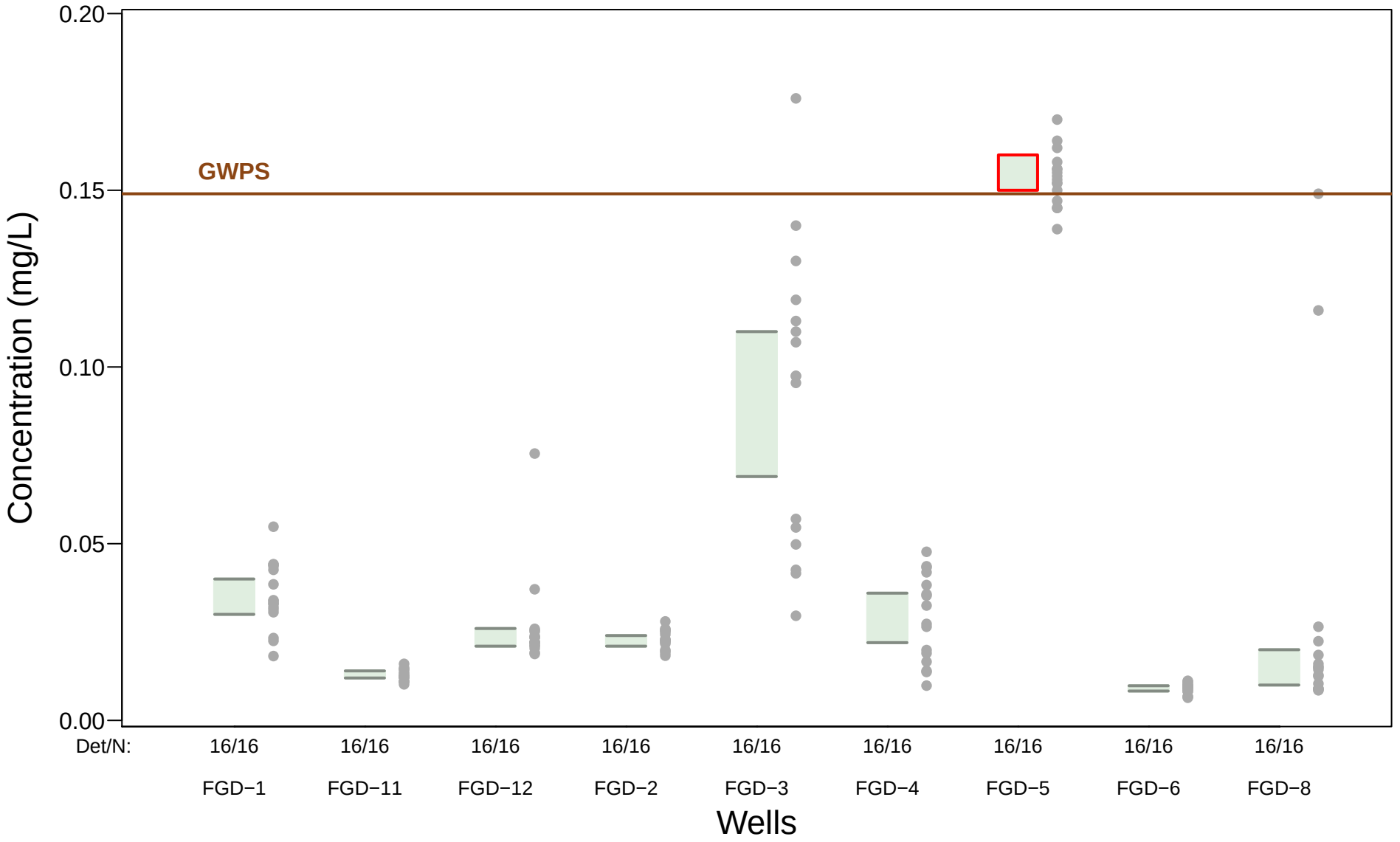
# Fluoride (Appendix IV) – 95% Confidence Intervals



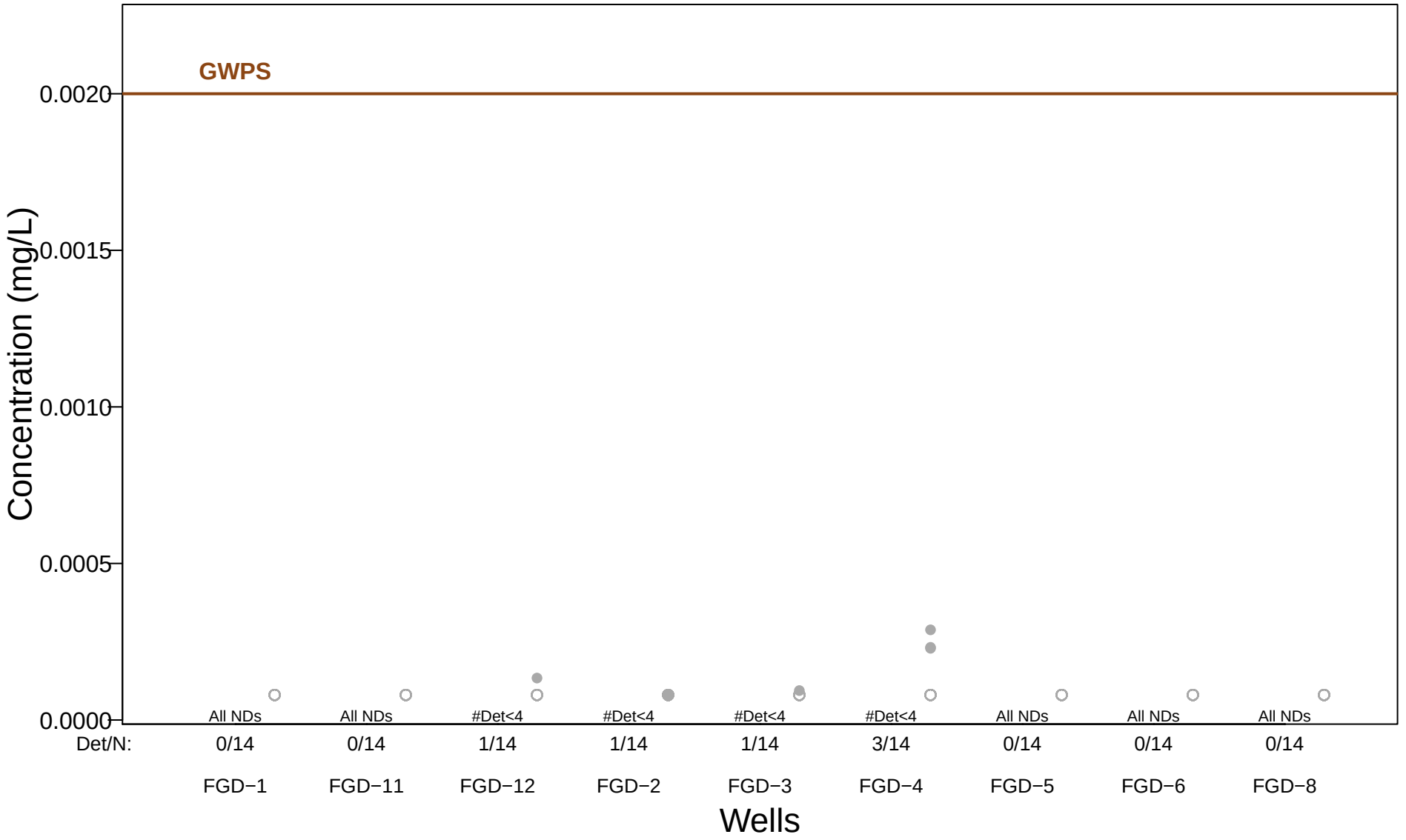
# Lead – 95% Confidence Intervals



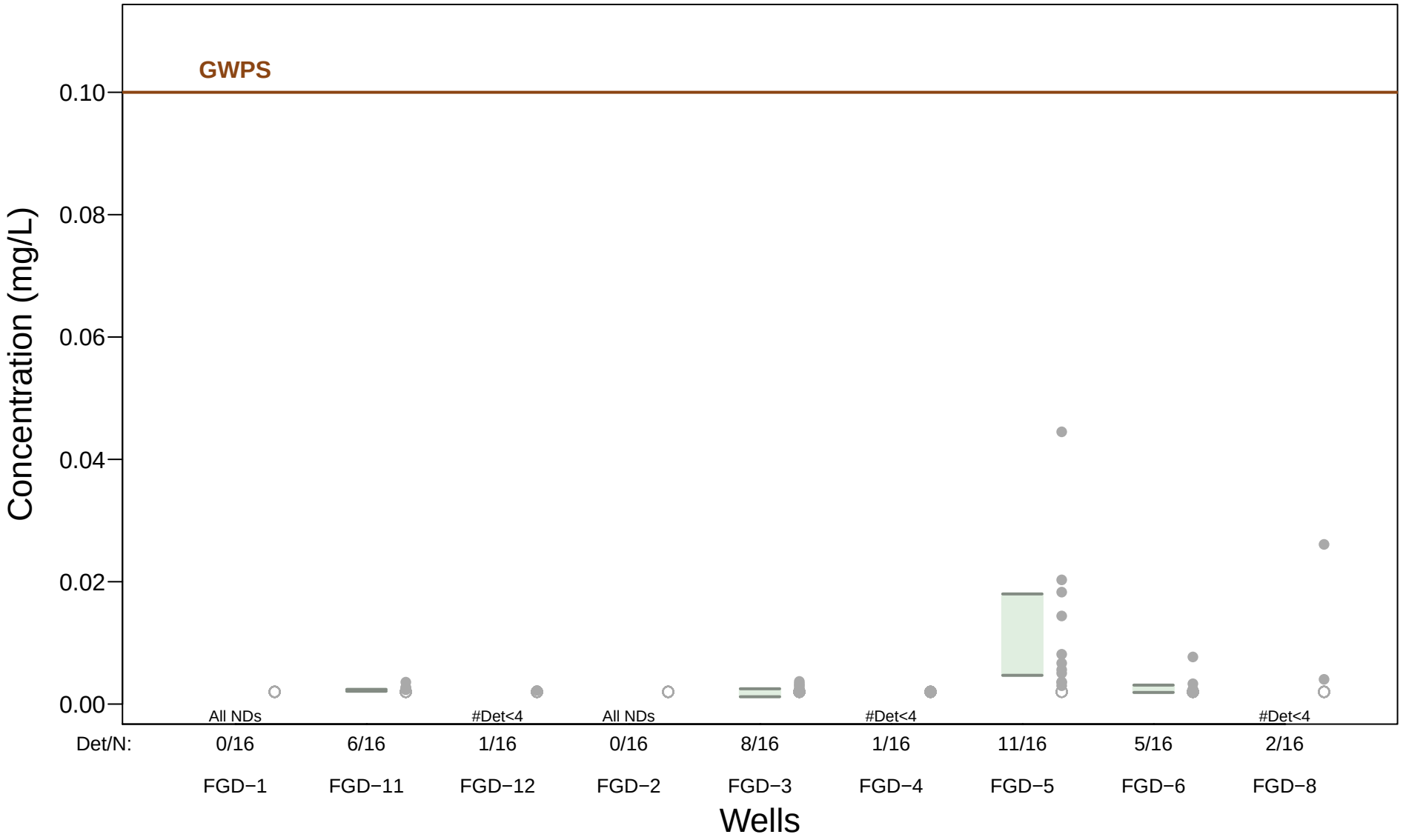
# Lithium – 95% Confidence Intervals



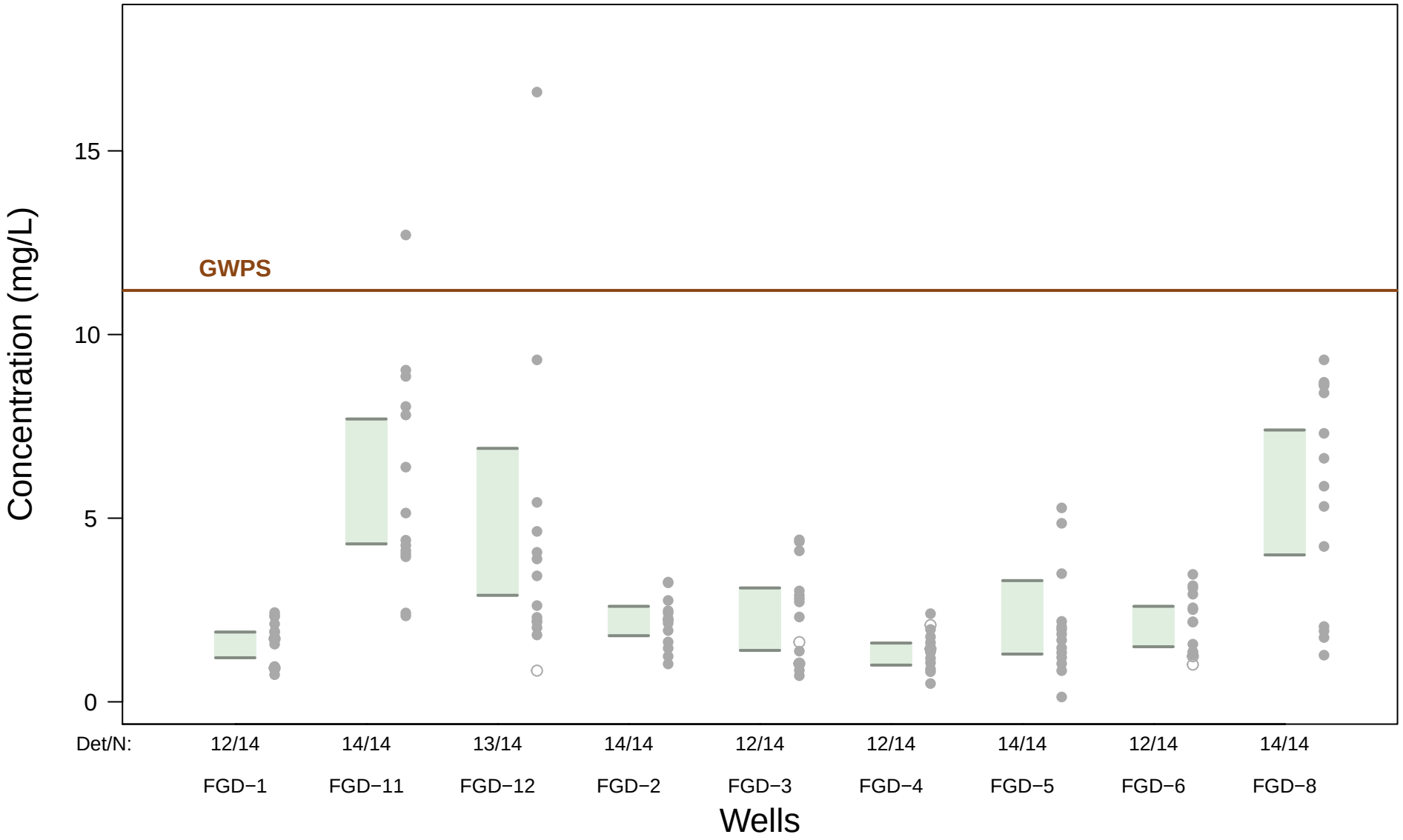
# Mercury – 95% Confidence Intervals



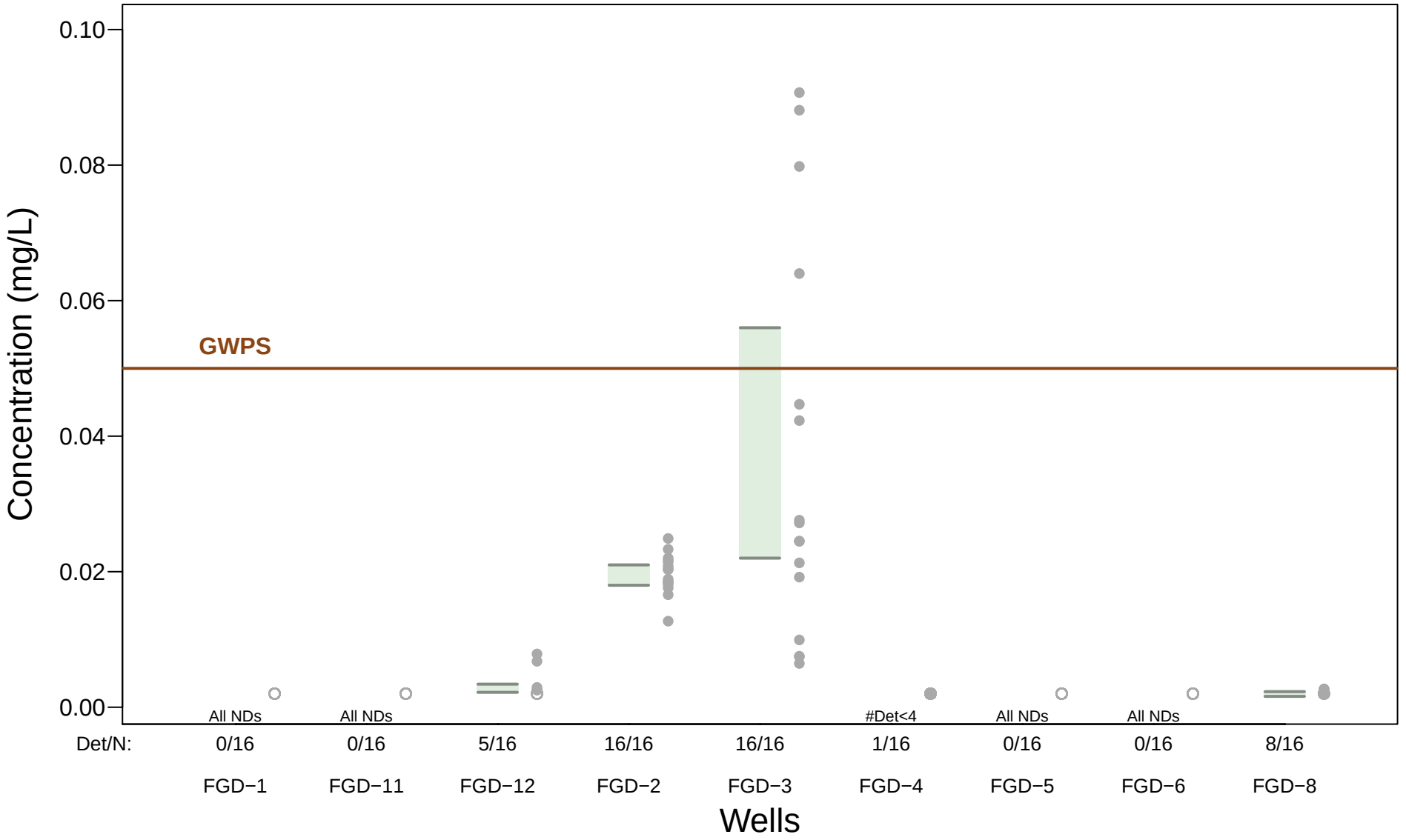
# Molybdenum – 95% Confidence Intervals



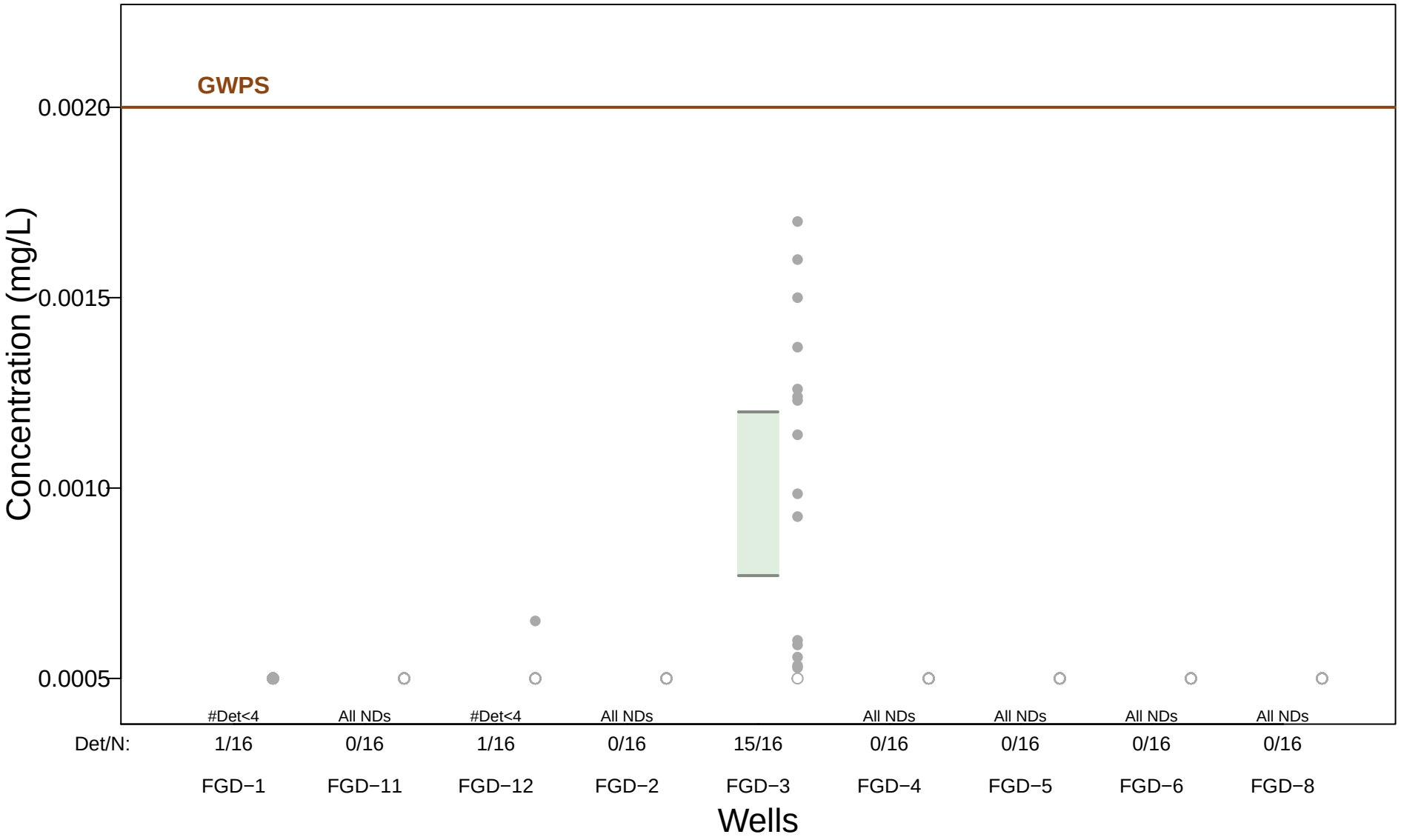
# Radium−226/228 combined − 95% Confidence Intervals



# Selenium – 95% Confidence Intervals

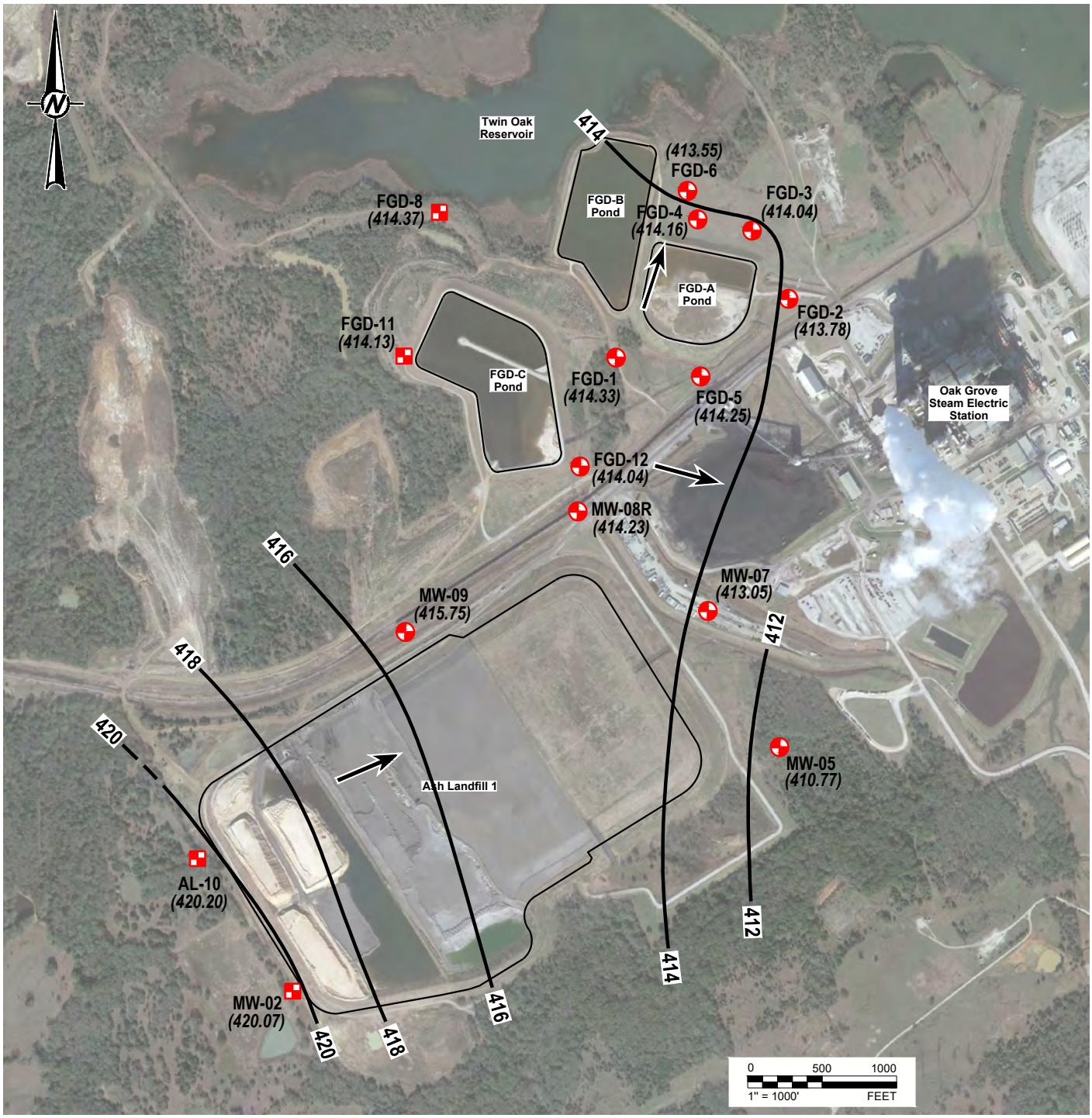


# Thallium – 95% Confidence Intervals



**ATTACHMENT 4**

**GROUNDWATER POTENTIOMETRIC SURFACE MAPS**




**LEGEND**

- CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL
- (410.06) GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
- 400 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 2 FT)
- INFERRED GROUNDWATER FLOW DIRECTION

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
11/16/2022

**REFERENCE(S)**
BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

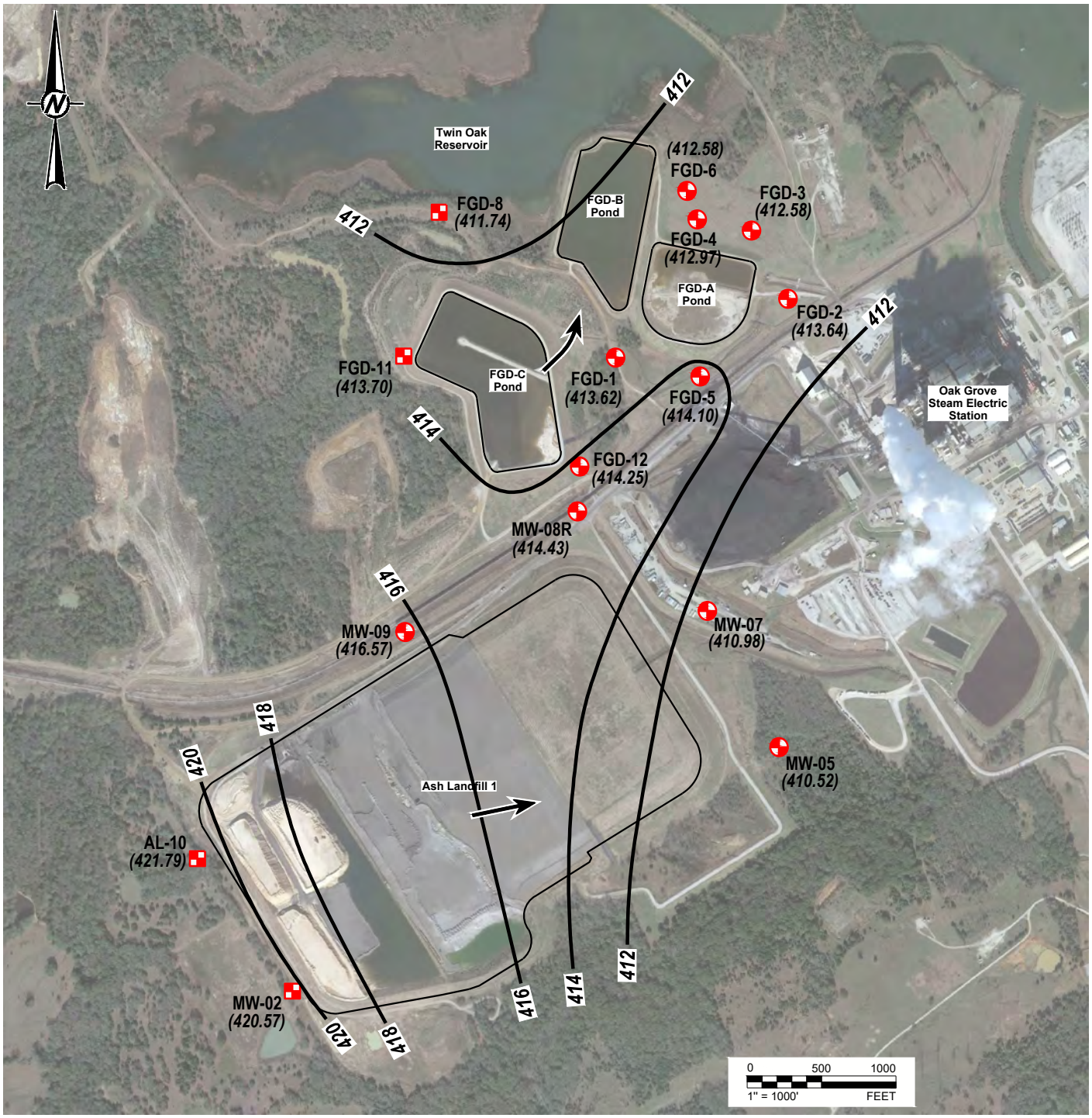
TITLE
**ASH LANDFILL AND FGD PONDS POTENTIOMETRIC SURFACE MAP JUNE 16, 2021**

CONSULTANT
WSP GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2022-11-11 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 31404097.007 | REV. 0 | FIGURE 1

Last Edited By: usad701305 Date: 2022-11-11 Time:9:45:43 AM | Printed By: USAD701305 Date: 2022-11-11 Time:10:27:12 AM
Path: \\golder.gds\corp\eudata\office\Texarkana\Projects - Round Rock_2022\31404097 - Luminant CCR\Oak Grove\PRODUCTION\2022-11\ | File Name: 1 - POT Surface Map (June 2021).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in




**LEGEND**

- CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL
- (410.06) GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
- 400 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 2 FT)
- INFERRED GROUNDWATER FLOW DIRECTION

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
11/16/2022

**REFERENCE(S)**
BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**ASH LANDFILL AND FGD PONDS POTENTIOMETRIC SURFACE MAP OCTOBER 11, 2021**

CONSULTANT
WSP GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2022-11-11 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 31404097.007 | REV. 0 | FIGURE 2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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**REPORT**

# CCR ASSESSMENT OF CORRECTIVE MEASURES REVISION 1

*Oak Grove Steam Electric Station - FGD Ponds*
*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

Submitted by:

**Golder Associates Inc.**

2201 Double Creek Dr, Suite 4004, Round Rock, Texas, USA 78664

+1 512 671-3434

19121403

May 2021

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**APPENDICES**

Appendix A Alternate Source Demonstration Report
Appendix B Boring Logs
Appendix C Laboratory Analytical Reports
Appendix D Groundwater Sampling Records

# DOCUMENT REVISION RECORD

| Issue No. | Date | Details of Revisions |
|---|---|---|
| **Revision 0** | September 2019 | Original Document |
| **Revision 1** | May 2021 | Revised to reflect an Alternate Source Demonstration for statistically significant levels of lithium for the FGD Ponds |

# 1.0 INTRODUCTION

On behalf of Oak Grove Management Company LLC (Luminant), Golder Associates Inc. (Golder) has prepared this revision to the assessment of corrective measures (ACM) report for FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the "FGD Ponds") located at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas (hereafter, the "Site"). The original ACM Report for the Site was prepared in September 2019 in accordance with §257.96 of the Coal Combustion Residual (CCR) Rule due to the presence of cobalt and lithium concentrations in the uppermost Site aquifer at statistically significant levels (SSLs) above the groundwater protection standards (GWPS) established for these constituents. The original ACM Report was placed in the OGSES operating record on September 5, 2019 in accordance with §257.105(h)(10).

In October 2020, an Alternate Source Demonstration (ASD) was completed for the lithium SSL (Appendix A), as allowed by §257.95(g)(3)(ii). As a result of the ASD for lithium, cobalt is the only remaining Appendix IV constituent that the ACM must address. This revised ACM Report was completed in accordance with §257.96 and §257.97 to assess potential corrective measures to address the cobalt SSL.

This report also incorporates the results of a site investigation conducted at the FGD Ponds in May and June 2019. The objectives of the site investigation were:

- delineate the nature and extent of the selected Appendix IV constituents to their respective GWPS;
- update the statistical evaluations of the Appendix IV constituents to include data collected during 2019 to confirm that SSL exceedances continue to occur at the Site;
- collect data to evaluate potential future alternate source demonstrations (ASDs) for the Appendix IV constituents; and
- assess the potential for monitored natural attenuation (MNA) to be successful at the Site for the Appendix IV constituents.

The OGSES is located approximately 10 miles north of the city of Franklin in Robertson County, Texas (Figure 1). Construction of the OGSES began in the mid-1980s; however, plant construction was suspended in the mid-1980s prior to completion. OGSES construction resumed in 2007 and the plant was commissioned in 2010. The OGSES is expected to remain in operation for the foreseeable future, depending on future power demands.

The FGD Ponds are located approximately 2,500 feet northwest of the OGSES power generation units (Figure 2). FGD-A Pond construction began in the mid-1980s, but pond construction stopped when construction of the OGSES as suspended (Golder 2016a). FGD-A construction resumed in 2007 and was completed in 2008. The FGD-A Pond covers an area of approximately 9.5 acres and stores CCR and other wastes generated from the OGSES prior to recycling or disposal in OGSES Ash Landfill 1. FGD-A is lined with a 3-foot thick compacted clay liner (Golder 2016b). FGD-A was formerly considered a lined CCR surface impoundment in accordance with §257.71(a)(1)(i) of the CCR Rule; however, the pond is now considered an unlined impoundment based on the August 2018 DC Circuit Court Ruling. The reline of this impoundment is expected to be complete in 2021.

Construction began on the FGD-B Pond in the mid-1980s during the initial OGSES construction phase for use as a storm water retention pond. Pond construction was halted in the 1980s when construction of the OGSES was suspended. The former retention pond was reconstructed in 2012 as FGD-B Pond for use in management of CCR and other wastes (Golder 2016a). FGD-B covers an area of approximately 12 acres in size and receives CCR and other wastes generated from the OGSES similar to the FGD-A Pond. FGD-B is constructed with a

composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain be a 60-mil HDPE geomembrane liner, overlain by a 1-foot thick layer of protective soil. (Golder 2016b). The composite liner system in FGD-B complies with the requirements of §257.71(a)(1)(ii) of the CCR Rule and the pond is considered a lined surface impoundment under the CCR Rule.

FGD-C Pond construction commenced in 2015 and was completed in 2016 (Golder 2016a). FGD-C Pond is approximately 25 acres in size and receives CCR and other wastes generated from the OGSES, similar to the FGD-A and FGD-B Ponds. FGD-C is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain by a 60-mil HDPE geomembrane liner, overlain by a 2-foot thick soil/ash protective layer (Golder 2016b). The composite liner system in FGD-C complies with the requirements of §257.71(a)(1)(ii) of the CCR Rule and the pond is considered a lined surface impoundment under the CCR Rule.

# 2.0 REGIONAL AND SITE SETTING

## 2.1 Regional Geology

The Site is located in the outcrop area of the Eocene-aged Wilcox Group (Barnes 1970), which is divided into three formations in the region: the Calvert Bluff, Simsboro, and Hooper Formations (in order from youngest to oldest). The FGD Ponds are completed in the Calvert Bluff Formation, which consists mostly of unconsolidated to moderately consolidated clay and silt, with various amounts of interbedded sand and lignite. The depositional environment of the Calvert Bluff Formation is associated with fluvial-deltaic processes such as inter-channel crevasse splays, overbank deposits, and localized channel fills. The Simsboro Formation, which underlies the Calvert Bluff Formation, consists mostly of sand (locally indurated) with some clay, mudstone, and mudstone conglomerates. The Hooper Formation, which underlies the Simsboro Formation, consists mostly of mudstone with various amounts of sandstone and minor amounts of lignite.

## 2.2 Regional Hydrogeology

Groundwater wells completed in the channel sands of the Calvert Bluff Formation are typically used for domestic and stock watering purposes. Groundwater within the upper 100 feet below ground surface (bgs) in the region typically flows under unconfined to semi-confined conditions. The direction and rate of groundwater movement in the Calvert Bluff Formation are affected by a number of physical features, including topography, surface drainage, and geology. The natural groundwater potentiometric surface in these shallow flow systems is generally a subdued replica of topography. In general, groundwater flow occurs from high potentiometric areas (recharge zones) toward valleys (discharge zones). Groundwater divides generally coincide with surface drainage divides.

## 2.3 Site Hydrogeology and CCR Monitoring Well Network

The CCR groundwater monitoring well network at the FGD Ponds was established in 2015 using pre-existing Site monitoring wells (FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, FGD-8, FGD-11, and FGD-12), which are each screened in the uppermost groundwater-bearing unit (GWBU) of the Calvert Bluff Formation (Figure 2). Pre-existing monitoring well FGD-14 and newly installed monitoring wells FGD-15 and FGD-16 were also monitored in 2019 as part of the nature and extent evaluation. Boring logs for the CCR monitoring wells and nature and extent wells are provided in Appendix A. Based on soil borings completed at the Site, the geology near the unit generally consists of an upper zone of relatively thick, interbedded sand and clay strata, which is underlain by a lower zone of interbedded silty to clayey sand and well sorted sand. The uppermost GWBU occurs under unconfined conditions within the shallow sand units at the Site. Geologic cross sections of the FGD Ponds are presented on Figures 3, 4, and 5.

Groundwater elevations are generally highest near the western side of the OGSES Ash Landfill I, which is located southeast of the FGD Ponds at the Site. A groundwater potentiometric map constructed using groundwater elevation data collected in September 2020 from the CCR monitoring networks for the FGD Ponds and Ash Landfill I is presented on Figure 6. Since CCR monitoring began in 2015, the inferred groundwater flow direction at the Site has been to the east-northeast. The groundwater gradient in the area of the FGD Ponds is relatively flat. Based on the inferred groundwater flow direction and the timing of pond construction, the location of each CCR monitoring well relative to the FGD Ponds is as follows:

| Upgradient/Background Wells | Downgradient Wells |
|---|---|
| FGD-8<br>FGD-11 | FGD-1<br>FGD-2<br>FGD-3<br>FGD-4<br>FGD-5<br>FGD-6<br>FGD-12 |

Rising- and falling-head aquifer tests (i.e., slug tests) were conducted in 2015 at monitoring wells FGD-5, FGD-11, and FGD-12 to evaluate lateral groundwater flow velocities of the uppermost GWBU. The test methods and results were documented in the CCR Groundwater System Certification Report for the Site (PBW 2017a). Based on the test results, the uppermost GWBU has an estimated horizontal hydraulic conductivity value of 4.2E-04 cm/sec and an estimated lateral groundwater flow velocity of about 2 feet per year.

Golder performed a survey of water supply wells located in the vicinity of the FGD Ponds in May 2019 as part of a Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program (TRRP) assessment of the Site. A Drinking Water Survey Report (Golder, 2019) documenting the water well survey activities and findings was approved by the TCEQ in a letter dated August 12, 2019. No imminent threats to water wells or potentially affected drinking water wells were identified.

# 3.0 NATURE AND EXTENT EVALUATION

## 3.1 Groundwater Monitoring Summary

Background monitoring of groundwater in the vicinity of the FGD Ponds began in November 2015 and was completed in December 2016. Samples collected during this period were analyzed for Appendix III and Appendix IV constituents to establish background concentrations pursuant to §257.94(b).

A detection monitoring program in accordance with §257.94 was initiated in September 2017. The evaluation of those data was completed in 2018 using procedures described in the Statistical Analysis Plan (PBW 2017b) to identify statistically significant increases (SSIs) of Appendix III parameters above background concentrations. Based on the identification of SSIs for one or more Appendix III parameters, an assessment monitoring program was established pursuant to §257.94(e)(1).

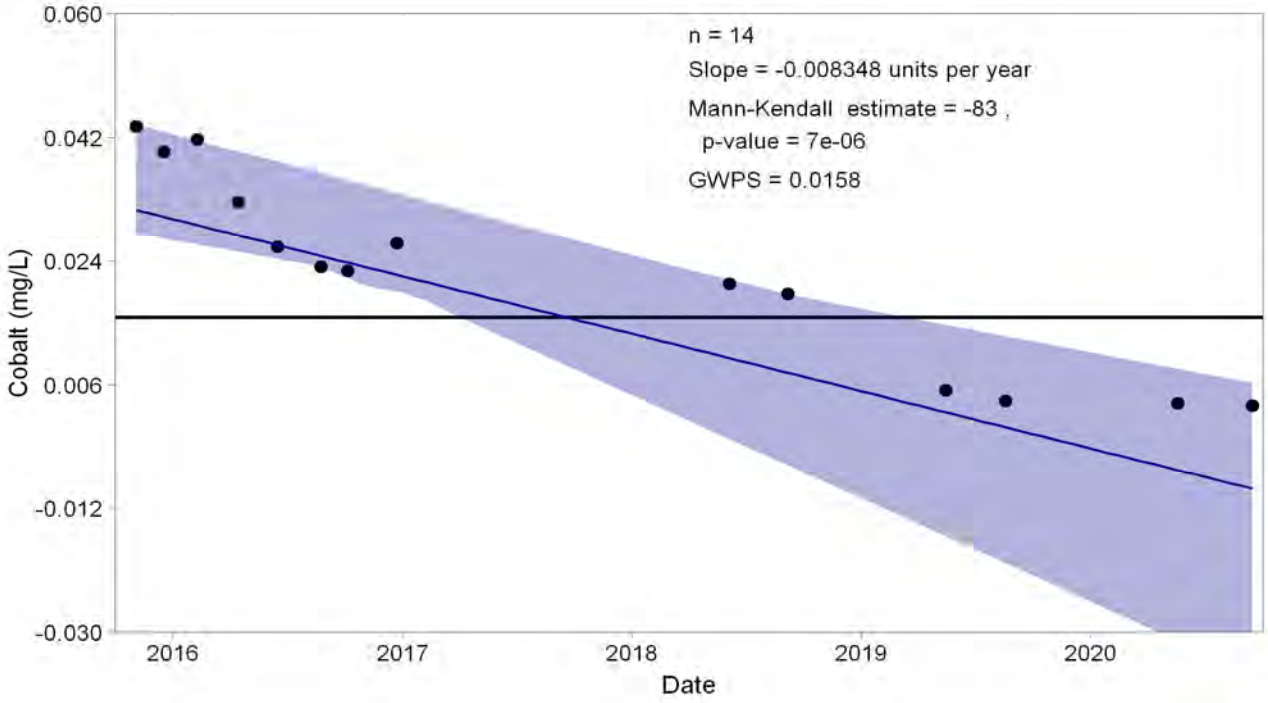
The initial assessment monitoring event was conducted in June 2018 and a subsequent semi-annual assessment monitoring event was conducted in September 2018 in accordance with §257.95(a) and §257.95(d). Using the Appendix IV data collected during the assessment monitoring period through September 2018, SSLs above GWPSs were initially identified in January 2019 for cobalt and lithium in downgradient monitoring wells FGD-3 for cobalt and FGD-5 for lithium (Figure 7); therefore, an ACM was completed in September 2019 in accordance with §257.96. As described previously, an ASD was completed in October 2020 to address the lithium SSL (Appendix A) and, as a result, cobalt is the only remaining Appendix IV constituent to be addressed by the ACM.

## 3.2 Assessment Monitoring SSL Evaluation

Additional assessment monitoring events were performed in 2019 and 2020 subsequent to the SSLs identified in January 2019. Groundwater sampling analytical results for all Appendix IV parameters from 2015 through 2020 are presented in Table 1. An updated statistical analysis of cobalt concentrations in downgradient CCR monitoring wells was performed including the 2019 and 2020 data to evaluate if cobalt concentrations remained at SSLs relative to the GWPS. The updated statistical analysis included a Sens Slope Analysis and a Confidence Interval Analysis in accordance with the Statistical Analysis Plan for CCR Groundwater Monitoring (PBW 2017b) and the USEPA Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities-Unified Guidance (USEPA 2009). The GWPS for cobalt was set at 0.0158 mg/L based on background concentrations in well FGD-8.

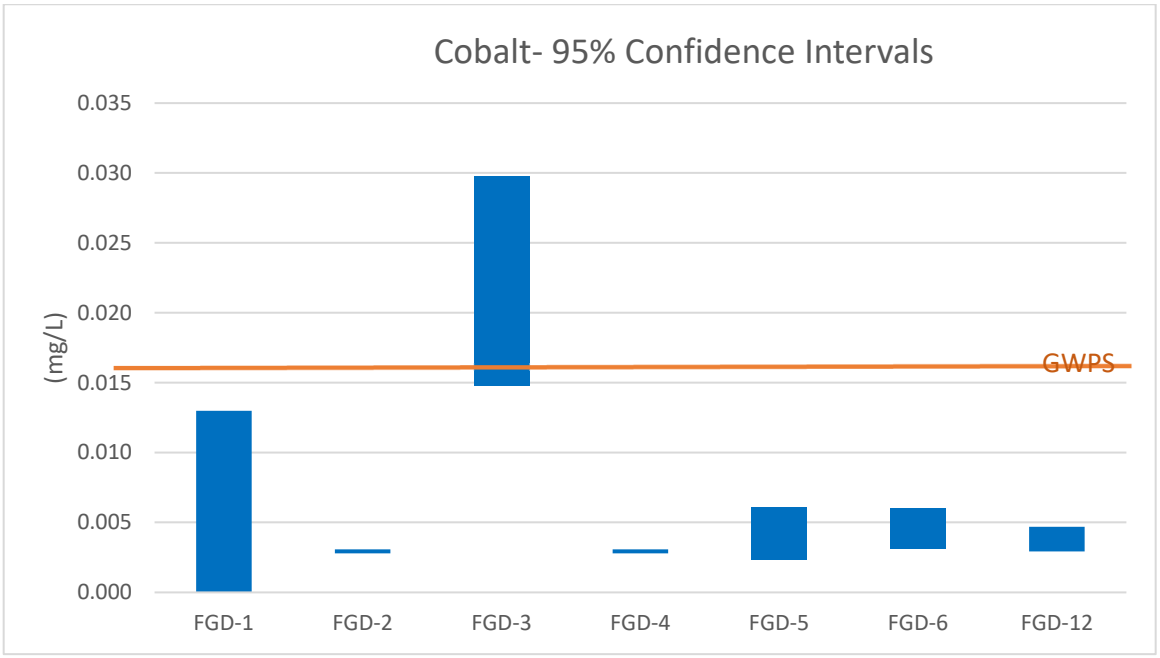
- Sens Slope Analysis: A Sen's slope analysis with 95% confidence intervals was conducted for cobalt in well FGD-3 to evaluate concentration trends since cobalt was historically detected at concentrations higher than the GWPS. A plot of the Sen's slope analysis with 95% confidence intervals is provided below:

**Sen's Slope analysis for Cobalt at FGD-3**




The Sen's slope analysis indicates that cobalt concentrations in FGD-3 are no longer present at SSLs above the GWPS.

- Confidence Interval Analysis: Confidence intervals for cobalt concentrations in FGD-3 and other monitoring wells were updated to include the 2019 and 2020 data as shown in the plot below:



The updated confidence interval analysis also indicates that cobalt concentrations are no longer present at SSLs above the GWPS in FGD-3 or other wells downgradient of the FGD Ponds.

The updated statistical analyses indicate that cobalt is no longer present at SSLs above the GWPS in FGD-3 or other wells downgradient of the FGD Ponds; however, cobalt concentrations in these wells will continue to be monitored to confirm that the concentrations remain below the GWPS in the future in accordance with the CCR Rule.

## 3.3 Field Investigation

### 3.3.1 General

Field investigation activities conducted as part of the ACM included collection of soil samples for a mineralogical assessment and chemical analysis, nature and extent monitoring well installation and development, groundwater-level measurements, and groundwater sampling and analysis. Figure 2 presents the locations of soil borings and monitoring wells installed and sampled as part of the field investigation.

### 3.3.2 Soil Sample Collection

Soil borings were completed in June 2019 at proposed nature and extent monitoring well locations FGD-15 and FGD-16, and from a location near well FGD-3 (soil boring FGD-2019-1). Soil samples were collected within the target GWBU in each of the soil borings. Soil samples were submitted under chain-of-custody for laboratory analysis of the following parameters:

- Mineralogical composition: The purpose of the mineralogical analysis was to identify and quantify the crystalline mineral phases in each sample. This information is required for geochemical modeling as the release or attenuation of constituents of interest is influenced by the mineral phase(s) present in the aquifer (Hem 1985). The mineralogical testing laboratory (SGS Minerals Services) performed the analysis using quantitative (Rietveld) X-ray diffraction (XRD) (ME-LR-MIN-MET-MN-DO5) and a Bruker AXS D8 Advance Diffractometer.
- Total metals: Analysis of total metals was conducted to quantify the chemical composition of soil materials. The total mass of metals, in combination with the results of sequential extraction testing, can be used to determine the provenance of metals and verify sequential extraction results.
- Sequential extraction (SEP): This test consists of a seven-step metals extraction from solids as per Tessier et al. (1979) to identify the provenance of constituents of interest (i.e. the operationally-defined fraction that contains the metal)[1] and determine their potential environmental mobility. For instance, metals bound in the carbonate fraction, or that are exchangeable, are much more likely to become mobile due to changes in groundwater conditions than metals bound within a sulfide or silicate fraction. The total concentration of a

[1] Sequential extraction of metals from soil samples consisted of seven discrete steps for this investigation:
Step 1 - Exchangeable Fraction: This extraction includes trace elements that are reversibly adsorbed to soil minerals, amorphous solids, and/or organic material by electrostatic forces.

Step 2 - Carbonate Fraction: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals.

Step 3 - Non-Crystalline Materials Fraction: This extraction targets trace elements that are complexed by amorphous minerals (e.g., iron).

Step 4 - Metal Hydroxide Fraction: Trace elements bound to hydroxides of iron, manganese, and/or aluminum.

Step 5 - Organic Fraction: This extraction targets trace elements strongly bound via chemisorption to organic material.

Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.

Step 7 - Residual Fraction: Trace elements remaining in soil after the previous extractions will be distributed between silicates, phosphates, and refractory oxides.

metal measured from all seven steps can be compared to the concentration determined from the total metal analysis for compositional accountability.

### 3.3.3 Monitoring Well Installation

Two new nature and extent monitoring wells were completed at FGD-15 and FGD-16 to total depths of 35 feet bgs and 40 feet bgs, respectively. The wells were constructed of 2-inch diameter, schedule 40 PVC casing and 0.010-inch slotted screen. Annular materials consisted of a sand/gravel pack around the screened interval, a bentonite seal above the sand/gravel pack, and grout or bentonite chips to ground surface. Surface completions consisted of a concrete pad, protective steel casing stickup, and guard posts. The monitoring wells were developed by surging the wells several times and purging the wells using an electric submersible pump to remove fine-sized particles and to establish a hydraulic connection between the well and the formation.

An existing monitoring well not previously part of the CCR monitoring program (FGD-14) was used as a third nature and extent well.

### 3.3.4 Groundwater Sampling

ACM groundwater samples were collected from the CCR monitoring network as part of the Assessment Monitoring Program semi-annually in 2019 and 2020. Additional groundwater samples evaluated in this report include major cation/anion and nutrient samples collected in May 2019 and nature and extent well samples collected in May and June 2019. Laboratory analytical reports are provided in Appendix C and groundwater sampling records, which include field-measured parameters, are provided in Appendix D.

Chemical/geochemical analysis of groundwater samples included field parameters and radionuclides, nutrients, and major cations and anions. The rationale and methods used are as follows:

- Field Parameters: Parameters measured in the field included pH, dissolved oxygen, oxidation reduction potential (ORP), conductivity, and temperature. These parameters were used to evaluate general geochemical conditions in the groundwater and support geochemical modeling.
- Metals and Regulated COIs: Analysis of Appendix III and IV metals to better understand the geochemical composition of groundwater. Metals analysis allows for the delineation of a potential plume, evaluation of mineral saturation indices, and evaluation of background contributions from natural sources or anthropogenic sources.
- Major Cations, Anions, and Nutrients: Geochemical modeling of mineral solubility, metals attenuation and background contributions requires analysis of major cations and anions because they affect and participate in sorption and mineral dissolution or precipitation reactions.

## 3.4 Evaluation of Groundwater Data

### 3.4.1 Geochemical Modeling Approach

Geochemical modeling was conducted to evaluate general groundwater quality, determine the potential for precipitation of sorbent media, evaluate the potential for mineral precipitation or adsorption in the aquifer, and determine the speciation of metals of interest. The geochemical computer code developed by the United States Geological Survey (USGS), PHREEQC, was used for these simulations (Parkhurst and Appelo 2013). PHREEQC version 3.4 is a general-purpose geochemical modeling code used to simulate reactions in water and between water and solid mineral phases (e.g., rocks and sediments). Reactions include aqueous equilibria, mineral dissolution and precipitation, ion exchange, surface complexation, solid solutions, gas-water equilibrium, and kinetic biogeochemical reactions. The widely-accepted thermodynamic database Minteq.v4, 2017 edition, was used as a basis for the thermodynamic constants required for modeling.

The Geochemist's Workbench Version 12 (Bethke 2015) was used to generate graphical representations of geochemical modeling outputs in the form of predominance, or Pourbaix diagrams (also known as Eh-pH diagrams) for cobalt and trilinear plots (also known as Piper plots) displaying the relative abundance of major ions. The Minteq.v4 database was used as the basis for the Pourbaix diagrams.

### 3.4.2 Summary of Groundwater Results

Groundwater quality data from background wells FGD-8 and FGD-11; monitoring wells FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, and FGD-12; and nature and extent monitoring wells FGD-14, FGD-15, and FGD-16 were used for this evaluation. The water quality monitoring data are presented in Appendices C and D and can be summarized as follows:

**General Chemistry Parameters**

- pH: The pH of groundwater samples collected from monitoring and nature and extent wells ranged from 6.46 to 6.86 across the site in May and June 2019. Historically, pH was lowest in June of 2018, at 5.58 in FGD-1 and the highest pH measured in groundwater was 7.12 in FGD-6 in February 2016. No geographical trend in pH was discernable in groundwater samples.
- ORP (Redox): Field-measured redox values in May and June 2019, corrected to Eh (+200mV), ranged from +144 to +181 mV in the groundwater samples in the CCR monitoring well network. The Eh of groundwater in the nature and extent monitoring wells ranged from +168 mV to +193 mV, indicating that redox conditions were similar to those in the CCR monitoring network wells.
- Total Dissolved Solids (TDS): Groundwater TDS concentrations were variable in May 2019 in the CCR monitoring and nature and extent well network. The lowest TDS concentrations (140 mg/L) occurred in groundwater at CCR monitoring well FGD-12. The highest measured TDS in groundwater (3970 mg/L) was observed in CCR monitoring well FGD-8. The TDS in groundwater of the nature and extent network ranged from 325 mg/L to 2880 mg/L in wells FGD-16 and FGD-15, respectively. Geographically, the highest TDS wells, FGD-8 and FGD-15 are located on opposite sides of the FGD Pond area.
- Major ion chemistry: A Piper plot was generated for groundwater samples to facilitate the identification of water types and source contributions (Figure 8a). Generally speaking, background, downgradient, and nature and extent wells plotted in a region of the trilinear plot separate from the FGD Pond water samples. Upon further investigation of three specific ions (sulfate, magnesium, and sodium) (Figure 8b), the difference between groundwater from CCR monitoring wells and nature and extent wells and FGD Pond water becomes more apparent. Based on the molar ratios of these ions, it is apparent that the groundwater in downgradient and nature and extent wells is similar to that of upgradient, background locations.

**Constituents Identified in February 2019 SSL Notification**

- Cobalt: Cobalt concentrations in groundwater samples from nature and extent wells or CCR monitoring network wells did not exceed the GWPS for cobalt in 2019 and 2020. The cobalt concentration in groundwater collected from the downgradient nature and extent monitoring well FGD-14 was non-detect (<0.003 mg/L) in May 2019. Cobalt in groundwater across the entire monitoring network was lowest in downgradient wells; the highest concentration was measured at 0.0132 mg/L in FGD-6 in May 2019. The highest cobalt in groundwater measured in May to June 2019 was in FGD-8, an upgradient background well, at 0.0146 mg/L, but still below the GWPS. The cobalt concentration in FGD-3, where previous exceedances of the GWPS occurred, was below the GWPS in the latest samples (Figure 9).

Recent groundwater data at the Site indicate that all Appendix IV parameters are currently below their respective GWPS. Although, as discussed previously in Section 3.2, cobalt has historically been detected at concentrations above the GWPS, it is considered highly likely that the cobalt originated from a natural source, rather than the FGD Ponds based on major ion chemistry.

## 3.5 Evaluation of Soil

### 3.5.1 Mineralogical Composition

Quantitative X-ray diffraction (XRD) with Rietveld refinement was used to identify and quantify minerals in three overburden samples collected during the drilling activities - one sample from each of the soil borings completed in June 2019 (FGD-15, FGD-16, and FGD-2019-1). These samples were obtained to better understand the mineralogical composition of the aquifer system and identify any minerals that would potentially influence attenuation of constituents of interest. In contrast, the presence of certain minerals could also indicate a potential for naturally-occurring release of metals into groundwater, for instance due to oxidation of sulfide minerals.

The mineralogical analysis identified the materials in boreholes samples at the FGD Ponds predominately consist of quartz with varying amounts of the silicate minerals K-feldspar, plagioclase, and muscovite. A trace amount of magnesite [$MgCO_3$] was encountered in one sample. Analytical reports for the XRD samples are provided in Appendix C.

### 3.5.2 Chemical Composition and Sequential Extraction

Chemical analysis and sequential extractions were used to determine the chemical composition of the soil and the distribution of constituents of interest over various operationally-defined fractions comprising the soil. Testing was completed as described in Section 3.3.2 on soil samples obtained from three borehole locations (Figure 2) and the analytical reports for the soil analyses are provided in Appendix C.

Soil sample locations were chosen to gain a better understanding of the underlying geological conditions of the area surrounding the FGD Ponds, mostly adjacent to or downgradient of a CCR monitoring well. In addition, this information allows for a better understanding of naturally-occurring metal contributions to groundwater or the potential for sequestration of constituents from groundwater.

A description of the individual fractions determined by sequential extraction is presented in Section 3.3.2. Metals extracted in steps 1 through 5 are considered environmentally available, whereas metals extracted in steps 6 and 7 are present in refractory fractions and are not expected to be released under conditions typically encountered in aquifers (Tessier et al. 1979). Total metal quantities from the sequential extraction are expressed as “SEP Total” in Appendix C. The sum of the sequential extraction steps is also presented for comparison but does not represent an analytically-determined value.

The results from the chemical analysis and sequential extraction presented in Appendix C are summarized as follows:

**General Chemistry Parameters**

- Aluminum: Aluminum is not a constituent of interest (COI) at the site but it has been well studied as a sorbing medium in soils (e.g., Karamalidis and Dzombak 2011). Total aluminum in soils ranged from 29,890 mg/kg to 41,270 mg/kg, and the environmentally-available fraction ranged from just 690 mg/kg (FGD-15) to 1,927 mg/kg (FGD-2019-1). Aluminum in the soil at the site is, therefore, largely (~88% to 94%) present in the residual, or silicate-bound fraction. This fraction is likely at least partially represented by hydrous aluminum phyllosilicates minerals or clays intermixed in the silica sand matrix. Clays can represent an important sorptive reservoir for numerous trace metals and metalloids (Uddin 2017).
- Iron: While not a COI, iron and its minerals commonly represent one of most abundant reservoirs for metal/metalloid attenuation in soils (Dzombak and Morel 1990; Smith 1999). Iron was present in all three core samples analyzed, varying from 5,458 mg/kg (FGD-15) to 8,961 mg/kg (FGD-2019-1). In all samples, the sulfide and residual fractions accounted for the largest proportion of total iron (61% to 73%) and, as

such, most of the iron is not environmentally available. However, the remainder of the iron in the samples is largely present in the metal hydroxide phase (+/-1%). This fraction, part of the labile fraction in steps 1 through 5, can generally be considered representative of the amount of iron in soil that may be available as a sorbing medium and can, therefore, be used as a proxy to determine the potential for attenuation of cobalt, along with aluminum.

**Constituents Identified in February 2019 SSL Notification**

- Cobalt: Total cobalt in soil ranged from 1.8 mg/kg to 69.9 mg/kg while the environmentally-available fraction ranged from 1.0 mg/kg in FGD-15 to 67.6 mg/kg in FGD-2019-1, representing from 58% to 97% of total cobalt. Cobalt in FGD-2019-1 was well above the level that would be considered naturally occurring in typical soils and rock (Hem 1985), with almost all cobalt associated with the metal hydroxide and amorphous metal fractions. Although cobalt was present in the soil of FGD-2019-1 at higher level compared to other soils samples, cobalt concentrations in groundwater from FGD-3 and FGD-14, the closest wells next to and downgradient of FGD-2019-1, respectively, were non-detect, or just above the detection limit of 0.005 mg/L.
- Based on the results from the soil analysis, there is a high likelihood of naturally occurring or alternate sources of the cobalt observed in groundwater at the Site, as represented by the non-environmentally-available fractions.

## 3.6 Summary of Site Characterization

Based on the above site characterization and nature and extent investigation, the following is concluded with respect to cobalt:

- Cobalt: Recent data indicates that cobalt concentrations in all CCR monitoring wells and nature and extent wells are currently below its GWPS. A Sen's slope analysis for FGD-3, where cobalt has historically exceeded the GWPS, confirms the decreasing trend in cobalt groundwater concentrations. Cobalt present in the non-environmentally available fraction of soils represents a likely alternate source of cobalt in groundwater. The presence of metal hydroxides in soils also supports a strong potential for cobalt attenuation (Smith 1999), which was confirmed by the sequential extraction results. Based on the data collected to date, cobalt concentrations are no longer considered to be present at an SSL above the GWPS; however, cobalt concentrations in groundwater will continue to be monitored to confirm that cobalt levels remain below the GWPS in the future.

# 4.0 ASSESSMENT OF CORRECTIVE MEASURES

In accordance with §257.96 and §257.97, an ACM was conducted for the FGD Ponds to address concentrations of the following Appendix IV constituent that is conservatively assumed to occur at SSLs above the GWPS based on the February 2019 SSL notification:

- cobalt concentrations in monitoring well FGD-3.

Potential response technologies were identified for Source Control (to reduce the potential for releases of constituents to groundwater) and Groundwater Response Actions (to reduce constituent concentrations below GWPS). The potential response technologies were then screened to identify options that are appropriate for further consideration in developing potential corrective measures alternatives for the Site. The results of the ACM are presented in this section.

## 4.1 Corrective Measures Objectives and Evaluation Criteria

As described in §257.96(a), the corrective measures must prevent further releases, remediate any releases and restore the affected area to original conditions. Potential corrective measures must meet the requirements specified in §257.97(b):

1) Be protective of human health and the environment;
2) Attain the groundwater protection standard as specified pursuant to § 257.95(h);
3) Control the source(s) of releases to reduce or eliminate, to the maximum extent feasible, further releases of constituents in appendix IV to this part into the environment;
4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, considering factors such as avoiding inappropriate disturbance of sensitive ecosystems;
5) Comply with standards for management of wastes as specified in § 257.98(d).

In accordance with §257.96(c), the assessment of potential corrective measures alternatives must include an evaluation of the following:

1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination
2) The time required to begin and complete the remedy
3) Institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

## 4.2 Potential Source Control Response Technologies

As discussed in Section 3.5, given declining concentrations of cobalt, there is a high likelihood of naturally-occurring or alternate sources of the cobalt observed in groundwater at the Site and the FGD Ponds are not the source of this constituent; however, for the purposes of this ACM, it is assumed that some degree of source control will be considered for the FGD Ponds, since one of the listed objectives in §257.97(b) for the corrective measures is to control the source of releases of Appendix IV constituents to the environment from the CCR Unit.

The OGSES FGD Ponds are an integral part of the CCR management system at the plant. As a result, any needed potential source control technologies would be designed to keep the FGD Ponds in operation.

FGD-B and FGD-C are constructed with composite liner systems that comply with the requirements of §257.71(a)(1)(ii) of the CCR Rule and these ponds are considered lined surface impoundments under the Rule. Since the liner systems in these ponds comply with the CCR Rule, FGD-B and FGD-C provide an appropriate level of source control as currently constructed and no modifications are necessary to these ponds.

FGD-A is constructed with a clay liner and the pond is considered an unlined surface impoundment based on the August 2018 DC Circuit Court Ruling. As a result, FGD-A is being retrofitted with a new composite liner system that complies with the requirements of §257.71(a)(1)(ii) of the CCR Rule to improve the level of source control in the pond. The new liner system will be installed in general accordance with the following procedures:

- Water will be removed from the pond and transferred to FGD-B and FGD-C;
- Solids in the pond will be dewatered, removed and transported to the OGSES Ash Landfill 1;
- A minimum of 2 feet of the existing compacted clay liner will be retained at the base of the pond;
- A 60-mil HDPE geomembrane liner will be installed over the 2 feet of compacted clay liner;
- A protective layer of soil or other material will be placed over the geomembrane liner.

Retrofitting FGD-A with a new composite liner system is assumed to serve as the source control component of the potential corrective measures for the FGD Ponds. It is estimated that the FGD-A liner retrofit will be completed in 2021.

## 4.3 Potential Groundwater Response Technologies

For the purposes of this ACM, cobalt is conservatively assumed to be present in groundwater at the Site at SSLs above the GWPS based on the February 2019 SSL notification. In this section, potential groundwater response technologies to address these constituents are identified and screened for further consideration in developing potential corrective measures alternatives for FGD Ponds.

### 4.3.1 Monitored Natural Attenuation

Monitored natural attenuation (MNA) refers to the reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific groundwater remediation objectives within a time frame that is reasonable compared to that offered by more active remediation methods (USEPA 2007a). MNA relies on a range of natural processes, including dispersion, dilution, sorption, (co)precipitation, radioactive decay, and abiotic degradation/transformation to achieve remediation objectives (ITRC 2010). Routine groundwater monitoring would be required to verify MNA is occurring at the Site.

Where necessary, MNA processes can be enhanced through the use of low-energy, in-situ techniques to stimulate or increase the attenuation of contaminants or reduce contaminant loading (ITRC 2010). Enhancement options include increasing the attenuation capacity of the aquifer, decreasing the mobility of contaminants, and/or increasing the stability of immobilized contaminants by increasing the ability of aquifer solids to remove contaminants from groundwater and/or manipulating the geochemistry to reduce remobilization of contaminants by desorption or dissolution of precipitates (ITRC 2010).

MNA has been demonstrated effective in reducing cobalt concentrations in groundwater (ITRC 2010; USEPA 2007b). Cobalt is removed through adsorption to iron hydroxides and/or amorphous metals and the level of effectiveness is dependent on iron hydroxide availability as well as pH, alkalinity, and calcium levels (ITRC 2010).

MNA would be effective in remediating groundwater beneath and downgradient of the FGD Ponds. An MNA feasibility evaluation for cobalt is currently being performed in accordance with USEPA and ITRC guidance and preliminary results indicate that MNA is an effective groundwater remedy for the FGD Ponds. The estimated time to implement MNA is estimated to be approximately 1 year including design and construction. The estimated time to achieve GWPS for the target Appendix IV constituents is dependent on site-specific conditions ; however, as stated previously, groundwater cobalt concentrations downgradient of the FGD Ponds did not exceed the GWPS for cobalt in 2019 and 2020.

### 4.3.2 Groundwater Extraction and Treatment

Groundwater extraction and treatment is one of the most widely implemented groundwater remediation technologies and is used to provide 1) hydraulic containment and 2) treatment (USEPA 1996). A groundwater extraction and treatment system consists of the following major components:

- A series of extraction wells or trenches strategically located to modify/interrupt the natural flow of groundwater;
- Extraction pumps installed in each well/trench to pump groundwater from the subsurface;
- A treatment system to remove constituents of concern from the extracted groundwater; and
- A point of discharge for the treated groundwater (surface water, re-injection to groundwater, etc.).

For the FGD Ponds, a system of extraction wells would be installed along the downgradient edge of the ponds to provide hydraulic control of the Appendix IV constituent groundwater plumes. The extracted groundwater would be treated in an on-site treatment system and treated water would be discharged to Twin Oaks Reservoir or re-injected into the aquifer.

Potential groundwater treatment methods for the target Appendix IV constituents include the following:

- Cobalt - ion exchange, adsorptive media, activated carbon, and chemical treatment with membrane filtration (USEPA 2019a).

Treatment methods for these constituents would need to be bench/pilot tested to evaluate their effectiveness prior to designing a full-scale system. Treatment will generate residual material (sludge, regenerate brine, etc.) containing concentrated levels of the target Appendix IV constituents that must managed.

Groundwater extraction and treatment would be effective in reducing contaminant concentrations in groundwater downgradient of the FGD Ponds through hydraulic containment, but would have little effect on groundwater conditions beneath the ponds. The estimated time to implement groundwater extraction and treatment is estimated to be approximately 3 to 4 years, including testing, design, and construction. The estimated time to achieve GWPS for the target Appendix IV constituents is dependent on site-specific conditions and groundwater modeling is needed to better evaluate remedial timeframes.

### 4.3.3 Vertical Hydraulic Barrier

A vertical, low permeability hydraulic barrier can be installed to provide a physical barrier to groundwater flow to contain the migration of contaminated groundwater. Vertical hydraulic barriers that have been demonstrated effective at controlling groundwater flow include the following (USEPA 1998):

- Slurry Wall. Slurry walls consist of a narrow, excavated trench that is filled with a soil-bentonite slurry mixture. The slurry shores and supports the trench walls and forms a low-permeability barrier in the trench. Key design considerations include wall depth, key depth, and material compatibility. Slurry trenches can be excavated to depths of 50 feet using standard excavators and over 80 feet using long-reach excavators or a crane mounted drag line/clamshell bucket. Geosynthetic materials can be placed in the trench in conjunction with the slurry wall to improve the hydraulic performance (decrease permeability) and chemical resistance.
- Soil-Mixed Wall. Soil-mixed walls form a hydraulic barrier through in-situ mixing of soil with amendments, such as bentonite and/or cement. Soil-mixed barrier walls can be installed to depths of over 100 feet. The walls are installed by sections or panels that overlap to achieve a continuous barrier.
- Grout Curtain. Grout curtain barriers are constructed by injecting grout into the subsurface in an overlapping injection pattern to form a continuous barrier. Grouted barriers can be installed using permeation grouting, jet grouting, or vibrating beam technologies. Grouted barriers must be designed and constructed to ensure hydrofracturing does not occur and the completed wall is effective at restricting groundwater flow.
- Sheet-pile Wall. Sheet-pile walls consist of steel, vinyl, or other materials driven into the subsurface using a hydraulic percussion hammer or vibratory hammer. Sheet-pile walls are common in civil engineering applications; however, their use in environmental applications has been more limited. One of the major concerns with sheet-walls in environmental applications is leakage through the vertical joints between piles; however, improvements in pile interlock designs have been made to improve joint sealing.

For a vertical hydraulic barrier to be effective, the bottom of the barrier must be “keyed” into a low-permeability confining layer. A detailed engineering analysis and design, likely including a bench/pilot test to identify most appropriate barrier materials, would be required for the construction of a vertical hydraulic barrier.

For the FGD Ponds, the vertical hydraulic barrier would be constructed along the downgradient edge of the ponds to provide hydraulic control of the cobalt groundwater plumes. A vertical hydraulic barrier physically interrupts the natural flow of groundwater; consequently, groundwater elevations upgradient of the barrier will rise, potentially to the point that groundwater could begin to flow around the edges of the barrier. To address this concern, a groundwater extraction and treatment system would be required upgradient of the barrier to control the groundwater levels. The groundwater extraction and treatment system used in conjunction with the vertical hydraulic barrier would be similar to the system described in Section 4.3.2; however, the required capacity of the system would be less since the rate of groundwater extraction would be limited to that required to control upgradient groundwater levels.

Construction of a vertical hydraulic barrier is expected to require significant effort and time. Prior to implementation of the barrier, pre-design field work, including site investigations and bench/pilot-scale barrier material testing would be required, followed by full-scale design and construction. The estimated time to implement a vertical hydraulic barrier with groundwater extraction and treatment is estimated to be approximately 5 to 8 years, including testing, design, and construction. The estimated time to achieve GWPS for the target Appendix IV constituents is dependent on site-specific conditions and groundwater modeling is needed to better

evaluate remedial timeframes however, as stated previously, groundwater cobalt concentrations downgradient of the FGD Ponds did not exceed the GWPS for cobalt in 2019 and 2020.

### 4.3.4 Permeable Reactive Barrier

A permeable reactive barrier (PRB) is an in-situ, permeable treatment zone that contains reactive media designed to intercept impacted groundwater and either immobilize contaminants or transform the contaminants to a more desirable state (ITRC 2011). A PRB is a passive treatment system that acts as a barrier to groundwater contamination but not groundwater flow. The PRB must intercept the flow of impacted groundwater and must be designed and constructed such that impacted groundwater cannot bypass the reactive media by flowing over, under, or around the PRB. A PRB must include the appropriate reactive media and the residence time within the PRB needs to sufficient to allow for effective treatment. The effectiveness of the reactive media will be reduced over time and the media will likely have to be replaced periodically. Groundwater monitoring is used to evaluate the performance/effectiveness of a PRB system.

There are two primary PRB configurations: continuous and funnel-and-gate. A continuous PRB features permeable reactive media across the entire length of the barrier. A funnel-and -gate PRB uses sections of vertical hydraulic barriers to direct groundwater flow through permeable reactive media sections that allow the groundwater to pass through while treating contaminants. In both configurations, the permeability of the reactive media must be greater than the aquifer to ensure flow is not diverted around the PRB media. For FGD Ponds, PRB system would be constructed along the downgradient edge of the ponds to provide control of the cobalt groundwater plume.

PRB systems are generally considered a proven technology, however, site conditions and the specific contaminants of interest affect the system performance. The potential applicability of a PRB system for the target Appendix IV constituents can be summarized as follows:

- Cobalt - potentially removed using sulfate-reducing media or combination of zero-valent iron (ZVI) and organic material (Ludwig 2002; ITRC 2011).

Removal of the target Appendix IV constituents using a PRB system has not been consistently demonstrated under full-scale conditions and bench/pilot-scale testing would be required to confirm the effectiveness of a PRB system at the Site. A groundwater model would be needed to evaluate the remedial timeframes.

Similar to a vertical hydraulic barrier, construction of a PRB system is expected to require significant effort and time. Prior to implementation of the PRB, pre-design field work, including site investigations, groundwater modeling, and bench-scale soil mix testing would be required, followed by full-scale design and construction. The estimated time to implement a PRB system is estimated to be approximately 5 to 8 years, including testing, design, and construction. The estimated time to achieve GWPS for the target Appendix IV constituents is dependent on site-specific conditions and groundwater modeling is needed to better evaluate remedial timeframes however, as stated previously, groundwater cobalt concentrations downgradient of the FGD Ponds did not exceed the GWPS for cobalt in 2019 and 2020.

### 4.3.5 In-situ Chemical Treatment

In-situ Chemical Treatment (ICT) involves the injection of a chemical reagent or other material into the groundwater aquifer to adjust the geochemistry to enhance the direct precipitation, co-precipitation, or related adsorption/precipitation of the target contaminants (USEPA 2019c). Direct precipitation occurs when a

constituent exceeds its solubility in water and precipitates out of solution. Co-precipitation refers to the removal of a constituent through adsorption onto the precipitate of another chemical reaction.

Cobalt has the potential to be removed through adsorption and/or coprecipitation under reducing groundwater conditions (Goldemund and Robb 2018).

Injection wells would be installed into the aquifer along the downgradient edge of the FGD Ponds and the chemical reagents would be injected to provide control of the target Appendix IV constituent groundwater plume.

ICT is considered an emerging remediation technology for the target Appendix IV constituents and the effectiveness of the technology on most of the constituents is uncertain. Bench/pilot-scale testing would be required to confirm the effectiveness of an ICT system at the Site. The estimated time to implement an ICT system is estimated to be approximately 5 to 8 years, including testing, design, and construction. The estimated time to achieve GWPS for the target Appendix IV constituents is dependent on site-specific conditions and groundwater modeling is needed to better evaluate remedial timeframes however, as stated previously, groundwater cobalt concentrations downgradient of the FGD Ponds did not exceed the GWPS for cobalt in 2019 and 2020

### 4.3.6 Phytoremediation

Phytoremediation refers to the use of plants to partially or substantially remediate selected contaminants in contaminated soil, sludge, sediment, ground water, surface water, and wastewater (USEPA 2001). The process utilizes a variety of plant biological processes and plant physical characteristics to aid in remediation; however, the primary plant process potentially applicable to the target Appendix IV constituents at the Site is phytoextraction, which is the uptake and accumulation of contaminants within aboveground portions of a plant. The contaminants are removed from the Site when the plants are harvested and managed off-site.

Phytoextraction occurs in the root zone of plants, which is typically relatively shallow, with the bulk of roots at shallower rather than deeper depths. This would limit the effectiveness of phytoextraction at the Site due to the depth of groundwater. Phytoremediation for cobalt removal from groundwater has not been demonstrated under full-scale conditions (USEPA 2001).

Implementation of a phytoremediation process at the Site would involve planting appropriate vegetation at intervals along the downgradient edge of the FGD Ponds and across the affected groundwater plume area. A comprehensive bench/pilot testing program would be required to select the most appropriate plants for removal of the target Appendix IV constituents from groundwater at the Site. Since the target Appendix IV constituents would likely accumulate in the plants, management of harvested plants in accordance with RCRA could be required. The estimated time to implement an ICT system is estimated to be approximately 15 to 20 years, based on the success and rate of vegetation growth. The estimated time to achieve GWPS for the target Appendix IV constituents is dependent on site-specific conditions and groundwater modeling is needed to better evaluate remedial timeframes however, as stated previously, groundwater cobalt concentrations downgradient of the FGD Ponds did not exceed the GWPS for cobalt in 2019 and 2020.

### 4.3.7 Screening of Potential Groundwater Response Technologies

Following identification of potential groundwater response technologies, Golder screened the potential options for further consideration in developing potential corrective measures alternatives for the FGD Ponds. The screening results for each potential source technology are summarized in Table 2. Based on the initial screening, the

following potential groundwater response technologies were retained for future evaluation as part of the corrective measures alternatives for the FGD Ponds:

- Monitored Natural Attenuation
- Groundwater Extraction and Treatment
- Vertical Hydraulic Barrier

## 4.4 Potential Corrective Measures Alternatives

Based on the response technology screening discussed above, Golder assembled the following potential corrective measures alternatives that could be both effective and implementable at the Site:

- Retrofit Liner in FGD-A with Monitored Natural Attenuation
- Retrofit Liner in FGD-A with Groundwater Extraction and Treatment
- Retrofit Liner in FGD-A with Vertical Hydraulic Barrier

A summary of the corrective measure alternatives, including an assessment of each alternative against the evaluation criteria presented in §257.96(c) is provided in Table 3.

## 4.5 Remedy Selection

The corrective measure alternative proposed as the remedy for the FGD Ponds will be selected as soon as feasible in accordance with §257.97.

It should also be noted that, for the purposes of this ACM, cobalt concentrations were conservatively assumed to be present at SSLs above the GWPS based on the February 2019 SSL notification. However, as discussed in Sections 3.4-3.6, all CCR monitoring wells and nature and extent wells exhibited cobalt concentrations below the GWPS in 2019 and 2020 and naturally occurring sources of cobalt exist in the vicinity of the FGD Ponds. Cobalt concentrations in groundwater will continue to be monitored in accordance with the CCR rule to confirm that the concentrations remain below the GWPS in the future. These monitoring results, along with updated statistical analysis and alternate source demonstrations (if applicable), will be considered as part of the remedy selection process.

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# Signature Page

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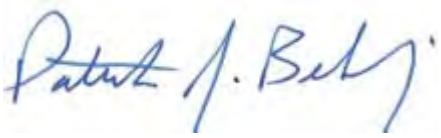

Patrick J. Behling, P.E.
*Principal Engineer*

William F. Vienne, P.G.
*Senior Hydrogeologist*

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# TABLES

**TABLE 1**
**APPENDIX IV GROUNDWATER ANALYTICAL DATA SUMMARY**
**FGD PONDS**
**OAK GROVE STEAM ELECTRIC STATION**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | F (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Tl (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GWPS*:** | | 0.006 | 0.0146 | 2 | 0.004 | 0.005 | 0.1 | 0.016 | 4 | 0.015 | 0.15 | 0.002 | 0.1 | 0.05 | 0.002 | -- | -- | 11.2 |
| **Background Wells** | | | | | | | | | | | | | | | | | | |
| FGD-8 | 11/04/15 | <0.0008 | <0.002 | 0.119 | <0.0003 | <0.0003 | 0.00542 | <0.003 | 0.173 J | <0.0003 | 0.149 | <0.00008 | 0.0261 | <0.002 | <0.0005 | 0.671 | 1.38 | 2.05 |
| | 12/17/15 | <0.0008 | <0.002 | 0.179 | <0.0003 | <0.0003 | 0.00373 J | 0.00646 | 0.361 J | <0.0003 | 0.116 | <0.00008 | 0.00404 J | <0.002 | <0.0005 | <0.609 | 1.32 | 1.93 |
| | 02/09/16 | <0.0008 | 0.0115 | 0.892 | <0.0003 | <0.0003 | 0.00234 J | 0.00609 | 0.331 J | 0.000406 J | 0.0104 | <0.00008 | <0.002 | 0.00231 J | <0.0005 | 1.77 | 3.55 | 5.32 |
| | 04/14/16 | <0.0008 | 0.0146 | 0.965 | <0.0003 | <0.0003 | 0.00202 J | 0.00876 | 0.218 J | 0.0016 | 0.016 | <0.00008 | <0.002 | 0.00211 J | <0.0005 | 0.973 | 8.34 | 9.31 |
| | 06/14/16 | <0.0008 | 0.00639 | 0.792 | <0.0003 | <0.0003 | <0.002 | 0.0158 | <0.100 | 0.00137 | 0.015 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.93 | 2.30 | 4.23 |
| | 08/24/16 | <0.0008 | <0.002 | 0.102 | 0.000417 J | <0.0003 | 0.0107 | 0.015 | 0.186 J | 0.00381 | 0.0265 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.778 | <0.491 | 1.27 |
| | 10/05/16 | <0.0008 | 0.00661 | 0.753 | <0.0003 | <0.0003 | 0.00672 | 0.00899 | 0.413 | 0.000908 J | 0.0224 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.35 | 5.96 | 7.31 |
| | 12/23/16 | <0.0008 | 0.0119 | 0.894 | <0.0003 | <0.0003 | 0.00259 J | 0.00745 | <0.100 | 0.00228 | 0.0185 | <0.00008 | <0.002 | 0.00217 J | <0.0005 | 2.17 | 3.70 | 5.87 |
| | 06/05/18 | <0.0008 | 0.00839 | 0.834 | <0.0003 | <0.0003 | <0.002 | 0.0193 | <0.100 | 0.00039 J | 0.0128 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.5 | 5.13 | 6.63 |
| | 09/06/18 | NA | 0.0137 | 0.635 | <0.0003 | <0.0003 | <0.002 | 0.0243 | 0.362 J | <0.0003 | 0.009 J | NA | <0.002 | 0.0025 J | <0.0005 | 0.349 | 1.4 | 1.75 |
| | 05/16/19 | <0.0008 | 0.0126 | 0.864 | <0.0003 | <0.0003 | 0.003 J | 0.0146 | <0.100 | <0.00194 | 0.009 J | <0.00008 | <0.002 | 0.0027 J | <0.0005 | 3.14 | 5.27 | 8.41 |
| | 08/19/19 | <0.0008 | 0.00645 | 0.608 | <0.0003 | <0.0003 | <0.002 | 0.0135 | <0.100 | 0.00134 | 0.0144 | <0.00008 | <0.002 | 0.00252 | <0.0005 | 1.79 | 6.82 | 8.61 |
| | 05/11/20 | <0.000800 | 0.00663 | 0.732 | <0.0003 | <0.000300 | <0.00200 | 0.0084 | <0.100 | 0.000415 J | 0.0152 | <0.00008 | <0.002 | 0.0021 J | <0.0005 | 2.07 | 6.58 | 8.65 |
| | 09/15/20 | NA | 0.00796 | 0.777 | <0.0003 | NA | 0.00287 J | 0.00379 J | <0.100 | 0.00107 | 0.00864 J | NA | <0.002 | <0.002 | <0.0005 | 2.5 | 6.2 | 8.7 |
| FGD-11 | 11/04/15 | <0.0008 | <0.002 | 0.0527 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | 0.000727 J | 0.0144 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.928 | <1.41 | 2.34 |
| | 12/17/15 | <0.0008 | <0.002 | 0.0676 | 0.000303 J | <0.0003 | <0.002 | <0.003 | 0.13 J | 0.000987 J | 0.016 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.786 | <1.63 | 2.42 |
| | 02/09/16 | <0.0008 | <0.002 | 0.271 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.548 | <0.0003 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.39 | 2.64 | 4.03 |
| | 04/14/16 | <0.0008 | <0.002 | 0.26 | <0.0003 | <0.0003 | 0.00222 J | <0.003 | 0.671 | 0.0012 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.69 | 2.43 | 4.12 |
| | 06/15/16 | <0.0008 | <0.002 | 0.216 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.331 J | 0.000407 J | 0.0126 | <0.00008 | 0.00238 J | <0.002 | <0.0005 | 2.34 | 2.06 | 4.40 |
| | 08/25/16 | <0.0008 | <0.002 | 0.439 | <0.0003 | <0.0003 | 0.00465 J | <0.003 | 0.128 J | 0.00179 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 4.23 | 3.58 | 7.81 |
| | 10/04/16 | <0.0008 | <0.002 | 0.55 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.579 | 0.000618 J | 0.0124 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.73 | 2.53 | 4.26 |
| | 12/22/16 | <0.0008 | <0.002 | 0.734 | <0.0003 | <0.0003 | 0.00258 J | <0.003 | 0.127 J | 0.000635 J | 0.0124 | <0.00008 | <0.002 | <0.002 | <0.0005 | 3.94 | 5.09 | 9.03 |
| | 06/05/18 | <0.0008 | <0.002 | 0.520 | <0.0003 | <0.0003 | 0.0372 | 0.007 | 0.836 | 0.00891 J | 0.0102 | <0.00008 | 0.00266 J | <0.002 | <0.0005 | 4.64 | 4.22 | 8.86 |
| | 09/06/18 | NA | <0.002 | 0.702 | <0.0003 | <0.0003 | 0.0039 J | <0.003 | 1.09 | <0.0003 | 0.0121 | NA | <0.002 | <0.002 | <0.0005 | 6.24 | 6.47 | 12.71 |
| | 05/16/19 | <0.0008 | <0.002 | 0.347 | <0.0003 | <0.0003 | 0.028 | <0.003 | 0.38 J | 0.000576 J | 0.0145 | <0.00008 | 0.00358 J | <0.002 | <0.0005 | 2.39 | 2.75 | 5.14 |
| | 08/19/19 | <0.0008 | <0.002 | 0.310 | <0.0003 | <0.0003 | 0.00391 J | <0.003 | 0.63 | <0.0003 | 0.0136 | <0.00008 | 0.00238 J | <0.002 | <0.0005 | 1.39 | 2.55 | 3.95 |
| | 05/11/20 | <0.000800 | <0.002 | 0.347 | <0.0003 | <0.000300 | 0.0146 | <0.003 | 0.365 J | 0.000658 J | 0.0132 | <0.00008 | <0.002 | <0.002 | <0.0005 | 2.39 | 4.00 | 6.39 |
| | 09/10/20 | NA | <0.002 | 0.330 | <0.0003 | NA | 0.0158 | <0.003 | 0.575 | 0.000706 J | 0.0121 | NA | <0.002 | <0.002 | <0.0005 | 3.35 | 4.69 | 8.04 |
| **Downgradient Wells** | | | | | | | | | | | | | | | | | | |
| FGD-1 | 11/03/15 | <0.0008 | <0.002 | 0.0311 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.363 J | <0.0003 | 0.034 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.718 | <1.40 | 2.12 |
| | 12/17/15 | <0.0008 | <0.002 | 0.0263 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.384 J | <0.0003 | 0.0306 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.919 | <1.43 | 2.35 |
| | 02/09/16 | <0.0008 | <0.002 | 0.0315 | <0.0003 | <0.0003 | 0.00437 J | 0.0033 J | 0.383 J | 0.000379 J | 0.0314 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.318 | 1.42 | 1.74 |
| | 04/14/16 | <0.0008 | <0.002 | 0.0296 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.229 J | <0.0003 | 0.0338 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.439 | <1.28 | <1.719 |
| | 06/15/16 | <0.0008 | <0.002 | 0.0276 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.302 J | <0.0003 | 0.0321 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.258 | 1.66 | 1.92 |
| | 08/24/16 | <0.0008 | <0.002 | 0.0294 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.225 J | <0.0003 | 0.033 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.188 | 2.24 | 2.43 |
| | 10/05/16 | <0.0008 | <0.002 | 0.0319 | <0.0003 | <0.0003 | <0.002 | 0.00447 J | 0.483 | <0.0003 | 0.0331 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.430 | 0.507 | 0.94 |
| | 12/22/16 | <0.0008 | <0.002 | 0.0418 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.326 J | <0.0003 | 0.0385 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.273 | <0.645 | <0.918 |
| | 06/05/18 | <0.0008 | <0.002 | 0.0422 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.206 J | <0.0003 | 0.0426 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.194 | <0.7680 | 0.962 |
| | 09/06/18 | NA | <0.002 | 0.0417 | <0.0003 | <0.0003 | <0.002 | 0.0033 J | 0.228 J | <0.0003 | 0.0436 | NA | <0.002 | <0.002 | 0.0005 | 0.209 | <0.53 | 0.739 |
| | 05/16/19 | <0.0008 | <0.002 | 0.0485 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.362 J | <0.0003 | 0.0442 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.33 | <0.59 | 0.923 |
| | 08/19/19 | <0.0008 | <0.002 | 0.0538 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.486 | <0.0003 | 0.0441 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.489 | 1.09 | 1.57 |
| | 05/11/20 | <0.000800 | <0.002 | 0.131 | <0.0003 | <0.000300 | <0.00200 | 0.0495 | 0.231 J | <0.0003 | 0.0548 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.08 | 0.808 | 1.89 |
| | 09/15/20 | NA | <0.002 | 0.162 | <0.0003 | NA | <0.00200 | <0.003 | 0.215 J | 0.000342 J | 0.0233 | NA | <0.002 | <0.002 | <0.0005 | 0.664 | 1.66 | 2.32 |

**TABLE 1**
**APPENDIX IV GROUNDWATER ANALYTICAL DATA SUMMARY**
**FGD PONDS**
**OAK GROVE STEAM ELECTRIC STATION**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | F (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Tl (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GWPS*:** | | 0.006 | 0.0146 | 2 | 0.004 | 0.005 | 0.1 | 0.016 | 4 | 0.015 | 0.15 | 0.002 | 0.1 | 0.05 | 0.002 | -- | -- | 11.2 |
| FGD-2 | 11/03/15 | <0.0008 | <0.002 | 0.146 | <0.0003 | <0.0003 | 0.00244 J | <0.003 | 0.224 J | <0.0003 | 0.0224 | <0.00008 | <0.002 | 0.0203 | <0.0005 | <0.249 | 1.97 | 2.22 |
| | 12/17/15 | <0.0008 | <0.002 | 0.103 | <0.0003 | <0.0003 | 0.00386 J | <0.003 | 0.347 J | 0.00145 | 0.0183 | <0.00008 | <0.002 | 0.0127 | <0.0005 | 1.030 | <1.24 | 2.27 |
| | 02/09/16 | <0.0008 | <0.002 | 0.133 | <0.0003 | <0.0003 | 0.00426 J | <0.003 | 0.315 J | <0.0003 | 0.0221 | <0.00008 | <0.002 | 0.0181 | <0.0005 | 0.669 | 1.81 | 2.48 |
| | 04/14/16 | <0.0008 | <0.002 | 0.129 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.192 J | <0.0003 | 0.0196 | <0.00008 | <0.002 | 0.0166 | <0.0005 | 0.198 | <2.03 | 2.23 |
| | 06/14/16 | <0.0008 | <0.002 | 0.091 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.122 J | <0.0003 | 0.0243 | <0.00008 | <0.002 | 0.0189 | <0.0005 | 0.275 | 1.66 | 1.94 |
| | 08/24/16 | <0.0008 | <0.002 | 0.144 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | 0.019 | <0.00008 | <0.002 | 0.0185 | <0.0005 | 2.47 | 0.769 | 3.24 |
| | 10/05/16 | <0.0008 | <0.002 | 0.129 | <0.0003 | <0.0003 | 0.00549 | <0.003 | 0.243 J | 0.000693 J | 0.0199 | <0.00008 | <0.002 | 0.0176 | <0.0005 | 0.716 | 1.70 | 2.42 |
| | 12/22/16 | <0.0008 | <0.002 | 0.158 | <0.0003 | <0.0003 | <0.002 | <0.003 | <0.1 | <0.0003 | 0.0217 | <0.00008 | <0.002 | 0.022 | <0.0005 | 0.345 | 1.79 | 2.14 |
| | 06/05/18 | <0.0008 | <0.002 | 0.108 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.185 J | <0.0003 | 0.0226 | <0.00008 | <0.002 | 0.0185 | <0.0005 | 0.505 | 1.12 | 1.63 |
| | 09/06/18 | NA | <0.002 | 0.125 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.32 J | <0.0003 | 0.0253 | NA | <0.002 | 0.0204 | <0.0005 | 0.641 | 0.822 | 1.46 |
| | 05/16/19 | <0.0008 | <0.002 | 0.0993 | <0.0003 | <0.0003 | 0.003 J | <0.003 | 0.383 J | <0.0003 | 0.0228 | 0.00008 | <0.002 | 0.0214 | <0.0005 | 0.648 | 0.588 | 1.24 |
| | 08/19/19 | <0.0008 | <0.002 | 0.181 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.413 | <0.0003 | 0.0257 | <0.00008 | <0.002 | 0.0249 | <0.0005 | 0.456 | 2.8 | 3.26 |
| | 05/11/20 | <0.000800 | <0.002 | 0.108 | <0.0003 | <0.000300 | 0.00234 J | <0.003 | <0.100 | <0.0003 | 0.028 | <0.00008 | <0.002 | 0.0208 | <0.0005 | 0.677 | 2.08 | 2.76 |
| | 09/10/20 | NA | <0.002 | 0.104 | <0.0003 | NA | 0.00239 J | <0.003 | <0.100 | <0.0003 | 0.0250 | NA | <0.002 | 0.0217 | <0.0005 | 0.744 | 0.29 | 1.03 |
| FGD-3 | 11/03/15 | <0.0008 | 0.00226 J | 0.0417 | <0.0003 | 0.00492 | <0.002 | 0.0436 | 0.505 | <0.0003 | 0.176 | <0.00008 | <0.002 | 0.0881 | 0.0017 | 0.930 | 3.18 | 4.11 |
| | 12/17/15 | <0.0008 | 0.00215 J | 0.0371 | 0.000475 J | 0.00372 | <0.002 | 0.0399 | <0.1 | <0.0003 | 0.14 | <0.00008 | <0.002 | 0.0798 | 0.0016 | 1.70 | 2.66 | 4.36 |
| | 02/09/16 | <0.0008 | 0.00206 J | 0.0407 | <0.0003 | 0.00343 | <0.002 | 0.0417 | 0.74 | 0.000438 J | 0.13 | <0.00008 | <0.002 | 0.0907 | 0.0015 J | 1.04 | 3.37 | 4.41 |
| | 04/14/16 | <0.0008 | 0.00218 J | 0.0371 | <0.0003 | 0.00212 | <0.002 | 0.0326 | 0.69 | <0.0003 | 0.119 | <0.00008 | <0.002 | 0.064 | 0.00137 J | <0.276 | <1.35 | <1.626 |
| | 06/14/16 | <0.0008 | 0.00205 J | 0.0392 | <0.0003 | 0.00156 | <0.002 | 0.0261 | 0.173 J | <0.0003 | 0.107 | <0.00008 | <0.002 | 0.0447 | 0.00126 J | 0.754 | 1.56 | 2.31 |
| | 08/24/16 | <0.0008 | 0.00221 J | 0.0387 | <0.0003 | 0.00146 | <0.002 | 0.0232 | 0.463 | <0.0003 | 0.0974 | <0.00008 | <0.002 | 0.0272 | 0.00123 J | 0.416 | 2.60 | 3.02 |
| | 10/05/16 | <0.0008 | 0.00225 J | 0.039 | <0.0003 | 0.00152 | <0.002 | 0.0226 | 0.723 | <0.0003 | 0.113 | <0.00008 | <0.002 | 0.0276 | 0.00114 J | 0.455 | 2.44 | 2.90 |
| | 12/22/16 | <0.0008 | 0.00226 J | 0.0437 | <0.0003 | 0.00173 | <0.002 | 0.0266 | 1.32 | <0.0003 | 0.11 | <0.00008 | <0.002 | 0.0245 | 0.00124 J | <0.352 | 2.46 | 2.81 |
| | 06/05/18 | <0.0008 | 0.00236 J | 0.0391 | <0.0003 | 0.00152 | <0.002 | 0.0207 | 1.06 | <0.0003 | 0.0975 | <0.00008 | 0.00212 J | 0.0192 | 0.000985 J | 0.528 | 2.19 | 2.72 |
| | 09/05/18 | NA | 0.00208 J | 0.0379 | <0.0003 | 0.00146 | <0.002 | 0.0192 | 1.03 | <0.0003 | 0.0955 | NA | 0.0021 J | 0.0213 | 0.000925 J | <0.323 | 0.704 | 1.03 |
| | 05/16/19 | <0.0008 | 0.0023 J | 0.051 | <0.0003 | <0.0003 | <0.002 | 0.0052 | 0.776 | <0.0003 | 0.057 | <0.00008 | 0.0031 J | 0.0423 | 0.0006 J | <0.403 | <0.638 | <1.041 |
| | 08/19/19 | <0.0008 | 0.00248 J | 0.0365 | <0.0003 | <0.0003 | <0.002 | 0.00364 J | 0.874 | <0.0003 | 0.0546 | <0.00008 | 0.00231 J | 0.0245 | 0.000588 J | 0.523 | 0.858 | 1.38 |
| | 05/06/20 | <0.000800 | 0.00209 J | 0.0353 | <0.0003 | <0.000300 | 0.0117 | 0.00332 J | 0.8 | <0.0003 | 0.0498 | <0.00008 | 0.00284 J | 0.00993 | 0.000556 J | 0.394 | 0.463 | 0.857 |
| | 09/15/20 | NA | 0.00225 J | 0.0326 | <0.0003 | NA | <0.00200 | <0.003 | 0.772 | <0.0003 | 0.0416 | NA | 0.00245 J | 0.00646 | 0.000534 J | 0.257 | 0.484 | 0.711 |
| FGD-4 | 11/03/15 | <0.0008 | <0.002 | 0.126 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.294 J | <0.0003 | 0.0433 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.01 | <1.39 | 2.40 |
| | 12/17/15 | <0.0008 | <0.002 | 0.105 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.295 J | <0.0003 | 0.0436 | 0.000229 | 0.00211 J | 0.00214 J | <0.0005 | <0.361 | <1.73 | <2.091 |
| | 02/09/16 | <0.0008 | <0.002 | 0.113 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.32 J | <0.0003 | 0.0419 | 0.000288 | <0.002 | <0.002 | <0.0005 | <0.332 | <1.11 | <1.442 |
| | 04/14/16 | <0.0008 | <0.002 | 0.12 | <0.0003 | <0.0003 | 0.00208 J | <0.003 | 0.323 J | 0.0271 | 0.0357 | 0.000232 | <0.002 | <0.002 | <0.0005 | 0.560 | <1.21 | 1.77 |
| | 06/14/16 | <0.0008 | <0.002 | 0.128 | <0.0003 | 0.000561 J | <0.002 | <0.003 | <0.1 | <0.0003 | 0.0477 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.437 | <0.975 | 1.41 |
| | 08/24/16 | <0.0008 | <0.002 | 0.111 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.148 J | 0.000578 J | 0.0383 | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.199 | 0.625 | 0.82 |
| | 10/05/16 | <0.0008 | <0.002 | 0.106 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.376 J | 0.000489 J | 0.0353 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.308 | 1.30 | 1.61 |
| | 12/22/16 | <0.0008 | <0.002 | 0.114 | <0.0003 | <0.0003 | 0.0023 J | <0.003 | 0.251 J | <0.0003 | 0.0273 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.227 | <0.667 | 0.89 |
| | 06/04/18 | <0.0008 | <0.002 | 0.119 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.297 J | <0.0003 | 0.0265 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.261 | <0.923 | 1.184 |
| | 09/05/18 | NA | <0.002 | 0.108 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.353 J | <0.0003 | 0.0199 | NA | <0.002 | <0.002 | <0.0005 | <0.39 | 0.673 | 1.063 |
| | 05/16/19 | <0.0008 | <0.002 | 0.117 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.327 J | <0.0003 | 0.0325 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.627 | 0.745 | 1.372 |
| | 08/19/19 | <0.0008 | <0.002 | 0.1 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.67 | <0.0003 | 0.019 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.39 | 1.58 | 1.97 |
| | 05/11/20 | <0.000800 | <0.002 | 0.104 | <0.0003 | <0.000300 | <0.00200 | <0.003 | 0.3 J | <0.0003 | 0.0166 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.15 | 1.2 | 1.35 |
| | 09/15/20 | NA | <0.002 | 0.0899 | <0.0003 | NA | <0.00200 | <0.003 | <0.100 | <0.0003 | 0.0140 | NA | <0.002 | <0.002 | <0.0005 | 0.498 | -0.0258 | 0.498 |

**TABLE 1**
**APPENDIX IV GROUNDWATER ANALYTICAL DATA SUMMARY**
**FGD PONDS**
**OAK GROVE STEAM ELECTRIC STATION**

| Sample Location | Date Sampled | Sb (mg/L) | As (mg/L) | Ba (mg/L) | Be (mg/L) | Cd (mg/L) | Cr (mg/L) | Co (mg/L) | F (mg/L) | Pb (mg/L) | Li (mg/L) | Hg (mg/L) | Mo (mg/L) | Se (mg/L) | Tl (mg/L) | Ra 226 (pCi/L) | Ra 228 (pCi/L) | Ra 226/228 Combined^ (pCi/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GWPS*:** | | 0.006 | 0.0146 | 2 | 0.004 | 0.005 | 0.1 | 0.016 | 4 | 0.015 | 0.15 | 0.002 | 0.1 | 0.05 | 0.002 | -- | -- | 11.2 |
| FGD-5 | 11/04/15 | <0.0008 | <0.002 | 0.13 | <0.0003 | 0.000557 J | 0.0121 | <0.003 | 0.227 J | <0.0003 | 0.17 | <0.00008 | 0.0445 | <0.002 | <0.0005 | 0.449 | 1.52 | 1.97 |
| | 12/17/15 | <0.0008 | <0.002 | 0.237 | <0.0003 | 0.000593 J | 0.0391 | 0.0164 | 0.469 | 0.000369 J | 0.156 | <0.00008 | 0.0203 | <0.002 | <0.0005 | 1.23 | 3.63 | 4.86 |
| | 02/09/16 | <0.0008 | <0.002 | 0.261 | <0.0003 | <0.0003 | <0.002 | 0.00441 J | 0.495 | <0.0003 | 0.158 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.99 | 1.50 | 3.49 |
| | 04/14/16 | <0.0008 | <0.002 | 0.224 | <0.0003 | 0.000392 J | 0.00477 J | <0.003 | 0.491 | <0.0003 | 0.164 | <0.00008 | 0.0183 | <0.002 | <0.0005 | 0.951 | <1.24 | 2.19 |
| | 06/15/16 | <0.0008 | <0.002 | 0.174 | <0.0003 | <0.0003 | 0.00599 | <0.003 | 0.284 J | <0.0003 | 0.162 | <0.00008 | 0.0144 | <0.002 | <0.0005 | 0.429 | 1.25 | 1.68 |
| | 08/24/16 | <0.0008 | <0.002 | 0.173 | <0.0003 | <0.0003 | 0.0189 | <0.003 | 0.168 J | 0.00045 J | 0.145 | <0.00008 | 0.00814 | <0.002 | <0.0005 | 0.398 | <0.643 | 1.04 |
| | 10/05/16 | <0.0008 | <0.002 | 0.229 | <0.0003 | <0.0003 | 0.00304 J | <0.003 | 0.38 J | <0.0003 | 0.153 | <0.00008 | 0.00355 J | <0.002 | <0.0005 | 0.877 | 1.16 | 2.04 |
| | 12/22/16 | <0.0008 | <0.002 | 0.261 | <0.0003 | <0.0003 | <0.002 | 0.00471 J | 0.291 J | <0.0003 | 0.152 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.579 | <0.76 | 1.34 |
| | 06/05/18 | <0.0008 | <0.002 | 0.136 | <0.0003 | <0.0003 | 0.00935 | <0.003 | 0.511 | <0.0003 | 0.154 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.705 | <0.765 | 1.47 |
| | 09/06/18 | NA | <0.002 | 0.215 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.548 | <0.0003 | 0.155 | NA | <0.002 | <0.002 | <0.0005 | 0.535 | 1.31 | 1.845 |
| | 05/16/19 | <0.0008 | <0.002 | 0.0926 | <0.0003 | <0.0003 | 0.024 | <0.003 | 0.579 | <0.0003 | 0.145 | <0.00008 | 0.003 J | <0.002 | <0.0005 | 0.342 | <0.506 | 0.848 |
| | 08/19/19 | <0.0008 | <0.002 | 0.106 | <0.0003 | <0.0003 | 0.0103 | <0.003 | 0.863 | <0.0003 | 0.152 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.551 | 0.659 | 1.21 |
| | 05/11/20 | <0.000800 | <0.002 | 0.0959 | <0.0003 | <0.000300 | 0.0374 | <0.003 | 0.413 | <0.0003 | 0.156 | <0.00008 | 0.00561 | <0.002 | <0.0005 | 0.0983 | 5.18 | 5.28 |
| | 09/10/20 | NA | <0.002 | 0.0929 | <0.0003 | NA | 0.0307 | <0.003 | 0.617 | <0.0003 | 0.150 | NA | 0.00362 J | <0.002 | <0.0005 | 0.132 | -0.0787 | 0.132 |
| FGD-6 | 11/03/15 | <0.0008 | <0.002 | 0.124 | <0.0003 | <0.0003 | 0.00253 J | <0.003 | 0.334 J | <0.0003 | 0.0112 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.470 | <1.70 | 2.17 |
| | 12/17/15 | <0.0008 | <0.002 | 0.135 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.333 J | <0.0003 | 0.00964 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.03 | <2.13 | 3.16 |
| | 02/09/16 | <0.0008 | <0.002 | 0.132 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.354 J | <0.0003 | 0.0105 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.801 | <1.71 | 2.51 |
| | 04/14/16 | <0.0008 | <0.002 | 0.122 | <0.0003 | <0.0003 | 0.0568 | <0.003 | 0.442 | <0.0003 | 0.011 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.484 | 2.08 | 2.56 |
| | 06/14/16 | <0.0008 | <0.002 | 0.16 | 0.000309 J | 0.000404 J | <0.002 | 0.00657 | <0.1 | 0.00132 | 0.0092 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.31 | 2.16 | 3.47 |
| | 08/24/16 | <0.0008 | 0.00725 | 0.127 | <0.0003 | <0.0003 | 0.00334 J | 0.00399 J | 0.147 J | 0.000656 J | 0.0089 J | <0.00008 | 0.00244 J | <0.002 | <0.0005 | 0.465 | 0.896 | 1.36 |
| | 10/05/16 | <0.0008 | 0.00536 | 0.117 | <0.0003 | <0.0003 | 0.00427 J | 0.00414 J | 0.364 J | <0.0003 | 0.0099 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.489 | 1.69 | 2.18 |
| | 12/22/16 | <0.0008 | 0.00458 J | 0.129 | <0.0003 | <0.0003 | <0.002 | 0.00352 J | 0.204 J | <0.0003 | 0.0102 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.349 | 0.917 | 1.27 |
| | 06/04/18 | <0.0008 | 0.0021 J | 0.0854 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.361 J | <0.0003 | 0.0098 J | <0.00008 | <0.002 | <0.002 | <0.0005 | <0.277 | <0.964 | <1.241 |
| | 09/05/18 | NA | <0.002 | 0.0824 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.405 | <0.0003 | 0.0094 J | NA | <0.002 | <0.002 | <0.0005 | <0.336 | <0.677 | <1.013 |
| | 05/16/19 | <0.0008 | 0.0294 | 0.107 | <0.0003 | <0.0003 | <0.002 | 0.0132 | 0.669 | <0.0003 | 0.0068 J | <0.00008 | 0.0077 | <0.002 | <0.0005 | 1.43 | 1.67 | 3.1 |
| | 08/19/19 | <0.0008 | 0.0146 | 0.0903 | <0.0003 | <0.0003 | <0.002 | 0.00493 J | 0.741 | <0.0003 | 0.0082 J | <0.00008 | 0.00332 J | <0.002 | <0.0005 | 0.385 | 2.55 | 2.93 |
| | 05/11/20 | <0.000800 | 0.00286 J | 0.0814 | <0.0003 | <0.000300 | <0.00200 | <0.003 | 0.292 J | <0.0003 | 0.00877 J | <0.00008 | 0.00205 J | <0.002 | <0.0005 | 0.513 | 0.845 | 1.36 |
| | 09/15/20 | NA | 0.00651 | 0.0695 | <0.0003 | NA | <0.00200 | 0.00615 | 0.354 J | <0.0003 | 0.00669 J | NA | <0.002 | <0.002 | <0.0005 | 0.485 | 1.08 | 1.57 |
| FGD-12 | 11/04/15 | <0.0008 | <0.002 | 0.0884 | <0.0003 | <0.0003 | 0.0124 | <0.003 | <0.1 | 0.000678 J | 0.0234 | <0.00008 | 0.00221 J | <0.002 | <0.0005 | 1.07 | <1.55 | 2.62 |
| | 12/17/15 | <0.0008 | <0.002 | 0.0781 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.159 J | 0.000775 J | 0.022 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.32 | <2.57 | 3.89 |
| | 02/09/16 | <0.0008 | <0.002 | 0.0664 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.157 J | 0.000339 J | 0.0211 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.771 | <1.53 | 2.30 |
| | 04/14/16 | <0.0008 | <0.002 | 0.104 | <0.0003 | <0.0003 | 0.00425 J | <0.003 | 0.109 J | 0.00371 | 0.0255 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.560 | 1.46 | 2.02 |
| | 06/15/16 | <0.0008 | <0.002 | 0.107 | 0.00039 J | <0.0003 | 0.00269 J | 0.00323 J | 0.101 J | 0.00513 | 0.0192 | 0.000134 J | <0.002 | <0.002 | <0.0005 | 2.01 | 2.06 | 4.07 |
| | 08/25/16 | <0.0008 | 0.00451 J | 0.262 | 0.000629 J | <0.0003 | 0.0135 | 0.00412 J | <0.1 | 0.00842 | 0.0204 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.59 | 1.84 | 3.43 |
| | 10/04/16 | <0.0008 | 0.00402 J | 0.122 | 0.00062 J | <0.0003 | 0.0133 | 0.00395 J | 0.129 J | 0.0084 | 0.0259 | <0.00008 | <0.002 | 0.00292 J | <0.0005 | 1.41 | <0.76 | 2.17 |
| | 12/23/16 | <0.0008 | 0.00938 | 0.557 | <0.0003 | <0.0003 | 0.00435 J | 0.00609 | 0.112 J | 0.00216 | 0.0755 | <0.00008 | <0.002 | 0.00786 | <0.0005 | 1.89 | 3.54 | 5.43 |
| | 06/05/18 | <0.0008 | <0.002 | 0.0777 | 0.00031 | <0.0003 | 0.00578 | <0.003 | 0.137 J | 0.0029 | 0.0213 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.68 | <0.526 | 2.206 |
| | 09/06/18 | NA | <0.002 | 0.0517 | <0.0003 | <0.0003 | 0.0024 J | <0.003 | <0.10 | 0.0005 J | 0.0188 | NA | <0.002 | <0.002 | <0.0005 | <0.304 | <0.5450 | <0.849 |
| | 05/16/19 | 0.0008 | <0.002 | 0.0474 | <0.0003 | <0.0003 | 0.0030 J | <0.003 | <0.10 | 0.0003 J | 0.0221 | <0.00008 | <0.002 | <0.002 | <0.0005 | 0.385 | 1.43 | 1.82 |
| | 08/19/19 | <0.0008 | <0.002 | 0.0631 | <0.0003 | <0.0003 | 0.00218 J | <0.003 | 0.145 J | 0.00139 | 0.0251 | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.12 | 3.52 | 4.64 |
| | 05/11/20 | <0.000800 | 0.0116 | 0.23 | 0.00166 | <0.000300 | 0.037 | 0.00883 | <0.100 | 0.0249 | 0.0371 | <0.00008 | <0.002 | 0.00678 | 0.000651 | 5.96 | 10.7 | 16.6 |
| | 09/10/20 | NA | 0.00252 J | 0.0922 | 0.000375 J | NA | 0.00723 | <0.003 | <0.100 | 0.00402 | 0.0235 | NA | <0.002 | 0.00254 J | <0.0005 | 2.59 | 6.72 | 9.31 |
| FGD-14 | 05/17/19 | NA | NA | NA | NA | NA | NA | <0.003 | NA | NA | 0.00564 | NA | NA | <0.002 | NA | NA | NA | NA |
| | 08/19/19 | <0.0008 | <0.002 | 0.426 | <0.0003 | <0.0003 | <0.002 | <0.003 | 0.318 J | <0.0003 | 0.0054 J | <0.00008 | <0.002 | <0.002 | <0.0005 | 1.35 | 2.22 | 3.57 |
| FGD-15 | 06/06/19 | NA | NA | NA | NA | NA | NA | NA | 0.622 | NA | 0.0768 | NA | NA | NA | NA | NA | NA | NA |
| | 08/19/19 | <0.0008 | <0.002 | 0.0236 | <0.0003 | 0.000838 J | <0.002 | <0.003 | 0.483 | 0.000934 J | 0.0823 | <0.00008 | <0.002 | 0.0221 | <0.0005 | 0.604 | 1.55 | 2.15 |
| FGD-16 | 06/06/19 | NA | NA | NA | NA | NA | NA | NA | 0.164 J | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Notes:
1. Abbreviations: mg/l - milligrams per liter; pCi/L - picocuries per liter.
2. ^ - Sum of Ra 226 and Ra 228 concentrations. Non-detect isotope results were assigned a value equal to the minimum detectable concentration.
3. J - Concentration is below method quantitation limit; result is an estimate.
4. NA - not analyzed.

**Table 2**

**Screening of Potential Groundwater Response Technologies**
**Oak Grove Steam Electric Station**
**FGD Ponds**

| Groundwater Response Technology | Description | Protective of Human Health and Environment | Attain Groundwater Protection Standard | Control Source of Release | Remove Contaminated Material From Environment | RCRA Compliance | Screening Comments | Retained for Further Evaluation |
|---|---|---|---|---|---|---|---|---|
| Monitored Natural Attenuation | Natural processes (dispersion, dilution, sorption, coprecipitation, degradation/transformation, etc.) remove CCR constituents from groundwater in-situ. Groundwater monitoring to verify MNA effectiveness. | Migration of CCR constituents in groundwater controlled and CCR concentrations in groundwater reduced. | CCR constituents removed through adsorption, precipitation or coprecipitation. CCR constituents removed from groundwater and retained in aquifer soil matrix to achieve GWPS below and downgradient of CCR Unit. | CCR constituents removed from groundwater below and downgradient of CCR Unit. | CCR constituents removed from groundwater and retained in aquifer soil matrix. | Purge water from groundwater monitoring requires management in accordance with applicable RCRA requirements. | Site is good MNA candidate for CCR constituents based on field MNA evaluation. Long-term groundwater monitoring required. Easy to implement. Groundwater modelling required to assess remediation timeframe. | Yes |
| Groundwater Extraction and Treatment | System of extraction wells along downgradient edge of ponds to provide hydraulic control of CCR constituent groundwater plumes. Extracted groundwater treated in an on-site treatment system and discharged to Twin Oaks Reservoir or re-injected into aquifer. Groundwater monitoring to verify system effectiveness. | Migration of CCR constituents in groundwater controlled. | GWPS attained downgradient of CCR Unit, but limited effect on concentrations beneath unit. | CCR groundwater constituents contained at edge of ponds. | CCR constituents removed from extracted groundwater by treatment system. Treatment residuals (sludge, regenerate brine, etc.) require management. | Treatment residuals (sludge, regenerate brine, etc.) require management in accordance with applicable RCRA requirements. | Regulatory authorization for treated water discharge required. Bench/pilot testing of treatment system required. Groundwater modelling required to assess remediation timeframe. | Yes |
| Vertical Hydraulic Barrier | Vertical, low permeability hydraulic barrier along downgradient edge of ponds to provide hydraulic control of CCR constituent groundwater plumes. Groundwater extraction and treatment required upgradient of barrier to control groundwater elevations. Groundwater monitoring to verify system effectiveness. | Migration of CCR constituents in groundwater controlled. | GWPS attained downgradient of CCR Unit, but limited effect on concentrations beneath unit. | CCR groundwater constituents contained at edge of ponds. | CCR constituents removed from extracted groundwater by treatment system. Treatment residuals (sludge, regenerate brine, etc.) require management. | Excavated soil generated from barrier installation requires testing and management as necessary. Treatment residuals (sludge, regenerate brine, etc.) require management in accordance with applicable RCRA requirements. | Bench/pilot test of barrier materials likely required. Regulatory authorization for treated water discharge required. Bench/pilot testing of treatment system required. Groundwater modelling required to assess remediation timeframe. | Yes |

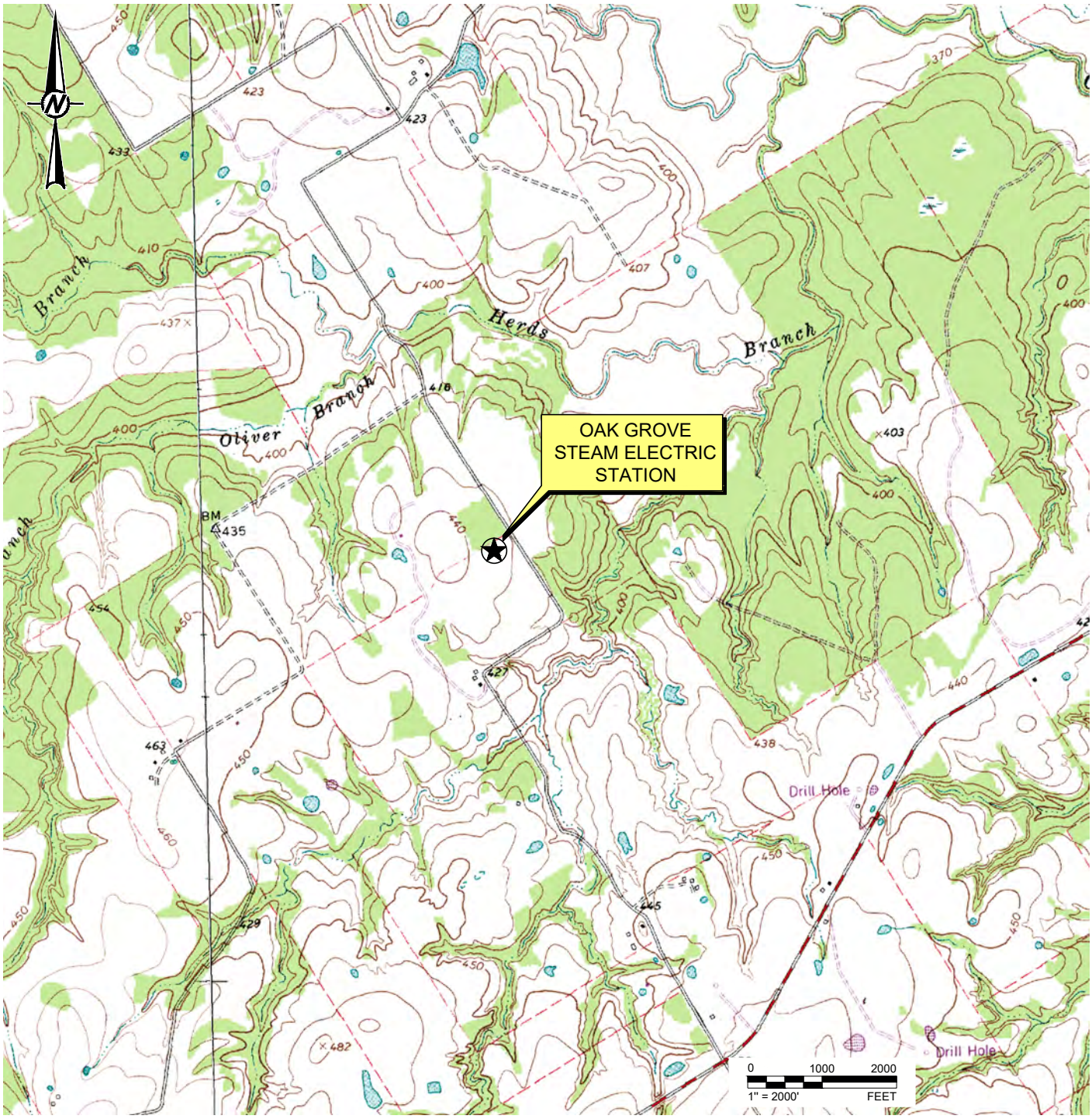
| Groundwater Response Technology | Description | Protective of Human Health and Environment | Attain Groundwater Protection Standard | Control Source of Release | Remove Contaminated Material From Environment | RCRA Compliance | Screening Comments | Retained for Further Evaluation |
|---|---|---|---|---|---|---|---|---|
| Permeable Reactive Barrier | In-situ, passive, permeable treatment zone containing reactive media designed to intercept impacted groundwater and adjust geochemistry to immobilize CCR contaminants.<br>CCR constituents removed from groundwater through adsorption and/or coprecipitation under reducing groundwater conditions.<br>PRB acts as a barrier to groundwater contamination but not groundwater flow.<br>Groundwater monitoring to verify system effectiveness. | Migration of CCR constituents in groundwater controlled. | GWPS attained downgradient of CCR Unit, but limited effect on concentrations beneath unit. | CCR groundwater constituents removed from groundwater downgradient of CCR Unit. | CCR constituents removed from groundwater and retained on reactive media or aquifer soil matrix. | Excavated soil generated from PRB installation requires testing and management as necessary. | CCR constituent removal using PRB possible but full-scale performance uncertain.<br>Reactive media effectiveness reduced over time and media likely replaced periodically.<br>Bench/pilot testing of PRB media/system required.<br>Groundwater modelling required to assess remediation timeframe. | No |
| In-Situ Chemical Treatment | Injection of chemical/material into aquifer to adjust geochemistry and enhance precipitation, co-precipitation, or indirect adsorption of CCR constituents.<br>CCR constituents potentially removed through adsorption, precipitation and/or coprecipitation.<br>Groundwater monitoring to verify system effectiveness. | Migration of CCR constituents in groundwater controlled. | GWPS attained downgradient of CCR Unit, but limited effect on concentrations beneath unit. | CCR groundwater constituents removed from groundwater downgradient of CCR Unit. | CCR constituents removed from groundwater and retained on aquifer soil matrix. | No significant RCRA compliance issues anticipated. | ICT considered emerging remediation technology for CCr constituents - not demonstrated under full-scale conditions.<br>Bench/pilot-scale testing of ICT system required.<br>Groundwater modelling required to assess remediation timeframe. | No |
| Phytoremediation | Use of plants to remove CCR constituents through uptake and accumulation within above ground portions of the plant.<br>Primary plant process for CCR constituent removal is phytoextraction (uptake/accumulation of contaminants within aboveground portions of a plant).<br>Groundwater monitoring to verify system effectiveness. | Migration of CCR constituents in groundwater controlled. | GWPS attained downgradient of CCR Unit, but limited effect on concentrations beneath unit. | CCR groundwater constituents removed from groundwater downgradient of CCR Unit. | CCR constituents removed from groundwater and accumulates in plants. | Management of harvested plants in accordance with RCRA may be required if accumulated CCR constituent concentrations are high. | Phytoextraction occurs in shallow root zone of plants, which limits the effectiveness for the groundwater depths at the Site.<br>Phytoremediation for CCR constituent removal from groundwater has not been demonstrated under full-scale conditions<br>Bench/pilot-scale testing of phytoremediation system required.<br>Groundwater modelling required to assess remediation timeframe. | No |

**Table 3**

**Evaluation of Corrective Measures Alternatives**
**Oak Grove Steam Electric Station**
**FGD Ponds**

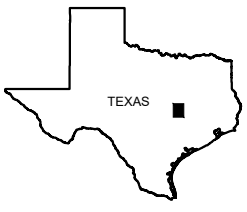
| Corrective Measures Alternative | Description | Performance | Reliability | Ease of Implementation | Potential Impacts | Time Requirements | Institutional Requirements |
|---|---|---|---|---|---|---|---|
| Retrofit Liner in FGD-A with Monitored Natural Attenuation | New Liner in FGD-A.<br>MNA to remove CCR constituents from groundwater and control migration.<br>Groundwater monitoring to verify MNA effectiveness. | New FGD-A Liner and existing FGD-B and FGD-C liners isolate CCR material in pond and mitigate on-going source of CCR constituents to groundwater.<br>Site is good MNA candidate for CCR constituents based on MNA field evaluation. | Liner construction is a common and effective source control technology.<br>On-going attenuation of CCR constituents in groundwater demonstrated during MNA field evaluation.<br>Groundwater monitoring used to verify long-term MNA effectiveness. | Readily implementable with common construction techniques. | Source controlled through pond liner systems.<br>CCR constituents removed from groundwater beneath and downgradient of ponds. | Retrofit Implementation: 1-2 years.<br>MNA Implementation: 2-3 years.<br>Groundwater modelling required to assess remediation timeframe. | Minimal regulatory requirements. |
| Retrofit Liner in FGD-A with Groundwater Extraction and Treatment | New Liner in FGD-A.<br>System of extraction wells along downgradient edge of ponds to provide hydraulic control of CCR constituents groundwater plumes. Extracted groundwater treated in an on-site treatment system and discharged to Twin Oaks Reservoir or re-injected into aquifer.<br>Groundwater monitoring to verify system effectiveness. | New FGD-A Liner and existing FGD-B and FGD-C liners isolate CCR material in pond and mitigate on-going source of CCR constituents to groundwater.<br>Migration of CCR constituents in groundwater controlled at pond boundaries by extraction wells. | Liner construction is a common and effective source control technology.<br>Groundwater extraction and treatment is a common and effective hydraulic control technology.<br>Treatment system operational reliability is key component of overall reliability. | Readily implementable with common construction techniques.<br>Bench/pilot testing of treatment system required.<br>Regulatory authorization for treated water discharge could be difficult to obtain. | Source controlled through pond liner systems.<br>Control of CCR constituent migration downgradient of ponds by extraction wells.<br>Extraction system does not address groundwater beneath ponds. | Retrofit Implementation: 1-2 years.<br>GW Ext/Treatment Implementation: 3-4 years.<br>Groundwater modelling required to assess remediation timeframe. | Regulatory authorization for treated water discharge required.<br>Treatment system residuals (sludge, regenerate brine, etc.) require management. |
| Retrofit Liner in FGD-A with Vertical Hydraulic Barrier and Groundwater Extraction and Treatment | New Liner in FGD-A.<br>Vertical, low permeability hydraulic barrier along downgradient edge of ponds to provide hydraulic control of CCR constituent groundwater plumes.<br>Groundwater extraction and treatment required upgradient of barrier to control groundwater elevations.<br>Groundwater monitoring to verify system effectiveness. | New FGD-A Liner and existing FGD-B and FGD-C liners isolate CCR material in pond and mitigate on-going source of CCR constituents to groundwater.<br>Migration of CCR constituents in groundwater controlled at pond boundaries by vertical barrier.<br>Groundwater elevations upgradient of barrier controlled by groundwater extraction. | Liner construction is a common and effective source control technology.<br>Vertical hydraulic barrier must be keyed into lower impermeable layer.<br>Groundwater extraction and treatment is a common and effective hydraulic control technology.<br>Treatment system operational reliability is key component of overall reliability. | Readily implementable with common construction techniques.<br>Bench/pilot testing of treatment system required.<br>Regulatory authorization for treated water discharge could be difficult to obtain. | Source controlled through pond liner systems.<br>Control of CCR constituent migration downgradient of pond by vertical barrier.<br>Vertical barrier does not address groundwater beneath pond. | Retrofit Implementation: 1-2 years.<br>Barrier and GW Ext/Treat Implementation: 5-8 years.<br>Groundwater modelling required to assess remediation timeframe. | Regulatory authorization for treated water discharge required.<br>Treatment system residuals (sludge, regenerate brine, etc.) require management. |

# FIGURES




**REFERENCE(S)**

BASE MAP TAKEN FROM WWW.TNRIS.GOV, BALD PRAIRIE, TX 7.5 MIN. USGS QUADRANGLE DATED 1965.




QUADRANGLE LOCATION

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**SITE LOCATION MAP**

CONSULTANT
GOLDER

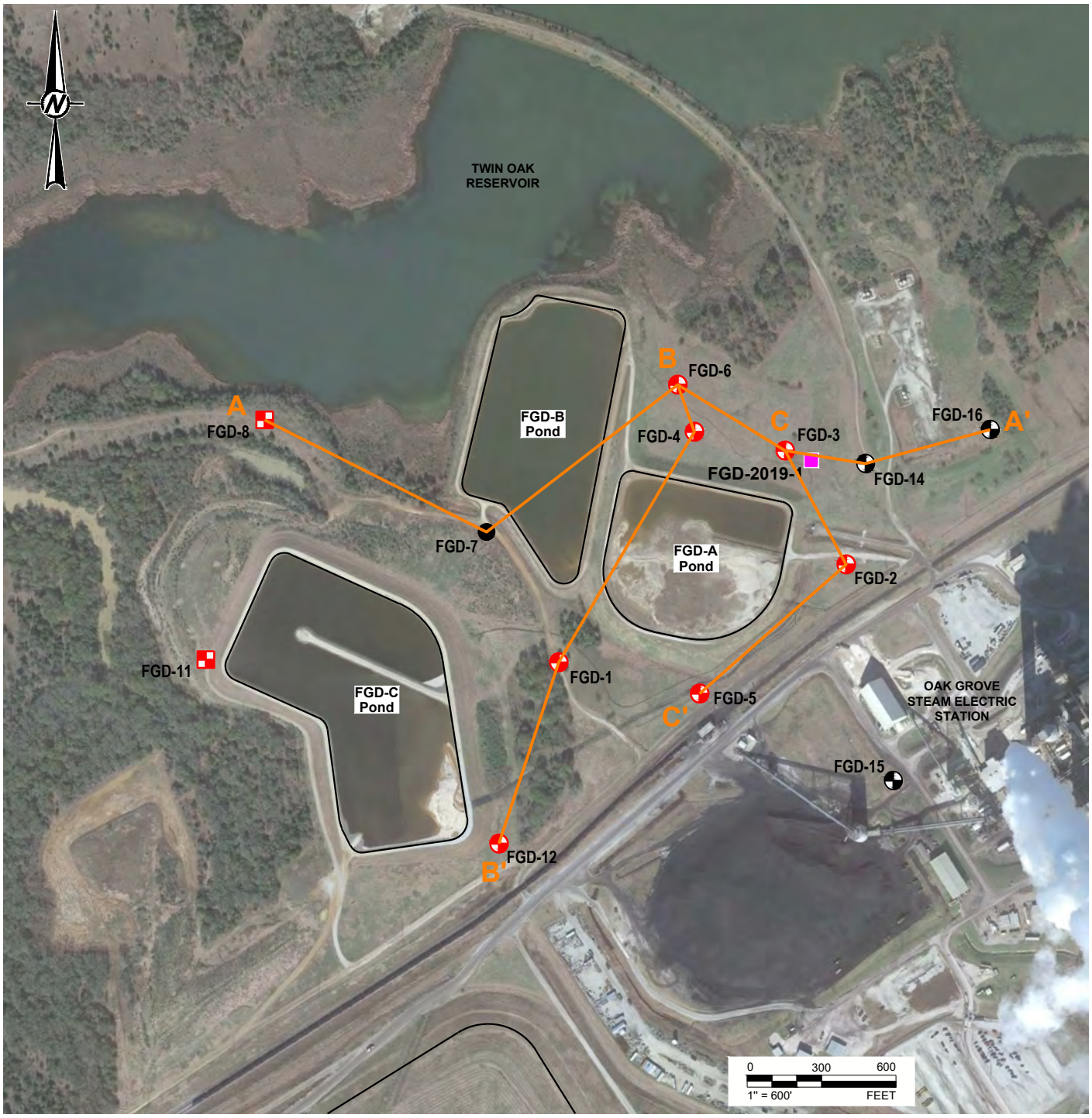
| | |
|---|---|
| YYYY-MM-DD | 2019-08-22 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 19121403 | REV. 0 | FIGURE 1



Last Edited By: adiamond Date: 2019-08-22 Time:10:37:15 AM | Printed By: adiamond Date: 2019-08-22 Time:10:41:40 AM
Path: \\texarkanadata\Projects - Round Rock\19121403 - Luminant\Oak Grove\ | File Name: FIG 1 - Site Location Map.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL
- CCR DELINEATION WELL
- NON-CCR MONITORING WELL
- MNA SOIL BORING
- A — A' CROSS SECTION LOCATION

**NOTE(S)**

1. NATURE AND EXTENT EXTENT DELINEATION IS NOT NECESSARY BASED ON THE UPDATED STATISTICAL EVALUATION.

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**DETAILED SITE PLAN - FGD POND AREA**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2019-08-28 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 19121403 | REV. 0 | FIGURE 2



Last Edited By: adiamond Date: 2019-08-28 Time:3:55:26 PM | Printed By: adiamond Date: 2019-08-28 Time:3:55:46 PM
Path: \\texarkanadata\Projects - Round Rock\19121403 - Luminant\Oak Grove\ | File Name: FIG 2 - Detaile Site Plan (FGD Pond Area).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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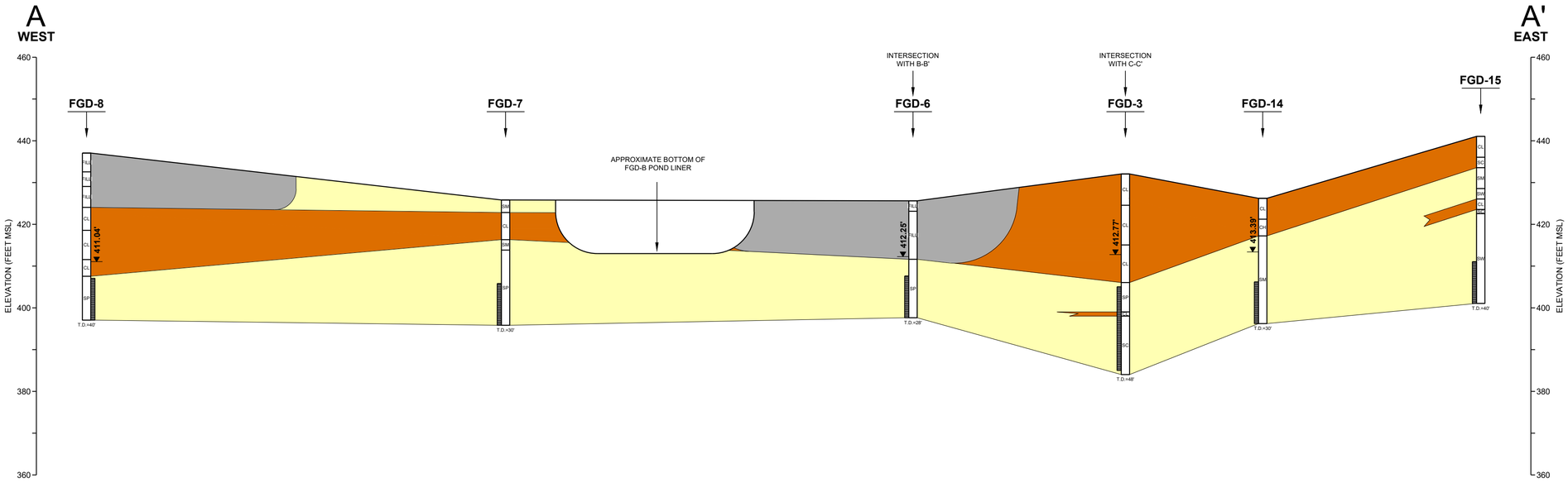
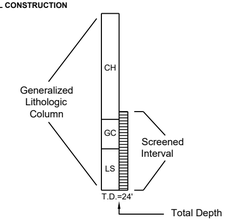



**LEGEND**

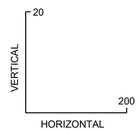
- SAND
- CLAY
- FILL

**MONITORING WELL CONSTRUCTION**




Water Level (Ft MSL)
Measured May 16-17, 2019

SCALE IN FEET




10x Vertical Exaggeration

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**FGD POND AREA**
**GEOLOGIC CROSS SECTIONS A-A'**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2019-08-28 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 19121403 | REV. 0 | FIGURE 3

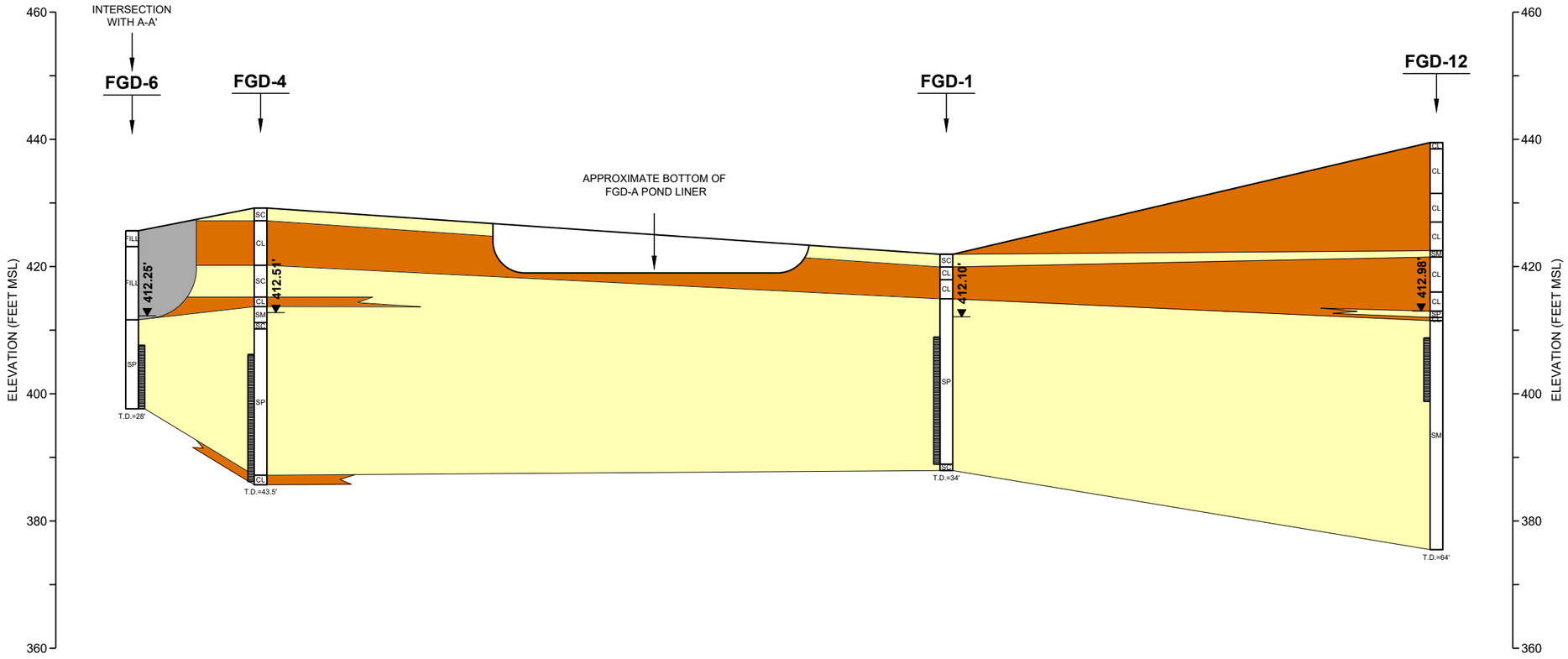
THIS DRAWING IS THE PROPERTY OF GOLDER AND MAY NOT BE REUSED WITHOUT PERMISSION. THIS SHEET WAS ORIGINALLY ISSUED AND MAY NOT BE ALTERED OR MODIFIED FROM ANSI B



Path: \\data\active\Projects - Round Rock\19121403 - Luminant\Oak Grove\ | File Name: FIG 4-6 - Cross Sections (FGD Ponds).dwg | Last Edited By: ajdiamond Date: 2019-08-29 Time:8:35:49 AM | Printed By: ajdiamond Date: 2019-08-29 Time:8:36:48 AM

# B
NORTH

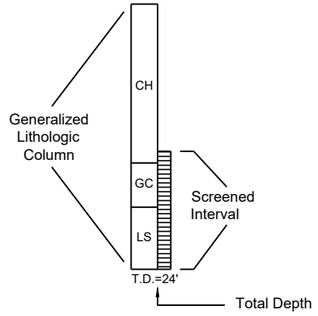
# B'
SOUTH




**LEGEND**

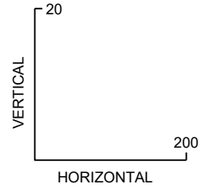
- SAND
- CLAY
- FILL

**MONITORING WELL CONSTRUCTION**




▼ Water Level (Ft MSL) Measured May 16-17, 2019

SCALE IN FEET




10x Vertical Exaggeration

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**FGD POND AREA**
**GEOLOGIC CROSS SECTIONS B-B'**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2019-08-28 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 19121403 | REV. 0 | FIGURE 4



Path: \\texarkana\data\Projects - Round Rock\19121403 - Luminant\Oak Grove\ | File Name: FIG 4-6 - Cross Sections (FGD Ponds).dwg | Last Edited By: adiamond Date: 2019-08-29 Time:8:35:49 AM | Printed By: adiamond Date: 2019-08-29 Time:8:37:35 AM
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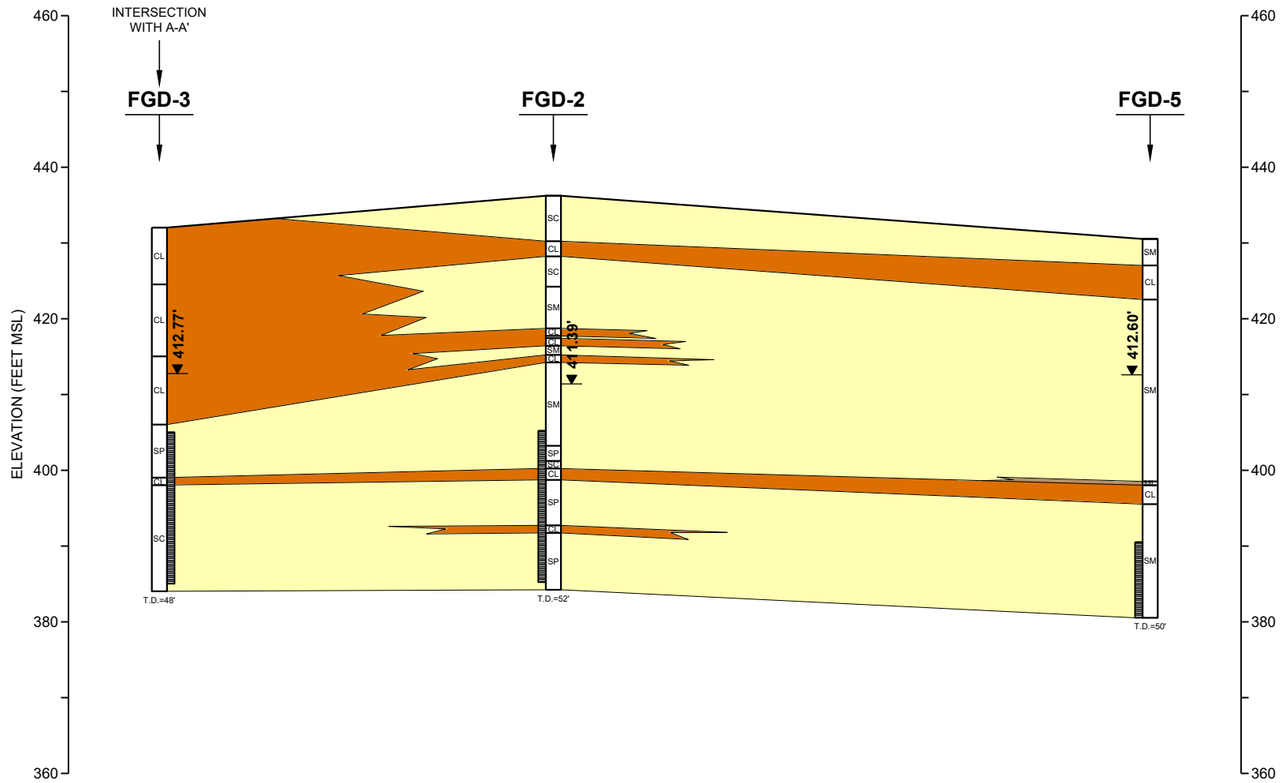
# C
**NORTH**

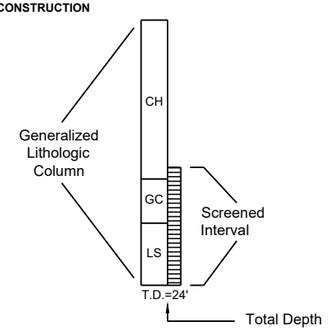
# C'
**SOUTH**




**LEGEND**

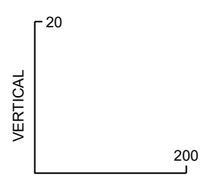
- SAND
- CLAY
- FILL

**MONITORING WELL CONSTRUCTION**




Water Level (Ft MSL)
Measured May 16-17, 2019

SCALE IN FEET




10x Vertical Exaggeration

APPENDIX F-Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**FGD POND AREA**
**GEOLOGIC CROSS SECTIONS C-C'**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2019-08-28 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 19121403 | REV. 0 | FIGURE 5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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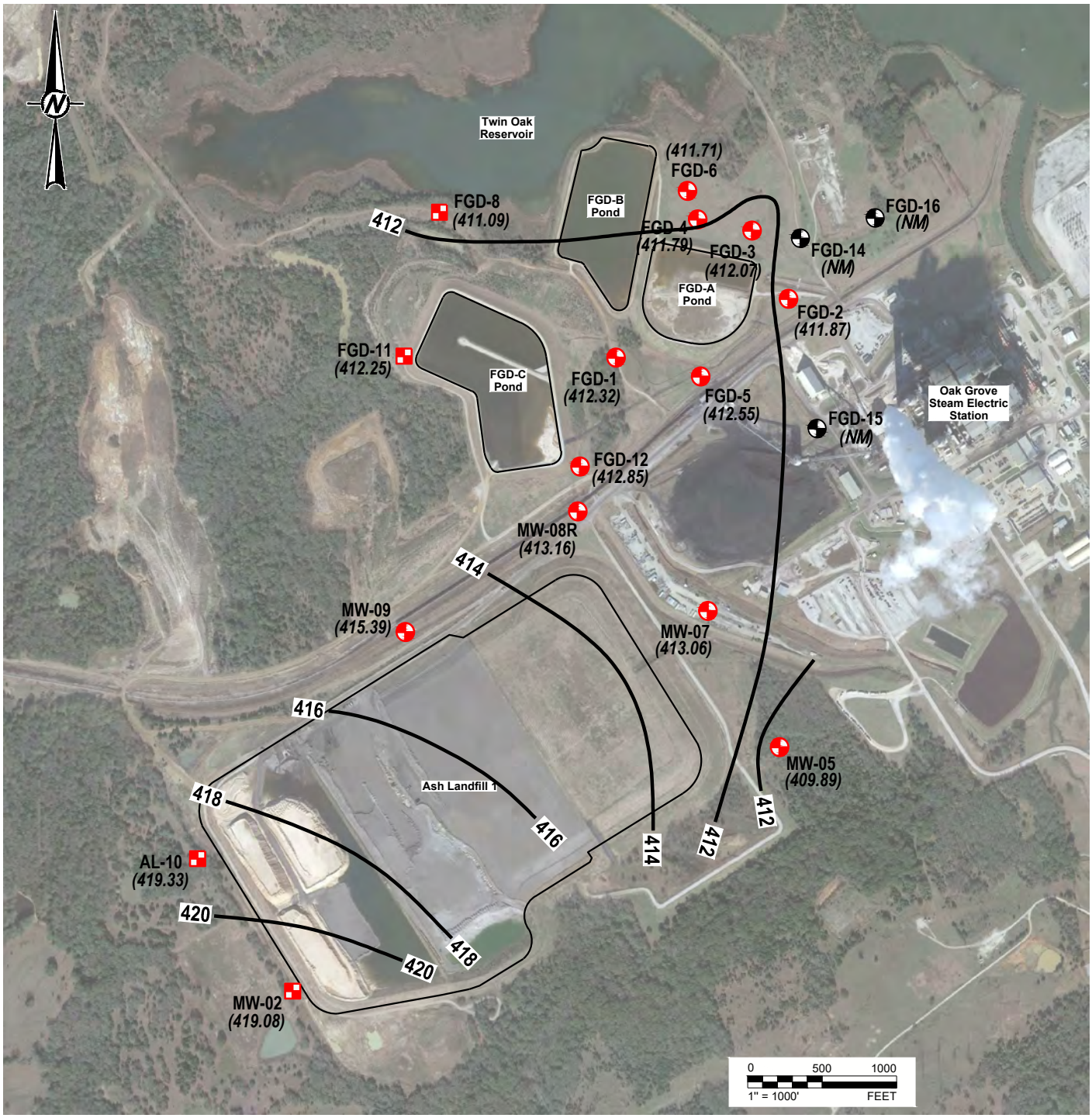


**LEGEND**

- CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL
- CCR DELINEATION WELL
- (410.06) GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
- 400 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 2 FT)

**NOTE(S)**

1. NATURE AND EXTENT DELINEATION IS NOT NECESSARY BASED ON THE UPDATED STATISTICAL EVALUATION. .
2. CCR MONITORING WELLS MW-02, MW-05, MW-07, MW-08R, MW-09, AND AL-10 ARE ASSOCIATED WITH ASH LANDFILL 1 CCR UNIT, WHICH IS NOT SUBJECT TO THE ACM.
3. NM - not measured

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**ASH LANDFILL AND FGD PONDS POTENTIOMETRIC SURFACE MAP SEPTEMBER 9, 2020**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-12-22 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | JJ |
| APPROVED | WFV |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 19122262 | | 0 | 6 |



Last Edited By: adiamond Date: 2020-12-22 Time:10:25:48 AM | Printed By: adiamond Date: 2020-12-22 Time:10:26:19 AM
Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\2020 CCR GWMR\ | File Name: FIG 3 - POT Surface Map (September 2020).dwg
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1 in
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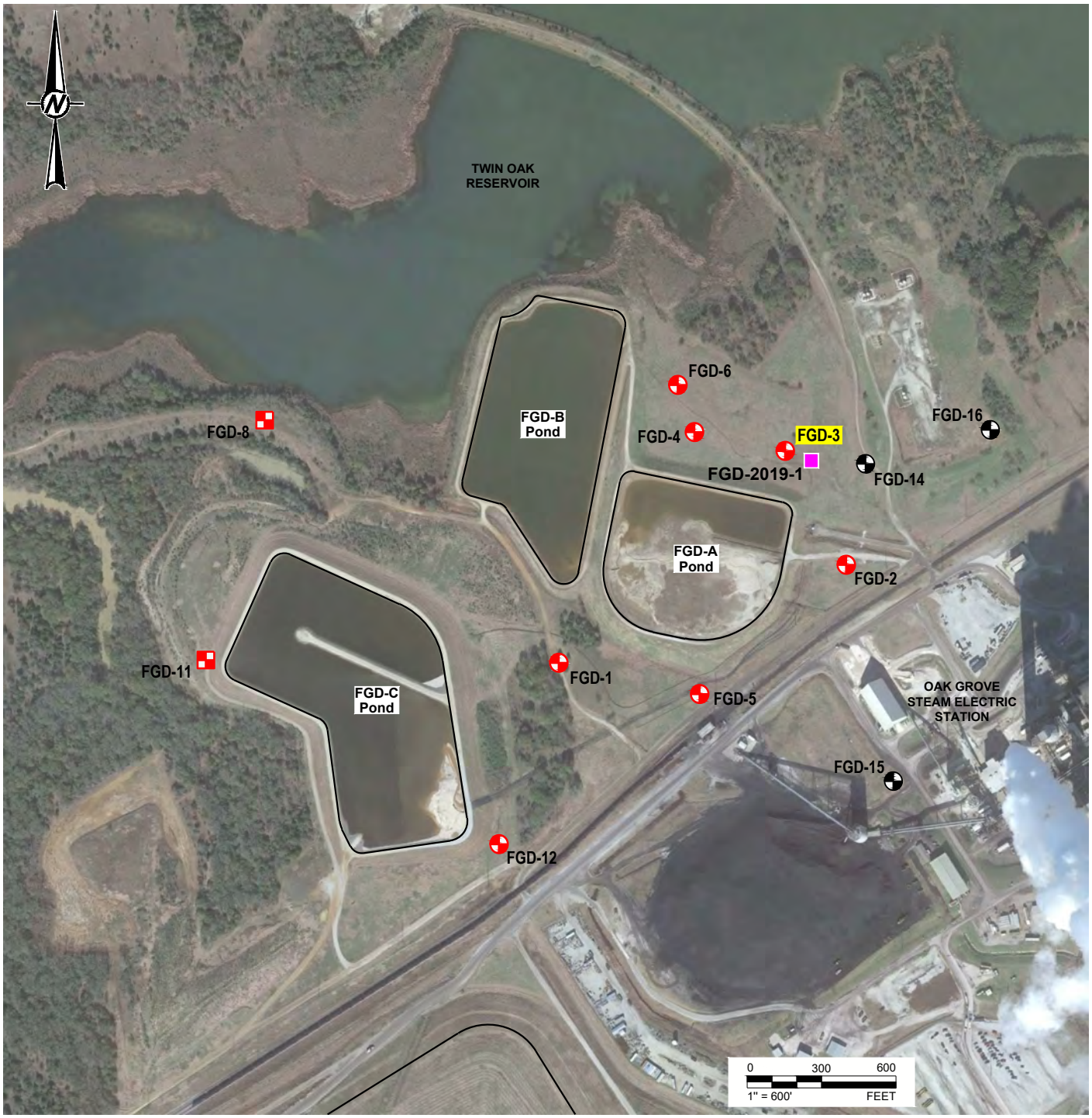



**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL
- CCR DELINEATION WELL
- MNA SOIL BORING
- SSLs FOR ONE OR MORE APPENDIX IV CONSTITUENTS IN DOWNGRADIENT WELLS BASED ON INITIAL STATISTICAL EVALUATION

**NOTE(S)**

1. NO SSLs WERE DETECTED BASED ON UPDATED STATISTICAL EVALUATION.

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**FGD POND AREA**
**EXTENT OF APPENDIX IV CONSTITUENTS**
**DETECTED AT SSLs ABOVE GWPSs**

CONSULTANT
GOLDER

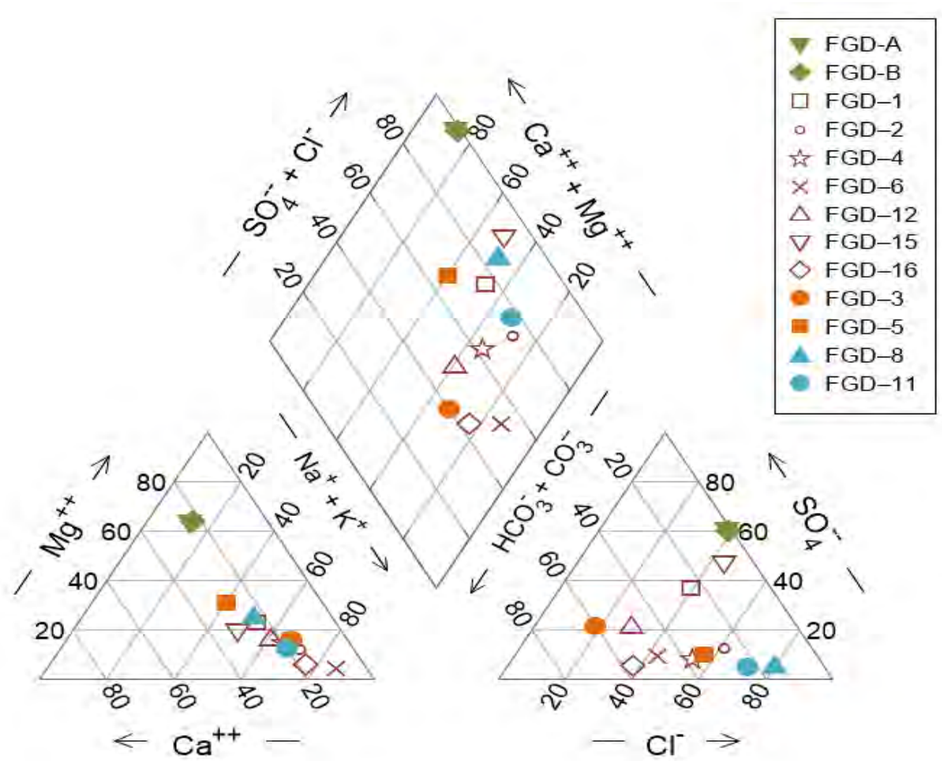
| | |
|---|---|
| YYYY-MM-DD | 2021-01-22 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 19121403 | 0 | 7 |



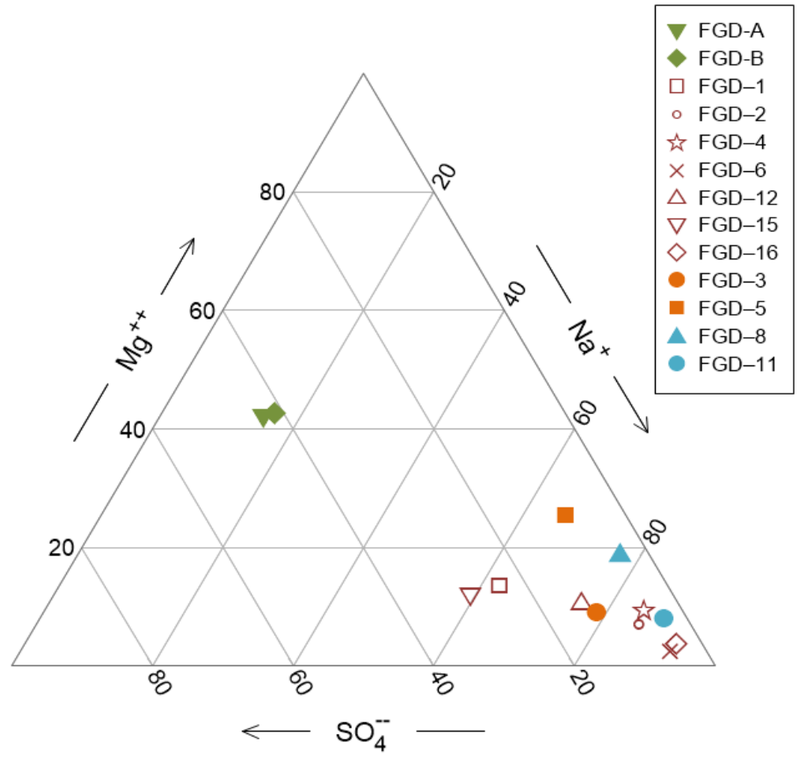
Last Edited By: adiamond Date: 2021-01-22 Time:1:35:33 PM | Printed By: adiamond Date: 2021-01-22 Time:1:36:13 PM
Path: \\texarkanadata\Projects - Round Rock_2019\19121403 - Luminant\Oak Grove\ | File Name: FIG 7 - Extent of App IV Constituents (FGD Ponds).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in

**(a)**




% meq/kg

**(b)**




% mol/l

CLIENT
LUMINANT
OAK GROVE
FGD PONDS

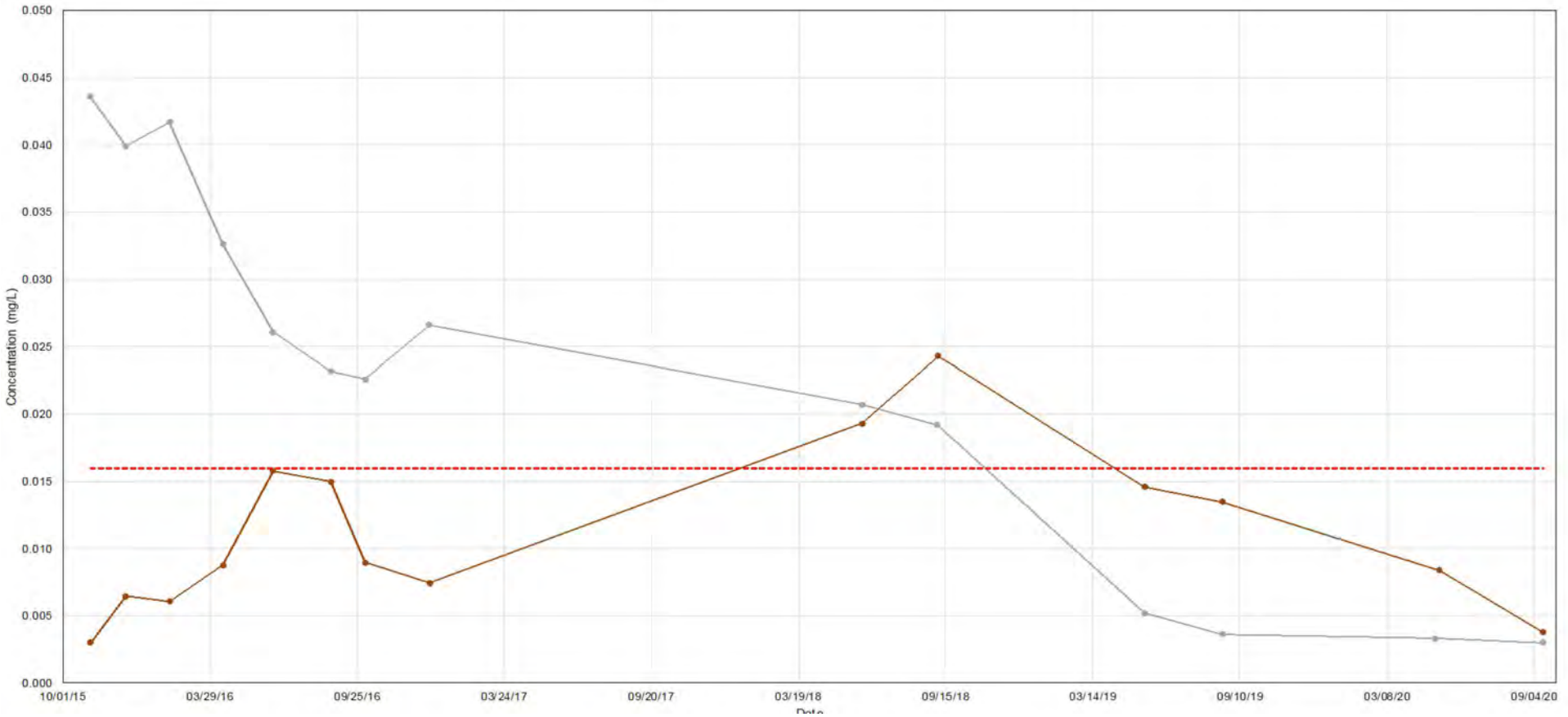
CONSULTANT
GOLDER

PROJECT
ASSESSMENT OF CORRECTIVE MEASURES
GEOCHEMICAL ASSESSMENT

TITLE
**GENEREAL GROUNDWATER RELATIVE ION ABUNDANCE (A) AND SELECT ION RATIOS (B) IN GROUNDWATER**

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19122434 | A | 1 | 8a-b |

Last Edited By: adiamond Date: 2021-01-22 Time:1:57:43 PM | Printed By: adiamond Date: 2021-01-22 Time:1:58:10 PM
Path: \\texarkana\data\Projects - Round Rock_2019\19121403 - Luminant\Oak Grove\ | File Name: FIG 9 - Historical Trends of Cobalt in MW.dwg



CLIENT
LUMINANT

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2021-01-22 |
| DESIGNED | PJN |
| PREPARED | AJD |
| REVIEWED | PJB |
| APPROVED | PJB |

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**HISTORICAL TRENDS OF COBALT IN MONITORING WELLS**

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 19121403 | 0 | 9 |



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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**APPENDIX A**

# ALTERNATE SOURCE DEMONSTRATION REPORT

# Alternate Source Demonstration

*Oak Grove Steam Electric Station*

*FGD Ponds - Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

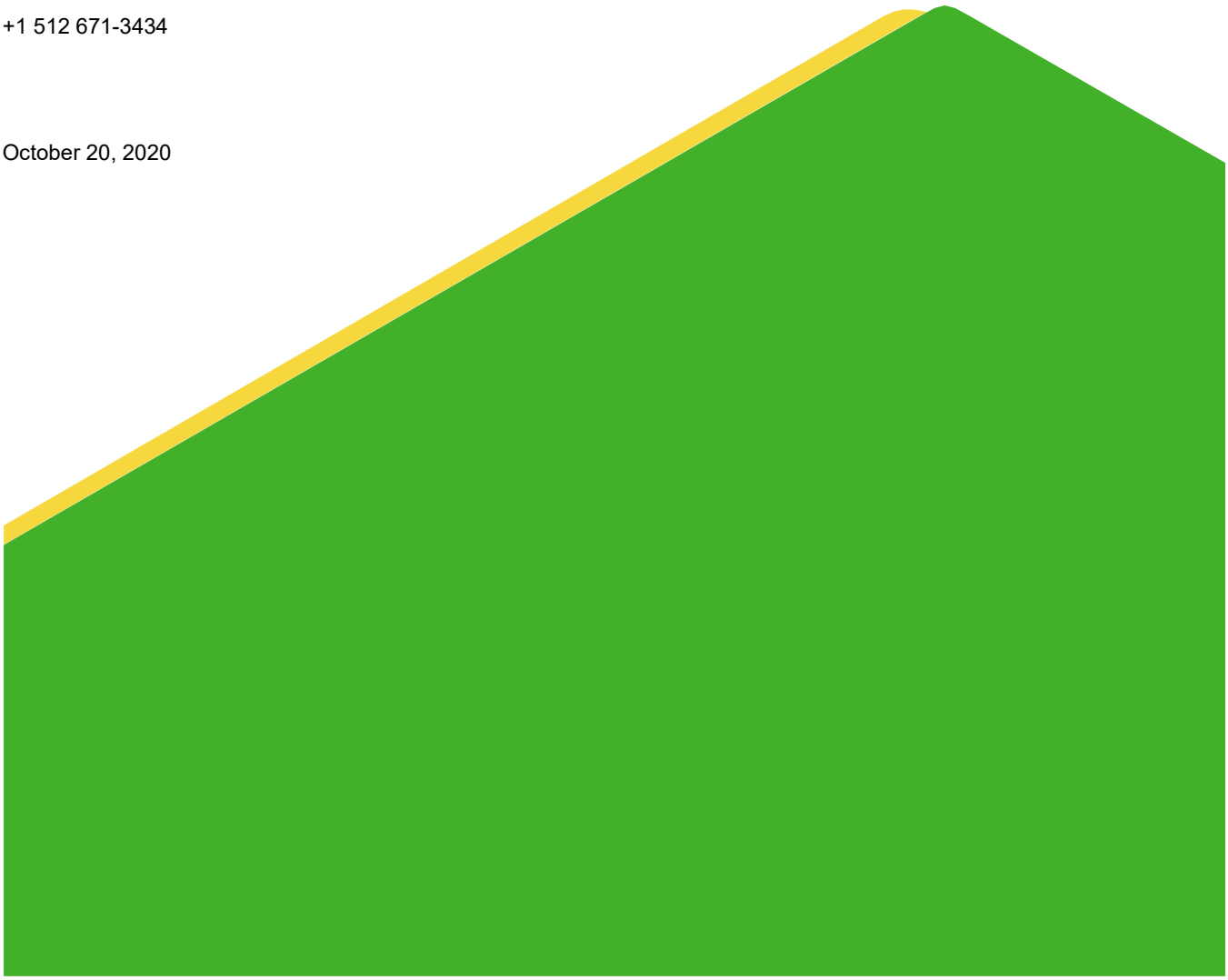
Submitted by:

**Golder Associates Inc.**

2201 Double Creek Dr, Suite 4004, Round Rock, Texas, USA 78664

+1 512 671-3434

October 20, 2020



# Executive Summary

In accordance with the United States Environmental Protection Agency (US EPA) Coal Combustion Residual (CCR) Rule (40 C.F.R. Part 257 Subpart D; 80 Fed. Reg. 21302 (April 17, 2015) (CCR Rule or The Rule), this Alternate Source Demonstration (ASD) was prepared to document that a source other than the FGD Ponds at the Oak Grove Steam Electric Station (the Site) caused a Statistically Significant Level (SSL) of lithium identified in monitoring well FGD-5 during the first semi-annual assessment monitoring event in 2020.

The following lines of evidence support the conclusion that the SSL of lithium in groundwater samples collected from FGD-5 of the FGD Ponds (FDG Pond A, FDG Pond B and FDG Pond C) monitoring well network is not caused by a release of CCR porewater/leachate, but instead results from an alternate source:

- The range of lithium concentrations in samples collected from FGD-5 (0.145 to 0.170 mg/L) is similar to that of samples in upgradient wells FGD-8 and FGD-11 (max 0.149 mg/L since 2015). The groundwater at FGD-5 is of the sodium-chloride type, which is the same type as the upgradient wells (FGD-8 and FGD-11), whereas samples from the FGD ponds indicate water of a magnesium-chloride dominant water type, indicating different water types for the groundwater system and FGD ponds.
- Concentrations of CCR tracers boron, chloride and sulfate, and ratios of boron to lithium differ significantly between FGD pond water and groundwater in the vicinity of FGD-5. Therefore, lithium in groundwater at FGD-5 cannot have originated from CCR porewater as selective dilution of lithium cannot occur.
- FGD-5 is downgradient from FGD Pond C and cross-gradient (and at times upgradient) from FGD Pond A and B. FGD Pond C has only been in operation since 2016. However, lithium concentrations in groundwater at FGD-5 have remained consistent since 2015 (0.145 to 0.170 mg/L). Therefore, lithium concentrations were already elevated in groundwater at FGD-5 prior to ash additions to FGD Pond C, which is the only FGD pond upgradient of FGD-5. Since FGD-5 is not directly downgradient from FGD Ponds A or B, it would not receive porewater from these ponds unless diluted with natural groundwater flowing to FGD-5 from upgradient areas. In groundwater samples collected from FGD-5, concentrations of CCR tracers (boron, sulfate and chloride) that are elevated in FGD Pond A and B water are similar to concentrations in background wells FGD-8 and FGD-11. Furthermore, lithium SSLs have not been observed in CCR monitoring wells directly downgradient of FGD Pond A or B (e.g., FGD-2, FGD-3, FGD-4 and FGD-6), or CCR monitoring wells FGD-1 and FGD-12, which are downgradient and more proximal to FGD Pond C than FGD-5. Thus, it is highly unlikely that lithium measured in FGD-5 groundwater originates from a release from any of the FGD ponds.
- Lithium is naturally occurring in soils at the Site. Sequential extraction of lithium from soil samples indicate total lithium concentrations ranging from 9 to 20 mg/kg, with the majority (76 to 97%) of lithium present in the non-environmentally available acid/sulfide and residual/refractory fractions.

In accordance with §257.95(g)(3), this ASD demonstrates that a source other than the FGD Ponds caused the SSL of lithium identified at monitoring well FGD-5.

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**EXHIBITS**

Exhibit 1: Site Location Map
Exhibit 2: Potentiometric Surface Map, May 2020

**APPENDICES**

Appendix A: Sequential Extraction Results

# Certification

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the alternative source demonstration at the referenced facility meets the requirements of 40 C.F.R. § 257.94(e)(2) of the CCR Rule.

**Golder Associates Inc.**

Patrick J. Behling, P.E.
Principal Engineer

Roberta Russell, P.G.
Senior Geologist

# 1.0 INTRODUCTION

In accordance with the United States Environmental Protection Agency (US EPA) Coal Combustion Residual (CCR) Rule (40 C.F.R. Part 257 Subpart D; 80 Fed. Reg. 21302 (April 17, 2015) (CCR Rule or The Rule), this Alternate Source Demonstration (ASD) was prepared to document that a source other than the FGD Ponds at the Oak Grove Steam Electric Station (the Site) caused a Statistically Significant Level (SSL) of lithium identified in monitoring well FGD-5 during the first semi-annual assessment monitoring event in 2020. This document satisfies the requirements of § 257.95(g)(3)(ii) which allows the owner or operator to demonstrate that a source other than the CCR Unit has caused an SSL and that the SSL was the result of an alternate source or resulted from errors in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

As documented by this report, the SSL for lithium at the FGD Pond monitoring well FGD-5 is attributed to naturally occurring sources in subsurface aquifer materials and is not caused by the CCR unit.

# 2.0 SITE DESCRIPTION AND BACKGROUND

Oak Grove Management Company LLC owns OGSES located approximately 10 miles north of Franklin, Robertson County, Texas (Exhibit 1). The OGSES consists of two 800-megawatt power generation units which burn lignite and coal. CCR, including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operations. Currently, CCRs generated at the OGSES are managed by Luminant in part within the FGD Pond Area (PBW, 2017a).

The FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the “FGD Ponds”) are located approximately 2,500 feet northwest of the power generation units at the Site (Exhibit 1). FGD-A Pond and FGD-B Pond were placed in service during approximately 2007. Use of FGD-C Pond began in 2016 (PBW, 2017a).

## 2.1 FGD Pond Area Monitoring Network

The monitoring well network for the FGD Pond Area consists of 9 monitoring wells (FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, FGD-8, FGD-11 and FGD-12) screened within the uppermost groundwater-bearing unit. Two wells, FGD-8 and FGD-11, are considered background monitoring wells. Monitoring well locations are shown on Exhibit 1.

## 2.2 Geologic and Hydrogeologic Setting

The FGD Ponds are located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1970). Previous boring investigations indicate the geology in the FGD Pond Area primarily consists of an upper zone of relatively thick, interbedded sand and clay strata and a lower zone of interbedded silty to clayey sand and well sorted sand. The uppermost groundwater-bearing unit at the Site occurs in the lower zone of interbedded silty to clayey sand (PBW, 2017a).

# 3.0 STATISTICAL ANALYSIS METHODS

The following sections summarize the assessment monitoring at the FGD Pond Area, present the statistical analysis method for evaluation of assessment monitoring constituents (i.e., Appendix IV parameters) as they pertain to this ASD, discuss the test methods used for soil samples, and describe the geochemical evaluation.

During assessment monitoring, concentrations of Appendix IV constituents are compared to an applicable Groundwater Protection Standard (GWPS). As specified in 40 C.F.R. § 257.95(h), the GWPS is the higher of the

Maximum Contaminant Level (MCL) or the background concentration. For lithium, the GWPS is the background concentration of 0.15 mg/L, which is calculated as the upper prediction limit (UPL) of data collected from upgradient wells during the background period, prior to the start of the detection and assessment monitoring period.

Statistical analysis of the data was performed in accordance with the Statistical Analysis Plan for CCR Groundwater Monitoring (PBW, 2017b) and the USEPA Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities-Unified Guidance (USEPA, 2009). The statistical analysis included an evaluation of confidence intervals for each of the Appendix IV parameter data sets for each well to evaluate whether constituent concentrations were present at concentrations above GWPSs.

Figure 1 shows the lithium concentrations in FGD-5 since 2015 compared to the GWPS. The calculated lower and upper confidence limits for lithium based on sample data collected from FGD-5 are 0.152 mg/L and 0.156 mg/L, respectively. An SSL was indicated at FGD-5 because the lower confidence limit based on the lithium data set from FGD-5 exceeded the GWPS of 0.152 mg/L. As indicated on Figure 1, lithium concentrations exceeded the GWPS in FGD-5 during two sampling events conducted in 2015, prior to the completion of FGD Pond C (in 2016), which is the only FGD pond that is directly upgradient of FGD-5. Furthermore, the highest sample concentration (0.170 mg/L) in FGD-5 occurred in November 2015, prior to the completion of FGD-C.

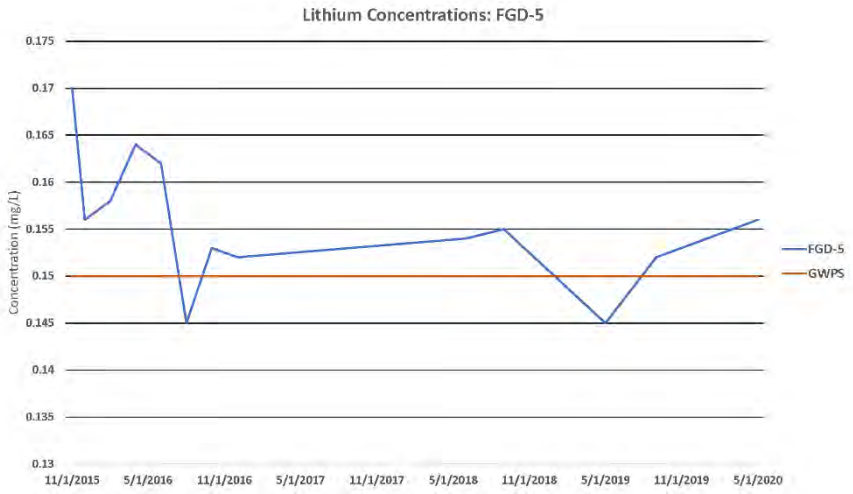


**Figure 1: Lithium concentrations in groundwater samples collected from FGD-5.**

## 3.1 Assessment Monitoring

Pursuant to 40 C.F.R. § 257.95(a), FGD Pond Area monitoring wells are sampled for all Appendix IV parameters. The 2015 through 2020 Appendix IV groundwater sample data were compared to the GWPS using confidence intervals.

## 3.2 Statistically Significant Levels

As stated in the Appendix IV SSL notification dated February 6, 2019, SSLs for cobalt and lithium were identified at the FGD Ponds during 2018 assessment monitoring completed in accordance with 40 C.F.R. § 257.95. No SSLs were identified for cobalt in subsequent semi-annual assessment monitoring completed during 2019 and 2020. No SSLs were identified for lithium in subsequent semi-annual assessment monitoring events in 2019;

however, an SSL notification for lithium was posted on August 21, 2020 based on the first 2020 semi-annual assessment monitoring event results.

## 3.3 Test Methods for Soil

### 3.3.1 Sequential Extraction

Chemical analysis of soils for total metals and sequential extraction analysis was conducted on three soil samples collected from FGD Pond Area within the groundwater-bearing unit (Appendix A). The sequential extraction procedure (SEP) consists of a seven-step metals extraction from solids to determine their potential environmental stability. The seven-step SEP is defined by specific extraction steps as illustrated and described (based on a modified Tessier et al. 1979 method) in Figure 2.

| SEQUENTIAL EXTRACTION PROCEDURE | | | | |
|---|---|---|---|---|
| ENVIRONMENTALLY AVAILABLE (Increasing Availability) | Step 1 | Increasing Extraction Strength | Exchangeable Fraction: | This extraction includes trace elements that are electrostatically adsorbed to overburden minerals |
| | Step 2 | | Carbonate Fraction: | This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals |
| | Step 3 | | Non-Crystalline Materials Fraction: | This extraction targets trace elements that are complexed by amorphous minerals |
| | Step 4 | | Metal Hydroxide Fraction: | This extraction targets trace elements bound to hydroxides of iron, manganese, and/or aluminum |
| | Step 5 | | Organic Fraction: | This extraction targets trace elements strongly bound via chemisorption to organic material |
| NON-ENVIRONMENTALLY AVAILABLE | Step 6 | | Acid/Sulfide Fraction: | The extraction is used to identify trace elements precipitated as sulfide minerals |
| | Step 7 | | Residual Fraction: | Trace elements remaining in the overburden after the previous extractions will be distributed between silicates, phosphates, and refractory oxide |

**Figure 2: Overview of sequential extraction procedure.**

Steps 1 through 7 represent an increasing amount of target metals that can be removed into solution from the solid phase. For instance, metals bound in the carbonate fraction are much more likely to become mobile due to changes in groundwater chemistry than metals bound in a sulfide or residual fraction. The total concentration of a metal measured from all seven steps can be compared to the concentration determined from the total metal analysis for compositional accountability. Metals extracted in Steps 1 through 5 are considered environmentally available, whereas metals extracted in Steps 6 and 7 are present in non-environmentally available fractions and are not expected to be released under conditions typically encountered in aquifers, except in the case of acidification or other excursions from typical groundwater conditions (Tessier et al., 1979).

## 4.0 ALTERNATE SOURCE DEMONSTRATION

The May 2020 SSL of lithium in groundwater at the monitoring well FGD-5 is not caused by a release of CCR porewater/leachate but instead results from an alternate source. The following lines of evidence support this conclusion:

- **The range of lithium concentrations in samples collected from FGD-5 is similar to that of samples in background wells. Additionally, the FGD pond water is a magnesium-chloride type water whereas water at FGD-5 is of the sodium-chloride type, which is the same type as background wells.**

Lithium concentrations in groundwater samples from FGD-5 range from 0.145 to 0.170 mg/L, which is similar to the upper range of concentrations in background well FGD-8 (max of 0.149 mg/L). In addition, as shown on the Piper diagram presented on Figure 3, the groundwater at FGD-5 is a sodium-chloride type, which is the same water type of the groundwater encountered within the background wells FGD-8 and FGD-11. The FGD pond water samples from FGD Pond A and FGD Pond B are the magnesium-chloride type. Because the lithium concentrations and water chemistry in groundwater samples collected from FGD-5 are similar to those encountered in background wells, it is more likely that groundwater at FGD-5 is representative of background conditions, including the presence of naturally-occurring lithium in groundwater. Groundwater and pond water ASD data are summarized in Table 1.

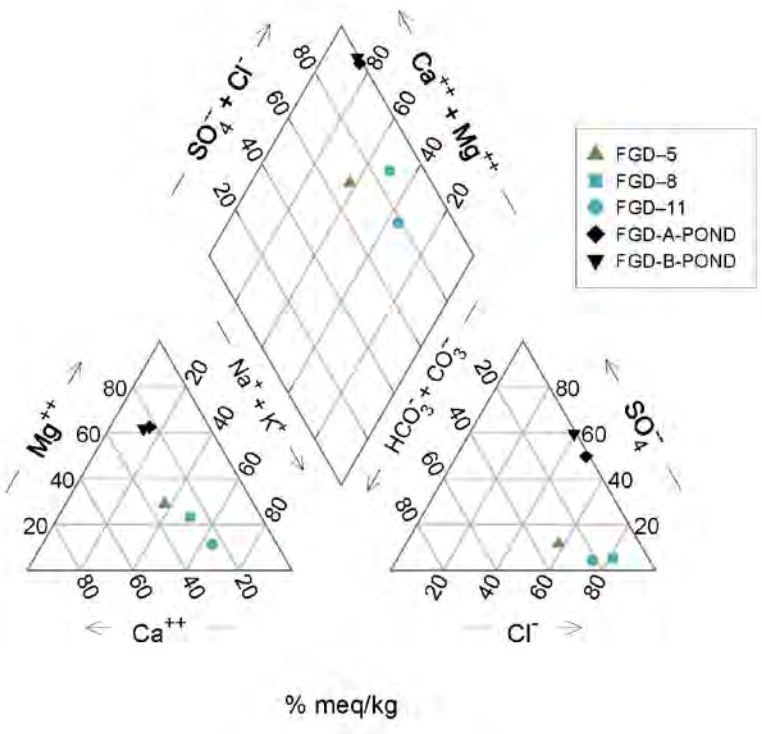


**Figure 3: Piper diagram showing water chemistry of FGD-5, FGD-8, FGD-11 and FGD-A Pond and FGD-B Pond samples.**

- **Concentrations of CCR tracers boron, chloride and sulfate, and ratios of boron to lithium differ significantly between FGD pond water and groundwater in the vicinity of FGD-5.**

Boron has been historically elevated in FGD pond samples (>72 mg/L). However, boron in groundwater samples collected from FGD-5 has never exceeded 0.2 mg/L since 2015 (when sampling started). Boron at well FGD-5 has also remained well below the maximum measured in background wells FGD-8 and FGD-11 (0.635 mg/L). Similarly, sulfate (max 83.8 mg/L) and chloride (max 307 mg/L) concentrations in FGD-5 are low compared to FGD pond samples (max of 4,680 mg/L and 3,440 mg/L, respectively). These differences are shown graphically in the ternary diagram presented in Figure 3. It should be noted that lithium concentrations in FGD pond water samples are generally similar to FGD-5. However, if lithium in groundwater at FGD-5 originated from the FGD ponds, sulfate, chloride and boron would also be expected to be comparatively higher. Additionally, the ratio of lithium to boron in FGD pond samples was approximately 1:500, while the ratio in groundwater from FGD-5 was approximately 1:1. Therefore, lithium at FGD-5 did not originate from CCR porewater as selective dilution of lithium cannot occur, assuming conservative transport.

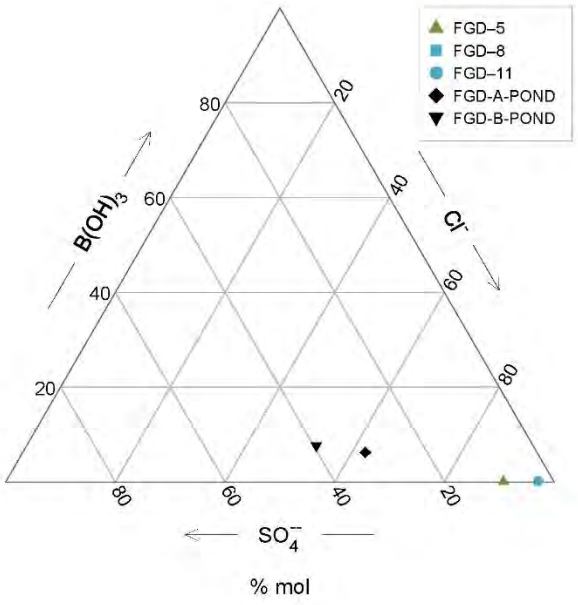


**Figure 4: Ternary diagram showing relative molar concentrations of boron, chloride and sulfate for FGD ponds, FGD-5, and background wells FGD-8 and FGD-11.**

- **FGD-5 is down-gradient from FGD Pond C, which has only been in operation since 2016. However, lithium in groundwater at FGD-5 has remained consistent since sampling began in 2015.**

Monitoring well FGD-5 is cross-gradient (and at times upgradient) to FGD Ponds A and B and directly down-gradient from FGD Pond C (Exhibit 2). FGD-5 has been sampled since 2015 and, as shown on Figure 1, lithium concentrations have remained consistently between 0.145 and 0.170 mg/L. If the lithium occurrence were due to a plume originating from FGD Pond C, its concentrations would be expected to increase. FGD Pond C was not in operation until 2016; thus, lithium concentrations were already within ranges normal for FGD-5 before CCR was placed in FGD Pond C. Since FGD-5 is cross-gradient to FGD Ponds A and B, any porewater reaching FGD-5 from FGD Ponds A or B would be significantly diluted with natural groundwater flowing to FGD-5 from upgradient areas. Furthermore, lithium SSLs have not been observed in CCR monitoring wells directly downgradient of FGD Pond A or B (e.g., FGD-2, FGD-3, FGD-4 and FGD-6), or CCR monitoring wells FGD-1 and FGD-12, which are downgradient and more proximal to FGD Pond C than FGD-5. As discussed previously, concentrations of boron,

chloride and sulfate, which are mobile constituents and elevated in FGD Pond water, are similar to concentrations in background wells FGD-8 and FGD-11. Thus, it is very unlikely that lithium measured in FGD-5 groundwater originates from FGD Ponds A or B.

- **Lithium is naturally occurring at the Site based on sequential extraction of lithium from soil.**

Total lithium concentrations in the three soil samples range from 9 to 20 mg/kg, which is within the range of naturally-occurring lithium in the Earth's crust and soils (18 to 65 mg/kg and 5 to 130 mg/kg, respectively; Smith and Huyck (1999)). Most of the lithium (between 76 and 97% of the total) is sequestered in the acid sulfide and refractory component of the soil material (SEP Steps 6 and 7). The environmentally-available fraction of lithium (which could contribute to concentrations observed at FGD-5) is less than 24% of the total, the largest of which is represented by the metal hydroxide phase.

# 5.0 ALTERNATE SOURCE DEMONSTRATION SUMMARY

The evaluation presented in this document demonstrates the statistically significant level of lithium identified in groundwater is due to the presence of naturally-occurring lithium and not caused by releases from the CCR unit. The following lines of evidence demonstrate the natural occurrence of lithium in groundwater at FGD-5:

- FGD-5 lithium concentrations are similar in range to concentrations in background wells. Additionally, the water type at FGD-5 is the same as background wells and different from FGD pond water.
- Concentrations of near-conservative CCR tracers boron, chloride and sulfate, and ratios of boron to lithium differ significantly between FGD pond water and groundwater in the vicinity of FGD-5.
- FGD-5 is located downgradient from FGD Pond C. However, lithium concentrations in FGD-5 have remained consistent since before FGD Pond C was put in operation.
- Lithium is naturally occurring at the Site based on sequential extraction of lithium from soil samples collected in the uppermost groundwater-bearing unit.

Based on these findings, the FGD Ponds are not the source for the SSL of lithium in FGD-5 samples. Instead, the SSL can be attributed to the presence of naturally-occurring lithium in subsurface aquifer materials

# 6.0 CONCLUSION

In accordance with 40 C.F.R. § 257.95(g)(3), this ASD addresses the SSL of lithium at FGD-5. Review of geochemical data indicates that the exceedance of lithium identified at FGD-5 is not the result of a release from the associated ash ponds at OGSES FGD Pond Area but can be attributed to the presence of naturally-occurring lithium in subsurface aquifer materials

# 7.0 REFERENCES


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PBW, 2017b. Coal Combustion Residual Rule Statistical Analysis Plan, Oak Grove Steam Electric Station FGD Pond Area, Robertson County, Texas.

Smith, K. and Huyck, H., 1999. An overview of the abundance, relative mobility, bioavailability, and human toxicity of metals. In: Plumlee and Logsdon (eds.): The Environmental Geochemistry of Mineral Deposits, Reviews in Economic Geology Vol. 6A, pp.29-70.

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USEPA. Federal Register. Volume 80. No. 74. Friday April 17, Part II. Environmental Protection Agency. 40 CFR Parts 257 and 261. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule/ [EPA-HQ-RCRA-2009-0640; FRL-9919-44-OSWER] (2015).

# Table

**Table 1**
**Analytical Results**
**Groundwater and Pond Samples**
**Oak Grove Steam Electric Station FGD Pond Area**

| Sample Location | Sample Date | Calcium mg/L | Magnesium mg/L | Potassium mg/L | Sodium mg/L | Alkalinity mg/L | Chloride mg/L | Sulfate mg/L | Fluoride mg/L | Boron mg/L | Lithium mg/L | Cobalt mg/L | Iron mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-1 | 5/16/2019 | 19.5 | 11.2 | 2.11 | 49.4 | 52.8 | 62.4 | 78.7 | 0.362 J | 0.0803 | 0.0442 | 0.003 | 0.186 |
| FGD-2 | 5/16/2019 | 38.9 | 16.7 | 2.57 | 198 | 157 | 260 | 70.7 | 0.383 J | 0.105 | 0.0228 | 0.003 | 0.0799 |
| FGD-3 | 5/16/2019 | 60.1 | 33.6 | 2.5 | 277 | 533 | 117 | 182 | 0.776 | 0.117 | 0.057 | 0.0052 | 0.126 |
| FGD-4 | 5/16/2019 | 41.7 | 18.6 | 1.62 | 160 | 201 | 205 | 41.7 | 0.327 J | 0.0733 | 0.0325 | 0.003 | 0.103 |
| FGD-5 | 5/16/2019 | 77.7 | 50 | 3.46 | 123 | 237 | 287 | 67.2 | 0.579 | 0.108 | 0.145 | 0.003 | 0.03 |
| FGD-6 | 5/16/2019 | 20.3 | 6.61 | 0.706 | 225 | 262 | 170 | 51.3 | 0.669 | 0.116 | 0.0068 J | 0.0132 | 4.86 |
| FGD-8 | 5/16/2019 | 314 | 204 | 19.2 | 792 | 516 | 2040 | 173 | 0.1 | 0.0687 | 0.0086 J | 0.0146 | 263 |
| FGD-11 | 5/16/2019 | 85 | 30.6 | 4.13 | 328 | 256 | 566 | 50.9 | 0.38 J | 0.108 | 0.0145 | 0.003 | 1.28 |
| FGD-12 | 5/16/2019 | 6.79 | 2.97 | 1.55 | 20.1 | 36.6 | 15.6 | 15 | <0.100 | 0.0723 | 0.0221 | 0.003 | 0.425 |
| FGD-A-POND | 6/6/2019 | 487 | 809 | 82.1 | 270 | 58.6 | 1510 | 3260 | 17.2 | 72.1 | 0.167 | 0.003 | 0.03 |
| FGD-B-POND | 6/6/2019 | 458 | 796 | 86.9 | 287 | 68 | 1470 | 3040 | 17.5 | 73.3 | 0.172 | 0.003 | 0.03 |
| FGD-1 | 5/11/2020 | 37.8 | 17.1 | 2.56 | 82 | 67.6 | 146 | 79.5 | 0.231 J | 0.121 | 0.0548 | 0.0495 | 1.09 |
| FGD-2 | 5/11/2020 | 217 | 74.2 | 5.73 | 507 | 114 | 1150 | 286 | <0.100 | 0.605 | 0.028 | 0.003 | 0.0636 |
| FGD-3 | 5/11/2020 | 42.3 | 23.5 | 2.14 | 230 | 434 | 70.2 | 129 | 0.8 | 0.152 | 0.0498 | 0.00332 | 0.0395 |
| FGD-4 | 5/11/2020 | 40.6 | 14.7 | 1.53 | 204 | 247 | 198 | 52.9 | 0.3 J | 0.145 | 0.0166 | 0.003 | 0.12 |
| FGD-5 | 5/11/2020 | 100 | 52 | 3.64 | 125 | 232 | 307 | 83.8 | 0.413 | 0.165 | 0.156 | 0.003 | 0.0483 |
| FGD-6 | 5/11/2020 | 27.4 | 7.17 | 0.743 | 235 | 275 | 189 | 70.7 | 0.292 J | 0.109 | 0.0088 J | 0.003 | 0.582 |
| FGD-8 | 5/11/2020 | 381 | 198 | 19.9 | 801 | 518 | 2240 | 188 | 0.1 | 0.129 | 0.0152 | 0.0084 | 220 |
| FGD-11 | 5/11/2020 | 103 | 28.5 | 4.42 | 306 | 230 | 560 | 43.3 | 0.365 J | 0.166 | 0.0132 | 0.003 | 0.225 |
| FGD-12 | 5/11/2020 | 15.6 | 8.03 | 5.31 | 22.1 | 34.6 | 19.3 | 19.9 | <0.100 | 0.149 | 0.0371 | 0.00883 | 32.5 |
| FGD-A-POND | 5/11/2020 | 895 | 1490 | 195 | 563 | 134 | 3440 | 4680 | 20.6 | 104 | 0.422 | 0.00625 | 0.15 |
| FGD-B-POND | 5/11/2020 | 696 | 1020 | 106 | 351 | 68.8 | 1940 | 3930 | 15.6 | 84.4 | 0.182 | 0.003 | 0.17 |

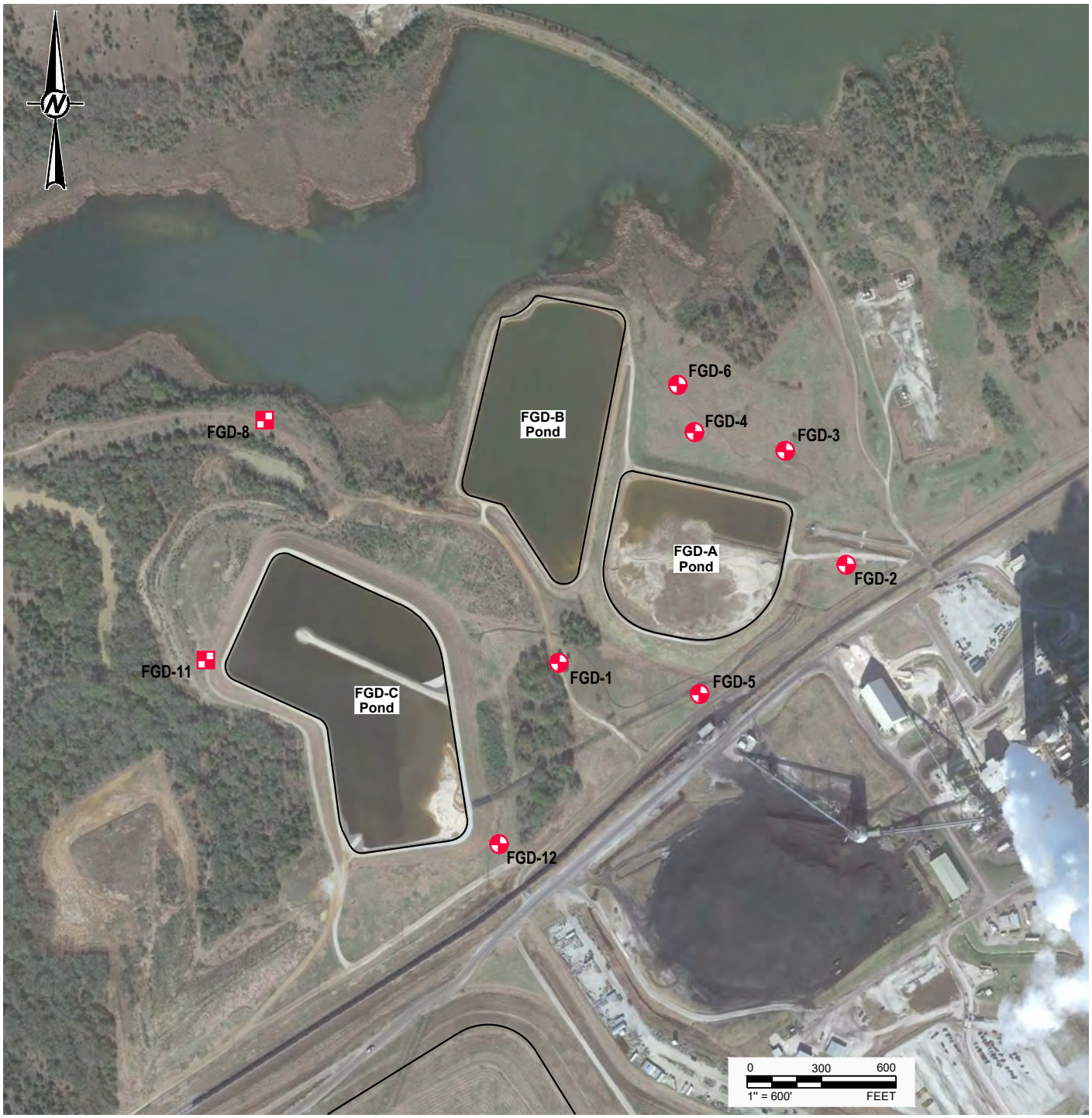
Notes:
mg/L - milligrams per liter
SU - standard units
J -estimated value

**Table 1**
**Analytical Results**
**Groundwater and Pond Samples**
**Oak Grove Steam Electric Station FGD Pond Area**

| Sample Location | Sample Date | Iron (Fe3+) mg/L | Iron (Fe2+) mg/L | Selenium mg/L | Nitrate-N mg/L | Phosphorus mg/L | pH SU | Eh mV | TDS mg/L |
|---|---|---|---|---|---|---|---|---|---|
| FGD-1 | 5/16/2019 | 0.186 | 0.05 | 0.002 | 0.1 | 0.473 | 6.63 | -32 | 320 |
| FGD-2 | 5/16/2019 | 0.0799 | 0.05 | 0.0214 | 1.54 | 0.237 | 6.86 | -91 | 729 |
| FGD-3 | 5/16/2019 | 0.126 | 0.05 | 0.0423 | 1.41 | 0.096 | 6.73 | -56 | 1100 |
| FGD-4 | 5/16/2019 | 0.103 | 0.05 | 0.002 | 0.1 | 0.251 | 6.57 | -41 | 651 |
| FGD-5 | 5/16/2019 | 0.05 | 0.05 | 0.002 | 0.859 | 0.176 | 6.46 | -31 | 801 |
| FGD-6 | 5/16/2019 | 4.86 | 0.05 | 0.002 | 0.1 | 0.714 | 6.85 | -28 | 710 |
| FGD-8 | 5/16/2019 | 61 | 202 | 0.00274 | 0.107 | 0.219 | 6.67 | -42 | 3970 |
| FGD-11 | 5/16/2019 | 1.28 | 0.05 | 0.002 | 0.1 | 0.2 | 6.83 | -48 | 1350 |
| FGD-12 | 5/16/2019 | 0.425 | 0.05 | 0.002 | 1.42 | 0.168 | 6.52 | -19 | 140 |
| FGD-A-POND | 6/6/2019 | 0.05 | 0.05 | 1.3 | 1.87 | 0.03 | 6.52 | -- | 7410 |
| FGD-B-POND | 6/6/2019 | 0.00427 | 0.05 | 1.2 | 3.24 | 0.03 | 6.57 | -- | 7240 |
| FGD-1 | 5/11/2020 | 0.732 | 0.358 | 0.002 | 0.1 | 0.37 | 6.95 | -55 | 448 |
| FGD-2 | 5/11/2020 | 0.0636 | 0.05 | 0.0208 | 2.52 | 0.052 | 6.61 | -27 | 2300 |
| FGD-3 | 5/11/2020 | 0.05 | 0.05 | 0.00993 | 0.535 | 0.053 | 6.62 | 16 | 777 |
| FGD-4 | 5/11/2020 | 0.12 | 0.05 | 0.002 | 0.1 | 0.139 | 6.62 | -46 | 702 |
| FGD-5 | 5/11/2020 | 0.05 | 0.05 | 0.002 | 0.563 | 0.03 | 6.82 | -15 | 836 |
| FGD-6 | 5/11/2020 | 0.582 | 0.05 | 0.002 | 0.129 | 0.076 | 6.75 | -17 | 746 |
| FGD-8 | 5/11/2020 | 68 | 152 | 0.0021 | 1.64 | 0.03 | 6.69 | -14 | 4090 |
| FGD-11 | 5/11/2020 | 0.225 | 0.05 | 0.002 | 0.1 | 0.064 | 6.74 | -45 | 1300 |
| FGD-12 | 5/11/2020 | 32.5 | 0.05 | 0.00678 | 1.22 | 0.056 | 6.59 | -33 | 198 |
| FGD-A-POND | 5/11/2020 | 0.15 | 0.05 | 4.71 | 6.27 | 0.03 | 6.59 | -- | 13200 |
| FGD-B-POND | 5/11/2020 | 0.17 | 0.05 | 0.681 | 2.23 | 0.03 | 6.64 | -- | 8890 |

Notes:
mg/L - milligrams per liter
SU - standard units
J -estimated value

# Exhibits




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**SITE LOCATION MAP**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 19122262 | REV. 0 | EXHIBIT 1



Last Edited By: adiamond Date: 2020-01-23 Time:9:34:07 AM | Printed By: adiamond Date: 2020-01-23 Time:9:34:57 AM
Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (FGD Pond Area).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

**LEGEND**

- CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL
- CCR DELINEATION WELL
- *(410.06)* GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
- 400 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 1 FT)

**NOTE(S)**

1. NATURE AND EXTENT DELINEATION IS NOT NECESSARY BASED ON THE UPDATED STATISTICAL EVALUATION.

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**FGD PONDS**
**POTENTIOMETRIC SURFACE MAP**
**MAY 2020**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-09-30 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

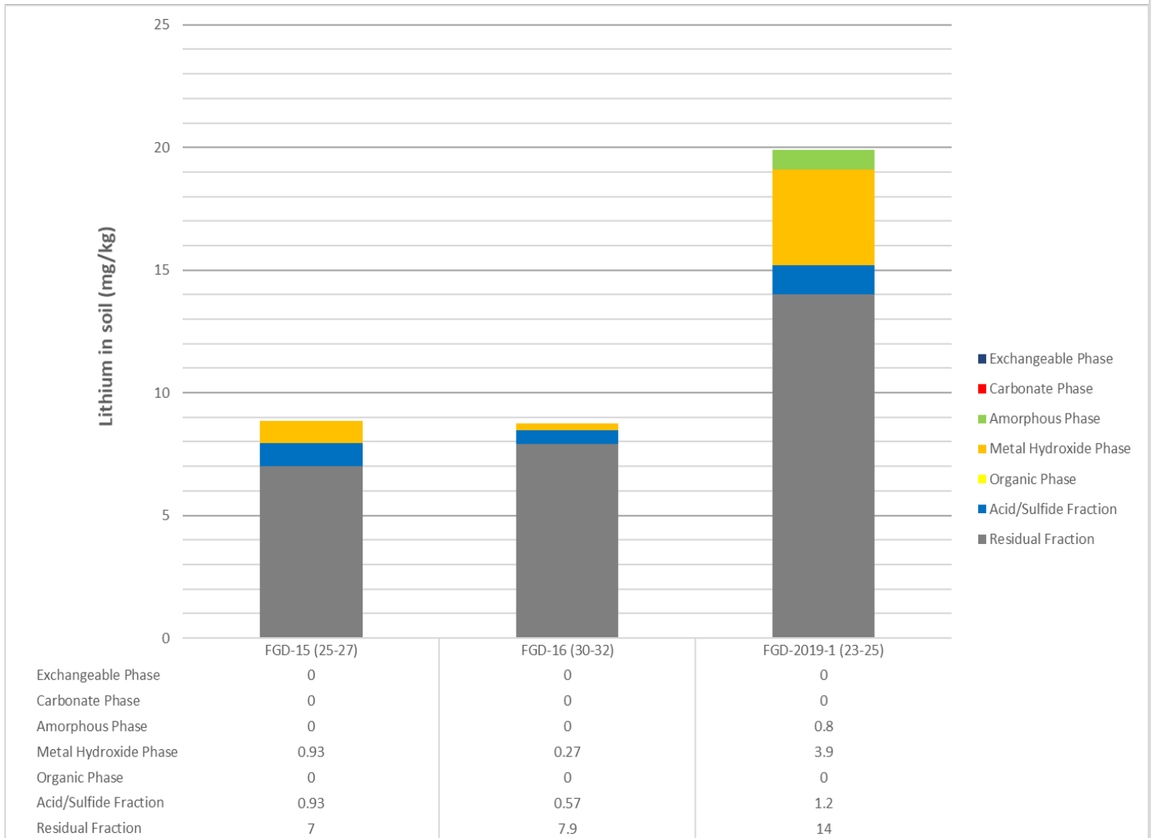
PROJECT NO. 19134019 | REV. 0 | EXHIBIT 2



Last Edited By: adiamond Date: 2020-09-30 Time:1:50:53 PM | Printed By: adiamond Date: 2020-09-30 Time:1:51:28 PM
Path: \\texarkanadata\Projects - Round Rock_2019\19134019 - Luminant\PRODUCTION\1 - Oak Grove\ | File Name: FIG X - FGD Ponds POT Surface Map (May 2020).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in

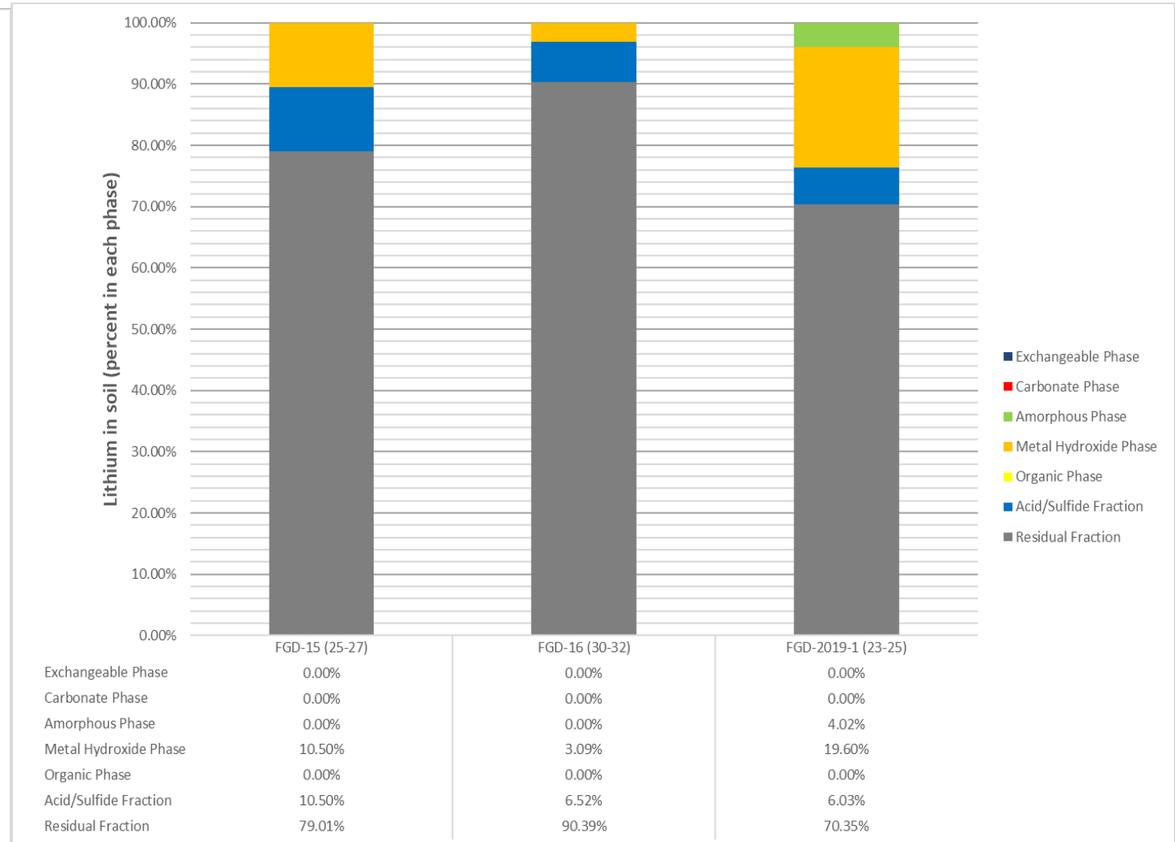
**APPENDIX A**

# Sequential Extraction Results




| | FGD-15 (25-27) | FGD-16 (30-32) | FGD-2019-1 (23-25) |
|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 |
| Carbonate Phase | 0 | 0 | 0 |
| Amorphous Phase | 0 | 0 | 0.8 |
| Metal Hydroxide Phase | 0.93 | 0.27 | 3.9 |
| Organic Phase | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 0.93 | 0.57 | 1.2 |
| Residual Fraction | 7 | 7.9 | 14 |

Borehole and depth below ground surface (Lithium in mg/kg soil)




| | FGD-15 (25-27) | FGD-16 (30-32) | FGD-2019-1 (23-25) |
|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 0.00% | 0.00% | 4.02% |
| Metal Hydroxide Phase | 10.50% | 3.09% | 19.60% |
| Organic Phase | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 10.50% | 6.52% | 6.03% |
| Residual Fraction | 79.01% | 90.39% | 70.35% |

Borehole and depth below ground surface (Lithium in percent of total)

CLIENT
LUMINANT OAK GROVE SES
FGD POND AREA

CONSULTANT
GOLDER

PROJECT
ASSESSMENT OF CORRECTIVE MEASURES
GEOCHEMICAL ASSESSMENT

TITLE
SEQUENTIAL EXTRACTION

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19134019 | 1000 | A | |

golder.com

**APPENDIX B**

# BORING LOGS

# RECORD OF BOREHOLE MW-FGD-01



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 27-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4549.42
EASTING (ft): 2454.41
ELEVATION (ft): 421.91

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy with vegetation | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 421.9 | | | | | | | | |
| | | Firm, brown to light brown, sandy CLAY, some vegetative presence, dry | | 0.0 | SB-1 | | 2<br>3<br>3<br>N6 | 40 | | | | |
| | | trace red at 1.5' | | | | | | | | | | |
| 2 | | Hard, grayish brown with red, CLAY, with sand, dry | | 2.0 | SB-2 | | 8<br>20<br>32<br>N52 | 67 | | | | |
| 4 | | Hard, gray, trace red, silty CLAY, dry | | 4.0 | SB-3 | | 10<br>14<br>18<br>N32 | 73 | | | | |
| 6 | | red, some iron oxide at 6' | | | | | | | | | | |
| | | Compact, grayish brown, SAND, with silt, damp | | 7.0 | SB-4 | | 7<br>13<br>14<br>N27 | 87 | | | | |
| 8 | | reddish brown, some clay at 8' | | | SB-5 | | 6<br>7<br>8<br>N15 | 87 | | | | |
| 10 | | trace red at 10' | | | SB-6 | | 7<br>8<br>8<br>N16 | 87 | | | | |
| 12 | | | | | SB-7 | | 3<br>10<br>13<br>N23 | 67 | | | | |
| 14 | | wet at 14' | | | SB-8 | | 7<br>9<br>9<br>N18 | 100 | | | | ▼ 14' 08/27/2008 |
| 16 | | | | | SB-9 | | 1<br>10<br>12<br>N22 | 87 | | | | |
| 18 | | | | | SB-10 | | 1<br>10<br>19<br>N29 | 93 | | | | |
| 20 | | some yellowish brown at 19.5' | | | | | | | | | | |
| | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

# RECORD OF BOREHOLE MW-FGD-01



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 27-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4549.42
EASTING (ft): 2454.41
ELEVATION (ft): 421.91

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | very dense at 20' | | 20.0 | SB-11 | | 15<br>26<br>35<br>N61 | 87 | | | | |
| 22 | | dense, grayish brown and mottled yellow at 22' | | | SB-12 | | 17<br>21<br>27<br>N48 | 100 | | | | |
| 24 | | very dense, moist at 24' | | | SB-13 | | 18<br>25<br>35<br>N60 | 87 | | | | |
| 26 | | | | | SB-14 | | 16<br>17<br>35<br>N52 | 93 | | | | |
| 28 | | | | | SB-15 | | 20<br>35<br>36<br>N71 | 100 | | | | |
| 30 | | | | | SB-16 | | 18<br>28<br>32<br>N60 | 87 | | | | |
| 32 | | | | | SB-17 | | 21<br>36<br>50/5" | 93 | | | | |
| 34 | | Very dense, dark brownish gray, clayey SAND, trace iron oxide, damp | | 33.0 | | | | | | | | |
| 36 | | BORING TERMINATED AT 34' | | 34.0 | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-02



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 436.2 | | | | | | | | |
| | | Stiff, brown with some dark brown, sandy CLAY, some gravel, damp | | 0.0 | SB-1 | | 4<br>4<br>5<br>N9 | 27 | | | | |
| 2 | | very stiff, dark brown at 2' | | | SB-2 | | 4<br>7<br>16<br>N23 | 47 | | | | |
| 4 | | very stiff, brown to yellowish brown, some iron oxide traces, possible lignite traces, dry at 4' | | | SB-3 | | 7<br>10<br>13<br>N23 | 53 | | | | |
| 6 | | Very stiff, mottled gray and brown, CLAY, some gravel, dry | | 6.0 | SB-4 | | 5<br>13<br>15<br>N28 | 67 | | | | |
| 8 | | Very stiff, brown, yellow, and gray, mottled, sandy CLAY | | 8.0 | SB-5 | | 5<br>13<br>16<br>N29 | 53 | | | | |
| 10 | | hard at 10' | | | SB-6 | | 7<br>13<br>20<br>N33 | 80 | | | | |
| | | gray at 11' | | | | | | | | | | |
| 12 | | Dense, light gray, fine, silty SAND, with a seam of clay, damp | | 12.0 | SB-7 | | 14<br>17<br>21<br>N38 | 87 | | | | |
| 14 | | | | | SB-8 | | 10<br>19<br>27<br>N46 | 93 | | | | |
| 16 | | | | | SB-9 | | 16<br>23<br>24<br>N47 | 87 | | | | |
| | | seam of hard CLAY | | 17.5 | | | | | | | | |
| 18 | | very dense at 18' | | | | | | | | | | |
| | | | | 18.5 | | | | | | | | |
| | | seam of very hard CLAY | | 18.8 | SB-10 | | 10<br>25<br>36<br>N61 | 87 | | | | |
| | | | | 19.8 | | | | | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

# RECORD OF BOREHOLE MW-FGD-02



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | dense at 20' | | 20.0 | SB-11 | | 14<br>19<br>27<br>N46 | 92 | | | | |
| | | seam of hard CLAY | | 21.0 | | | | | | | | |
| 22 | | very dense at 22' | | 22.0 | SB-12 | | 13<br>27<br>37<br>N64 | 100 | | | | |
| 24 | | | | | SB-13 | | 17<br>29<br>28<br>N57 | 87 | | | | |
| 26 | | | | | SB-14 | | 17<br>25<br>42<br>N67 | 67 | | | | |
| | | yellow at 27.5' | | | | | | | | | | |
| 28 | | | | | SB-15 | | 20<br>39<br>50/5" | 87 | | | | |
| 30 | | gray at 30.5' | | | SB-16 | | 25<br>45<br>24<br>N69 | 87 | | | | |
| 32 | | | | | | | | | | | | ▼ 32' 08/22/2008 |
| | | Very loose, brown, SAND, moist | | 33.0 | SB-17 | | 4<br>1<br>2<br>N3 | 80 | | | | |
| 34 | | | | | SB-18 | | 7<br>14<br>14<br>N28 | 73 | | | | |
| | | Very stiff, brown, sandy CLAY, moist | | 35.0 | | | | | | | | |
| 36 | | Hard, brown, CLAY, with silt, moist | | 36.0 | SB-19 | | 8<br>25<br>50/4" | 93 | | | | |
| | | Very dense, brown, SAND | | 37.5 | | | | | | | | |
| 38 | | gray and yellow, mottled at 39' | | | SB-20 | | 20<br>45<br>50/3" | 80 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-02



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | brownish gray at 40' | | 40.0 | SB-21 | | 24<br>42<br>50/4" | 87 | | | | |
| 42 | | gray at 41'<br>dense at 42' | | | SB-22 | | 32<br>25<br>22<br>N47 | 100 | | | | |
| 44 | | seam of hard, yellowish gray and brown, CLAY at 43.5' | | 43.5 | SB-23 | | 18<br>36<br>50/4" | 100 | | | | |
| | | very dense at 44' | | 44.5 | SB-24 | | 32<br>45<br>50/3" | 73 | | | | |
| 48 | | | | | SB-25 | | 24<br>24<br>50/5" | 80 | | | | |
| 50 | | | | | SB-26 | | 32<br>45<br>50/3" | 87 | | | | |
| 52 | | BORING TERMINATED AT 52' | | 52.0 | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | GROUND SURFACE | | 432.0 | | | | | | | | |
| | | Soft to firm, reddish brown, CLAY, with sand, some gravel | | 0.0 | SB-1 | | 2<br>2<br>2<br>N4 | 33 | | | | |
| 2 | | | | | ST-2 | | | 70 | ⊕ | | | |
| 4 | | very stiff, brown, mottled at 4' | | | SB-3 | | 5<br>7<br>12<br>N19 | 83 | | | | |
| 6 | | | | | SB-4 | | 5<br>12<br>15<br>N27 | 93 | | | | |
| | | Very stiff, gray, silty CLAY | | 7.5 | | | | | | | | |
| 8 | | | | | SB-5 | | 5<br>8<br>12<br>N20 | 87 | | | | |
| 10 | | trace brown at 10' | | | SB-6 | | 4<br>7<br>9<br>N16 | 93 | | | | |
| 12 | | stiff, light brown at 12' | | | SB-7 | | 3<br>5<br>7<br>N12 | 73 | | | | |
| 14 | | | | | SB-8 | | 3<br>5<br>6<br>N11 | 87 | | | | |
| 16 | | | | | ST-9 | | | 55 | ⊕ | | | |
| | | Stiff, brown, CLAY, damp | | 17.0 | | | | | | | | |
| 18 | | firm to stiff at 18' | | | SB-10 | | 2<br>3<br>5<br>N8 | 100 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL ⊖W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | firm at 20' | | 20.0 | SB-11 | | 2<br>2<br>3<br>N5 | 100 | | | | |
| 22 | | firm to stiff at 22' | | | SB-12 | | 2<br>3<br>5<br>N8 | 100 | | | | |
| 24 | | dark brown, some silt at 24' | | | SB-13 | | 2<br>3<br>5<br>N8 | 87 | | | | |
| 26 | | Dense, light brown, SAND, moist | | 26.0 | SB-14 | | 12<br>15<br>30<br>N45 | 73 | | | | ▼ *26' 08/21/2008* |
| 28 | | very dense, gray at 28' | | | SB-15 | | 12<br>31<br>30<br>N61 | 73 | | | | |
| 30 | | dense, trace yellowish brown at 30' | | | SB-16 | | 5<br>14<br>17<br>N31 | 67 | | | | |
| 32 | | | | | SB-17 | | 3<br>13<br>21<br>N34 | 67 | | | | |
| | | Hard, brown, some mottled dark brown, CLAY, damp | | 33.0 | | | | | | | | |
| 34 | | Hard, gray and yellowish brown mottled, sandy CLAY, some iron staining | | 34.0 | SB-18 | | 6<br>21<br>23<br>N44 | 67 | | | | |
| 36 | | | | | SB-19 | | 5<br>13<br>20<br>N33 | 87 | | | | |
| 38 | | | | | SB-20 | | 7<br>16<br>25<br>N41 | 80 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | trace iron oxide at 40' | | 40.0 | SB-21 | | 7<br>16<br>25<br>N41 | 80 | | | | |
| 42 | | | | | SB-22 | | 10<br>19<br>29<br>N48 | 74 | | | | |
| 44 | | | | | ST-23 | | | 100 | | | | |
| 46 | | | | | SB-24 | | 13<br>23<br>36<br>N59 | 73 | | | | |
| 48 | | BORING TERMINATED AT 48' | | 48.0 | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-04



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 429.2 | | | | | | | | |
| | | Brown, sandy CLAY, damp | | 0.0 | ST-1 | | | 75 | | | | |
| 2 | | Brown, CLAY, with silt, damp | | 2.0 | ST-2 | | | 65 | | | | |
| 4 | | very stiff, reddish and yellowish brown, mottled, with occasional calcareous nodules at 4' | | | SB-3 | | 4<br>6<br>10<br>N16 | 67 | | | | |
| 6 | | | | | ST-4 | | | 87 | | | | |
| 8 | | | | | SB-5 | | 9<br>11<br>14<br>N25 | 27 | | | | |
| | | Very stiff, brown, sandy CLAY, damp | | 9.0 | | | | | | | | |
| 10 | | with occasional coarse, angular gravel at 9.5'<br>reddish brown at 10' | | | SB-6 | | 7<br>9<br>9<br>N18 | 53 | | | | |
| 12 | | stiff at 12' | | | SB-7 | | 10<br>5<br>4<br>N9 | 40 | | | | |
| 14 | | Stiff, reddish brown, CLAY, with sand, damp | | 14.0 | SB-8 | | 4<br>6<br>5<br>N11 | 27 | | | | |
| | | Compact, brown, fine, silty SAND, damp | | 15.5 | | | | | | | | |
| 16 | | light brown at 16.25' | | | SB-9 | | 7<br>12<br>14<br>N26 | 93 | | | | |
| | | reddish brown at 17.25' | | | | | | | | | | |
| 18 | | Compact, reddish brown, clayey SAND, moist | | 18.0 | SB-10 | | 5<br>8<br>15<br>N23 | 87 | | | | |
| | | Compact, light brown, fine, SAND, moist | | 19.0 | | | | | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: BLT

# RECORD OF BOREHOLE MW-FGD-04



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | dense, occasional seams of gray at 20' | | 20.0 | SB-11 | | 6<br>20<br>20<br>N40 | 100 | | | | |
| 22 | | occasional streaks of yellowish brown at 22' | | | SB-12 | | 12<br>15<br>19<br>N34 | 93 | | | | ▼ 22' 08/20/2008 |
| 24 | | very dense, gray with mottled reddish brown at 24' | | | SB-13 | | 14<br>28<br>30<br>N58 | 100 | | | | |
| 26 | | dense, mottled, reddish brown, yellowish brown, and gray at 26' | | | SB-14 | | 13<br>21<br>22<br>N43 | 100 | | | | |
| 28 | | very dense at 28' | | | SB-15 | | 11<br>15<br>50<br>N65 | 87 | | | | |
| 30 | | dense at 30' | | | SB-16 | | 8<br>15<br>21<br>N36 | 87 | | | | |
| 32 | | | | | SB-17 | | 14<br>18<br>27<br>N45 | 80 | | | | |
| 34 | | very dense at 34' | | | SB-18 | | 20<br>31<br>35<br>N66 | 100 | | | | |
| 36 | | | | | SB-19 | | 20<br>31<br>31<br>N62 | 100 | | | | |
| 38 | | | | | SB-20 | | 21<br>42<br>50/5" | 100 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-04



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | | | 40.0 | SB-21 | | 18<br>35<br>33<br>N68 | 100 | | | | |
| 42 | | Hard, gray, CLAY, with sand | | 42.0 | SB-22 | | 11<br>21<br>34<br>N55 | 100 | | | | |
| 44 | | BORING TERMINATED AT 43.5' | | 43.5 | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

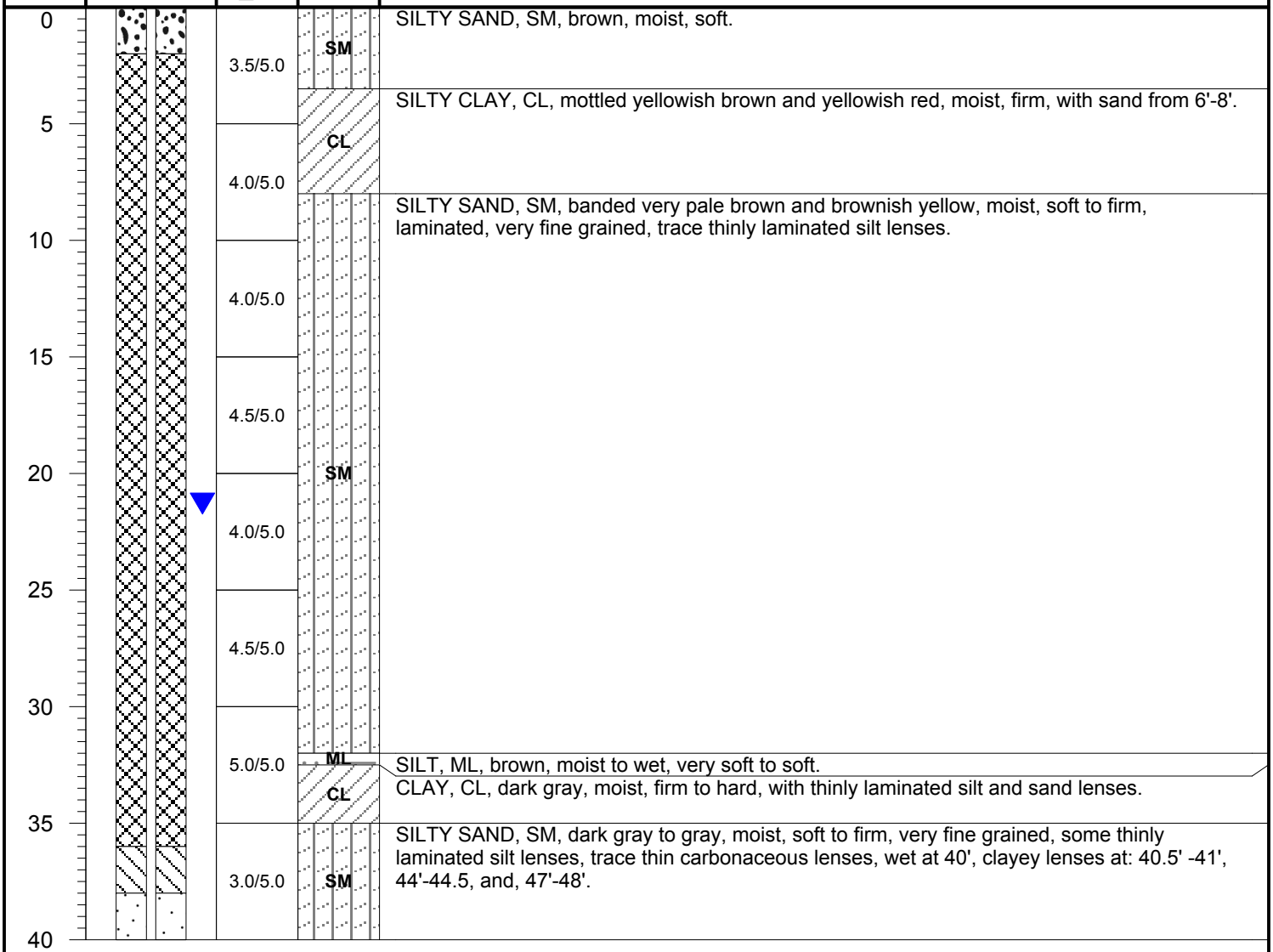
# Luminant Power

# Log of Boring: FGD-5

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/3/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 50 |
| Driller's License: | 3121 | Northing: | 571950.33 |
| Field Supervisor: | Chris Moore | Easting: | 3200628.33 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 430.54 |





**PBW**

**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446


Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 23.67 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 36.0) Cement/Bentonite Grout
(36.0 - 38.0) Bentonite Chips
(38.0 - 50.0) 12/20 Silica Sand

Well Materials
(+2.4 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

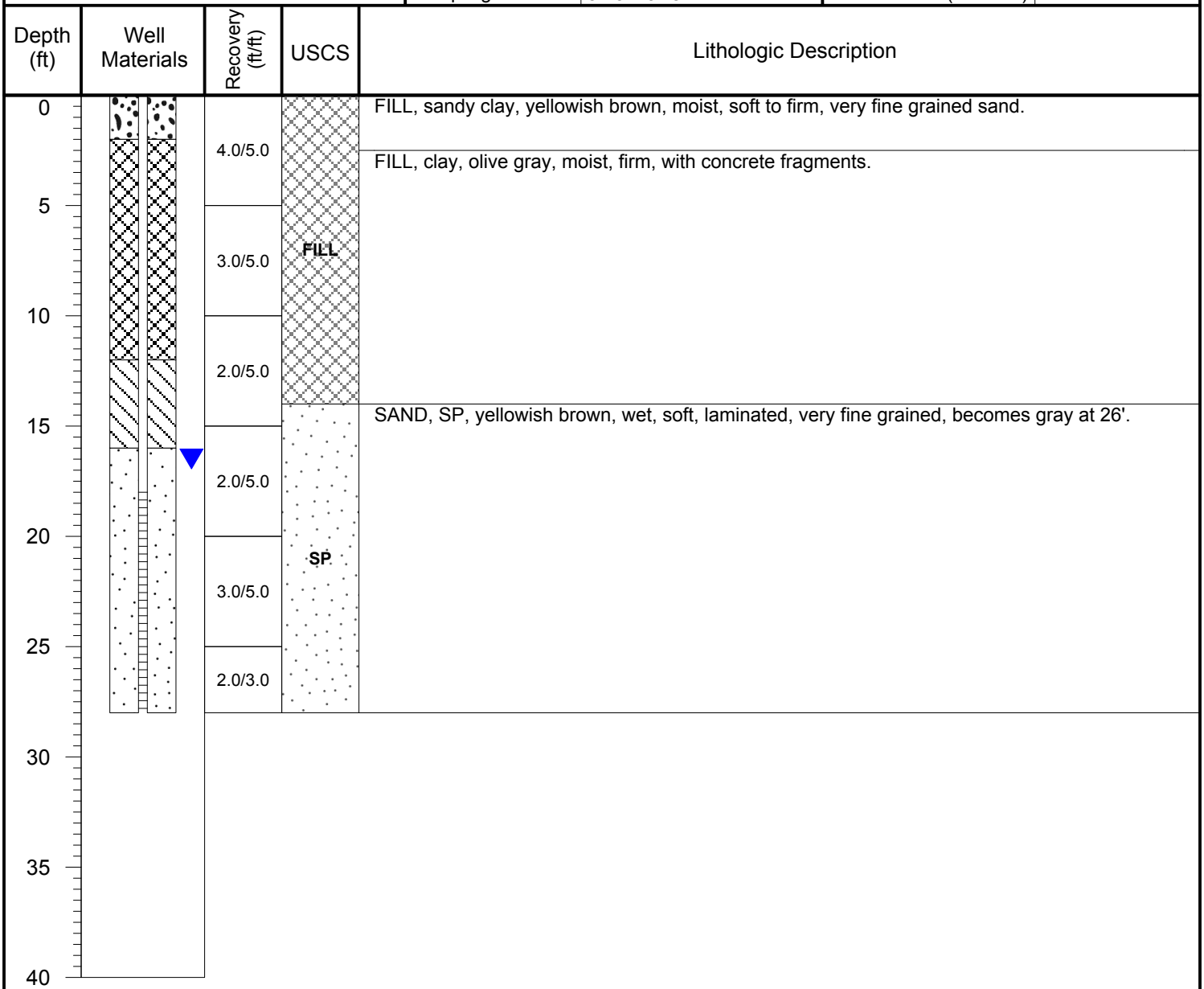
# Luminant Power

# Log of Boring: FGD-6

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/4/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 28 |
| Driller's License: | 3121 | Northing: | 573195.06 |
| Field Supervisor: | Chris Moore | Easting: | 3200525.61 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 425.63 |




Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 19.48 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 14.0) Cement/Bentonite Grout
(14.0 - 16.0) Bentonite Chips
(16.0 - 28.0) 12/20 Silica Sand

Well Materials
(+3.0 - 18.0) Casing, 2" Sch 40 FJT PVC
(18.0 - 28.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot


**PBW**
**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

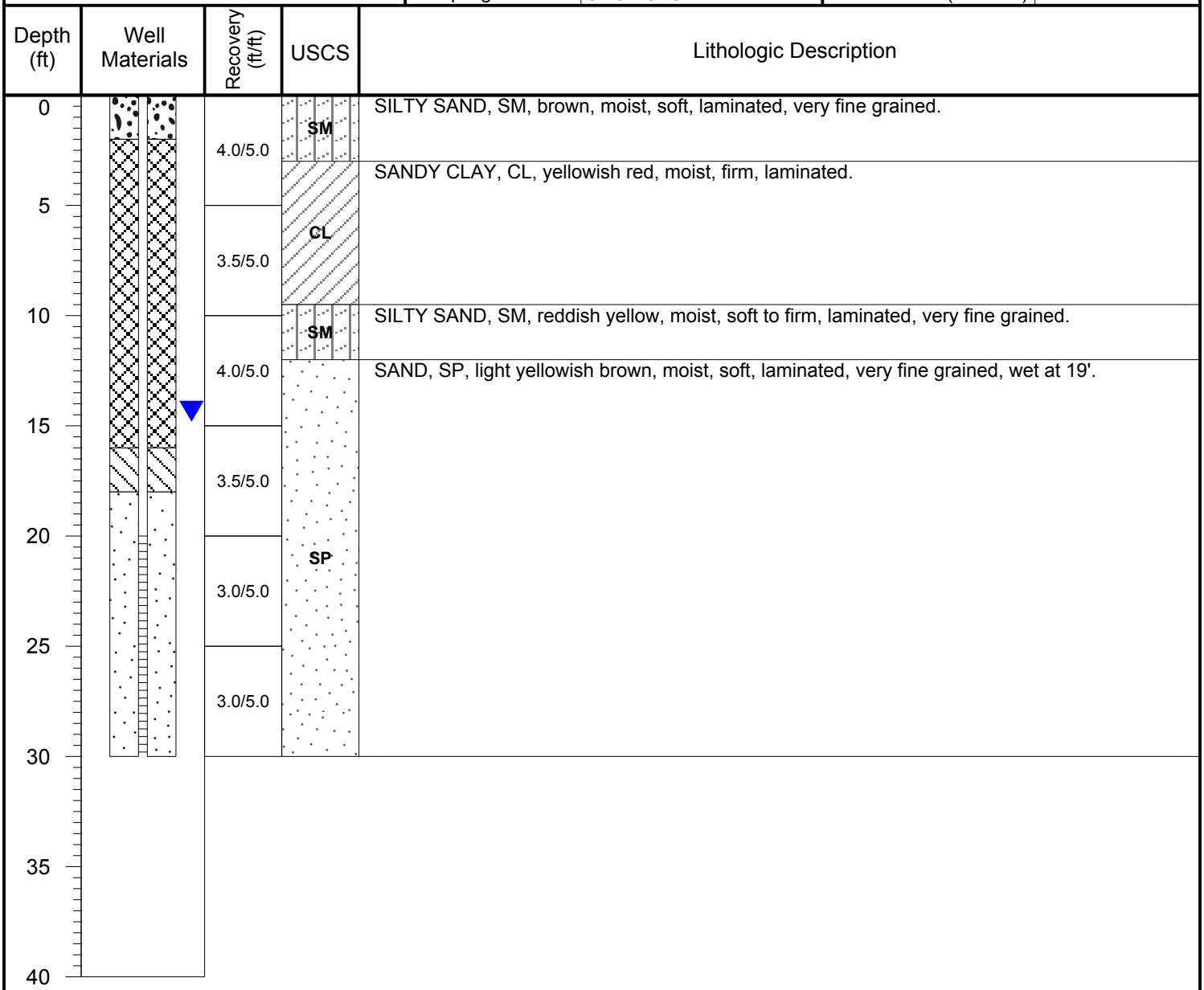
# Luminant Power

# Log of Boring: FGD-7

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/3/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 30 |
| Driller's License: | 3121 | Northing: | 572591.64 |
| Field Supervisor: | Chris Moore | Easting: | 3199761.32 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 423.6 |




Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 16.55 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 16.0) Cement/Bentonite Grout
(16.0 - 18.0) Bentonite Chips
(18.0 - 30.0) 12/20 Silica Sand

Well Materials
(+2.2 - 20.0) Casing, 2" Sch 40 FJT PVC
(20.0 - 30.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot


**PBW**
**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

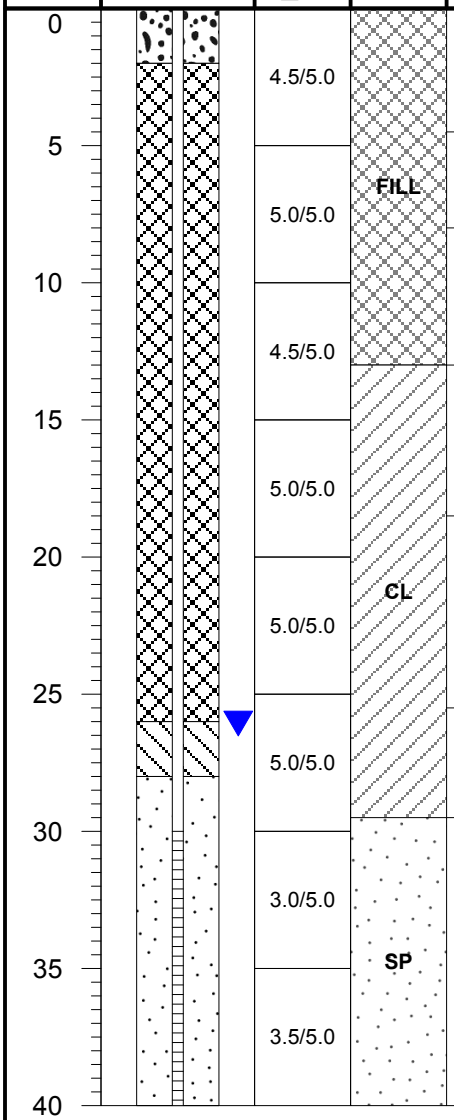
# Luminant Power

# Log of Boring: FGD-8

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/4/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 40 |
| Driller's License: | 3121 | Northing: | 573033.29 |
| Field Supervisor: | Chris Moore | Easting: | 3198862.3 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 437.06 |




Lithologic Description

FILL, silty clay, CL, brown, moist, soft to firm.

FILL, silty sand, SM, very pale brown, dry to moist, soft, very fine grained.

FILL, silty clay, CL, dark gray, moist, firm, crumbles easily, some sand layers.

SANDY, CLAY, CL, strong brown, moist, firm, laminated, very fine grained sand

SILTY CLAY, CL, dark gray, moist, firm, with sand laminae.

SILTY CLAY, CL, mottled gray and brown, moist, firm to hard, some sand laminae, some oxidized staining.

SAND, SP, dark gray, wet, very soft to soft, very fine grained, some silty laminae.

Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 29.11 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 26.0) Cement/Bentonite Grout
(26.0 - 28.0) Bentonite Chips
(28.0 - 40.0) 12/20 Silica Sand

Well Materials
(+3.0 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot


**PBW**
**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-11



**CLIENT** Luminant Power
**PROJECT NAME** Luminant
**PROJECT NUMBER** 1406296
**PROJECT LOCATION** Oak Grove SES
**DATE STARTED** 11/25/14 **COMPLETED** 11/26/14
**GROUND ELEVATION** 448.67 ft **HOLE SIZE** 6 inches
**DRILLING CONTRACTOR** Envirotech
**GROUND WATER LEVELS:**
**DRILLING METHOD** Auger
▽ **AT TIME OF DRILLING 40** 40' bgs
**LOGGED BY** DMW **CHECKED BY** CFR
**AT END OF DRILLING**
**NOTES**
**AFTER DRILLING**

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) | ▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL / □ FINES CONTENT (%) □ 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|
| 0 | | Firm, brown and green, CLAY, and topsoil, moist | ST | 75 | | 1.0 | | |
| | | Hard, brown and tan, SANDY CLAY, moist | ST | 50 | | 4.5 | | |
| 5 | | | ST | 54 | | 4.5 | | |
| | | | SS | 58 | 3-5-7-10 (12) | | | |
| | | | SS | 79 | 6-8-8-9 (16) | | | |
| 10 | | | SS | 67 | 5-9-10-12 (19) | | | |
| | | | SS | 71 | 6-8-9-12 (17) | | | |
| | | Very stiff, red and black, CLAY, with brown sand, moist | | | | | | |
| 15 | | Stiff, brown and tan, SANDY CLAY, moist | SS | 67 | 6-8-6-7 (14) | | | |
| | | maroon, gravel sized rocks at 15.0' | SS | 92 | 5-6-8-9 (14) | | | |
| | | | SS | 79 | 4-6-8-9 (14) | | | |
| 20 | | Compact, brown and tan, CLAYEY SAND, moist | SS | 71 | 6-8-7-8 (15) | | | |
| | | with gray and brown clay lenses at 21.0' | SS | 79 | 7-8-11-15 (19) | | | |
| | | loosely consolidated sand at 23.0' | SS | 83 | 9-13-17-19 (30) | | | |
| 25 | | orange mottlings at 25.0' | SS | 83 | 9-10-14-16 (24) | | | |
| | | | SS | 92 | 8-9-18-21 (27) | | | |
| 30 | | Very stiff, gray, SAND and CLAY, moist dense at 29.5' | | | | | | |

*(Continued Next Page)*

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 1/23/15 10:02 - L:\14- 2014 FILE FOLDER\1406296- LUMINANT_FGD-C\1406296 LUMINANT.GPJ

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-11

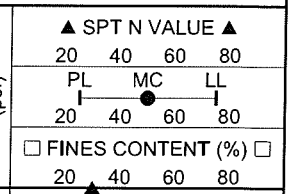


**CLIENT** Luminant Power **PROJECT NAME** Luminant

**PROJECT NUMBER** 1406296 **PROJECT LOCATION** Oak Grove SES

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 30 | | Very stiff, gray, SAND and CLAY, moist *(continued)* | SS | 83 | 9-13-17-19 (30) | | |
| | | without clay at 31.0' | SS | 88 | 10-16-22-22 (38) | | |
| | | Dense, gray and tan, SILTY SAND, moist | | | | | |
| | | poorly consoldiated at 33.0' | SS | 83 | 7-11-17-17 (28) | | |
| 35 | | | SS | 71 | 6-13-14-15 (27) | | |
| | | Very stiff, gray, SILTY CLAY, moist | SS | 75 | 4-6-13-17 (19) | | |
| | | Dense, gray and tan, SILTY SAND, moist<br>moist to wet at 38.0' | SS | 71 | 6-5-8-10 (13) | | |
| 40 | | Compact, gray and tan, SAND, moist to wet | SS | 67 | 3-4-4-7 (8) | | |
| | | Compact, gray and tan, SILTY SAND, wet<br>Very stiff, gray, SILTY CLAY, moist | SS | 88 | 7-9-10-13 (19) | | |
| 45 | | Dense, gray and tan, SILTY SAND, moist to wet | SS | 92 | 3-8-24-28 (32) | | |
| | | moist at 46.0' | SS | 83 | 4-8-26-40 (34) | | |
| | | slightly wet at 48.0' | SS | 75 | 14-28-29-34 (57) | | |
| 50 | | very dense at 50.0' | SS | 92 | 9-38-50 (88) | | |
| | | moist at 52.0' | SS | 83 | 15-28-46-50 (74) | | |
| | | moist to wet at 54.0' | SS | 71 | 14-36-50 (86) | | |
| 55 | | | SS | | 21-39-48-113 (87) | | |

Bottom of borehole at 58.0 feet.

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Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-12



**CLIENT** Luminant Power
**PROJECT NAME** Luminant
**PROJECT NUMBER** 1406296
**PROJECT LOCATION** Oak Grove SES
**DATE STARTED** 11/26/14 **COMPLETED** 11/26/14
**GROUND ELEVATION** 439.48 ft **HOLE SIZE** 6 inches
**DRILLING CONTRACTOR** Envirotech
**GROUND WATER LEVELS:**
**DRILLING METHOD** Auger
▽ **AT TIME OF DRILLING 32** 32' bgs
**LOGGED BY** DMW **CHECKED BY** CFR
**AT END OF DRILLING**
**NOTES**
**AFTER DRILLING**

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) | ▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|
| 0 | | Firm, brown, CLAY, topsoil, moist | ST | 46 | | 1.0 | | |
| | | Hard, brown, SANDY CLAY, moist | ST | 63 | | 4.5 | | |
| 5 | | | ST | 42 | | 4.5 | | |
| | | | SS | 75 | 6-8-10-7 (18) | | | ▲ |
| | | Firm, red, orange and gray, CLAY, moist, with red and orange mottling | SS | 75 | 5-8-10-11 (18) | | | ▲ |
| 10 | | | SS | 75 | 6-8-12-14 (20) | | | ▲ |
| | | Very stiff, gray and red, SILTY CLAY, moist, silt partings | SS | 71 | 4-8-14-15 (22) | | | ▲ |
| 15 | | increasing silt at 15.0' | SS | 63 | 8-10-19-16 (29) | | | ▲ |
| | | decreasing silt at 16.0' | SS | 75 | 5-9-12-16 (21) | | | ▲ |
| | | Dense, red and gray, SANDY SILT, moist<br>increasing silt at 17.5' | SS | 79 | 8-14-12-8 (26) | | | ▲ |
| | | Compact, orange and tan, SILTY SAND, moist | SS | 63 | 7-5-5-6 (10) | | | ▲ |
| 20 | | loosely consoldiated at 19.0' | SS | 83 | 9-12-13-15 (25) | | | ▲ |
| | | increased clay at 20.0' | SS | | 17-11-16-20 (27) | | | ▲ |
| | | more consolidated at 21.0' | SS | | 12-18-14-15 (32) | | | ▲ |
| 25 | | Stiff, gray, SILTY CLAY, moist, silt partings | SS | 83 | 9-19-19-17 (38) | | | ▲ |
| | | intervals of gray sand mixed with silty clay at 25.0' | | | | | | |
| | | Dense, gray, SAND, moist | | | | | | |
| | | Stiff, gray, SILTY CLAY, moist | | | | | | |
| 30 | | Dense, gray, SILTY SAND, with interbedded clay, moist, with red staining | | | | | | |

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Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-12



**CLIENT** Luminant Power **PROJECT NAME** Luminant

**PROJECT NUMBER** 1406296 **PROJECT LOCATION** Oak Grove SES

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 30 | | Dense, gray, SILTY SAND, with interbedded clay, moist, with red staining *(continued)* | SS | 88 | 4-5-15-24 (20) | | |
| | | ▽ red to moist, turning red at 32.0' | SS | 67 | 10-16-30-28 (46) | | |
| 35 | | brown to gray at 34.0' | SS | 63 | 14-24-48-42 (72) | | |
| | | | SS | 92 | 8-18-32-42 (50) | | |
| | | increasing sand at 38.0' | SS | 92 | 8-26-48-50 (74) | | |
| 40 | | | SS | 92 | 3-4-10-26 (14) | | |
| | | gray and tan at 42.0' | SS | 92 | 13-24-42-43 (66) | | |
| 45 | | | SS | 92 | 16-30-45-50 (75) | | |
| | | | SS | 58 | 20-36-50 (86) | | |
| 50 | | | SS | 88 | 16-40-50 (90) | | |
| | | | SS | 71 | 18-26-50 (76) | | |
| | | | SS | 63 | 4-30-50 (80) | | |
| 55 | | | SS | 50 | 7-24-50 (74) | | |
| | | | SS | 58 | 22-48-50 (98) | | |
| | | | SS | 54 | 24-48-50 (98) | | |
| 60 | | dark gray at 60.0' | SS | 46 | 25-48-50 (98) | | |
| | | | SS | 50 | 30-50 | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 64.0 feet.

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 1/23/15 10:02 - L:\14- 2014 FILE FOLDER\1406296- LUMINANT_FGD-C\1406296 LUMINANT.GPJ

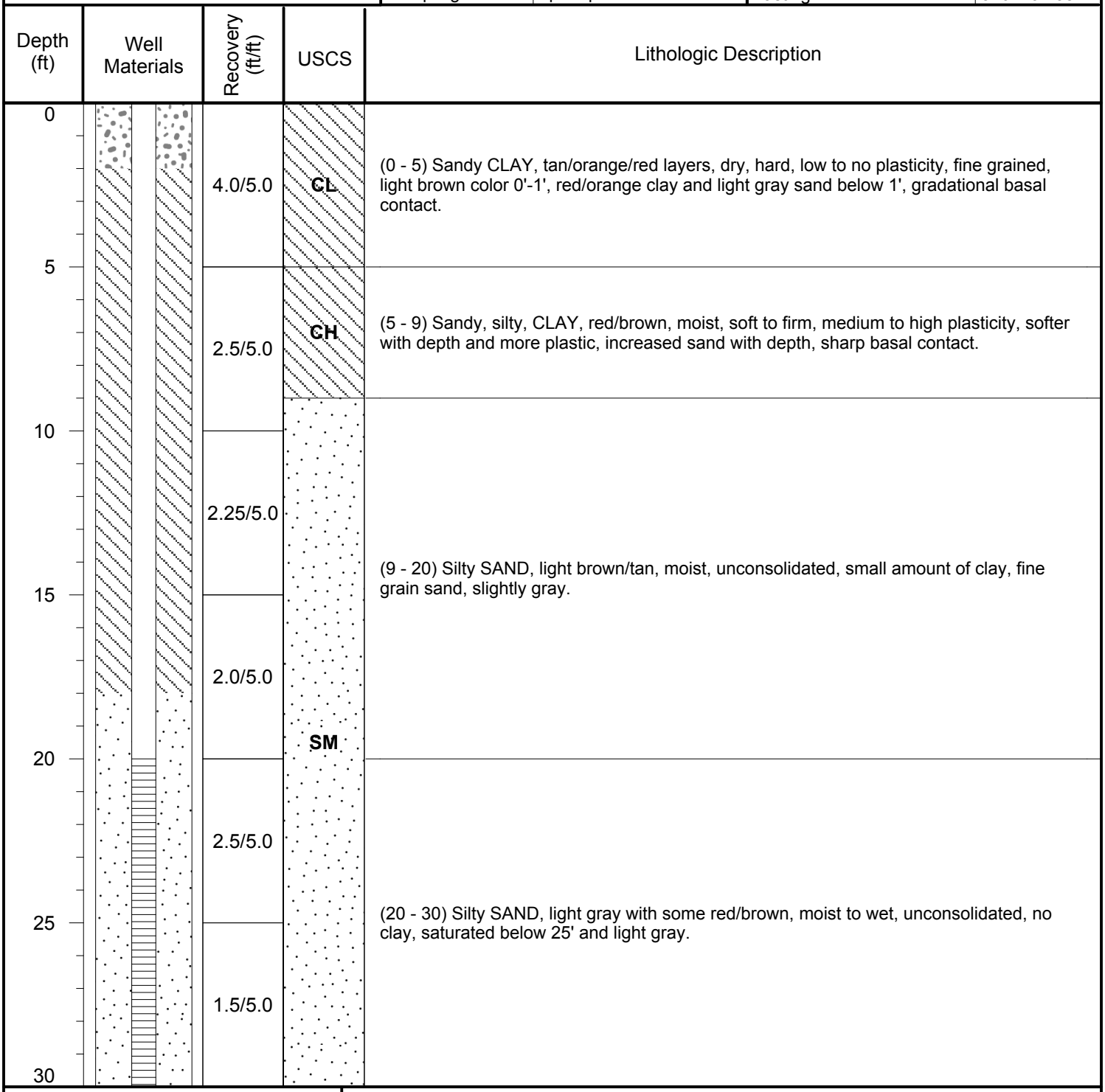
# Luminant

# Log of Boring: FGD-14

Oak Grove Steam Electric Station
Petteway, TX

PBW Project No. 5244

| | | | |
|---|---|---|---|
| Completion Date: | 7/25/2016 | Drilling Method: | HSA |
| Drilling Company: | Sunbelt | Borehole Diameter (in.): | 8.25 |
| Driller: | Raymond Alcala | Total Depth (ft): | 30 |
| Driller's License: | 59430 | TOC Elevation (ft. AMSL): | 428.91 |
| Logged By: | Sara Taube | Northing: | 572912.27 |
| Sampling Method: | Split Spoon | Easting: | 3201297.58 |





**PBW**

**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 - Fax (512) 671-3446


Notes:

Well Materials
(+2.70 - 20) Casing, 2" Sch 40 FJT PVC
(20 - 30) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-2') Cement
(2'-18') Bentonite chips
(18'-30') 16/30 sand

# Luminant

## Log of Boring: FGD-15

Big Brown Steam Electric Station
Franklin, Texas

Golder Project No. 19122434E

| | | | |
|---|---|---|---|
| Completion Date: | 5/22/2019 | Drilling Method: | HSA |
| Drilling Company: | Vortex | Borehole Diameter (in.): | 6 |
| Driller: | Robert Joiner | Total Depth (ft): | 35 |
| Driller's License: | 54776M | TOC Elevation (ft. AMSL): | 437.17 |
| Logged By: | Sergio Ruiz | Northing: | 3452427 |
| Sampling Method: | 2"X2.5' Split Spoon | Easting: | 739119.1 |

| Depth (ft) | Well Materials | Recovery (ft/ft) | USCS | Lithologic Description |
|---|---|---|---|---|
| 0 | | 0.0/5.0 | NR | (0 - 5) HydroVAC |
| 5 | | 1.2/2.5 | SM | (5 - 12.8) Silty SAND, fine grained, light tan with some yellow orange, trace roots, clay lense from 7.5'-7.6', slightly moist, orange at 12.2' then back to light brown, some more cohesive, some small firm pieces |
| | | 1.2/2.5 | | |
| 10 | | 1.3/2.5 | | |
| | | 1.6/2.5 | CL | (12.8 - 16.5) Sandy, silty, CLAY, brownish gray, thin fine sand lenses throughout, orange color 12.9'-13.1' |
| 15 | | 1.0/2.5 | | |
| | | 1.0/2.5 | SM | (16.5 - 20.1) Silty SAND, fine grained with silt, more clay with increased depth, some Fe staining. |
| 20 | | 1.9/2.5 | CL | (20.1 - 23) CLAY, brownish purple, moist to wet, firm, orange red staining at 20', fine sand lenses present |
| | | 1.5/2.5 | SM | (23 - 24.5) Silty SAND, moist, soft, fine silty sand, some orange Fe staining, some clay throughout |
| 25 | | | CL | (24.5 - 25) CLAY, brown purple, moist, low to moderate plasticity, saturated at 25', |
| | | 1.5/2.5 | SM | (25 - 35) Silty SAND, grayish purple, fine to very fine, wet, very soft, trace clay, some Fe staining |
| | | 1.0/2.5 | | |
| 30 | | 1.0/2.5 | | |
| | | 2.5/2.5 | | |
| 35 | | | | |

GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
O·512.671.3434 F·512.671.3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(+3 - 25) Casing, 2" Sch 40 FJT PVC
(25 - 35) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-2') Grout
(2'-23') Bentonite chips
(23'-35) 10/20 sand

# Luminant

## Log of Boring: FGD-16

Big Brown Steam Electric Station
Franklin, Texas

Golder Project No. 19122434E

| | | | |
|---|---|---|---|
| Completion Date: | 5/23/2019 | Drilling Method: | HSA |
| Drilling Company: | Vortex | Borehole Diameter (in.): | 6 |
| Driller: | Robert Joiner | Total Depth (ft): | 40 |
| Driller's License: | 54776M | TOC Elevation (ft. AMSL): | 444.3 |
| Logged By: | Jacob Jarvis | Northing: | 3452861 |
| Sampling Method: | 2"X2.5' Split Spoon | Easting: | 739235.7 |

| Depth (ft) | Well Materials | Recovery (ft/ft) | USCS | Lithologic Description |
|---|---|---|---|---|
| 0 | | 0.0/5.0 | NR | (0 - 5) HydroVAC |
| 5 | | 1.25/5.0 | SC | (5 - 7.5) Sandy CLAY, dry, soft, low plasticity, clay decreases with depth, yellow orange |
| | | 1.2/2.5 | SM | (7.5 - 10) Silty SAND, yellow orange, dry, very soft, subround, no plasticity, clay increases in bottom 3 inches |
| 10 | | 1.75/2.5 | | (10 - 12.5) Silty SAND, yellow orange, dry, soft, subround, no plasticity, few clay lenses, few clean sand lenses |
| | | 0.8/2.5 | SW | (12.5 - 15) SAND, fine, well sorted, brown, very soft, dry, no plasticity, color change from brown to dark brown |
| 15 | | 1.7/2.5 | CL | (15 - 17.5) Sandy CLAY, red, dry, hard, medium plasticity, hard clay with sand throughout |
| | | 1.25/2.5 | SC | (17.5 - 18.5) Clayey SAND, dark red, hard, low plasticity, dry |
| 20 | | 1.5/2.5 | | |
| | | 1.7/2.5 | | |
| 25 | | 1.4/2.5 | | |
| | | 1.75/2.5 | SW | (18.5 - 40) SAND, red to purple gray, well sorted, very soft, subround, no plasticity, gradual transition to clean sand, lighter red color, clay lenses 20.0'-22.5', saturated at 30' |
| 30 | | 1.75/2.5 | | |
| | | 1.75/2.5 | | |
| 35 | | 5.0/5.0 | | |
| 40 | | | | |

GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
O·512.671.3434 F·512.671.3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(3 - 30) Casing, 2" Sch 40 FJT PVC
(30 - 40) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-2') Grout
(2'-28') Bentonite chips
(28'-40') 10/20 sand

# Luminant

# Log of Boring: FGD-2019-1

Big Brown Steam Electric Station
Franklin, TX

Golder Project No. 19122434E

| | | | |
|---|---|---|---|
| Completion Date: | 6/3/2019 | Drilling Method: | HSA |
| Drilling Company: | Vortex | Borehole Diameter (in.): | 6 |
| Driller: | Robert Joiner | Total Depth (ft): | 30 |
| Driller's License: | 54776 | TOC Elevation (ft. AMSL): | |
| Logged By: | Jacob Jarvis | Northing: | 3452823 |
| Sampling Method: | 2'X2.5' Split Spoon | Easting: | 739015.9 |

| Depth (ft) | Recovery (ft/ft) | USCS | Lithologic Description |
|---|---|---|---|
| 0 | 0.0/5.0 | NR | (0 - 5) HydroVAC |
| 5 | 1.6/2.5 | CL | (5 - 7.5) Silty Sandy CLAY, light tan, dry, firm, low to mod plasticity |
| | 1.55/2.5 | SC | (7.5 - 10) Silty SAND, yellow orange, dry, soft, few clay lenses throughout |
| 10 | 2.5/2.5 | CL | (10 - 12.5) Silty CLAY, light gray, dry to moist, soft, low to moderate plasticity, plasticity and silt increases with depth |
| | 2.5/2.5 | CH | (12.5 - 22) CLAY, wet, brown to dark brown, soft to firm, high plasticity |
| 15 | 2/2.5 | | |
| | 2.5/2.5 | | |
| 20 | 2.1/2.5 | | |
| | 2.2/2.5 | SW | (22 - 25) SAND, light tan, saturated, soft, no plasticity |
| 25 | 5.0/5.0 | | |
| 30 | | | |

GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
O·512.671.3434 F·512.671.3446

Notes:
1. This log should not be used separately from the report to which it is attached.

**APPENDIX C**

# LABORATORY ANALYTICAL REPORTS

June 05, 2019

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1905205

RE: Luminant-OGSES FGD Ponds

Dear Will Vienne:

DHL Analytical, Inc. received 9 sample(s) on 5/17/2019 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-19-24

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 82719

# CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR, ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-17-19 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 1905205
PROJECT LOCATION OR NAME: LUMINANT - OGSES FGD PONDS
CLENT PROJECT #: 19122262-F COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl, $HNO_3$, $H_2SO_4$ ❑ NaOH ❑, ICE, UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ (METHOD 8021) | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO (METHOD 8015) ❑ DRO (METHOD 8105) ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS ❑ | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | ATTENUIT ALK, NO3, SO4, Na, Mg, K, FERROUS & FERRIC IRON

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | ATTENUIT | ALK, NO3, SO4, Na, Mg, K, FERROUS & FERRIC IRON | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 01 | 5-16-19 | 0920 | W | | 7 | | | | | | X | X X | |
| FGD-4 | 02 | | 1015 | W | | 7 | | | | | | X | X X | |
| FGD-3 | 03 | | 1110 | W | | 7 | | | | | | X | X X | |
| FGD-2 | 04 | | 1200 | W | | 7 | | | | | | X | X X | |
| FGD-5 | 05 | | 1350 | W | | 7 | | | | | | X | X X | |
| FGD-1 | 06 | | 1450 | W | | 7 | | | | | | X | X X | |
| [redacted] JB | — | | ~~1450~~ JB | W | | 7 | | | | | | X | X X | |
| FGD-8 | 07 | | 1545 | W | | 7 | | | | | | X | X X | |
| FGD-11 | 08 | | 1640 | W | | 7 | | | | | | X | X X | |
| FGD-12 | 09 | | 1735 | W | | 7 | | | | | | X | X X | |
| [redacted] JB | — | | | | | | | | | | | | | |

RELINQUISHED BY: (Signature) DATE/TIME 5-17-19 9:10 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME 5-17-19 11:20 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

❑ DHL DISPOSAL @ $5.00 each ❑ Return

TURN AROUND TIME
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑ _____

LABORATORY USE ONLY:
RECEIVING TEMP: 0.9/0.6 °C THERM #: 78
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ☒ NOT USED
CARRIER: ❑ LONE STAR ❑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
☒ HAND DELIVERED

Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Golder | Date Received: 5/17/2019

Work Order Number 1905205 | Received by EL

Checklist completed by: [signature] Signature | 5/17/2019 Date | Reviewed by [initials] Initials | 5/17/2019 Date

Carrier name Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 0.9 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 11837 |
| | Adjusted? no | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *05-Jun-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD Ponds
**Lab Order:** 1905205

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2320 B - Alkalinity Analysis
Method M3500-Fe D - Ferrous Iron Analysis (this parameter is not NELAP certified)
Method M3500-Fe D - Ferric Iron (calculation) (this calculation is not NELAP certified).
Method M4500-P E - Orthophosphate Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904 and SM 7500 Ra B M. Analyzed at Pace Analytical.

## LOG IN

The samples were received and log-in performed on 5/17/19. A total of 9 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 5/20/19 the matrix spike and matrix spike duplicate recoveries were out of control limits for three analytes. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

For Metals analysis performed on 5/22/19 the RPD for the serial dilution was slightly above control limits for Boron. This is flagged accordingly. The PDS was within control limits for this analyte. No further corrective actions were taken.

For Metals analysis peformed on 5/22/19 LCVL6-190522 was above control limits for Sodium. This is flagged accordingly. The associated CCV6-190522 was within control limits for this analyte. No further corrective actions were taken.

## ALKALINITY ANALYSIS

For Alkalinity analysis performed on 5/21/19 the recovery of the Initial Calibration Verification (ICV-190521) was slightly above control limits. This is flagged accordingly in the QC summary report. The remaining bracketing CCVs were within control limits. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *05-Jun-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD Ponds
**Lab Order:** 1905205

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1905205-01 | FGD-6 | | 05/16/19 09:20 AM | 5/17/2019 |
| 1905205-02 | FGD-4 | | 05/16/19 10:15 AM | 5/17/2019 |
| 1905205-03 | FGD-3 | | 05/16/19 11:10 AM | 5/17/2019 |
| 1905205-04 | FGD-2 | | 05/16/19 12:00 PM | 5/17/2019 |
| 1905205-05 | FGD-5 | | 05/16/19 01:50 PM | 5/17/2019 |
| 1905205-06 | FGD-1 | | 05/16/19 02:50 PM | 5/17/2019 |
| 1905205-07 | FGD-8 | | 05/16/19 03:45 PM | 5/17/2019 |
| 1905205-08 | FGD-11 | | 05/16/19 04:40 PM | 5/17/2019 |
| 1905205-09 | FGD-12 | | 05/16/19 05:35 PM | 5/17/2019 |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1905205-01A | FGD-6 | 05/16/19 09:20 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-01B | FGD-6 | 05/16/19 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-01C | FGD-6 | 05/16/19 09:20 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-02A | FGD-4 | 05/16/19 10:15 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-02B | FGD-4 | 05/16/19 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-02C | FGD-4 | 05/16/19 10:15 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-03A | FGD-3 | 05/16/19 11:10 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-03B | FGD-3 | 05/16/19 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-03C | FGD-3 | 05/16/19 11:10 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-04A | FGD-2 | 05/16/19 12:00 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1905205-04B | FGD-2 | 05/16/19 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-04C | FGD-2 | 05/16/19 12:00 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-05A | FGD-5 | 05/16/19 01:50 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-05B | FGD-5 | 05/16/19 01:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-05C | FGD-5 | 05/16/19 01:50 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/30/19 03:00 PM | 91142 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-06A | FGD-1 | 05/16/19 02:50 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-06B | FGD-1 | 05/16/19 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-06C | FGD-1 | 05/16/19 02:50 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/30/19 03:00 PM | 91142 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1905205-07A | FGD-8 | 05/16/19 03:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-07B | FGD-8 | 05/16/19 03:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-07C | FGD-8 | 05/16/19 03:45 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | E300 | Anion Preparation | 05/20/19 09:14 AM | 90986 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-08A | FGD-11 | 05/16/19 04:40 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-08B | FGD-11 | 05/16/19 04:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-08C | FGD-11 | 05/16/19 04:40 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | E300 | Anion Preparation | 05/20/19 09:14 AM | 90986 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-09A | FGD-12 | 05/16/19 05:35 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-09B | FGD-12 | 05/16/19 05:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-12 | 05/16/19 05:35 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-09C | FGD-12 | 05/16/19 05:35 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-12 | 05/16/19 05:35 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-12 | 05/16/19 05:35 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1905205-09C | FGD-12 | 05/16/19 05:35 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-12 | 05/16/19 05:35 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1905205-01A | FGD-6 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-6 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:41 PM | UV/VIS_2_190521B |
| 1905205-01B | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 10:48 AM | CETAC2_HG_190524A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 03:52 PM | ICP-MS4_190522D |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 20 | 05/23/19 11:55 AM | ICP-MS4_190523A |
| 1905205-01C | FGD-6 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 10:03 AM | TITRATOR_190521A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 01:24 PM | IC4_190517A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 05:56 PM | IC4_190517A |
| | FGD-6 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:35 PM | UV/VIS_2_190517B |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-02A | FGD-4 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-4 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:42 PM | UV/VIS_2_190521B |
| 1905205-02B | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 10:50 AM | CETAC2_HG_190524A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 03:54 PM | ICP-MS4_190522D |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 10 | 05/23/19 11:57 AM | ICP-MS4_190523A |
| 1905205-02C | FGD-4 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 10:23 AM | TITRATOR_190521A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 02:12 PM | IC4_190517A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 06:12 PM | IC4_190517A |
| | FGD-4 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:35 PM | UV/VIS_2_190517B |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-03A | FGD-3 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-3 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:42 PM | UV/VIS_2_190521B |
| 1905205-03B | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:01 AM | CETAC2_HG_190524A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 20 | 05/23/19 11:59 AM | ICP-MS4_190523A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 03:56 PM | ICP-MS4_190522D |
| 1905205-03C | FGD-3 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 10:42 AM | TITRATOR_190521A |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1905205-03C | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 03:00 PM | IC4_190517A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 06:28 PM | IC4_190517A |
| | FGD-3 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:35 PM | UV/VIS_2_190517B |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-04A | FGD-2 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-2 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:43 PM | UV/VIS_2_190521B |
| 1905205-04B | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:03 AM | CETAC2_HG_190524A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 10 | 05/23/19 12:01 PM | ICP-MS4_190523A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 03:58 PM | ICP-MS4_190522D |
| 1905205-04C | FGD-2 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 10:50 AM | TITRATOR_190521A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 06:44 PM | IC4_190517A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 03:16 PM | IC4_190517A |
| | FGD-2 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:37 PM | UV/VIS_2_190517B |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-05A | FGD-5 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-5 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:43 PM | UV/VIS_2_190521B |
| 1905205-05B | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:06 AM | CETAC2_HG_190524A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 04:00 PM | ICP-MS4_190522D |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 10 | 05/23/19 12:03 PM | ICP-MS4_190523A |
| 1905205-05C | FGD-5 | Aqueous | M2320 B | Alkalinity | 91142 | 1 | 05/30/19 03:20 PM | TITRATOR_190530A |
| | FGD-5 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 10:54 AM | TITRATOR_190521A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 03:32 PM | IC4_190517A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 07:00 PM | IC4_190517A |
| | FGD-5 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:37 PM | UV/VIS_2_190517B |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-06A | FGD-1 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-1 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:44 PM | UV/VIS_2_190521B |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1905205-06B | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:08 AM | CETAC2_HG_190524A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 04:02 PM | ICP-MS4_190522D |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 10 | 05/23/19 12:05 PM | ICP-MS4_190523A |
| 1905205-06C | FGD-1 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 11:03 AM | TITRATOR_190521A |
| | FGD-1 | Aqueous | M2320 B | Alkalinity | 91142 | 1 | 05/30/19 03:23 PM | TITRATOR_190530A |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 03:48 PM | IC4_190517A |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 07:16 PM | IC4_190517A |
| | FGD-1 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:37 PM | UV/VIS_2_190517B |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-07A | FGD-8 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-8 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:44 PM | UV/VIS_2_190521B |
| | FGD-8 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 100 | 05/21/19 05:52 PM | UV/VIS_2_190521B |
| | FGD-8 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1000 | 05/21/19 05:59 PM | UV/VIS_2_190521B |
| 1905205-07B | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:10 AM | CETAC2_HG_190524A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 04:04 PM | ICP-MS4_190522D |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 50 | 05/23/19 12:07 PM | ICP-MS4_190523A |
| 1905205-07C | FGD-8 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 11:30 AM | TITRATOR_190521A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 04:04 PM | IC4_190517A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 90986 | 100 | 05/20/19 02:43 PM | IC4_190520A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 07:32 PM | IC4_190517A |
| | FGD-8 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:40 PM | UV/VIS_2_190517B |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-08A | FGD-11 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-11 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:44 PM | UV/VIS_2_190521B |
| 1905205-08B | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:12 AM | CETAC2_HG_190524A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 04:06 PM | ICP-MS4_190522D |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1905205-08B | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 20 | 05/23/19 12:09 PM | ICP-MS4_190523A |
| 1905205-08C | FGD-11 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 11:40 AM | TITRATOR_190521A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 07:48 PM | IC4_190517A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 90986 | 100 | 05/20/19 02:59 PM | IC4_190520A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 04:20 PM | IC4_190517A |
| | FGD-11 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:41 PM | UV/VIS_2_190517B |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-09A | FGD-12 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-12 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:44 PM | UV/VIS_2_190521B |
| 1905205-09B | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:15 AM | CETAC2_HG_190524A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 04:08 PM | ICP-MS4_190522D |
| 1905205-09C | FGD-12 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 11:44 AM | TITRATOR_190521A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 04:36 PM | IC4_190517A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 08:04 PM | IC4_190517A |
| | FGD-12 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:41 PM | UV/VIS_2_190517B |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 09:20 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 03:52 PM |
| Arsenic | 0.0294 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:52 PM |
| Barium | 0.107 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 03:52 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:52 PM |
| Boron | 0.116 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 03:52 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:52 PM |
| Calcium | 20.3 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:52 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:52 PM |
| Cobalt | 0.0132 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 03:52 PM |
| Iron | 4.86 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 03:52 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:52 PM |
| Lithium | 0.00679 | 0.00500 | 0.0100 | J | mg/L | 1 | 05/22/19 03:52 PM |
| Magnesium | 6.61 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:52 PM |
| Molybdenum | 0.00770 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:52 PM |
| Potassium | 0.706 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:52 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:52 PM |
| Sodium | 225 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 11:55 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 03:52 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 10:48 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 170 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 01:24 PM |
| Fluoride | 0.669 | 0.100 | 0.400 | | mg/L | 1 | 05/17/19 05:56 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 05:56 PM |
| Sulfate | 51.3 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 05:56 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 262 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:03 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:03 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:03 AM |
| Alkalinity, Total (As CaCO3) | 262 | 20.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:03 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 4.86 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:41 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 09:20 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.714 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:35 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 710 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-02 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 10:15 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 03:54 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:54 PM |
| Barium | 0.117 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Boron | 0.0733 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 03:54 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Calcium | 41.7 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 11:57 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:54 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 03:54 PM |
| Iron | 0.103 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Lithium | 0.0325 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Magnesium | 18.6 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:54 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:54 PM |
| Potassium | 1.62 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:54 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:54 PM |
| Sodium | 160 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 11:57 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 03:54 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 10:50 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 205 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 02:12 PM |
| Fluoride | 0.327 | 0.100 | 0.400 | J | mg/L | 1 | 05/17/19 06:12 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 06:12 PM |
| Sulfate | 41.7 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 06:12 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 201 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 10:23 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 10:23 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 10:23 AM |
| Alkalinity, Total (As CaCO3) | 201 | 20.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 10:23 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.103 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:42 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-02 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 10:15 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.251 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:35 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 651 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-03 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 11:10 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 03:56 PM |
| Arsenic | 0.00230 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 03:56 PM |
| Barium | 0.0510 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Boron | 0.117 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 03:56 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Calcium | 60.1 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 11:59 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:56 PM |
| Cobalt | 0.00520 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 03:56 PM |
| Iron | 0.126 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Lithium | 0.0570 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Magnesium | 33.6 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 11:59 AM |
| Molybdenum | 0.00311 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 03:56 PM |
| Potassium | 2.50 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:56 PM |
| Selenium | 0.0423 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:56 PM |
| Sodium | 277 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 11:59 AM |
| Thallium | 0.000600 | 0.000500 | 0.00150 | J | mg/L | 1 | 05/22/19 03:56 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:01 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 117 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 03:00 PM |
| Fluoride | 0.776 | 0.100 | 0.400 | | mg/L | 1 | 05/17/19 06:28 PM |
| Nitrate-N | 1.41 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 06:28 PM |
| Sulfate | 182 | 10.0 | 30.0 | | mg/L | 10 | 05/17/19 03:00 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 533 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:42 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:42 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:42 AM |
| Alkalinity, Total (As CaCO3) | 533 | 20.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:42 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.126 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:42 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-03 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 11:10 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.0960 | 0.0300 | 0.100 | J | mg/L | 1 | 05/17/19 12:35 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1100 | 50.0 | 50.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-04 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 12:00 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 03:58 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:58 PM |
| Barium | 0.0993 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 03:58 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:58 PM |
| Boron | 0.105 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 03:58 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:58 PM |
| Calcium | 38.9 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:01 PM |
| Chromium | 0.00266 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 03:58 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 03:58 PM |
| Iron | 0.0799 | 0.0300 | 0.100 | J | mg/L | 1 | 05/22/19 03:58 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:58 PM |
| Lithium | 0.0228 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 03:58 PM |
| Magnesium | 16.7 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:58 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:58 PM |
| Potassium | 2.57 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:58 PM |
| Selenium | 0.0214 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:58 PM |
| Sodium | 198 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:01 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 03:58 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:03 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 260 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 03:16 PM |
| Fluoride | 0.383 | 0.100 | 0.400 | J | mg/L | 1 | 05/17/19 06:44 PM |
| Nitrate-N | 1.54 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 06:44 PM |
| Sulfate | 70.7 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 06:44 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 157 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/21/19 10:50 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/21/19 10:50 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/21/19 10:50 AM |
| Alkalinity, Total (As CaCO3) | 157 | 20.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/21/19 10:50 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.0799 | 0.0500 | 0.100 | JN | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:43 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-04 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 12:00 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.237 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:37 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 729 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-05 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 01:50 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 04:00 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:00 PM |
| Barium | 0.0926 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Boron | 0.108 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 04:00 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Calcium | 77.7 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:03 PM |
| Chromium | 0.0240 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:00 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 04:00 PM |
| Iron | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Lithium | 0.145 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Magnesium | 50.0 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:03 PM |
| Molybdenum | 0.00256 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 04:00 PM |
| Potassium | 3.46 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:00 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:00 PM |
| Sodium | 123 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:03 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 04:00 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:06 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 287 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 03:32 PM |
| Fluoride | 0.579 | 0.100 | 0.400 | | mg/L | 1 | 05/17/19 07:00 PM |
| Nitrate-N | 0.859 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 07:00 PM |
| Sulfate | 67.2 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 07:00 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 237 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/30/19 03:20 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/30/19 03:20 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/30/19 03:20 PM |
| Alkalinity, Total (As CaCO3) | 237 | 20.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/30/19 03:20 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:43 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-05 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 01:50 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.176 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:37 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 801 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-06 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 02:50 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 04:02 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:02 PM |
| Barium | 0.0485 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Boron | 0.0803 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 04:02 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Calcium | 19.5 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:02 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:02 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 04:02 PM |
| Iron | 0.186 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Lithium | 0.0442 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Magnesium | 11.2 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:02 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:02 PM |
| Potassium | 2.11 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:02 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:02 PM |
| Sodium | 49.4 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:05 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 04:02 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:08 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 62.4 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 03:48 PM |
| Fluoride | 0.362 | 0.100 | 0.400 | J | mg/L | 1 | 05/17/19 07:16 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 07:16 PM |
| Sulfate | 78.7 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 07:16 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 52.8 | 10.0 | 20.0 | | mg/L @ pH 4.5 | 1 | 05/30/19 03:23 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.5 | 1 | 05/30/19 03:23 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.5 | 1 | 05/30/19 03:23 PM |
| Alkalinity, Total (As CaCO3) | 52.8 | 20.0 | 20.0 | | mg/L @ pH 4.5 | 1 | 05/30/19 03:23 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.186 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:44 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-06 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 02:50 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.473 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:37 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 320 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-07 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 03:45 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 04:04 PM |
| Arsenic | 0.0126 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:04 PM |
| Barium | 0.864 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 04:04 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:04 PM |
| Boron | 0.0687 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 04:04 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:04 PM |
| Calcium | 314 | 5.00 | 15.0 | | mg/L | 50 | 05/23/19 12:07 PM |
| Chromium | 0.00346 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 04:04 PM |
| Cobalt | 0.0146 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 04:04 PM |
| Iron | 263 | 1.50 | 5.00 | | mg/L | 50 | 05/23/19 12:07 PM |
| Lead | 0.00194 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:04 PM |
| Lithium | 0.00864 | 0.00500 | 0.0100 | J | mg/L | 1 | 05/22/19 04:04 PM |
| Magnesium | 204 | 5.00 | 15.0 | | mg/L | 50 | 05/23/19 12:07 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:04 PM |
| Potassium | 19.2 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:04 PM |
| Selenium | 0.00274 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 04:04 PM |
| Sodium | 792 | 5.00 | 15.0 | | mg/L | 50 | 05/23/19 12:07 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 04:04 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:10 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 2040 | 30.0 | 100 | | mg/L | 100 | 05/20/19 02:43 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/17/19 07:32 PM |
| Nitrate-N | 0.107 | 0.100 | 0.500 | J | mg/L | 1 | 05/17/19 07:32 PM |
| Sulfate | 173 | 10.0 | 30.0 | | mg/L | 10 | 05/17/19 04:04 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 516 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/21/19 11:30 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/21/19 11:30 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/21/19 11:30 AM |
| Alkalinity, Total (As CaCO3) | 516 | 20.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/21/19 11:30 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 61.0 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | 202 | 50.0 | 100 | N | mg/L | 1000 | 05/21/19 05:59 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-07 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 03:45 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.219 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:40 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 3970 | 50.0 | 50.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-08 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 04:40 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 04:06 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:06 PM |
| Barium | 0.347 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 04:06 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:06 PM |
| Boron | 0.108 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 04:06 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:06 PM |
| Calcium | 85.0 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 12:09 PM |
| Chromium | 0.0280 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:06 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 04:06 PM |
| Iron | 1.28 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 04:06 PM |
| Lead | 0.000576 | 0.000300 | 0.00100 | J | mg/L | 1 | 05/22/19 04:06 PM |
| Lithium | 0.0145 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 04:06 PM |
| Magnesium | 30.6 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 12:09 PM |
| Molybdenum | 0.00358 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 04:06 PM |
| Potassium | 4.13 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:06 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:06 PM |
| Sodium | 328 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 12:09 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 04:06 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:12 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 566 | 30.0 | 100 | | mg/L | 100 | 05/20/19 02:59 PM |
| Fluoride | 0.380 | 0.100 | 0.400 | J | mg/L | 1 | 05/17/19 07:48 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 07:48 PM |
| Sulfate | 50.9 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 07:48 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 256 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 11:40 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 11:40 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 11:40 AM |
| Alkalinity, Total (As CaCO3) | 256 | 20.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 11:40 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 1.28 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:44 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-08 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 04:40 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.200 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:41 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1350 | 50.0 | 50.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-09 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 05:35 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 04:08 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:08 PM |
| Barium | 0.0474 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Boron | 0.0723 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 04:08 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Calcium | 6.79 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:08 PM |
| Chromium | 0.00295 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 04:08 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 04:08 PM |
| Iron | 0.425 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Lithium | 0.0221 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Magnesium | 2.97 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:08 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:08 PM |
| Potassium | 1.55 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:08 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:08 PM |
| Sodium | 20.1 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:08 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 04:08 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:15 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 15.6 | 0.300 | 1.00 | | mg/L | 1 | 05/17/19 08:04 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/17/19 08:04 PM |
| Nitrate-N | 1.42 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 08:04 PM |
| Sulfate | 15.0 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 08:04 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 36.6 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/21/19 11:44 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/21/19 11:44 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/21/19 11:44 AM |
| Alkalinity, Total (As CaCO3) | 36.6 | 20.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/21/19 11:44 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.425 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:44 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-09 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 05:35 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.168 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:41 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 140 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190524A**

The QC data in batch 91060 applies to the following samples: 1905205-01B, 1905205-02B, 1905205-03B, 1905205-04B, 1905205-05B, 1905205-06B, 1905205-07B, 1905205-08B, 1905205-09B

| Sample ID | **MB-91060** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:41:16 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-91060** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:43:31 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00188 | 0.000200 | 0.00200 | 0 | 94.0 | 85 | 115 | | | |

| Sample ID | **LCSD-91060** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:45:47 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00188 | 0.000200 | 0.00200 | 0 | 94.0 | 85 | 115 | 0 | 15 | |

| Sample ID | **1905205-02B MS** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:52:35 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00183 | 0.000200 | 0.00200 | 0 | 91.5 | 80 | 120 | | | |

| Sample ID | **1905205-02B MSD** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:54:51 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00186 | 0.000200 | 0.00200 | 0 | 93.0 | 80 | 120 | 1.63 | 15 | |

| Sample ID | **1905205-02B SD** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:57:06 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1905205-02B PDS** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:59:22 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00233 | 0.000200 | 0.00250 | 0 | 93.2 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190524A**

| Sample ID | **ICV-190524** | Batch ID: | **R104261** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 9:24:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00400 | 0.000200 | 0.00400 | 0 | 100 | 90 | 110 | | | |

| Sample ID | **CCV2-190524** | Batch ID: | **R104261** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:36:42 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00212 | 0.000200 | 0.00200 | 0 | 106 | 90 | 110 | | | |

| Sample ID | **CCV3-190524** | Batch ID: | **R104261** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 11:19:48 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00200 | 0.000200 | 0.00200 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

The QC data in batch 90989 applies to the following samples: 1905205-01B, 1905205-02B, 1905205-03B, 1905205-04B, 1905205-05B, 1905205-06B, 1905205-07B, 1905205-08B, 1905205-09B

Sample ID **MB-90989** Batch ID: **90989** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_190522D** Analysis Date: **5/22/2019 2:44:00 PM** Prep Date: **5/20/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Iron | <0.0300 | 0.100 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Magnesium | <0.100 | 0.300 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Potassium | <0.100 | 0.300 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Sodium | <0.100 | 0.300 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-90989** Batch ID: **90989** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_190522D** Analysis Date: **5/22/2019 2:46:00 PM** Prep Date: **5/20/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.2 | 80 | 120 | | | |
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 80 | 120 | | | |
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Calcium | 4.60 | 0.300 | 5.00 | 0 | 92.1 | 80 | 120 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Iron | 5.23 | 0.100 | 5.00 | 0 | 105 | 80 | 120 | | | |
| Lead | 0.184 | 0.00100 | 0.200 | 0 | 91.9 | 80 | 120 | | | |
| Lithium | 0.196 | 0.0100 | 0.200 | 0 | 98.0 | 80 | 120 | | | |
| Magnesium | 5.02 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | | | |
| Molybdenum | 0.190 | 0.00500 | 0.200 | 0 | 95.1 | 80 | 120 | | | |
| Potassium | 5.06 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | | | |
| Selenium | 0.209 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **LCS-90989** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:46:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sodium | 5.02 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | | | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID **LCSD-90989** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:48:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | 0.333 | 15 | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.942 | 15 | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.3 | 80 | 120 | 0.128 | 15 | |
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 80 | 120 | 0.129 | 15 | |
| Boron | 0.201 | 0.0300 | 0.200 | 0 | 101 | 80 | 120 | 0.298 | 15 | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 80 | 120 | 0.362 | 15 | |
| Calcium | 4.62 | 0.300 | 5.00 | 0 | 92.4 | 80 | 120 | 0.325 | 15 | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 80 | 120 | 0.085 | 15 | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.820 | 15 | |
| Iron | 5.15 | 0.100 | 5.00 | 0 | 103 | 80 | 120 | 1.50 | 15 | |
| Lead | 0.185 | 0.00100 | 0.200 | 0 | 92.3 | 80 | 120 | 0.421 | 15 | |
| Lithium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 80 | 120 | 2.22 | 15 | |
| Magnesium | 5.07 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.937 | 15 | |
| Molybdenum | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 80 | 120 | 0.081 | 15 | |
| Potassium | 5.12 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | 1.16 | 15 | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 2.39 | 15 | |
| Sodium | 5.05 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.519 | 15 | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.3 | 80 | 120 | 1.55 | 15 | |

| Sample ID **1905185-06B SD** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:54:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0256 | 0.0500 | 0 | 0.0253 | | | | 1.30 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Boron | 0.501 | 0.150 | 0 | 0.449 | | | | 10.8 | 10 | R |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Iron | <0.150 | 0.500 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.109 | 0.0500 | 0 | 0.101 | | | | 7.40 | 10 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **1905185-06B SD** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:54:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | <0.0100 | 0.0250 | 0 | 0.00218 | | | | 0 | 10 | |
| Potassium | 13.4 | 1.50 | 0 | 13.2 | | | | 1.21 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1905185-06B PDS** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:13:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Barium | 0.218 | 0.0100 | 0.200 | 0.0253 | 96.3 | 80 | 120 | | | |
| Beryllium | 0.174 | 0.00100 | 0.200 | 0 | 87.2 | 80 | 120 | | | |
| Boron | 0.613 | 0.0300 | 0.200 | 0.449 | 81.7 | 80 | 120 | | | |
| Cadmium | 0.183 | 0.00100 | 0.200 | 0 | 91.4 | 80 | 120 | | | |
| Chromium | 0.188 | 0.00500 | 0.200 | 0 | 94.2 | 80 | 120 | | | |
| Cobalt | 0.193 | 0.00500 | 0.200 | 0 | 96.4 | 80 | 120 | | | |
| Iron | 4.70 | 0.100 | 5.00 | 0 | 94.1 | 80 | 120 | | | |
| Lead | 0.186 | 0.00100 | 0.200 | 0 | 93.0 | 80 | 120 | | | |
| Lithium | 0.265 | 0.0100 | 0.200 | 0.101 | 81.8 | 80 | 120 | | | |
| Molybdenum | 0.186 | 0.00500 | 0.200 | 0.00218 | 91.9 | 80 | 120 | | | |
| Potassium | 17.5 | 0.300 | 5.00 | 13.3 | 84.0 | 80 | 120 | | | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 80 | 120 | | | |

| Sample ID **1905185-06B MS** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:15:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Barium | 0.226 | 0.0100 | 0.200 | 0.0253 | 100 | 80 | 120 | | | |
| Beryllium | 0.174 | 0.00100 | 0.200 | 0 | 87.0 | 80 | 120 | | | |
| Boron | 0.654 | 0.0300 | 0.200 | 0.449 | 103 | 80 | 120 | | | |
| Cadmium | 0.185 | 0.00100 | 0.200 | 0 | 92.7 | 80 | 120 | | | |
| Calcium | 197 | 0.300 | 5.00 | 194 | 64.2 | 80 | 120 | | | S |
| Chromium | 0.186 | 0.00500 | 0.200 | 0 | 93.0 | 80 | 120 | | | |
| Cobalt | 0.193 | 0.00500 | 0.200 | 0 | 96.7 | 80 | 120 | | | |
| Iron | 4.82 | 0.100 | 5.00 | 0 | 96.4 | 80 | 120 | | | |
| Lead | 0.187 | 0.00100 | 0.200 | 0 | 93.7 | 80 | 120 | | | |
| Lithium | 0.270 | 0.0100 | 0.200 | 0.101 | 84.2 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **1905185-06B MS** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:15:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Magnesium | 128 | 0.300 | 5.00 | 128 | -3.79 | 80 | 120 | | | S |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0.00218 | 96.2 | 80 | 120 | | | |
| Potassium | 18.5 | 0.300 | 5.00 | 13.3 | 105 | 80 | 120 | | | |
| Selenium | 0.214 | 0.00500 | 0.200 | 0 | 107 | 80 | 120 | | | |
| Sodium | 252 | 0.300 | 5.00 | 257 | -103 | 80 | 120 | | | S |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID **1905185-06B MSD** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:17:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | 0.836 | 15 | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 0.067 | 15 | |
| Barium | 0.227 | 0.0100 | 0.200 | 0.0253 | 101 | 80 | 120 | 0.141 | 15 | |
| Beryllium | 0.174 | 0.00100 | 0.200 | 0 | 86.8 | 80 | 120 | 0.265 | 15 | |
| Boron | 0.618 | 0.0300 | 0.200 | 0.449 | 84.6 | 80 | 120 | 5.65 | 15 | |
| Cadmium | 0.184 | 0.00100 | 0.200 | 0 | 92.1 | 80 | 120 | 0.555 | 15 | |
| Calcium | 195 | 0.300 | 5.00 | 194 | 16.8 | 80 | 120 | 1.21 | 15 | S |
| Chromium | 0.187 | 0.00500 | 0.200 | 0 | 93.6 | 80 | 120 | 0.569 | 15 | |
| Cobalt | 0.192 | 0.00500 | 0.200 | 0 | 95.8 | 80 | 120 | 1.00 | 15 | |
| Iron | 4.73 | 0.100 | 5.00 | 0 | 94.7 | 80 | 120 | 1.78 | 15 | |
| Lead | 0.190 | 0.00100 | 0.200 | 0 | 94.8 | 80 | 120 | 1.15 | 15 | |
| Lithium | 0.265 | 0.0100 | 0.200 | 0.101 | 81.8 | 80 | 120 | 1.82 | 15 | |
| Magnesium | 127 | 0.300 | 5.00 | 128 | -17.7 | 80 | 120 | 0.544 | 15 | S |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0.00218 | 97.5 | 80 | 120 | 1.33 | 15 | |
| Potassium | 18.3 | 0.300 | 5.00 | 13.3 | 100 | 80 | 120 | 1.25 | 15 | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 80 | 120 | 0.639 | 15 | |
| Sodium | 256 | 0.300 | 5.00 | 257 | -34.0 | 80 | 120 | 1.36 | 15 | S |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 80 | 120 | 1.46 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **ICV-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 11:38:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.101 | 0.00250 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.0975 | 0.0100 | 0.100 | 0 | 97.5 | 90 | 110 | | | |
| Beryllium | 0.0986 | 0.00100 | 0.100 | 0 | 98.6 | 90 | 110 | | | |
| Boron | 0.104 | 0.0300 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Cadmium | 0.0995 | 0.00100 | 0.100 | 0 | 99.5 | 90 | 110 | | | |
| Calcium | 2.35 | 0.300 | 2.50 | 0 | 94.2 | 90 | 110 | | | |
| Chromium | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Iron | 2.57 | 0.100 | 2.50 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.0926 | 0.00100 | 0.100 | 0 | 92.6 | 90 | 110 | | | |
| Lithium | 0.103 | 0.0100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Magnesium | 2.45 | 0.300 | 2.50 | 0 | 98.2 | 90 | 110 | | | |
| Molybdenum | 0.0911 | 0.00500 | 0.100 | 0 | 91.1 | 90 | 110 | | | |
| Potassium | 2.52 | 0.300 | 2.50 | 0 | 101 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Sodium | 2.53 | 0.300 | 2.50 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.0926 | 0.00150 | 0.100 | 0 | 92.6 | 90 | 110 | | | |

| Sample ID **LCVL-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 11:43:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00190 | 0.00250 | 0.00200 | 0 | 95.0 | 70 | 130 | | | |
| Arsenic | 0.00497 | 0.00500 | 0.00500 | 0 | 99.4 | 70 | 130 | | | |
| Barium | 0.00463 | 0.0100 | 0.00500 | 0 | 92.6 | 70 | 130 | | | |
| Beryllium | 0.00117 | 0.00100 | 0.00100 | 0 | 117 | 70 | 130 | | | |
| Boron | 0.0197 | 0.0300 | 0.0200 | 0 | 98.5 | 70 | 130 | | | |
| Cadmium | 0.000953 | 0.00100 | 0.00100 | 0 | 95.3 | 70 | 130 | | | |
| Calcium | 0.0981 | 0.300 | 0.100 | 0 | 98.1 | 70 | 130 | | | |
| Chromium | 0.00486 | 0.00500 | 0.00500 | 0 | 97.2 | 70 | 130 | | | |
| Cobalt | 0.00493 | 0.00500 | 0.00500 | 0 | 98.7 | 70 | 130 | | | |
| Iron | 0.111 | 0.100 | 0.100 | 0 | 111 | 70 | 130 | | | |
| Lead | 0.000870 | 0.00100 | 0.00100 | 0 | 87.0 | 70 | 130 | | | |
| Lithium | 0.00926 | 0.0100 | 0.0100 | 0 | 92.6 | 70 | 130 | | | |
| Magnesium | 0.0967 | 0.300 | 0.100 | 0 | 96.7 | 70 | 130 | | | |
| Molybdenum | 0.00458 | 0.00500 | 0.00500 | 0 | 91.5 | 70 | 130 | | | |
| Potassium | 0.0964 | 0.300 | 0.100 | 0 | 96.4 | 70 | 130 | | | |
| Selenium | 0.00494 | 0.00500 | 0.00500 | 0 | 98.8 | 70 | 130 | | | |
| Sodium | 0.0966 | 0.300 | 0.100 | 0 | 96.6 | 70 | 130 | | | |
| Thallium | 0.000843 | 0.00150 | 0.00100 | 0 | 84.3 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **CCV4-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:34:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.209 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Barium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Boron | 0.215 | 0.0300 | 0.200 | 0 | 108 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.66 | 0.300 | 5.00 | 0 | 93.3 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Iron | 5.05 | 0.100 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.7 | 90 | 110 | | | |
| Lithium | 0.195 | 0.0100 | 0.200 | 0 | 97.5 | 90 | 110 | | | |
| Magnesium | 5.05 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.193 | 0.00500 | 0.200 | 0 | 96.4 | 90 | 110 | | | |
| Potassium | 5.13 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Selenium | 0.212 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Sodium | 5.03 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.205 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL4-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:40:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00194 | 0.00250 | 0.00200 | 0 | 96.9 | 70 | 130 | | | |
| Arsenic | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Barium | 0.00472 | 0.0100 | 0.00500 | 0 | 94.5 | 70 | 130 | | | |
| Beryllium | 0.00124 | 0.00100 | 0.00100 | 0 | 124 | 70 | 130 | | | |
| Boron | 0.0223 | 0.0300 | 0.0200 | 0 | 111 | 70 | 130 | | | |
| Cadmium | 0.000955 | 0.00100 | 0.00100 | 0 | 95.5 | 70 | 130 | | | |
| Calcium | 0.111 | 0.300 | 0.100 | 0 | 111 | 70 | 130 | | | |
| Chromium | 0.00487 | 0.00500 | 0.00500 | 0 | 97.4 | 70 | 130 | | | |
| Cobalt | 0.00501 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Iron | 0.114 | 0.100 | 0.100 | 0 | 114 | 70 | 130 | | | |
| Lead | 0.000846 | 0.00100 | 0.00100 | 0 | 84.6 | 70 | 130 | | | |
| Lithium | 0.00964 | 0.0100 | 0.0100 | 0 | 96.4 | 70 | 130 | | | |
| Magnesium | 0.101 | 0.300 | 0.100 | 0 | 101 | 70 | 130 | | | |
| Molybdenum | 0.00453 | 0.00500 | 0.00500 | 0 | 90.7 | 70 | 130 | | | |
| Potassium | 0.0997 | 0.300 | 0.100 | 0 | 99.7 | 70 | 130 | | | |
| Selenium | 0.00427 | 0.00500 | 0.00500 | 0 | 85.3 | 70 | 130 | | | |
| Sodium | 0.111 | 0.300 | 0.100 | 0 | 111 | 70 | 130 | | | |
| Thallium | 0.000835 | 0.00150 | 0.00100 | 0 | 83.5 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **CCV5-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.205 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Boron | 0.220 | 0.0300 | 0.200 | 0 | 110 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.68 | 0.300 | 5.00 | 0 | 93.5 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Iron | 5.15 | 0.100 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.188 | 0.00100 | 0.200 | 0 | 93.8 | 90 | 110 | | | |
| Lithium | 0.203 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 5.17 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.3 | 90 | 110 | | | |
| Potassium | 5.20 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Sodium | 5.13 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL5-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:46:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00186 | 0.00250 | 0.00200 | 0 | 93.2 | 70 | 130 | | | |
| Arsenic | 0.00475 | 0.00500 | 0.00500 | 0 | 95.0 | 70 | 130 | | | |
| Barium | 0.00461 | 0.0100 | 0.00500 | 0 | 92.3 | 70 | 130 | | | |
| Beryllium | 0.000947 | 0.00100 | 0.00100 | 0 | 94.7 | 70 | 130 | | | |
| Boron | 0.0229 | 0.0300 | 0.0200 | 0 | 115 | 70 | 130 | | | |
| Cadmium | 0.000924 | 0.00100 | 0.00100 | 0 | 92.4 | 70 | 130 | | | |
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |
| Chromium | 0.00452 | 0.00500 | 0.00500 | 0 | 90.4 | 70 | 130 | | | |
| Cobalt | 0.00479 | 0.00500 | 0.00500 | 0 | 95.8 | 70 | 130 | | | |
| Iron | 0.106 | 0.100 | 0.100 | 0 | 106 | 70 | 130 | | | |
| Lead | 0.000756 | 0.00100 | 0.00100 | 0 | 75.6 | 70 | 130 | | | |
| Lithium | 0.00948 | 0.0100 | 0.0100 | 0 | 94.8 | 70 | 130 | | | |
| Magnesium | 0.0981 | 0.300 | 0.100 | 0 | 98.1 | 70 | 130 | | | |
| Molybdenum | 0.00455 | 0.00500 | 0.00500 | 0 | 91.0 | 70 | 130 | | | |
| Potassium | 0.0951 | 0.300 | 0.100 | 0 | 95.1 | 70 | 130 | | | |
| Selenium | 0.00474 | 0.00500 | 0.00500 | 0 | 94.7 | 70 | 130 | | | |
| Sodium | 0.126 | 0.300 | 0.100 | 0 | 126 | 70 | 130 | | | |
| Thallium | 0.000763 | 0.00150 | 0.00100 | 0 | 76.3 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **CCV6-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 4:12:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.208 | 0.00250 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Arsenic | 0.211 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Barium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.5 | 90 | 110 | | | |
| Boron | 0.207 | 0.0300 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.74 | 0.300 | 5.00 | 0 | 94.8 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.209 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Iron | 5.12 | 0.100 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 96.1 | 90 | 110 | | | |
| Lithium | 0.197 | 0.0100 | 0.200 | 0 | 98.7 | 90 | 110 | | | |
| Magnesium | 5.05 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 90 | 110 | | | |
| Potassium | 5.17 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Sodium | 5.09 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL6-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 4:22:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00200 | 0.00250 | 0.00200 | 0 | 100 | 70 | 130 | | | |
| Arsenic | 0.00486 | 0.00500 | 0.00500 | 0 | 97.1 | 70 | 130 | | | |
| Barium | 0.00495 | 0.0100 | 0.00500 | 0 | 99.0 | 70 | 130 | | | |
| Beryllium | 0.000939 | 0.00100 | 0.00100 | 0 | 93.9 | 70 | 130 | | | |
| Boron | 0.0216 | 0.0300 | 0.0200 | 0 | 108 | 70 | 130 | | | |
| Cadmium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Calcium | 0.113 | 0.300 | 0.100 | 0 | 113 | 70 | 130 | | | |
| Chromium | 0.00486 | 0.00500 | 0.00500 | 0 | 97.1 | 70 | 130 | | | |
| Cobalt | 0.00489 | 0.00500 | 0.00500 | 0 | 97.8 | 70 | 130 | | | |
| Iron | 0.113 | 0.100 | 0.100 | 0 | 113 | 70 | 130 | | | |
| Lead | 0.000805 | 0.00100 | 0.00100 | 0 | 80.5 | 70 | 130 | | | |
| Lithium | 0.00903 | 0.0100 | 0.0100 | 0 | 90.3 | 70 | 130 | | | |
| Magnesium | 0.104 | 0.300 | 0.100 | 0 | 104 | 70 | 130 | | | |
| Molybdenum | 0.00464 | 0.00500 | 0.00500 | 0 | 92.8 | 70 | 130 | | | |
| Potassium | 0.0982 | 0.300 | 0.100 | 0 | 98.2 | 70 | 130 | | | |
| Selenium | 0.00531 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Sodium | 0.147 | 0.300 | 0.100 | 0 | 147 | 70 | 130 | | | S |
| Thallium | 0.000807 | 0.00150 | 0.00100 | 0 | 80.7 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190523A**

The QC data in batch 90989 applies to the following samples: 1905205-01B, 1905205-02B, 1905205-03B, 1905205-04B, 1905205-05B, 1905205-06B, 1905205-07B, 1905205-08B, 1905205-09B

Sample ID **1905185-06B SD** Batch ID: **90989** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_190523A** Analysis Date: **5/23/2019 11:20:00 AM** Prep Date: **5/20/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 207 | 30.0 | 0 | 200 | | | | 3.62 | 10 | |
| Magnesium | 134 | 30.0 | 0 | 130 | | | | 2.71 | 10 | |
| Sodium | 266 | 30.0 | 0 | 265 | | | | 0.189 | 10 | |

Sample ID **1905185-06B PDS** Batch ID: **90989** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_190523A** Analysis Date: **5/23/2019 11:40:00 AM** Prep Date: **5/20/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 295 | 6.00 | 100 | 200 | 95.2 | 80 | 120 | | | |
| Magnesium | 227 | 6.00 | 100 | 130 | 96.8 | 80 | 120 | | | |
| Sodium | 365 | 6.00 | 100 | 265 | 99.6 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

| Sample ID **ICV-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 11:01:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.39 | 0.300 | 2.50 | 0 | 95.8 | 90 | 110 | | | |
| Iron | 2.56 | 0.100 | 2.50 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 2.53 | 0.300 | 2.50 | 0 | 101 | 90 | 110 | | | |
| Sodium | 2.56 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 11:09:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0901 | 0.300 | 0.100 | 0 | 90.1 | 70 | 130 | | | |
| Iron | 0.105 | 0.100 | 0.100 | 0 | 105 | 70 | 130 | | | |
| Magnesium | 0.0985 | 0.300 | 0.100 | 0 | 98.5 | 70 | 130 | | | |
| Sodium | 0.0949 | 0.300 | 0.100 | 0 | 94.9 | 70 | 130 | | | |

| Sample ID **CCV1-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 11:42:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.76 | 0.300 | 5.00 | 0 | 95.2 | 90 | 110 | | | |
| Iron | 5.10 | 0.100 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 5.21 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Sodium | 5.14 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL1-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 11:48:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0899 | 0.300 | 0.100 | 0 | 89.9 | 70 | 130 | | | |
| Iron | 0.105 | 0.100 | 0.100 | 0 | 105 | 70 | 130 | | | |
| Magnesium | 0.0985 | 0.300 | 0.100 | 0 | 98.5 | 70 | 130 | | | |
| Sodium | 0.0973 | 0.300 | 0.100 | 0 | 97.3 | 70 | 130 | | | |

| Sample ID **CCV2-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 12:21:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.79 | 0.300 | 5.00 | 0 | 95.7 | 90 | 110 | | | |
| Iron | 5.15 | 0.100 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Magnesium | 5.29 | 0.300 | 5.00 | 0 | 106 | 90 | 110 | | | |
| Sodium | 5.22 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190523A**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **LCVL2-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | | Units: **mg/L** | |
| SampType: **LCVL** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 12:29:00 PM** | | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.101 | 0.300 | 0.100 | 0 | 101 | 70 | 130 | | | |
| Iron | 0.105 | 0.100 | 0.100 | 0 | 105 | 70 | 130 | | | |
| Magnesium | 0.0985 | 0.300 | 0.100 | 0 | 98.5 | 70 | 130 | | | |
| Sodium | 0.0994 | 0.300 | 0.100 | 0 | 99.4 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190517A**

The QC data in batch 90965 applies to the following samples: 1905205-01C, 1905205-02C, 1905205-03C, 1905205-04C, 1905205-05C, 1905205-06C, 1905205-07C, 1905205-08C, 1905205-09C

Sample ID **MB-90965** Batch ID: **90965** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_190517A** Analysis Date: **5/17/2019 10:28:41 AM** Prep Date: **5/17/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Nitrate-N | <0.100 | 0.500 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-90965** Batch ID: **90965** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_190517A** Analysis Date: **5/17/2019 10:44:41 AM** Prep Date: **5/17/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.65 | 1.00 | 10.00 | 0 | 96.5 | 90 | 110 | | | |
| Fluoride | 4.17 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 5.13 | 0.500 | 5.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 29.8 | 3.00 | 30.00 | 0 | 99.5 | 90 | 110 | | | |

Sample ID **LCSD-90965** Batch ID: **90965** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_190517A** Analysis Date: **5/17/2019 11:00:41 AM** Prep Date: **5/17/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.72 | 1.00 | 10.00 | 0 | 97.2 | 90 | 110 | 0.774 | 20 | |
| Fluoride | 4.22 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | 1.24 | 20 | |
| Nitrate-N | 5.18 | 0.500 | 5.000 | 0 | 104 | 90 | 110 | 0.847 | 20 | |
| Sulfate | 30.0 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | 0.565 | 20 | |

Sample ID **1905205-01CMS** Batch ID: **90965** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_190517A** Analysis Date: **5/17/2019 1:40:13 PM** Prep Date: **5/17/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 365 | 10.0 | 200.0 | 170.3 | 97.2 | 90 | 110 | | | |
| Fluoride | 216 | 4.00 | 200.0 | 0 | 108 | 90 | 110 | | | |
| Nitrate-N | 44.7 | 5.00 | 45.16 | 0 | 99.1 | 90 | 110 | | | |
| Sulfate | 251 | 30.0 | 200.0 | 49.70 | 101 | 90 | 110 | | | |

Sample ID **1905205-01CMSD** Batch ID: **90965** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_190517A** Analysis Date: **5/17/2019 1:56:13 PM** Prep Date: **5/17/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 363 | 10.0 | 200.0 | 170.3 | 96.3 | 90 | 110 | 0.462 | 20 | |
| Fluoride | 217 | 4.00 | 200.0 | 0 | 108 | 90 | 110 | 0.421 | 20 | |
| Nitrate-N | 46.1 | 5.00 | 45.16 | 0 | 102 | 90 | 110 | 2.98 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190517A**

| Sample ID **1905205-01CMSD** | Batch ID: **90965** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 1:56:13 PM** | Prep Date: **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 251 | 30.0 | 200.0 | 49.70 | 101 | 90 | 110 | 0.050 | 20 | |

| Sample ID **1905205-02CMS** | Batch ID: **90965** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 2:28:13 PM** | Prep Date: **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 393 | 10.0 | 200.0 | 204.5 | 94.3 | 90 | 110 | | | |
| Fluoride | 215 | 4.00 | 200.0 | 0 | 107 | 90 | 110 | | | |
| Nitrate-N | 45.4 | 5.00 | 45.16 | 0 | 100 | 90 | 110 | | | |
| Sulfate | 239 | 30.0 | 200.0 | 41.25 | 98.7 | 90 | 110 | | | |

| Sample ID **1905205-02CMSD** | Batch ID: **90965** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 2:44:13 PM** | Prep Date: **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 396 | 10.0 | 200.0 | 204.5 | 95.8 | 90 | 110 | 0.770 | 20 | |
| Fluoride | 218 | 4.00 | 200.0 | 0 | 109 | 90 | 110 | 1.50 | 20 | |
| Nitrate-N | 46.0 | 5.00 | 45.16 | 0 | 102 | 90 | 110 | 1.44 | 20 | |
| Sulfate | 242 | 30.0 | 200.0 | 41.25 | 100 | 90 | 110 | 1.42 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190517A**

| Sample ID **ICV-190517** | Batch ID: **R104153** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 9:56:41 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.0 | 1.00 | 25.00 | 0 | 99.8 | 90 | 110 | | | |
| Fluoride | 10.2 | 0.400 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Nitrate-N | 13.0 | 0.500 | 12.50 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 75.7 | 3.00 | 75.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **CCV1-190517** | Batch ID: **R104153** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 5:24:12 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.74 | 1.00 | 10.00 | 0 | 97.4 | 90 | 110 | | | |
| Fluoride | 4.33 | 0.400 | 4.000 | 0 | 108 | 90 | 110 | | | |
| Nitrate-N | 5.19 | 0.500 | 5.000 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 30.1 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV2-190517** | Batch ID: **R104153** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 9:08:12 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.75 | 1.00 | 10.00 | 0 | 97.5 | 90 | 110 | | | |
| Fluoride | 4.40 | 0.400 | 4.000 | 0 | 110 | 90 | 110 | | | |
| Nitrate-N | 5.18 | 0.500 | 5.000 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 30.1 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190520A**

The QC data in batch 90986 applies to the following samples: 1905205-07C, 1905205-08C

| Sample ID | **MB-90986** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 10:20:17 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |

| Sample ID | **LCS-90986** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 10:36:17 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.25 | 1.00 | 10.00 | 0 | 92.5 | 90 | 110 | | | |

| Sample ID | **LCSD-90986** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 10:52:17 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.37 | 1.00 | 10.00 | 0 | 93.7 | 90 | 110 | 1.29 | 20 | |

| Sample ID | **1905193-02DMS** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 12:51:06 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2120 | 100 | 2000 | 187.2 | 96.4 | 90 | 110 | | | |

| Sample ID | **1905193-02DMSD** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 1:07:06 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2130 | 100 | 2000 | 187.2 | 97.0 | 90 | 110 | 0.536 | 20 | |

| Sample ID | **1905194-01DMS** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 1:39:06 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2020 | 100 | 2000 | 0 | 101 | 90 | 110 | | | |

| Sample ID | **1905194-01DMSD** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 1:55:06 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2020 | 100 | 2000 | 0 | 101 | 90 | 110 | 0.304 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190520A**

| Sample ID **ICV-190520** | Batch ID: **R104175** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_190520A** | Analysis Date: **5/20/2019 9:48:17 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 23.6 | 1.00 | 25.00 | 0 | 94.4 | 90 | 110 | | | |

| Sample ID **CCV1-190520** | Batch ID: **R104175** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190520A** | Analysis Date: **5/20/2019 4:03:05 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.60 | 1.00 | 10.00 | 0 | 96.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190521A**

The QC data in batch 91010 applies to the following samples: 1905205-01C, 1905205-02C, 1905205-03C, 1905205-04C, 1905205-05C, 1905205-06C, 1905205-07C, 1905205-08C, 1905205-09C

Sample ID **MB-91010** Batch ID: **91010** TestNo: **M2320 B** Units: **mg/L @ pH 4.17**
SampType: **MBLK** Run ID: **TITRATOR_190521A** Analysis Date: **5/21/2019 9:19:00 AM** Prep Date: **5/21/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Total (As CaCO3) | <20.0 | 20.0 | | | | | | | | |

Sample ID **LCS-91010** Batch ID: **91010** TestNo: **M2320 B** Units: **mg/L @ pH 3.91**
SampType: **LCS** Run ID: **TITRATOR_190521A** Analysis Date: **5/21/2019 9:23:00 AM** Prep Date: **5/21/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 54.4 | 20.0 | 50.00 | 0 | 109 | 74 | 129 | | | |

Sample ID **LCSD-91010** Batch ID: **91010** TestNo: **M2320 B** Units: **mg/L @ pH 3.97**
SampType: **LCSD** Run ID: **TITRATOR_190521A** Analysis Date: **5/21/2019 9:27:00 AM** Prep Date: **5/21/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 53.6 | 20.0 | 50.00 | 0 | 107 | 74 | 129 | 1.48 | 20 | |

Sample ID **1905205-01C DUP** Batch ID: **91010** TestNo: **M2320 B** Units: **mg/L @ pH 4.53**
SampType: **DUP** Run ID: **TITRATOR_190521A** Analysis Date: **5/21/2019 10:14:00 AM** Prep Date: **5/21/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 267 | 20.0 | 0 | 261.5 | | | | 2.04 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 267 | 20.0 | 0 | 261.5 | | | | 2.04 | 20 | |

Sample ID **1905229-02B DUP** Batch ID: **91010** TestNo: **M2320 B** Units: **mg/L @ pH 4.53**
SampType: **DUP** Run ID: **TITRATOR_190521A** Analysis Date: **5/21/2019 4:14:00 PM** Prep Date: **5/21/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 250 | 20.0 | 0 | 251.0 | | | | 0.319 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 250 | 20.0 | 0 | 251.0 | | | | 0.319 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190521A**

| Sample ID **ICV-190521** | Batch ID: **R104203** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.08** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **TITRATOR_190521A** | Analysis Date: **5/21/2019 9:15:00 AM** | Prep Date: **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 8.08 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 96.5 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 105 | 20.0 | 100.0 | 0 | 105 | 98 | 102 | | | S |

| Sample ID **CCV1-190521** | Batch ID: **R104203** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.14** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190521A** | Analysis Date: **5/21/2019 12:25:00 PM** | Prep Date: **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 13.9 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 86.6 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 100 | 20.0 | 100.0 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV2-190521** | Batch ID: **R104203** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.2** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190521A** | Analysis Date: **5/21/2019 4:19:00 PM** | Prep Date: **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 16.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 82.9 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.0 | 20.0 | 100.0 | 0 | 99.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190530A**

The QC data in batch 91142 applies to the following samples: 1905205-05C, 1905205-06C

| Sample ID **MB-91142** | Batch ID: **91142** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.2** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 3:08:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Total (As CaCO3) | <20.0 | 20.0 | | | | | | | | |

| Sample ID **LCS-91142** | Batch ID: **91142** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.3** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 3:12:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 50.5 | 20.0 | 50.00 | 0 | 101 | 74 | 129 | | | |

| Sample ID **1905205-05C DUP** | Batch ID: **91142** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.52** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 3:41:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 236 | 20.0 | 0 | 237.0 | | | | 0.296 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 236 | 20.0 | 0 | 237.0 | | | | 0.296 | 20 | |

| Sample ID **LCSD-91142** | Batch ID: **91142** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.18** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 4:10:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 50.9 | 20.0 | 50.00 | 0 | 102 | 74 | 129 | 0.789 | 20 | |

| Sample ID **1905321-02A DUP** | Batch ID: **91142** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.51** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 5:07:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 142 | 20.0 | 0 | 138.0 | | | | 2.86 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 142 | 20.0 | 0 | 138.0 | | | | 2.86 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190530A**

| Sample ID **ICV-190530** | Batch ID: **R104367** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.31** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 2:50:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 11.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 88.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.8 | 20.0 | 100.0 | 0 | 99.8 | 98 | 102 | | | |

| Sample ID **CCV1-190530** | Batch ID: **R104367** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.27** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 4:23:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 14.6 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 83.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 97.8 | 20.0 | 100.0 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID **CCV2-190530** | Batch ID: **R104367** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.5** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 5:10:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 95.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 95.8 | 20.0 | 100.0 | 0 | 95.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190517B**

The QC data in batch 90972 applies to the following samples: 1905205-01C, 1905205-02C, 1905205-03C, 1905205-04C, 1905205-05C, 1905205-06C, 1905205-07C, 1905205-08C, 1905205-09C

| Sample ID | **MB-90972** | Batch ID: | **90972** | TestNo: | **M4500-P E** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **UV/VIS_2_190517B** | Analysis Date: | **5/17/2019 12:34:00 PM** | Prep Date: | **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | <0.0300 | 0.100 | | | | | | | | |

| Sample ID | **LCS-90972** | Batch ID: | **90972** | TestNo: | **M4500-P E** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **UV/VIS_2_190517B** | Analysis Date: | **5/17/2019 12:34:00 PM** | Prep Date: | **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.520 | 0.100 | 0.5000 | 0 | 104 | 80 | 120 | | | |

| Sample ID | **LCSD-90972** | Batch ID: | **90972** | TestNo: | **M4500-P E** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **UV/VIS_2_190517B** | Analysis Date: | **5/17/2019 12:34:00 PM** | Prep Date: | **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.503 | 0.100 | 0.5000 | 0 | 101 | 80 | 120 | 3.32 | 15 | |

| Sample ID | **1905205-01CMS** | Batch ID: | **90972** | TestNo: | **M4500-P E** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **UV/VIS_2_190517B** | Analysis Date: | **5/17/2019 12:42:00 PM** | Prep Date: | **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 1.61 | 0.200 | 1.000 | 0.7140 | 90.0 | 80 | 120 | | | |

| Sample ID | **1905205-01CMSD** | Batch ID: | **90972** | TestNo: | **M4500-P E** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **UV/VIS_2_190517B** | Analysis Date: | **5/17/2019 12:42:00 PM** | Prep Date: | **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 1.59 | 0.200 | 1.000 | 0.7140 | 87.2 | 80 | 120 | 1.75 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190517B**

| Sample ID **ICV-190517** | Batch ID: **R104132** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_190517B** | Analysis Date: **5/17/2019 12:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.218 | 0.100 | 0.2000 | 0 | 109 | 85 | 115 | | | |

| Sample ID **CCV1-190517** | Batch ID: **R104132** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190517B** | Analysis Date: **5/17/2019 12:42:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.536 | 0.100 | 0.5000 | 0 | 107 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190521B**

The QC data in batch 91028 applies to the following samples: 1905205-01A, 1905205-02A, 1905205-03A, 1905205-04A, 1905205-05A, 1905205-06A, 1905205-07A, 1905205-08A, 1905205-09A

| Sample ID | **MB-91028** | Batch ID: | **91028** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:39:00 PM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | <0.0500 | 0.100 | | | | | | | | N |

| Sample ID | **LCS-91028** | Batch ID: | **91028** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:40:00 PM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.103 | 0.100 | 0.1000 | 0 | 103 | 85 | 115 | | | N |

| Sample ID | **LCSD-91028** | Batch ID: | **91028** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:40:00 PM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.0959 | 0.100 | 0.1000 | 0 | 95.9 | 85 | 115 | 7.39 | 15 | N |

| Sample ID | **1905205-09AMS** | Batch ID: | **91028** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:45:00 PM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.108 | 0.100 | 0.1000 | 0 | 108 | 85 | 115 | | | N |

| Sample ID | **1905205-09AMSD** | Batch ID: | **91028** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:45:00 PM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.110 | 0.100 | 0.1000 | 0 | 110 | 85 | 115 | 2.25 | 15 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190521B**

| Sample ID | **ICV-190521** | Batch ID: | **R104200** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:38:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.0971 | 0.100 | 0.1000 | 0 | 97.1 | 85 | 115 | | | N |

| Sample ID | **CCV1-190521** | Batch ID: | **R104200** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:46:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.221 | 0.100 | 0.2000 | 0 | 111 | 85 | 115 | | | N |

| Sample ID | **CCV2-190521** | Batch ID: | **R104200** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 6:00:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.212 | 0.100 | 0.2000 | 0 | 106 | 85 | 115 | | | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_190521C**

The QC data in batch 91019 applies to the following samples: 1905205-01C, 1905205-02C, 1905205-03C, 1905205-04C, 1905205-05C, 1905205-06C, 1905205-07C, 1905205-08C, 1905205-09C

| Sample ID | **MB-91019** | Batch ID: | **91019** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_190521C** | Analysis Date: | **5/21/2019 10:00:00 AM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-91019** | Batch ID: | **91019** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_190521C** | Analysis Date: | **5/21/2019 10:00:00 AM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 748 | 10.0 | 745.6 | 0 | 100 | 90 | 113 | | | |

| Sample ID | **1905188-01E-DUP** | Batch ID: | **91019** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190521C** | Analysis Date: | **5/21/2019 10:00:00 AM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 9980 | 200 | 0 | 10160 | | | | 1.79 | 5 | |

| Sample ID | **1905188-02E-DUP** | Batch ID: | **91019** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190521C** | Analysis Date: | **5/21/2019 10:00:00 AM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 10800 | 200 | 0 | 10840 | | | | 0.370 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

May 29, 2019



## DHL Analytical, Inc.

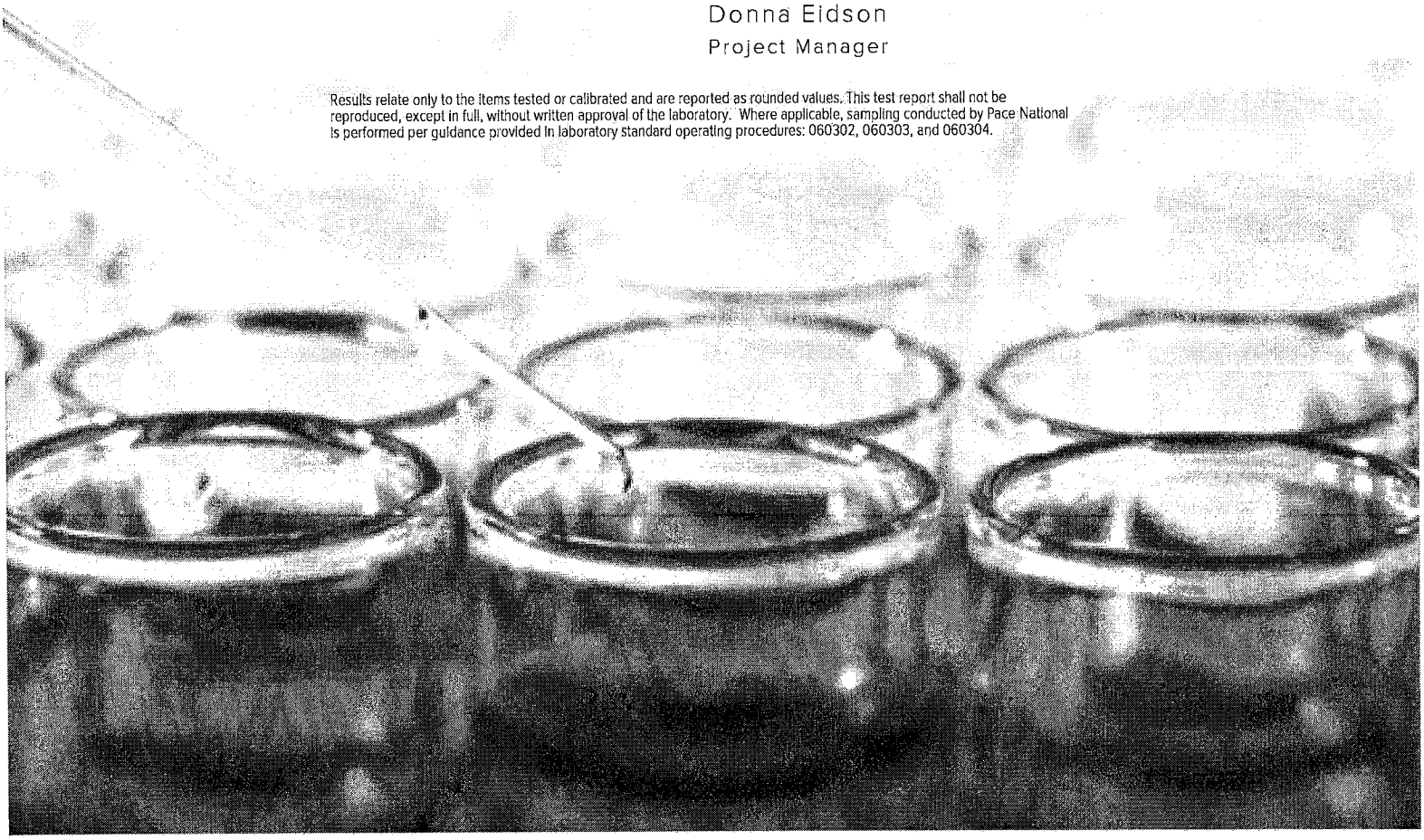
| | |
|---|---|
| Sample Delivery Group: | L1100949 |
| Samples Received: | 05/21/2019 |
| Project Number: | 1905205 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager


Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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## FGD-6 L1100949-01 Non-Potable Water

Collected by | Collected date/time 05/16/19 09:20 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 10:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 10:55 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:05 | RRE | Mt. Juliet, TN |

## FGD-4 L1100949-02 Non-Potable Water

Collected by | Collected date/time 05/16/19 10:15 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 10:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 10:55 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:05 | RRE | Mt. Juliet, TN |

## FGD-3 L1100949-03 Non-Potable Water

Collected by | Collected date/time 05/16/19 11:10 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:05 | RRE | Mt. Juliet, TN |

## FGD-2 L1100949-04 Non-Potable Water

Collected by | Collected date/time 05/16/19 12:00 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

## FGD-5 L1100949-05 Non-Potable Water

Collected by | Collected date/time 05/16/19 13:50 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

## FGD-1 L1100949-06 Non-Potable Water

Collected by | Collected date/time 05/16/19 14:50 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

## FGD-8 L1100949-07 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time |
|---|---|---|---|---|---|
| | | | | 05/16/19 15:45 | 05/21/19 10:10 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

## FGD-11 L1100949-08 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time |
|---|---|---|---|---|---|
| | | | | 05/16/19 16:40 | 05/21/19 10:10 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

## FGD-12 L1100949-09 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time |
|---|---|---|---|---|---|
| | | | | 05/16/19 17:35 | 05/21/19 10:10 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 1.67 | | 0.422 | 0.593 | 05/28/2019 10:55 | WG1284744 |
| *(T) Barium* | *97.9* | | | *62.0-143* | *05/28/2019 10:55* | WG1284744 |
| *(T) Yttrium* | *113* | | | *79.0-136* | *05/28/2019 10:55* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 3.10 | | 0.890 | 0.863 | 05/28/2019 10:55 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 1.43 | | 0.468 | 0.27 | 05/24/2019 17:05 | WG1284773 |
| *(T) Barium-133* | *90.8* | | | *30.0-143* | *05/24/2019 17:05* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.745 | | 0.407 | 0.556 | 05/28/2019 10:55 | WG1284744 |
| *(T) Barium* | *109* | | | *62.0-143* | *05/28/2019 10:55* | WG1284744 |
| *(T) Yttrium* | *110* | | | *79.0-136* | *05/28/2019 10:55* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 1.37 | | 0.716 | 0.755 | 05/28/2019 10:55 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.627 | | 0.309 | 0.199 | 05/24/2019 17:05 | WG1284773 |
| *(T) Barium-133* | *92.0* | | | *30.0-143* | *05/24/2019 17:05* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.403 | | 0.412 | 0.638 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *92.8* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *112* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.797 | | 0.752 | 1.04 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.394 | | 0.340 | 0.403 | 05/24/2019 17:05 | WG1284773 |
| *(T) Barium-133* | *59.2* | | | *30.0-143* | *05/24/2019 17:05* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 0.588 | | 0.391 | 0.541 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *109* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *109* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 1.24 | | 0.819 | 0.937 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.648 | | 0.428 | 0.396 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *92.1* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.0624 | | 0.333 | 0.506 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *105* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *108* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.404 | | 0.552 | 0.696 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.342 | | 0.219 | 0.19 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *86.7* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | -0.0608 | | 0.401 | 0.593 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *95.4* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *110* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 0.184 | | 0.635 | 0.923 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.184 | | 0.234 | 0.33 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *83.4* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 5.27 | | 0.459 | 0.616 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *91.3* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 8.40 | | 1.14 | 0.795 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 3.14 | | 0.685 | 0.179 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *88.2* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 2.75 | | 0.444 | 0.645 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *112* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *108* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 5.14 | | 0.963 | 0.952 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 2.39 | | 0.519 | 0.307 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *97.4* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 1.43 | | 0.395 | 0.572 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *111* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *115* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 1.81 | | 0.642 | 0.813 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.385 | | 0.247 | 0.241 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *96.0* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Method Blank (MB)

(MB) R3415641-1 05/28/19 10:55

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | -0.164 | | 0.413 |
| *(T) Barium* | *108* | | |
| *(T) Yttrium* | *115* | | |

## L1100192-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1100192-01 05/28/19 10:55 • (DUP) R3415641-5 05/28/19 10:55

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.157 | -0.0367 | 1 | 200 | 0.366 | | 20 | 3 |
| *(T) Barium* | *91.7* | *102* | | | | | | |
| *(T) Yttrium* | *110* | *107* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3415641-2 05/28/19 10:55

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 4.47 | 89.4 | 80.0-120 | |
| *(T) Barium* | | | *103* | | |
| *(T) Yttrium* | | | *107* | | |

## L1100922-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1100922-01 05/28/19 10:55 • (MS) R3415641-3 05/28/19 10:55 • (MSD) R3415641-4 05/28/19 10:55

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 7.14 | -0.136 | 7.62 | 7.50 | 107 | 105 | 1 | 70.0-130 | | | 1.50 | | 20 |
| *(T) Barium* | | *111* | | | *107* | *110* | | | | | | | |
| *(T) Yttrium* | | *114* | | | *107* | *110* | | | | | | | |

## Method Blank (MB)

(MB) R3415635-1 05/24/19 17:04

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-226 | 0.459 | | 0.209 |
| *(T) Barium-133* | *84.6* | | |

## L1100844-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1100844-01 05/24/19 17:04 • (DUP) R3415635-5 05/24/19 17:04

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.495 | 0.573 | 1 | 14.6 | 0.182 | | 20 | 3 |
| *(T) Barium-133* | *90.4* | *88.8* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3415635-2 05/24/19 17:04

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 20.1 | 19.1 | 95.0 | 80.0-120 | |
| *(T) Barium-133* | | | *79.1* | | |

## L1100433-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1100433-01 05/24/19 17:04 • (MS) R3415635-3 05/24/19 17:04 • (MSD) R3415635-4 05/24/19 17:04

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 20.1 | 1.16 | 19.9 | 20.9 | 93.2 | 98.0 | 1 | 75.0-125 | | | 4.71 | | 20 |
| *(T) Barium-133* | | *83.2* | | | *81.1* | *84.7* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| | The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG. |

# ACCREDITATIONS & LOCATIONS

ONE LAB. NATIONWIDE.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.



## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LA000356 |
| Kentucky [1 6] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

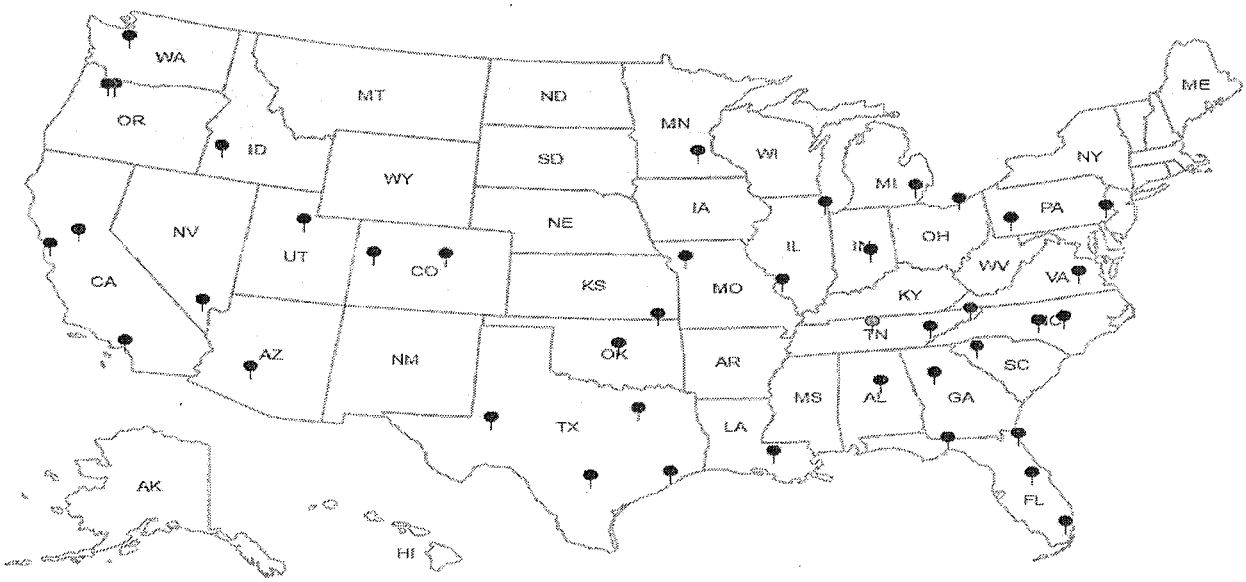
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



# Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | | |
|---|---|---|---|
| Client: DHLRTX | SDG#: | 1100949 | |
| Cooler Received/Opened On: 5/21/19 | Temperature: | Amb | |
| Received By: Brock Fariss | | | |
| Signature: BF Fariss | | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | ✓ | | |
| COC Signed / Accurate? | | ✓ | |
| Bottles arrive intact? | | ✓ | |
| Correct bottles used? | | ✓ | |
| Sufficient volume sent? | | ✓ | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | | | ✓ |

Pace Analytical®
National Center for Testing & Innovation

| Login #:L1100949 | Client:DHLRRTX | Date:05/21 | Evaluated by:Kelsey S |
|---|---|---|---|

**Non-Conformance (check applicable items)**

| | Sample Integrity | | Chain of Custody Clarification | | |
|---|---|---|---|---|---|
| | Parameter(s) past holding time | | Login Clarification Needed | | **If Broken Container:** |
| | Temperature not in range | | Chain of custody is incomplete | | Insufficient packing material around container |
| | Improper container type | | Please specify Metals requested. | | Insufficient packing material inside cooler |
| x | pH not in range. | | Please specify TCLP requested. | | Improper handling by carrier (FedEx / UPS / Courie |
| | Insufficient sample volume. | | Received additional samples not listed on coc. | | Sample was frozen |
| | Sample is biphasic. | | Sample ids on containers do not match ids on coc | | Container lid not intact |
| | Vials received with headspace. | | Trip Blank not received. | | **If no Chain of Custody:** |
| | Broken container | | Client did not "X" analysis. | | Received by: |
| | Broken container: | | Chain of Custody is missing | | Date/Time: |
| | Sufficient sample remains | | | | Temp./Cont. Rec./pH: |
| | | | | | Carrier: |
| | | | | | Tracking# |

**Login Comments: 2 of 2 FGD-8 was received with a pH of 6. pH adj in login 1424 05/21**

| Client informed by: | | Call | | Email | | Voice Mail | | Date: | Time: |
|---|---|---|---|---|---|---|---|---|---|
| TSR Initials: | Client Contact: | | | | | | | | |

**Login Instructions:**

Noted. DE 5/24/19

1100949

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



H005

Work Order: 1905205

**Subcontractor:**

Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

17-May-19

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Ra-228 E904.0 | Ra-226 M7500 Ra B M | Requested Tests | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | Aqueous | -01D | 05/16/19 09:20 AM | 1LHDPEHNO3 | | 1 | | | | -01 |
| FGD-6 | Aqueous | -01E | 05/16/19 09:20 AM | 1LHDPEHNO3 | 1 | | | | | 01 |
| FGD-4 | Aqueous | -02D | 05/16/19 10:15 AM | 1LHDPEHNO3 | | 1 | | | | 02 |
| FGD-4 | Aqueous | -02E | 05/16/19 10:15 AM | 1LHDPEHNO3 | 1 | | | | | 02 |
| FGD-3 | Aqueous | -03D | 05/16/19 11:10 AM | 1LHDPEHNO3 | | 1 | | | | 03 |
| FGD-3 | Aqueous | -03E | 05/16/19 11:10 AM | 1LHDPEHNO3 | 1 | | | | | 03 |
| FGD-2 | Aqueous | -04D | 05/16/19 12:00 PM | 1LHDPEHNO3 | | 1 | | | | 04 |
| FGD-2 | Aqueous | -04E | 05/16/19 12:00 PM | 1LHDPEHNO3 | 1 | | | | | 04 |
| FGD-5 | Aqueous | -05D | 05/16/19 01:50 PM | 1LHDPEHNO3 | | 1 | | | | 05 |
| FGD-5 | Aqueous | -05E | 05/16/19 01:50 PM | 1LHDPEHNO3 | 1 | | | | | 05 |
| FGD-1 | Aqueous | -06D | 05/16/19 02:50 PM | 1LHDPEHNO3 | | 1 | | | | 06 |
| FGD-1 | Aqueous | -06E | 05/16/19 02:50 PM | 1LHDPEHNO3 | 1 | | | | | 06 |
| FGD-8 | Aqueous | -07D | 05/16/19 03:45 PM | 1LHDPEHNO3 | | 1 | | | | 07 |
| FGD-8 | Aqueous | -07E | 05/16/19 03:45 PM | 1LHDPEHNO3 | 1 | | | | | 07 |
| FGD-11 | Aqueous | -08D | 05/16/19 04:40 PM | 1LHDPEHNO3 | | 1 | | | | 08 |
| FGD-11 | Aqueous | -08E | 05/16/19 04:40 PM | 1LHDPEHNO3 | 1 | | | | | 08 |
| FGD-12 | Aqueous | -09D | 05/16/19 05:35 PM | 1LHDPEHNO3 | | 1 | | | | 09 |
| FGD-12 | Aqueous | -09E | 05/16/19 05:35 PM | 1LHDPEHNO3 | 1 | | | | | 09 |

< 2 < 2

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

UPS
Rec: 18

| | Date/Time | | Date/Time |
|---|---|---|---|
| **Relinquished by:** | 5/17/19 1700 | **Received by:** | 5/21/19 1010 |
| **Relinquished by:** | | **Received by:** | |

pH adj @ 1424

NCL

AM RAD SCREEN: <0.5 mR/hr

May 29, 2019

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1905222

RE: Luminant-OGSES-FGD Pond

Dear Will Vienne:

DHL Analytical, Inc. received 1 sample(s) on 5/18/2019 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-19-24

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**Analytical Report 1905222** ..... **10**

**AnalyticalQCSummaryReport 1905222** ..... **11**

DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 86481

# CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR, ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-17-19 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 1905222
PROJECT LOCATION OR NAME: LUMINANT - OGSES - FGD POND
CLENT PROJECT #: 19122262-F COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL P=PAINT
W=WATER SL=SLUDGE
A=AIR O=OTHER
L=LIQUID SO=SOLID
SE=SEDIMENT

PRESERVATION: HCl, $HNO_3$, $H_2SO_4$ ☐ NaOH ☐, ICE, UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ (METHOD 8021) | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO (METHOD 8015) ☐ DRO (METHOD 8105) ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ 8082 PCB ☐ 8270 PCB ☐ | 8270 O-P PEST ☐ 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ | RCRA ☐ TX11 ☐ ____ ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ____ ☐ | TCLP SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | SULFATE, COBALT, LITHIUM, SELENIUM

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | SULFATE, COBALT, LITHIUM, SELENIUM | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-14 | 01 | 5-17-19 | 0750 | W | P | 2 | | | | | | X X | |

RELINQUISHED BY: (Signature) DATE/TIME 5-17-19 1730 RECEIVED BY: (Signature) FEDEX
RELINQUISHED BY: (Signature) FEDEX DATE/TIME 5/18/19 4:30 PM RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

APPENDIX F-Revision 1 November 21, 2022
☐ DHL DISPOSAL @ $5.00 each ☐ Return

3

**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 3.0 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

DHL COC Rev 1 | FEB 2010

ORIGIN ID:FWHA (512) 671-3434
J. BRAYTON
GOLDER
2201 DOUBLE CREEK DR

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 17MAY19
ACTWGT: 45.40 LB
CAD: 6981003/SSFO2002
DIMS: 25x14x14 IN

BILL THIRD PARTY

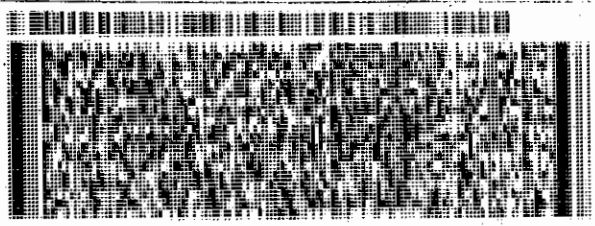
Part # 156[illegible]
DB2 EXP 03/20

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664

(512) 388-8222 REF:
INV:
PO: DEPT:



FedEx
Express

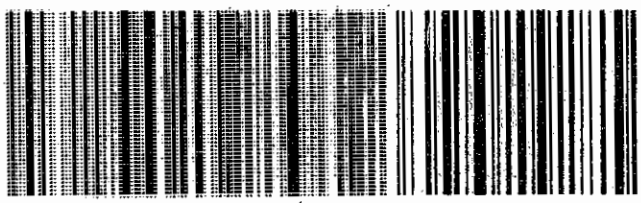
2 of 2

MPS# 0263 7873 2787 1824

Mstr# 7873 2787 1813 0201

XO BSMA

SATURDAY 12:00P
PRIORITY OVERNIGHT
AHS
78664
TX-US AUS



DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Golder | Date Received: 5/18/2019

Work Order Number 1905222 | Received by AH

Checklist completed by: _____ (Signature) 5/20/2019 (Date) | Reviewed by CC (Initials) 5/20/2019 (Date)

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 3.0 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 11837 |
| | Adjusted? no | | Checked by CC |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes | No | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

Page 1 of 1

**DHL Analytical, Inc.** **Date:** *29-May-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES-FGD Pond
**Lab Order:** 1905222

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method E300 - Anions Analysis

LOG IN

The sample was received and log-in performed on 5/18/19. A total of 1 sample was received. The sample arrived in good condition and was properly packaged. All method blanks, laboratory spikes, and/or matrix spikes met quality assurance objectives.

## DHL Analytical, Inc.

**Date:** *29-May-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES-FGD Pond
**Lab Order:** 1905222

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1905222-01 | FGD-14 | | 05/17/19 07:50 AM | 5/18/2019 |

**Lab Order:** 1905222
**Client:** Golder
**Project:** Luminant-OGSES-FGD Pond

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1905222-01A | FGD-14 | 05/17/19 07:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:41 AM | 90992 |
| 1905222-01B | FGD-14 | 05/17/19 07:50 AM | Aqueous | E300 | Anion Preparation | 05/20/19 09:15 AM | 90987 |

**Lab Order:** 1905222
**Client:** Golder
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1905222-01A | FGD-14 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90992 | 1 | 05/21/19 01:06 PM | ICP-MS4_190521B |
| 1905222-01B | FGD-14 | Aqueous | E300 | Anions by IC method - Water | 90987 | 10 | 05/20/19 05:25 PM | IC2_190520A |

# DHL Analytical, Inc.

**Date:** *29-May-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-14 |
| **Project:** | Luminant-OGSES-FGD Pond | **Lab ID:** | 1905222-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/17/19 07:50 AM |
| **Lab Order:** | 1905222 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/21/19 01:06 PM |
| Lithium | 0.00564 | 0.00500 | 0.0100 | J | mg/L | 1 | 05/21/19 01:06 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/21/19 01:06 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Sulfate | 41.6 | 10.0 | 30.0 | | mg/L | 10 | 05/20/19 05:25 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190521B**

The QC data in batch 90992 applies to the following samples: 1905222-01A

| Sample ID | **MB-90992** | Batch ID: | **90992** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_190521B** | Analysis Date: | **5/21/2019 12:50:00 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |

| Sample ID | **LCS-90992** | Batch ID: | **90992** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_190521B** | Analysis Date: | **5/21/2019 12:52:00 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID | **LCSD-90992** | Batch ID: | **90992** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_190521B** | Analysis Date: | **5/21/2019 12:54:00 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 1.11 | 15 | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 3.06 | 15 | |
| Selenium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.424 | 15 | |

| Sample ID | **1905201-01A SD** | Batch ID: | **90992** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_190521B** | Analysis Date: | **5/21/2019 1:00:00 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.0251 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1905201-01A PDS** | Batch ID: | **90992** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_190521B** | Analysis Date: | **5/21/2019 1:14:00 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Lithium | 0.209 | 0.0100 | 0.200 | 0.0251 | 92.0 | 80 | 120 | | | |
| Selenium | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190521B**

| Sample ID **1905201-01A MS** | Batch ID: **90992** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 1:16:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.194 | 0.00500 | 0.200 | 0 | 96.8 | 80 | 120 | | | |
| Lithium | 0.211 | 0.0100 | 0.200 | 0.0251 | 93.2 | 80 | 120 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 80 | 120 | | | |

| Sample ID **1905201-01A MSD** | Batch ID: **90992** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 1:18:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.193 | 0.00500 | 0.200 | 0 | 96.5 | 80 | 120 | 0.256 | 15 | |
| Lithium | 0.216 | 0.0100 | 0.200 | 0.0251 | 95.3 | 80 | 120 | 2.00 | 15 | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 2.05 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190521B**

| Sample ID **ICV-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 11:02:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Lithium | 0.105 | 0.0100 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 11:07:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.00507 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Selenium | 0.00506 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |

| Sample ID **CCV2-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 12:37:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.196 | 0.0100 | 0.200 | 0 | 97.9 | 90 | 110 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL2-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 12:42:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.00505 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |
| Selenium | 0.00483 | 0.00500 | 0.00500 | 0 | 96.6 | 70 | 130 | | | |

| Sample ID **CCV3-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 1:20:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Lithium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |

| Sample ID **LCVL3-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 1:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.00509 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190521B**

Sample ID **LCVL3-190521** Batch ID: **R104193** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_190521B** Analysis Date: **5/21/2019 1:26:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.0102 | 0.0100 | 0.0100 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00554 | 0.00500 | 0.00500 | 0 | 111 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190520A**

The QC data in batch 90987 applies to the following samples: 1905222-01B

| Sample ID | **MB-90987** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 10:20:40 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-90987** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 10:36:40 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 30.7 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID | **LCSD-90987** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 10:52:40 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 30.7 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | 0.038 | 20 | |

| Sample ID | **1905221-01BMS** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 3:01:53 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 238 | 30.0 | 200.0 | 29.76 | 104 | 90 | 110 | | | |

| Sample ID | **1905221-01BMSD** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 3:17:53 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 236 | 30.0 | 200.0 | 29.76 | 103 | 90 | 110 | 0.887 | 20 | |

| Sample ID | **1905221-02BMS** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 3:49:53 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 218 | 30.0 | 200.0 | 12.12 | 103 | 90 | 110 | | | |

| Sample ID | **1905221-02BMSD** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 4:05:53 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 221 | 30.0 | 200.0 | 12.12 | 104 | 90 | 110 | 1.08 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190520A**

| Sample ID **ICV-190520** | Batch ID: **R104174** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_190520A** | Analysis Date: **5/20/2019 9:48:40 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 78.2 | 3.00 | 75.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID **CCV1-190520** | Batch ID: **R104174** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190520A** | Analysis Date: **5/20/2019 6:29:53 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 31.3 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

June 18, 2019

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1906072

RE: LUMINANT-OGSES-FGD

Dear Will Vienne:

DHL Analytical, Inc. received 2 sample(s) on 6/7/2019 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-19-24

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# № 83076 CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671 3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 6-6-19 PAGE 1 OF 1
PO #: 19122262-F DHL WORK ORDER #: 1906072
PROJECT LOCATION OR NAME: LUMINANT - OGSES - FGD
CLENT PROJECT #: 19122262-F COLLECTOR: J. BRAXTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT
P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ | RCRA ☐ TX11 ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | LITHIUM | CATIONS | ANIONS | FERROUS | FERRIC | TBM

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-16 | 01 | 6-6-19 | 1300 | W | | 7 | | X | | X | | |
| FGD-15 | 02 | 6-6-19 | 1445 | W | | 7 | | X | | X | | |

RELINQUISHED BY: (Signature) DATE/TIME 6-6-19 1830 RECEIVED BY: (Signature) Fed EX
RELINQUISHED BY: (Signature) Fed EX DATE/TIME 6-7-19 1029 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

APPENDIX F-Revision 1 November 21, 2022

☐ DHL DISPOSAL @ $5.00 each ☐ Return



**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐

**LABORATORY USE ONLY:**
RECEIVING TEMP: 5.3°C THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

DHL COC Rev 1 | FEB 2010

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

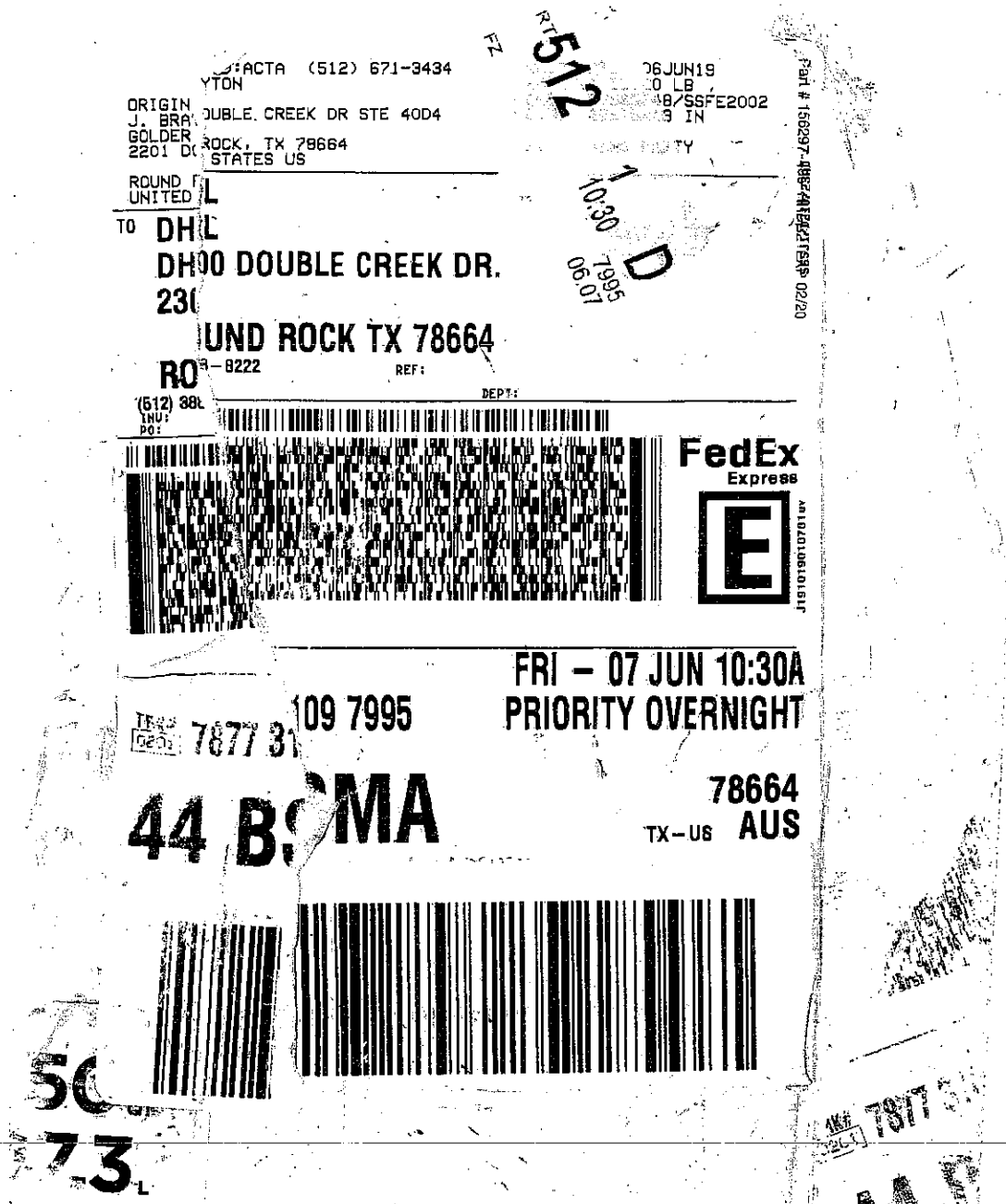
Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

---

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis


ORIGIN
DOUBLE CREEK DR STE 40D4
ROCK, TX 78664
STATES US
TO DHL
DH00 DOUBLE CREEK DR.
UND ROCK TX 78664
REF:
DEPT:
FedEx
Express
FRI - 07 JUN 10:30A
PRIORITY OVERNIGHT
78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Golder | Date Received: 6/7/2019

Work Order Number 1906072 | Received by EL

Checklist completed by: _____ 6/17/2019 (Signature / Date) | Reviewed by JD 6/17/2019 (Initials / Date)

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 5.5 °C |
| Water - VOA vials have zero headspace? | Yes ☑ | No ☐ | No VOA vials submitted ☐ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 11837 |
| | Adjusted? no | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? _____ | | Checked by _____ |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *18-Jun-19*

**CLIENT:** Golder
**Project:** LUMINANT-OGSES-FGD
**Lab Order:** 1906072

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method E300 - Anions Analysis
Method M2320 B - Alkalinity Analysis
Method M3500-Fe D - Ferrous Iron Analysis (this parameter is not NELAP certified)
Method M3500-Fe D - Ferric Iron (calculation) (this calculation is not NELAP certified).
Method M4500-P E - Orthophosphate Analysis
Method M2540C - TDS Analysis

## LOG IN

The samples were received and log-in performed on 6/7/19. A total of 2 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 6/12/19 the matrix spike and matrix spike duplicate recoveries were below control limits for Sodium. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

## FERRIC IRON CALCULATION

The Ferric Iron is calculated as the Total Iron minus the Ferrous Iron.

## DHL Analytical, Inc.

**Date:** *18-Jun-19*

**CLIENT:** Golder
**Project:** LUMINANT-OGSES-FGD
**Lab Order:** 1906072

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1906072-01 | FGD-16 | | 06/06/19 01:00 PM | 6/7/2019 |
| 1906072-02 | FGD-15 | | 06/06/19 02:45 PM | 6/7/2019 |

**Lab Order:** 1906072
**Client:** Golder
**Project:** LUMINANT-OGSES-FGD

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1906072-01A | FGD-16 | 06/06/19 01:00 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 06/10/19 09:28 AM | 91267 |
| 1906072-01B | FGD-16 | 06/06/19 01:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| 1906072-01C | FGD-16 | 06/06/19 01:00 PM | Aqueous | M2320 B | Alkalinity Preparation | 06/10/19 09:34 AM | 91271 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | E300 | Anion Preparation | 06/07/19 12:27 PM | 91226 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | E300 | Anion Preparation | 06/17/19 08:40 AM | 91349 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | E300 | Anion Preparation | 06/17/19 08:40 AM | 91349 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | M4500-P E | Orthophosphate Prep | 06/07/19 01:20 PM | 91254 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | M2540C | TDS Preparation | 06/13/19 04:04 PM | 91332 |
| 1906072-02A | FGD-15 | 06/06/19 02:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 06/10/19 09:28 AM | 91267 |
| 1906072-02B | FGD-15 | 06/06/19 02:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| 1906072-02C | FGD-15 | 06/06/19 02:45 PM | Aqueous | M2320 B | Alkalinity Preparation | 06/10/19 09:34 AM | 91271 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | E300 | Anion Preparation | 06/07/19 12:27 PM | 91226 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | E300 | Anion Preparation | 06/17/19 08:40 AM | 91349 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | M4500-P E | Orthophosphate Prep | 06/07/19 01:20 PM | 91254 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | M2540C | TDS Preparation | 06/13/19 04:04 PM | 91332 |

**Lab Order:** 1906072
**Client:** Golder
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1906072-01A | FGD-16 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R104593 | 1 | 06/14/19 | UV/VIS_2_190614A |
| | FGD-16 | Aqueous | M3500-Fe D | Ferrous Iron | 91267 | 1 | 06/10/19 11:01 AM | UV/VIS_2_190610A |
| 1906072-01B | FGD-16 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 10 | 06/12/19 11:53 AM | ICP-MS4_190612A |
| | FGD-16 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 1 | 06/12/19 01:41 PM | ICP-MS4_190612A |
| | FGD-16 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 1 | 06/11/19 04:05 PM | ICP-MS5_190611D |
| 1906072-01C | FGD-16 | Aqueous | M2320 B | Alkalinity | 91271 | 1 | 06/10/19 12:47 PM | TITRATOR_190610A |
| | FGD-16 | Aqueous | E300 | Anions by IC method - Water | 91226 | 1 | 06/07/19 04:58 PM | IC2_190607A |
| | FGD-16 | Aqueous | E300 | Anions by IC method - Water | 91349 | 10 | 06/17/19 10:56 AM | IC2_190617A |
| | FGD-16 | Aqueous | E300 | Anions by IC method - Water | 91349 | 1 | 06/17/19 12:16 PM | IC2_190617A |
| | FGD-16 | Aqueous | M4500-P E | Orthophosphate | 91254 | 1 | 06/07/19 01:51 PM | UV/VIS_2_190607B |
| | FGD-16 | Aqueous | M2540C | Total Dissolved Solids | 91332 | 1 | 06/14/19 12:00 PM | WC_190614B |
| 1906072-02A | FGD-15 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R104593 | 1 | 06/14/19 | UV/VIS_2_190614A |
| | FGD-15 | Aqueous | M3500-Fe D | Ferrous Iron | 91267 | 1 | 06/10/19 11:03 AM | UV/VIS_2_190610A |
| 1906072-02B | FGD-15 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 50 | 06/12/19 11:55 AM | ICP-MS4_190612A |
| | FGD-15 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 1 | 06/12/19 01:43 PM | ICP-MS4_190612A |
| | FGD-15 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 1 | 06/11/19 04:08 PM | ICP-MS5_190611D |
| 1906072-02C | FGD-15 | Aqueous | M2320 B | Alkalinity | 91271 | 1 | 06/10/19 12:56 PM | TITRATOR_190610A |
| | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 91226 | 1 | 06/07/19 05:14 PM | IC2_190607A |
| | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 91349 | 100 | 06/17/19 11:44 AM | IC2_190617A |
| | FGD-15 | Aqueous | M4500-P E | Orthophosphate | 91254 | 1 | 06/07/19 01:52 PM | UV/VIS_2_190607B |
| | FGD-15 | Aqueous | M2540C | Total Dissolved Solids | 91332 | 1 | 06/14/19 12:00 PM | WC_190614B |

# DHL Analytical, Inc.

**Date:** *18-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-16 |
| **Project:** | LUMINANT-OGSES-FGD | **Lab ID:** | 1906072-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 06/06/19 01:00 PM |
| **Lab Order:** | 1906072 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Calcium | 16.5 | 1.00 | 3.00 | | mg/L | 10 | 06/12/19 11:53 AM |
| Iron | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 06/11/19 04:05 PM |
| Magnesium | 3.33 | 0.100 | 0.300 | | mg/L | 1 | 06/11/19 04:05 PM |
| Potassium | 3.06 | 0.100 | 0.300 | | mg/L | 1 | 06/12/19 01:41 PM |
| Sodium | 82.1 | 1.00 | 3.00 | | mg/L | 10 | 06/12/19 11:53 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 74.8 | 3.00 | 10.0 | | mg/L | 10 | 06/17/19 10:56 AM |
| Fluoride | 0.164 | 0.100 | 0.400 | J | mg/L | 1 | 06/07/19 04:58 PM |
| Nitrate-N | 0.361 | 0.100 | 0.500 | J | mg/L | 1 | 06/07/19 04:58 PM |
| Sulfate | 13.9 | 1.00 | 3.00 | | mg/L | 1 | 06/17/19 12:16 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 159 | 10.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 12:47 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 12:47 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 12:47 PM |
| Alkalinity, Total (As CaCO3) | 159 | 20.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 12:47 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/14/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/10/19 11:01 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.0490 | 0.0300 | 0.100 | J | mg/L | 1 | 06/07/19 01:51 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 325 | 10.0 | 10.0 | | mg/L | 1 | 06/14/19 12:00 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *18-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-15 |
| **Project:** | LUMINANT-OGSES-FGD | **Lab ID:** | 1906072-02 |
| **Project No:** | 19122262-F | **Collection Date:** | 06/06/19 02:45 PM |
| **Lab Order:** | 1906072 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Calcium | 252 | 5.00 | 15.0 | | mg/L | 50 | 06/12/19 11:55 AM |
| Iron | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 06/11/19 04:08 PM |
| Lithium | 0.0768 | 0.00500 | 0.0100 | | mg/L | 1 | 06/11/19 04:08 PM |
| Magnesium | 97.2 | 5.00 | 15.0 | | mg/L | 50 | 06/12/19 11:55 AM |
| Potassium | 5.06 | 0.100 | 0.300 | | mg/L | 1 | 06/12/19 01:43 PM |
| Sodium | 457 | 5.00 | 15.0 | | mg/L | 50 | 06/12/19 11:55 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 634 | 30.0 | 100 | | mg/L | 100 | 06/17/19 11:44 AM |
| Fluoride | 0.622 | 0.100 | 0.400 | | mg/L | 1 | 06/07/19 05:14 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 06/07/19 05:14 PM |
| Sulfate | 926 | 100 | 300 | | mg/L | 100 | 06/17/19 11:44 AM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 178 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:56 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:56 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:56 PM |
| Alkalinity, Total (As CaCO3) | 178 | 20.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:56 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/14/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/10/19 11:03 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.0840 | 0.0300 | 0.100 | J | mg/L | 1 | 06/07/19 01:52 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 2880 | 50.0 | 50.0 | | mg/L | 1 | 06/14/19 12:00 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190612A**

The QC data in batch 91261 applies to the following samples: 1906072-01B, 1906072-02B

Sample ID **MB-91261** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 10:50:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Potassium | <0.100 | 0.300 | | | | | | | | |
| Sodium | <0.100 | 0.300 | | | | | | | | |

Sample ID **LCS-91261** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 10:52:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.66 | 0.300 | 5.00 | 0 | 93.2 | 80 | 120 | | | |
| Potassium | 4.97 | 0.300 | 5.00 | 0 | 99.4 | 80 | 120 | | | |
| Sodium | 5.11 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | | | |

Sample ID **LCSD-91261** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 10:54:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.67 | 0.300 | 5.00 | 0 | 93.4 | 80 | 120 | 0.234 | 15 | |
| Potassium | 4.93 | 0.300 | 5.00 | 0 | 98.5 | 80 | 120 | 0.913 | 15 | |
| Sodium | 5.15 | 0.300 | 5.00 | 0 | 103 | 80 | 120 | 0.824 | 15 | |

Sample ID **1906056-01A SD** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 11:00:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 39.0 | 75.0 | 0 | 38.0 | | | | 2.46 | 10 | |
| Potassium | <25.0 | 75.0 | 0 | 0 | | | | 0 | 10 | |
| Sodium | 116 | 75.0 | 0 | 115 | | | | 0.316 | 10 | |

Sample ID **1906056-01A PDS** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 11:20:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 276 | 15.0 | 250 | 38.0 | 95.0 | 80 | 120 | | | |
| Potassium | 247 | 15.0 | 250 | 0 | 98.7 | 80 | 120 | | | |
| Sodium | 379 | 15.0 | 250 | 115 | 105 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190612A**

| Sample ID **1906056-01A MS** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:22:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 42.9 | 15.0 | 5.00 | 38.0 | 98.3 | 80 | 120 | | | |
| Potassium | 5.61 | 15.0 | 5.00 | 0 | 112 | 80 | 120 | | | |
| Sodium | 118 | 15.0 | 5.00 | 115 | 44.1 | 80 | 120 | | | S |

| Sample ID **1906056-01A MSD** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:24:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 42.4 | 15.0 | 5.00 | 38.0 | 87.2 | 80 | 120 | 1.30 | 15 | |
| Potassium | 5.65 | 15.0 | 5.00 | 0 | 113 | 80 | 120 | 0.726 | 15 | |
| Sodium | 116 | 15.0 | 5.00 | 115 | 20.3 | 80 | 120 | 1.02 | 15 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190612A**

| Sample ID **ICV-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 10:34:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.45 | 0.300 | 2.50 | 0 | 98.1 | 90 | 110 | | | |
| Magnesium | 2.44 | 0.300 | 2.50 | 0 | 97.4 | 90 | 110 | | | |
| Potassium | 2.48 | 0.300 | 2.50 | 0 | 99.1 | 90 | 110 | | | |
| Sodium | 2.55 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 10:44:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0989 | 0.300 | 0.100 | 0 | 98.9 | 70 | 130 | | | |
| Magnesium | 0.0972 | 0.300 | 0.100 | 0 | 97.2 | 70 | 130 | | | |
| Potassium | 0.101 | 0.300 | 0.100 | 0 | 101 | 70 | 130 | | | |
| Sodium | 0.103 | 0.300 | 0.100 | 0 | 103 | 70 | 130 | | | |

| Sample ID **CCV1-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:26:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.71 | 0.300 | 5.00 | 0 | 94.3 | 90 | 110 | | | |
| Magnesium | 4.96 | 0.300 | 5.00 | 0 | 99.1 | 90 | 110 | | | |
| Potassium | 5.03 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Sodium | 4.99 | 0.300 | 5.00 | 0 | 99.8 | 90 | 110 | | | |

| Sample ID **LCVL1-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:42:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |
| Magnesium | 0.0966 | 0.300 | 0.100 | 0 | 96.6 | 70 | 130 | | | |
| Potassium | 0.0990 | 0.300 | 0.100 | 0 | 99.0 | 70 | 130 | | | |
| Sodium | 0.103 | 0.300 | 0.100 | 0 | 103 | 70 | 130 | | | |

| Sample ID **CCV2-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 12:01:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.65 | 0.300 | 5.00 | 0 | 93.1 | 90 | 110 | | | |
| Magnesium | 5.02 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |
| Sodium | 5.11 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190612A**

| Sample ID | **LCVL2-190612** | Batch ID: | **R104563** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_190612A** | Analysis Date: | **6/12/2019 12:08:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0958 | 0.300 | 0.100 | 0 | 95.8 | 70 | 130 | | | |
| Magnesium | 0.0967 | 0.300 | 0.100 | 0 | 96.7 | 70 | 130 | | | |
| Sodium | 0.103 | 0.300 | 0.100 | 0 | 103 | 70 | 130 | | | |

| Sample ID | **CCV4-190612** | Batch ID: | **R104563** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_190612A** | Analysis Date: | **6/12/2019 1:23:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Potassium | 5.05 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID | **LCVL4-190612** | Batch ID: | **R104563** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_190612A** | Analysis Date: | **6/12/2019 1:27:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Potassium | 0.0950 | 0.300 | 0.100 | 0 | 95.0 | 70 | 130 | | | |

| Sample ID | **CCV5-190612** | Batch ID: | **R104563** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_190612A** | Analysis Date: | **6/12/2019 1:45:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Potassium | 5.00 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID | **LCVL5-190612** | Batch ID: | **R104563** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_190612A** | Analysis Date: | **6/12/2019 1:50:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Potassium | 0.0947 | 0.300 | 0.100 | 0 | 94.7 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

The QC data in batch 91261 applies to the following samples: 1906072-01B, 1906072-02B

| Sample ID | **MB-91261** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:05:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | <0.0300 | 0.100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Magnesium | <0.100 | 0.300 | | | | | | | | |

| Sample ID | **LCS-91261** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:07:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.05 | 0.100 | 5.00 | 0 | 101 | 80 | 120 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Magnesium | 5.05 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | | | |

| Sample ID | **LCSD-91261** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:10:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.01 | 0.100 | 5.00 | 0 | 100 | 80 | 120 | 0.604 | 15 | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 0.952 | 15 | |
| Magnesium | 5.04 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.085 | 15 | |

| Sample ID | **1906056-01A SD** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:16:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.190 | 0.500 | 0 | 0.0550 | | | | 110 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.00980 | | | | 0 | 10 | |
| Magnesium | 8.05 | 1.50 | 0 | 7.98 | | | | 0.840 | 10 | |

| Sample ID | **1906056-01A PDS** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:39:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 4.99 | 0.100 | 5.00 | 0.0550 | 98.7 | 80 | 120 | | | |
| Lithium | 0.215 | 0.0100 | 0.200 | 0.00980 | 103 | 80 | 120 | | | |
| Magnesium | 12.3 | 0.300 | 5.00 | 7.98 | 87.2 | 80 | 120 | | | |

| Sample ID | **1906056-01A MS** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:41:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **1906056-01A MS** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:41:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.06 | 0.100 | 5.00 | 0.0550 | 100 | 80 | 120 | | | |
| Lithium | 0.210 | 0.0100 | 0.200 | 0.00980 | 100 | 80 | 120 | | | |
| Magnesium | 12.9 | 0.300 | 5.00 | 7.98 | 97.7 | 80 | 120 | | | |

| Sample ID **1906056-01A MSD** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:43:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.08 | 0.100 | 5.00 | 0.0550 | 101 | 80 | 120 | 0.370 | 15 | |
| Lithium | 0.209 | 0.0100 | 0.200 | 0.00980 | 99.7 | 80 | 120 | 0.400 | 15 | |
| Magnesium | 13.0 | 0.300 | 5.00 | 7.98 | 99.4 | 80 | 120 | 0.654 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **ICV-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 10:46:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 2.45 | 0.100 | 2.50 | 0 | 98.2 | 90 | 110 | | | |
| Lithium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 2.39 | 0.300 | 2.50 | 0 | 95.6 | 90 | 110 | | | |

| Sample ID **LCVL-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 10:52:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.0944 | 0.100 | 0.100 | 0 | 94.4 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Magnesium | 0.0959 | 0.300 | 0.100 | 0 | 95.9 | 70 | 130 | | | |

| Sample ID **CCV3-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 2:53:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 4.97 | 0.100 | 5.00 | 0 | 99.4 | 90 | 110 | | | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 4.96 | 0.300 | 5.00 | 0 | 99.2 | 90 | 110 | | | |

| Sample ID **LCVL3-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 2:57:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.0963 | 0.100 | 0.100 | 0 | 96.3 | 70 | 130 | | | |
| Lithium | 0.0104 | 0.0100 | 0.0100 | 0 | 104 | 70 | 130 | | | |
| Magnesium | 0.0942 | 0.300 | 0.100 | 0 | 94.2 | 70 | 130 | | | |

| Sample ID **CCV4-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:48:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 4.93 | 0.100 | 5.00 | 0 | 98.6 | 90 | 110 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Magnesium | 4.99 | 0.300 | 5.00 | 0 | 99.7 | 90 | 110 | | | |

| Sample ID **LCVL4-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.0969 | 0.100 | 0.100 | 0 | 96.9 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **LCVL4-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |
| Magnesium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |

| Sample ID **CCV5-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 4:21:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 4.87 | 0.100 | 5.00 | 0 | 97.5 | 90 | 110 | | | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 5.01 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID **LCVL5-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 4:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.0924 | 0.100 | 0.100 | 0 | 92.4 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Magnesium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190607A**

The QC data in batch 91226 applies to the following samples: 1906072-01C, 1906072-02C

| Sample ID | **MB-91226** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 10:25:46 AM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Nitrate-N | <0.100 | 0.500 | | | | | | | | |

| Sample ID | **LCS-91226** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 10:41:46 AM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 4.06 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | | | |
| Nitrate-N | 5.17 | 0.500 | 5.000 | 0 | 103 | 90 | 110 | | | |

| Sample ID | **LCSD-91226** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 10:57:46 AM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 4.07 | 0.400 | 4.000 | 0 | 102 | 90 | 110 | 0.405 | 20 | |
| Nitrate-N | 5.11 | 0.500 | 5.000 | 0 | 102 | 90 | 110 | 1.10 | 20 | |

| Sample ID | **1906064-01EMS** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 12:01:26 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 21.2 | 0.400 | 20.00 | 0.1842 | 105 | 90 | 110 | | | |
| Nitrate-N | 4.75 | 0.500 | 4.516 | 0.1911 | 101 | 90 | 110 | | | |

| Sample ID | **1906064-01EMSD** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 12:17:26 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 21.2 | 0.400 | 20.00 | 0.1842 | 105 | 90 | 110 | 0.188 | 20 | |
| Nitrate-N | 4.75 | 0.500 | 4.516 | 0.1911 | 101 | 90 | 110 | 0.115 | 20 | |

| Sample ID | **1906066-01DMS** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 1:46:15 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 2110 | 40.0 | 2000 | 0 | 106 | 90 | 110 | | | |
| Nitrate-N | 456 | 50.0 | 451.6 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190607A**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **1906066-01DMSD** | Batch ID: **91226** | TestNo: **E300** | Units: **mg/L** | | |
| SampType: **MSD** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 2:02:15 PM** | Prep Date: **6/7/2019** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 2110 | 40.0 | 2000 | 0 | 105 | 90 | 110 | 0.071 | 20 | |
| Nitrate-N | 455 | 50.0 | 451.6 | 0 | 101 | 90 | 110 | 0.150 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190607A**

| Sample ID **ICV-190607** | Batch ID: **R104496** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 9:53:47 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 10.4 | 0.400 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 13.2 | 0.500 | 12.50 | 0 | 106 | 90 | 110 | | | |

| Sample ID **CCV1-190607** | Batch ID: **R104496** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 3:38:14 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 4.14 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 5.23 | 0.500 | 5.000 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV2-190607** | Batch ID: **R104496** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 6:18:14 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 4.16 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 5.17 | 0.500 | 5.000 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190617A**

The QC data in batch 91349 applies to the following samples: 1906072-01C, 1906072-02C

| Sample ID | **MB-91349** | Batch ID: | **91349** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC2_190617A** | Analysis Date: | **6/17/2019 9:53:33 AM** | Prep Date: | **6/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-91349** | Batch ID: | **91349** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC2_190617A** | Analysis Date: | **6/17/2019 10:09:33 AM** | Prep Date: | **6/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.0 | 1.00 | 10.00 | 0 | 100 | 90 | 110 | | | |
| Sulfate | 30.4 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID | **LCSD-91349** | Batch ID: | **91349** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC2_190617A** | Analysis Date: | **6/17/2019 10:25:33 AM** | Prep Date: | **6/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | 1.27 | 20 | |
| Sulfate | 30.8 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | 1.19 | 20 | |

| Sample ID | **1906072-01CMS** | Batch ID: | **91349** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190617A** | Analysis Date: | **6/17/2019 11:12:11 AM** | Prep Date: | **6/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 284 | 10.0 | 200.0 | 74.78 | 105 | 90 | 110 | | | |
| Sulfate | 219 | 30.0 | 200.0 | 15.57 | 102 | 90 | 110 | | | |

| Sample ID | **1906072-01CMSD** | Batch ID: | **91349** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_190617A** | Analysis Date: | **6/17/2019 11:28:11 AM** | Prep Date: | **6/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 287 | 10.0 | 200.0 | 74.78 | 106 | 90 | 110 | 0.914 | 20 | |
| Sulfate | 222 | 30.0 | 200.0 | 15.57 | 103 | 90 | 110 | 1.08 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190617A**

| Sample ID **ICV-190615** | Batch ID: **R104618** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_190617A** | Analysis Date: **6/17/2019 9:21:33 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.5 | 1.00 | 25.00 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 77.0 | 3.00 | 75.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **CCV1-190617** | Batch ID: **R104618** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190617A** | Analysis Date: **6/17/2019 1:20:11 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 30.8 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190610A**

The QC data in batch 91271 applies to the following samples: 1906072-01C, 1906072-02C

| Sample ID **MB-91271** | Batch ID: **91271** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.27** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 10:17:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Total (As CaCO3) | <20.0 | 20.0 | | | | | | | | |

| Sample ID **LCS-91271** | Batch ID: **91271** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.39** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 10:22:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 49.8 | 20.0 | 50.00 | 0 | 99.5 | 74 | 129 | | | |

| Sample ID **1906073-02C DUP** | Batch ID: **91271** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.54** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 1:11:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 66.8 | 20.0 | 0 | 68.00 | | | | 1.78 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 66.8 | 20.0 | 0 | 68.00 | | | | 1.78 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190610A**

| Sample ID **ICV-190610** | Batch ID: **R104513** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.29** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 10:15:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 4.00 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 96.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 100 | 20.0 | 100.0 | 0 | 100 | 98 | 102 | | | |

| Sample ID **CCV1-190610** | Batch ID: **R104513** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.22** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 1:08:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 27.7 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 74.1 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 102 | 20.0 | 100.0 | 0 | 102 | 90 | 110 | | | |

| Sample ID **CCV2-190610** | Batch ID: **R104513** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.21** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 1:16:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 26.1 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 73.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.8 | 20.0 | 100.0 | 0 | 99.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190607B**

The QC data in batch 91254 applies to the following samples: 1906072-01C, 1906072-02C

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **MB-91254** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MBLK** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:50:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | <0.0300 | 0.100 | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **LCS-91254** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **LCS** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:50:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.509 | 0.100 | 0.5000 | 0 | 102 | 80 | 120 | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **LCSD-91254** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **LCSD** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:50:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.507 | 0.100 | 0.5000 | 0 | 101 | 80 | 120 | 0.394 | 15 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **1906073-02CMS** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MS** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:53:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.517 | 0.100 | 0.5000 | 0 | 103 | 80 | 120 | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **1906073-02CMSD** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MSD** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:53:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.518 | 0.100 | 0.5000 | 0 | 104 | 80 | 120 | 0.193 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190607B**

| Sample ID **ICV-190607** | Batch ID: **R104504** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_190607B** | Analysis Date: **6/7/2019 1:49:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.203 | 0.100 | 0.2000 | 0 | 102 | 85 | 115 | | | |

| Sample ID **CCV1-190607** | Batch ID: **R104504** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190607B** | Analysis Date: **6/7/2019 1:53:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.566 | 0.100 | 0.5000 | 0 | 113 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190610A**

The QC data in batch 91267 applies to the following samples: 1906072-01A, 1906072-02A

| Sample ID | **MB-91267** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 10:55:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | <0.0500 | 0.100 | | | | | | | | N |

| Sample ID | **LCS-91267** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 10:57:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.110 | 0.100 | 0.1000 | 0 | 110 | 85 | 115 | | | N |

| Sample ID | **LCSD-91267** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 10:57:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.110 | 0.100 | 0.1000 | 0 | 110 | 85 | 115 | 0.609 | 15 | N |

| Sample ID | **1906073-02AMS** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 11:05:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.107 | 0.100 | 0.1000 | 0 | 107 | 85 | 115 | | | N |

| Sample ID | **1906073-02AMSD** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 11:05:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.102 | 0.100 | 0.1000 | 0 | 102 | 85 | 115 | 4.86 | 15 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190610A**

| Sample ID **ICV-190610** | Batch ID: **R104507** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_190610A** | Analysis Date: **6/10/2019 10:51:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.0908 | 0.100 | 0.1000 | 0 | 90.8 | 85 | 115 | | | N |

| Sample ID **CCV1-190610** | Batch ID: **R104507** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190610A** | Analysis Date: **6/10/2019 11:01:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.223 | 0.100 | 0.2000 | 0 | 112 | 85 | 115 | | | N |

| Sample ID **CCV2-190610** | Batch ID: **R104507** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190610A** | Analysis Date: **6/10/2019 11:06:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.204 | 0.100 | 0.2000 | 0 | 102 | 85 | 115 | | | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_190614B**

The QC data in batch 91332 applies to the following samples: 1906072-01C, 1906072-02C

| Sample ID | **MB-91332** | Batch ID: | **91332** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_190614B** | Analysis Date: | **6/14/2019 12:00:00 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-91332** | Batch ID: | **91332** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_190614B** | Analysis Date: | **6/14/2019 12:00:00 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 762 | 10.0 | 745.6 | 0 | 102 | 90 | 113 | | | |

| Sample ID | **1906109-02B-DUP** | Batch ID: | **91332** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190614B** | Analysis Date: | **6/14/2019 12:00:00 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1800 | 50.0 | 0 | 1825 | | | | 1.38 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

September 25, 2019

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1908215

RE: Luminant-OGSES FGD Ponds

Dear Will Vienne:

DHL Analytical, Inc. received 12 sample(s) on 8/21/2019 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-19-24

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 85731

# CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 8-20-19 PAGE 1 OF 1
PO #: 19122262-F DHL WORK ORDER #: 1908215
PROJECT LOCATION OR NAME: LUMINANT - OGSES FGD PONDS
CLENT PROJECT #: 19122262-F COLLECTOR: J BEAUTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ ☐ | RCRA ☐ TX11 ☐ ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | APPENDIX III & IV

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 01 | 8-19-19 | 0735 | W | P | 4 | | | | | | X | |
| FGD-3 | 02 | | 0825 | W | P | 4 | | | | | | X | |
| FGD-2 | 03 | | 0915 | W | P | 4 | | | | | | X | |
| FGD-5 | 04 | | 1000 | W | P | 4 | | | | | | X | |
| DUP-1 | 05 | | 1000 | W | P | 4 | | | | | | X | |
| FGD-8 | 06 | | 1100 | W | P | 4 | | | | | | X | |
| FGD-1 | 07 | | 1205 | W | P | 4 | | | | | | X | |
| FGD-14 | 08 | | 1315 | W | P | 4 | | | | | | X | |
| FGD-4 | 09 | | 1415 | W | P | 4 | | | | | | X | |
| FGD-11 | 10 | | 1520 | W | P | 4 | | | | | | X | |
| FGD-12 | 11 | | 1625 | W | P | 4 | | | | | | X | |
| FGD-15 | 12 | | 1730 | W | P | 4 | | | | | | X | |

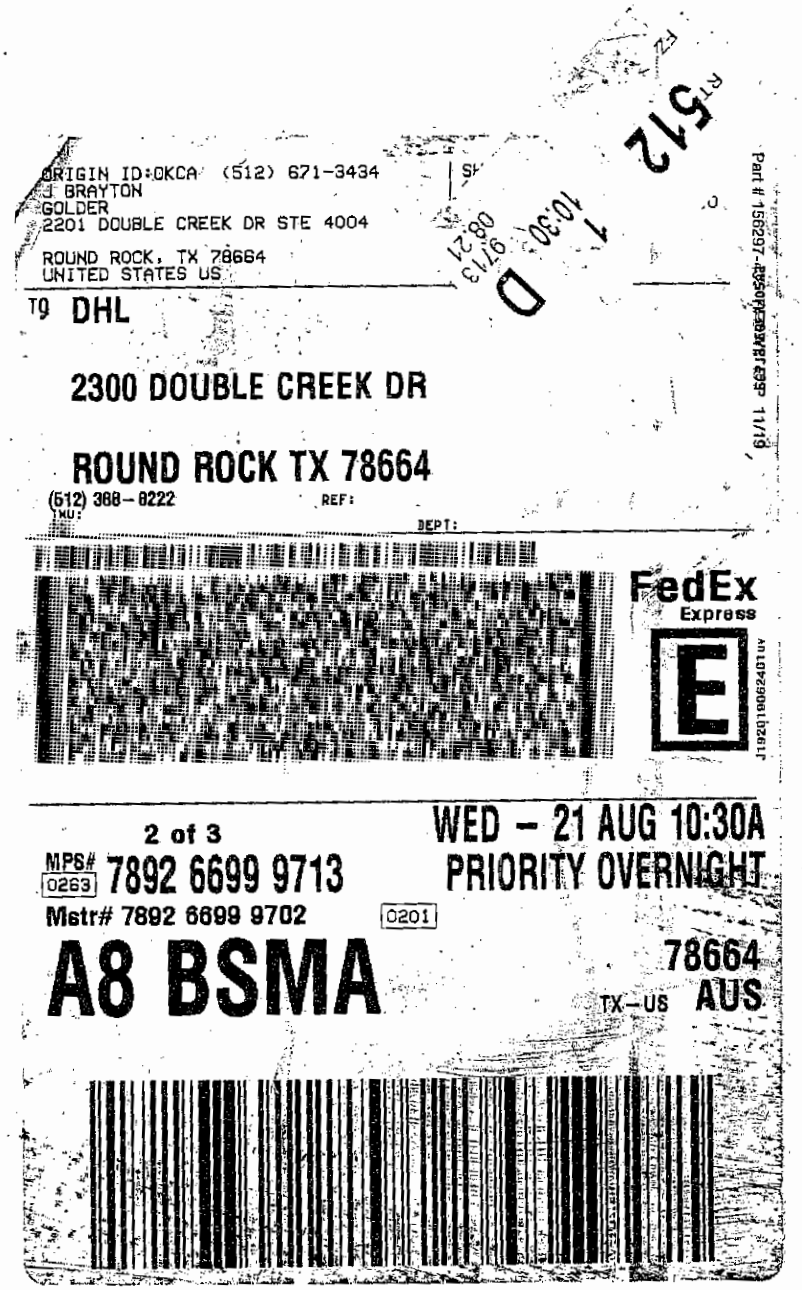
RELINQUISHED BY: (Signature) DATE/TIME 8-20-19 1945 RECEIVED BY: (Signature) FEDEX
RELINQUISHED BY: (Signature) FEDEX DATE/TIME 8/21/19 9:19 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

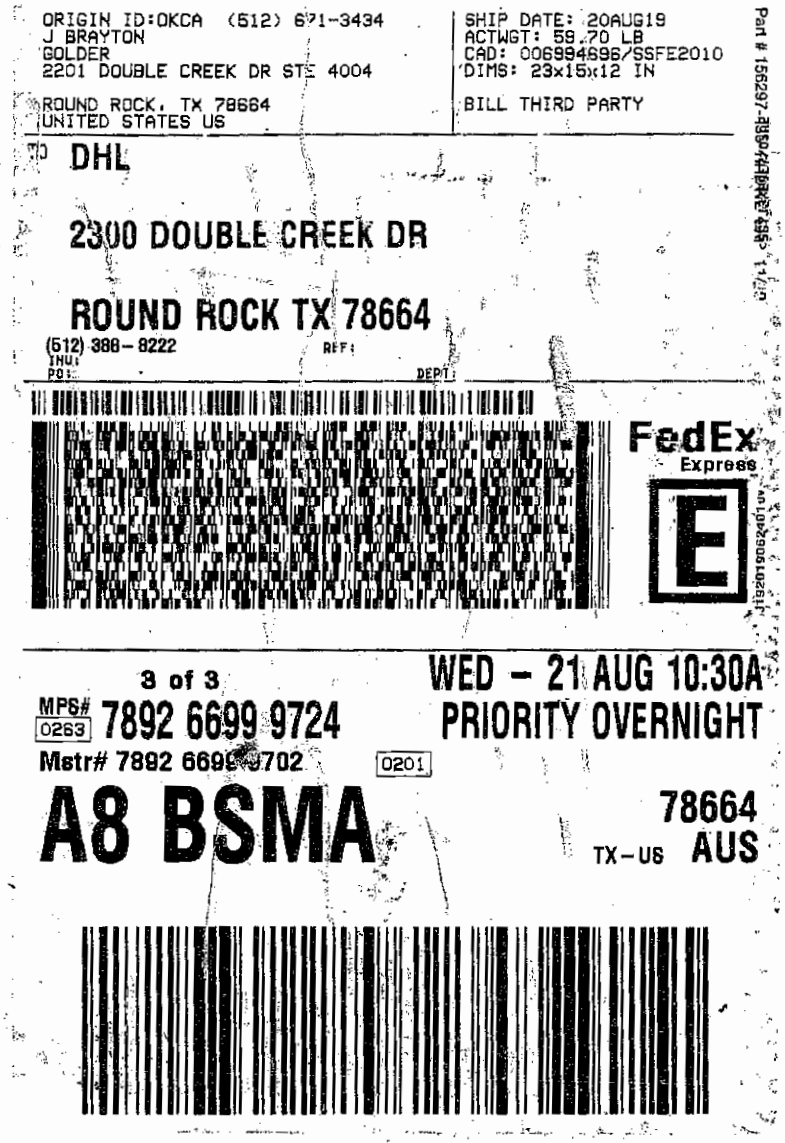
☐ DHL DISPOSAL @ $5.00 each ☐ Return

**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 2.2/1.0/3.2.C THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

ORIGIN ID:OKCA (512) 671-3434
J BRAYTON
GOLDER
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DATE: 20AUG19
ACTWGT: 60.00 LB
CAD: 006994696/SSFE2010
DIMS: 29x15x12 IN
BILL THIRD PARTY
TO DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
REF:
DEPT:
FedEx
Express
1 of 3
TRK# 7892 6699 9702
0201
WED - 21 AUG 10:30A
PRIORITY OVERNIGHT
## MASTER ##
A8 BSMA
78664
TX-US AUS


ORIGIN ID:OKCA (512) 671-3434
J BRAYTON
GOLDER
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 78664
UNITED STATES US
TO DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
REF:
DEPT:
FedEx
Express
2 of 3
MPS# 0283 7892 6699 9713
Mstr# 7892 6699 9702
0201
WED - 21 AUG 10:30A
PRIORITY OVERNIGHT
A8 BSMA
78664
TX-US AUS


ORIGIN ID:OKCA (512) 671-3434
J BRAYTON
GOLDER
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DATE: 20AUG19
ACTWGT: 59.70 LB
CAD: 006994696/SSFE2010
DIMS: 23x15x12 IN
BILL THIRD PARTY
TO DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
REF:
INV:
PO:
DEPT:
FedEx
Express
3 of 3
MPS#
0263 7892 6699 9724
Mstr# 7892 6699 9702
0201
WED - 21 AUG 10:30A
PRIORITY OVERNIGHT
A8 BSMA
78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Golder | Date Received: 8/21/2019

Work Order Number 1908215 | Received by JW

Checklist completed by: _____ (Signature) 8/21/2019 (Date) | Reviewed by PL (Initials) 8/21/2019 (Date)

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 2.2 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? no | | Checked by CC |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

## Laboratory Name: DHL Analytical, Inc.

## Laboratory Review Checklist: Reportable Data

| | |
|---|---|
| **Project Name:** Luminant-OGSES FGD Ponds | **LRC Date:** 9/25/19 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 1908215 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | **X** | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | **X** | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | **X** | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | **X** | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | **X** | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | **X** | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | **X** | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | **X** | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | **X** | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | **X** | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | **X** | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | **X** | | |
| | | **9)** If required for the project, TICs reported? | | | **X** | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | **X** | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | **X** | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | **X** | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | **X** | | | | |
| | | **4)** Were blank concentrations < MDL? | **X** | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | **X** | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | **X** | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | **X** | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | **X** | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | **X** | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | **X** | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | **X** | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | **X** | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | **X** | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | | | **X** | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | | | **X** | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | | | **X** | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | **X** | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | **X** | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | **X** | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | **X** | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | **X** | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | **X** | | | | |

## Laboratory Name: DHL Analytical, Inc.

## Laboratory Review Checklist (continued): Supporting Data

| | |
|---|---|
| **Project Name:** Luminant-OGSES FGD Ponds | **LRC Date:** 9/25/19 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 1908215 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | **X** | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | **X** | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | **X** | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | **X** | | | | |
| | | **5)** Are ICAL data available for all instruments used? | **X** | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | **X** | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | **X** | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | **X** | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | **X** | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | **X** | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | **X** | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | **X** | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | **X** | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | **X** | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | **X** | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | **X** | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | **X** | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | **X** | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | **X** | | | **S9-01** |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | **X** | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | **X** | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | **X** | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | **X** | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | **X** | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | **X** | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | **X** | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | **X** | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | **X** | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

09/25/19

Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *25-Sep-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD Ponds
**Lab Order:** 1908215

# CASE NARRATIVE

Samples were analyzed using the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis

Exception Report R1-01

The samples were received and log-in performed on 8/21/19. A total of 12 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Metals analysis performed on 8/27/19 the matrix spike and matrix spike duplicate recoveries were out of control limits for Calcium. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

For Anions analysis performed on 8/23/19 (batch 92504) the matrix spike and matrix spike duplicate recoveries (1908250-05 MS/MSD) were slightly below control limits for Chloride. These are flagged accordingly. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

Exception Report S9-01

For Metals analysis performed on 8/27/19 the RPD of the serial dilution was above control limits for Boron. This is flagged accordingly in the QC summary report. The PDS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *25-Sep-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD Ponds
**Lab Order:** 1908215

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1908215-01 | FGD-6 | | 08/19/19 07:35 AM | 8/21/2019 |
| 1908215-02 | FGD-3 | | 08/19/19 08:25 AM | 8/21/2019 |
| 1908215-03 | FGD-2 | | 08/19/19 09:15 AM | 8/21/2019 |
| 1908215-04 | FGD-5 | | 08/19/19 10:00 AM | 8/21/2019 |
| 1908215-05 | DUP-1 | | 08/19/19 10:00 AM | 8/21/2019 |
| 1908215-06 | FGD-8 | | 08/19/19 11:00 AM | 8/21/2019 |
| 1908215-07 | FGD-1 | | 08/19/19 12:05 PM | 8/21/2019 |
| 1908215-08 | FGD-14 | | 08/19/19 01:15 PM | 8/21/2019 |
| 1908215-09 | FGD-4 | | 08/19/19 02:15 PM | 8/21/2019 |
| 1908215-10 | FGD-11 | | 08/19/19 03:20 PM | 8/21/2019 |
| 1908215-11 | FGD-12 | | 08/19/19 04:25 PM | 8/21/2019 |
| 1908215-12 | FGD-15 | | 08/19/19 05:30 PM | 8/21/2019 |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1908215-01A | FGD-6 | 08/19/19 07:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-6 | 08/19/19 07:35 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-01B | FGD-6 | 08/19/19 07:35 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-6 | 08/19/19 07:35 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-6 | 08/19/19 07:35 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-02A | FGD-3 | 08/19/19 08:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-3 | 08/19/19 08:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-3 | 08/19/19 08:25 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-02B | FGD-3 | 08/19/19 08:25 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-3 | 08/19/19 08:25 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-3 | 08/19/19 08:25 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-03A | FGD-2 | 08/19/19 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-2 | 08/19/19 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-2 | 08/19/19 09:15 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-03B | FGD-2 | 08/19/19 09:15 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-2 | 08/19/19 09:15 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-2 | 08/19/19 09:15 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-2 | 08/19/19 09:15 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-04A | FGD-5 | 08/19/19 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-5 | 08/19/19 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-5 | 08/19/19 10:00 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-04B | FGD-5 | 08/19/19 10:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-5 | 08/19/19 10:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-5 | 08/19/19 10:00 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-05A | DUP-1 | 08/19/19 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | DUP-1 | 08/19/19 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | DUP-1 | 08/19/19 10:00 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-05B | DUP-1 | 08/19/19 10:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1908215-05B | DUP-1 | 08/19/19 10:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | DUP-1 | 08/19/19 10:00 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-06A | FGD-8 | 08/19/19 11:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-8 | 08/19/19 11:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-8 | 08/19/19 11:00 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-06B | FGD-8 | 08/19/19 11:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-8 | 08/19/19 11:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-8 | 08/19/19 11:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-8 | 08/19/19 11:00 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-07A | FGD-1 | 08/19/19 12:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-1 | 08/19/19 12:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-1 | 08/19/19 12:05 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-07B | FGD-1 | 08/19/19 12:05 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-1 | 08/19/19 12:05 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-1 | 08/19/19 12:05 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-08A | FGD-14 | 08/19/19 01:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-14 | 08/19/19 01:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-14 | 08/19/19 01:15 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-08B | FGD-14 | 08/19/19 01:15 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-14 | 08/19/19 01:15 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-14 | 08/19/19 01:15 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-09A | FGD-4 | 08/19/19 02:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-4 | 08/19/19 02:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-4 | 08/19/19 02:15 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-09B | FGD-4 | 08/19/19 02:15 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-4 | 08/19/19 02:15 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-4 | 08/19/19 02:15 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-10A | FGD-11 | 08/19/19 03:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1908215-10A | FGD-11 | 08/19/19 03:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-11 | 08/19/19 03:20 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-10B | FGD-11 | 08/19/19 03:20 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-11 | 08/19/19 03:20 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-11 | 08/19/19 03:20 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-11 | 08/19/19 03:20 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-11A | FGD-12 | 08/19/19 04:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-12 | 08/19/19 04:25 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-11B | FGD-12 | 08/19/19 04:25 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-12 | 08/19/19 04:25 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-12 | 08/19/19 04:25 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-12A | FGD-15 | 08/19/19 05:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-15 | 08/19/19 05:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-15 | 08/19/19 05:30 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-12B | FGD-15 | 08/19/19 05:30 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-15 | 08/19/19 05:30 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-15 | 08/19/19 05:30 PM | Aqueous | E300 | Anion Preparation | 08/23/19 09:53 AM | 92504 |
| | FGD-15 | 08/19/19 05:30 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1908215-01A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:05 AM | CETAC2_HG_190823A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 10:55 AM | ICP-MS4_190827B |
| 1908215-01B | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 11:55 AM | IC4_190822A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 05:42 PM | IC4_190822A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-02A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:07 AM | CETAC2_HG_190823A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 10:57 AM | ICP-MS4_190827B |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:09 PM | ICP-MS4_190827B |
| 1908215-02B | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 12:11 PM | IC4_190822A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 05:58 PM | IC4_190822A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-03A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:09 AM | CETAC2_HG_190823A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 10:59 AM | ICP-MS4_190827B |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:11 PM | ICP-MS4_190827B |
| 1908215-03B | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 12:27 PM | IC4_190822A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 92485 | 100 | 08/22/19 04:06 PM | IC4_190822A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 06:14 PM | IC4_190822A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-04A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:11 AM | CETAC2_HG_190823A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 10:51 AM | ICP-MS4_190827B |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:05 PM | ICP-MS4_190827B |
| 1908215-04B | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 12:43 PM | IC4_190822A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 06:30 PM | IC4_190822A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-05A | DUP-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:14 AM | CETAC2_HG_190823A |
| | DUP-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:13 PM | ICP-MS4_190827B |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1908215-05A | DUP-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:01 AM | ICP-MS4_190827B |
| 1908215-05B | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 12:59 PM | IC4_190822A |
| | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 09:10 PM | IC4_190822A |
| | DUP-1 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-06A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:16 AM | CETAC2_HG_190823A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:03 AM | ICP-MS4_190827B |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 50 | 08/27/19 12:15 PM | ICP-MS4_190827B |
| 1908215-06B | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 01:15 PM | IC4_190822A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 92485 | 100 | 08/22/19 04:22 PM | IC4_190822A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 09:26 PM | IC4_190822A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-07A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:23 AM | CETAC2_HG_190823A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:05 AM | ICP-MS4_190827B |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 5 | 08/27/19 12:17 PM | ICP-MS4_190827B |
| 1908215-07B | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 01:31 PM | IC4_190822A |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 09:42 PM | IC4_190822A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-08A | FGD-14 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:25 AM | CETAC2_HG_190823A |
| | FGD-14 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:19 PM | ICP-MS4_190827B |
| | FGD-14 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:07 AM | ICP-MS4_190827B |
| 1908215-08B | FGD-14 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 01:47 PM | IC4_190822A |
| | FGD-14 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 09:58 PM | IC4_190822A |
| | FGD-14 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-09A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:27 AM | CETAC2_HG_190823A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:09 AM | ICP-MS4_190827B |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:21 PM | ICP-MS4_190827B |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1908215-09B | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 02:03 PM | IC4_190822A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 10:14 PM | IC4_190822A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-10A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:30 AM | CETAC2_HG_190823A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:11 AM | ICP-MS4_190827B |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:23 PM | ICP-MS4_190827B |
| 1908215-10B | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 02:19 PM | IC4_190822A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 92485 | 100 | 08/22/19 04:38 PM | IC4_190822A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 10:30 PM | IC4_190822A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-11A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:32 AM | CETAC2_HG_190823A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:32 AM | ICP-MS4_190827B |
| 1908215-11B | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 04:54 PM | IC4_190822A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 10:46 PM | IC4_190822A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-12A | FGD-15 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:34 AM | CETAC2_HG_190823A |
| | FGD-15 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:34 AM | ICP-MS4_190827B |
| | FGD-15 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 50 | 08/27/19 12:25 PM | ICP-MS4_190827B |
| 1908215-12B | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 05:10 PM | IC4_190822A |
| | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 11:02 PM | IC4_190822A |
| | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 92504 | 100 | 08/23/19 05:00 PM | IC4_190823A |
| | FGD-15 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 07:35 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 10:55 AM |
| Arsenic | 0.0146 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:55 AM |
| Barium | 0.0903 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 10:55 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:55 AM |
| Boron | 0.102 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 10:55 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:55 AM |
| Calcium | 23.6 | 0.100 | 0.300 | | mg/L | 1 | 08/27/19 10:55 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:55 AM |
| Cobalt | 0.00493 | 0.00300 | 0.00500 | J | mg/L | 1 | 08/27/19 10:55 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:55 AM |
| Lithium | 0.00820 | 0.00500 | 0.0100 | J | mg/L | 1 | 08/27/19 10:55 AM |
| Molybdenum | 0.00332 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 10:55 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:55 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 10:55 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:05 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 158 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 11:55 AM |
| Fluoride | 0.741 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 05:42 PM |
| Sulfate | 60.3 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 05:42 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 754 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-02 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 08:25 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 10:57 AM |
| Arsenic | 0.00248 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 10:57 AM |
| Barium | 0.0365 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 10:57 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:57 AM |
| Boron | 0.134 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 10:57 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:57 AM |
| Calcium | 51.1 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:09 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:57 AM |
| Cobalt | 0.00364 | 0.00300 | 0.00500 | J | mg/L | 1 | 08/27/19 10:57 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:57 AM |
| Lithium | 0.0546 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 10:57 AM |
| Molybdenum | 0.00231 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 10:57 AM |
| Selenium | 0.0245 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:57 AM |
| Thallium | 0.000588 | 0.000500 | 0.00150 | J | mg/L | 1 | 08/27/19 10:57 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:07 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 84.9 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 12:11 PM |
| Fluoride | 0.874 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 05:58 PM |
| Sulfate | 150 | 10.0 | 30.0 | | mg/L | 10 | 08/22/19 12:11 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 882 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-03 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 09:15 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 10:59 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:59 AM |
| Barium | 0.181 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 10:59 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:59 AM |
| Boron | 0.192 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 10:59 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:59 AM |
| Calcium | 167 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:11 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:59 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 10:59 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:59 AM |
| Lithium | 0.0257 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 10:59 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:59 AM |
| Selenium | 0.0249 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:59 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 10:59 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:09 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 863 | 30.0 | 100 | | mg/L | 100 | 08/22/19 04:06 PM |
| Fluoride | 0.413 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 06:14 PM |
| Sulfate | 218 | 10.0 | 30.0 | | mg/L | 10 | 08/22/19 12:27 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1890 | 50.0 | 50.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-04 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 10:00 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 10:51 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:51 AM |
| Barium | 0.106 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 10:51 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:51 AM |
| Boron | 0.114 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 10:51 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:51 AM |
| Calcium | 90.7 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:05 PM |
| Chromium | 0.0103 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:51 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 10:51 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:51 AM |
| Lithium | 0.152 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 10:51 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:51 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:51 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 10:51 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:11 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 283 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 12:43 PM |
| Fluoride | 0.863 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 06:30 PM |
| Sulfate | 70.7 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 06:30 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 816 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | DUP-1 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-05 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 10:00 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:01 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:01 AM |
| Barium | 0.0972 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:01 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:01 AM |
| Boron | 0.112 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:01 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:01 AM |
| Calcium | 91.0 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:13 PM |
| Chromium | 0.0115 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:01 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:01 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:01 AM |
| Lithium | 0.151 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:01 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:01 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:01 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:01 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:14 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 283 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 12:59 PM |
| Fluoride | 0.915 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 09:10 PM |
| Sulfate | 70.1 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 09:10 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 816 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
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- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-06 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 11:00 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:03 AM |
| Arsenic | 0.00645 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:03 AM |
| Barium | 0.608 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:03 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:03 AM |
| Boron | 0.0756 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:03 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:03 AM |
| Calcium | 427 | 5.00 | 15.0 | | mg/L | 50 | 08/27/19 12:15 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:03 AM |
| Cobalt | 0.0135 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:03 AM |
| Lead | 0.00134 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:03 AM |
| Lithium | 0.0144 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:03 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:03 AM |
| Selenium | 0.00252 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 11:03 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:03 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:16 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 2260 | 30.0 | 100 | | mg/L | 100 | 08/22/19 04:22 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 09:26 PM |
| Sulfate | 452 | 10.0 | 30.0 | | mg/L | 10 | 08/22/19 01:15 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 4600 | 50.0 | 50.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
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S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-07 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 12:05 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:05 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:05 AM |
| Barium | 0.0538 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:05 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:05 AM |
| Boron | 0.0864 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:05 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:05 AM |
| Calcium | 26.1 | 0.500 | 1.50 | | mg/L | 5 | 08/27/19 12:17 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:05 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:05 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:05 AM |
| Lithium | 0.0441 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:05 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:05 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:05 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:05 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:23 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 69.3 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 01:31 PM |
| Fluoride | 0.486 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 09:42 PM |
| Sulfate | 80.9 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 09:42 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 328 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

See Final Page of Report for MQLs and MDLs

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-14 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-08 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 01:15 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:07 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:07 AM |
| Barium | 0.426 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:07 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:07 AM |
| Boron | 0.0714 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:07 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:07 AM |
| Calcium | 84.4 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:19 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:07 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:07 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:07 AM |
| Lithium | 0.00542 | 0.00500 | 0.0100 | J | mg/L | 1 | 08/27/19 11:07 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:07 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:07 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:07 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:25 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 387 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 01:47 PM |
| Fluoride | 0.318 | 0.100 | 0.400 | J | mg/L | 1 | 08/22/19 09:58 PM |
| Sulfate | 33.2 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 09:58 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 925 | 50.0 | 50.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-09 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 02:15 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:09 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:09 AM |
| Barium | 0.100 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:09 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:09 AM |
| Boron | 0.0850 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:09 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:09 AM |
| Calcium | 42.5 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:21 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:09 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:09 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:09 AM |
| Lithium | 0.0190 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:09 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:09 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:09 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:09 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:27 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 188 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 02:03 PM |
| Fluoride | 0.670 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 10:14 PM |
| Sulfate | 55.4 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 10:14 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 681 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-10 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 03:20 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:11 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:11 AM |
| Barium | 0.310 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:11 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:11 AM |
| Boron | 0.120 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:11 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:11 AM |
| Calcium | 92.5 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:23 PM |
| Chromium | 0.00391 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 11:11 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:11 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:11 AM |
| Lithium | 0.0136 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:11 AM |
| Molybdenum | 0.00238 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 11:11 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:11 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:11 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:30 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 535 | 30.0 | 100 | | mg/L | 100 | 08/22/19 04:38 PM |
| Fluoride | 0.630 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 10:30 PM |
| Sulfate | 44.7 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 10:30 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1430 | 50.0 | 50.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-11 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 04:25 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:32 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:32 AM |
| Barium | 0.0631 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:32 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:32 AM |
| Boron | 0.0794 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:32 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:32 AM |
| Calcium | 10.5 | 0.100 | 0.300 | | mg/L | 1 | 08/27/19 11:32 AM |
| Chromium | 0.00218 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 11:32 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:32 AM |
| Lead | 0.00139 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:32 AM |
| Lithium | 0.0251 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:32 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:32 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:32 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:32 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:32 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 16.1 | 0.300 | 1.00 | | mg/L | 1 | 08/22/19 10:46 PM |
| Fluoride | 0.145 | 0.100 | 0.400 | J | mg/L | 1 | 08/22/19 10:46 PM |
| Sulfate | 17.1 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 10:46 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 209 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-15 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-12 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 05:30 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:34 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:34 AM |
| Barium | 0.0236 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:34 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:34 AM |
| Boron | 0.631 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:34 AM |
| Cadmium | 0.000838 | 0.000300 | 0.00100 | J | mg/L | 1 | 08/27/19 11:34 AM |
| Calcium | 335 | 5.00 | 15.0 | | mg/L | 50 | 08/27/19 12:25 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:34 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:34 AM |
| Lead | 0.000934 | 0.000300 | 0.00100 | J | mg/L | 1 | 08/27/19 11:34 AM |
| Lithium | 0.0823 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:34 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:34 AM |
| Selenium | 0.0221 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:34 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:34 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:34 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 1030 | 30.0 | 100 | | mg/L | 100 | 08/23/19 05:00 PM |
| Fluoride | 0.483 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 11:02 PM |
| Sulfate | 985 | 10.0 | 30.0 | | mg/L | 10 | 08/22/19 05:10 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 3180 | 50.0 | 50.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
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- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190611B**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID **DCS-91284** | Batch ID: **91284** | TestNo: **SW7470A** | Units: **mg/L** |
| SampType: **DCS** | Run ID: **CETAC2_HG_190611** | Analysis Date: **6/11/2019 5:01:26 PM** | Prep Date: **6/11/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.000206 | 0.000200 | 0.000200 | 0 | 103 | 82 | 119 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190823A**

The QC data in batch 92489 applies to the following samples: 1908215-01A, 1908215-02A, 1908215-03A, 1908215-04A, 1908215-05A, 1908215-06A, 1908215-07A, 1908215-08A, 1908215-09A, 1908215-10A, 1908215-11A, 1908215-12A

| Sample ID | **MB-92489** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:37:58 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-92489** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:42:30 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00188 | 0.000200 | 0.00200 | 0 | 94.0 | 85 | 115 | | | |

| Sample ID | **LCSD-92489** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:44:46 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00186 | 0.000200 | 0.00200 | 0 | 93.0 | 85 | 115 | 1.07 | 15 | |

| Sample ID | **1908173-01B MS** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:49:18 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00940 | 0.00100 | 0.0100 | 0 | 94.0 | 80 | 120 | | | |

| Sample ID | **1908173-01B MSD** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:51:33 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00915 | 0.00100 | 0.0100 | 0 | 91.5 | 80 | 120 | 2.70 | 15 | |

| Sample ID | **1908173-01B SD** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:53:49 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.00200 | 0.00500 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1908173-01B PDS** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:56:05 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0116 | 0.00100 | 0.0125 | 0 | 92.8 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190823A**

| Sample ID | **ICV-190823** | Batch ID: | **R106002** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:33:24 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00384 | 0.000200 | 0.00400 | 0 | 96.0 | 90 | 110 | | | |

| Sample ID | **CCV1-190823** | Batch ID: | **R106002** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 11:18:47 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 90 | 110 | | | |

| Sample ID | **CCV2-190823** | Batch ID: | **R106002** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 11:39:17 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190621B**

| Sample ID **DCS2-91398** | Batch ID: **91398** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS4_190621B** | Analysis Date: **6/21/2019 1:24:00 PM** | Prep Date: **6/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.321 | 0.300 | 0.300 | 0 | 107 | 70 | 130 | 0 | 0 | |

| Sample ID **DCS3-91398** | Batch ID: **91398** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS4_190621B** | Analysis Date: **6/21/2019 1:27:00 PM** | Prep Date: **6/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | 0 | 0 | |
| Barium | 0.00479 | 0.0100 | 0.00500 | 0 | 95.8 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00523 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00564 | 0.00500 | 0.00500 | 0 | 113 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00602 | 0.0100 | 0.00500 | 0 | 120 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00480 | 0.00500 | 0.00500 | 0 | 95.9 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00569 | 0.00500 | 0.00500 | 0 | 114 | 70 | 130 | 0 | 0 | |

| Sample ID **DCS4-91398** | Batch ID: **91398** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS4_190621B** | Analysis Date: **6/21/2019 1:30:00 PM** | Prep Date: **6/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0311 | 0.0300 | 0.0300 | 0 | 104 | 70 | 130 | 0 | 0 | |

| Sample ID **DCS1-91398** | Batch ID: **91398** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS4_190621B** | Analysis Date: **6/21/2019 1:34:00 PM** | Prep Date: **6/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.000904 | 0.00250 | 0.00100 | 0 | 90.4 | 70 | 130 | 0 | 0 | |
| Beryllium | 0.000493 | 0.00100 | 0.000500 | 0 | 98.6 | 70 | 130 | 0 | 0 | |
| Cadmium | 0.000516 | 0.00100 | 0.000500 | 0 | 103 | 70 | 130 | 0 | 0 | |
| Lead | 0.000475 | 0.00100 | 0.000500 | 0 | 95.0 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000471 | 0.00150 | 0.000500 | 0 | 94.2 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

The QC data in batch 92519 applies to the following samples: 1908215-01A, 1908215-02A, 1908215-03A, 1908215-04A, 1908215-05A, 1908215-06A, 1908215-07A, 1908215-08A, 1908215-09A, 1908215-10A, 1908215-11A, 1908215-12A

Sample ID **MB-92519** Batch ID: **92519** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_190827B** Analysis Date: **8/27/2019 10:43:00 AM** Prep Date: **8/26/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-92519** Batch ID: **92519** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_190827B** Analysis Date: **8/27/2019 10:45:00 AM** Prep Date: **8/26/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.1 | 80 | 120 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Boron | 0.215 | 0.0300 | 0.200 | 0 | 107 | 80 | 120 | | | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Calcium | 4.93 | 0.300 | 5.00 | 0 | 98.7 | 80 | 120 | | | |
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 99.0 | 80 | 120 | | | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Selenium | 0.195 | 0.00500 | 0.200 | 0 | 97.7 | 80 | 120 | | | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.6 | 80 | 120 | | | |

Sample ID **LCSD-92519** Batch ID: **92519** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_190827B** Analysis Date: **8/27/2019 10:47:00 AM** Prep Date: **8/26/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | 0.325 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

| Sample ID **LCSD-92519** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 10:47:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.372 | 15 | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.6 | 80 | 120 | 0.515 | 15 | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.5 | 80 | 120 | 1.57 | 15 | |
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 80 | 120 | 5.99 | 15 | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 80 | 120 | 0.663 | 15 | |
| Calcium | 4.91 | 0.300 | 5.00 | 0 | 98.2 | 80 | 120 | 0.485 | 15 | |
| Chromium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.986 | 15 | |
| Cobalt | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 1.01 | 15 | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 98.8 | 80 | 120 | 0.219 | 15 | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.3 | 80 | 120 | 2.71 | 15 | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.275 | 15 | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 4.26 | 15 | |
| Thallium | 0.195 | 0.00150 | 0.200 | 0 | 97.7 | 80 | 120 | 0.896 | 15 | |

| Sample ID **1908215-04A SD** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 10:53:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.108 | 0.0500 | 0 | 0.106 | | | | 2.23 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Boron | 0.157 | 0.150 | 0 | 0.114 | | | | 32.1 | 10 | R |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Chromium | 0.0107 | 0.0250 | 0 | 0.0103 | | | | 4.05 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.160 | 0.0500 | 0 | 0.152 | | | | 4.97 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1908215-04A PDS** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:13:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.211 | 0.00250 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Barium | 0.301 | 0.0100 | 0.200 | 0.106 | 97.6 | 80 | 120 | | | |
| Beryllium | 0.192 | 0.00100 | 0.200 | 0 | 96.1 | 80 | 120 | | | |
| Boron | 0.301 | 0.0300 | 0.200 | 0.114 | 93.4 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

| Sample ID **1908215-04A PDS** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:13:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.4 | 80 | 120 | | | |
| Chromium | 0.216 | 0.00500 | 0.200 | 0.0103 | 103 | 80 | 120 | | | |
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lithium | 0.329 | 0.0100 | 0.200 | 0.152 | 88.5 | 80 | 120 | | | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID **1908215-04A MS** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:15:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Barium | 0.303 | 0.0100 | 0.200 | 0.106 | 98.4 | 80 | 120 | | | |
| Beryllium | 0.189 | 0.00100 | 0.200 | 0 | 94.5 | 80 | 120 | | | |
| Boron | 0.303 | 0.0300 | 0.200 | 0.114 | 94.9 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0 | 96.0 | 80 | 120 | | | |
| Calcium | 90.5 | 0.300 | 5.00 | 86.7 | 75.4 | 80 | 120 | | | S |
| Chromium | 0.207 | 0.00500 | 0.200 | 0.0103 | 98.3 | 80 | 120 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.5 | 80 | 120 | | | |
| Lead | 0.201 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Lithium | 0.335 | 0.0100 | 0.200 | 0.152 | 91.6 | 80 | 120 | | | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Selenium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 99.8 | 80 | 120 | | | |

| Sample ID **1908215-04A MSD** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:17:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.208 | 0.00250 | 0.200 | 0 | 104 | 80 | 120 | 1.58 | 15 | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 1.95 | 15 | |
| Barium | 0.310 | 0.0100 | 0.200 | 0.106 | 102 | 80 | 120 | 2.30 | 15 | |
| Beryllium | 0.192 | 0.00100 | 0.200 | 0 | 96.1 | 80 | 120 | 1.61 | 15 | |
| Boron | 0.307 | 0.0300 | 0.200 | 0.114 | 96.9 | 80 | 120 | 1.27 | 15 | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 98.8 | 80 | 120 | 2.81 | 15 | |
| Calcium | 92.8 | 0.300 | 5.00 | 86.7 | 122 | 80 | 120 | 2.55 | 15 | S |
| Chromium | 0.212 | 0.00500 | 0.200 | 0.0103 | 101 | 80 | 120 | 2.58 | 15 | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 2.49 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

| Sample ID **1908215-04A MSD** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:17:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | 1.47 | 15 | |
| Lithium | 0.339 | 0.0100 | 0.200 | 0.152 | 93.6 | 80 | 120 | 1.18 | 15 | |
| Molybdenum | 0.212 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | 3.60 | 15 | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 1.84 | 15 | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | 1.20 | 15 | |

| Sample ID **1908215-04A SD** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 12:07:00 PM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 90.7 | 15.0 | 0 | 90.7 | | | | 0.035 | 10 | |

| Sample ID **1908215-04A PDS** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 12:27:00 PM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 141 | 3.00 | 50.0 | 90.7 | 101 | 80 | 120 | | | |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

| Sample ID **ICV-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 10:30:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.105 | 0.00250 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Arsenic | 0.0984 | 0.00500 | 0.100 | 0 | 98.4 | 90 | 110 | | | |
| Barium | 0.101 | 0.0100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Boron | 0.108 | 0.0300 | 0.100 | 0 | 108 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.61 | 0.300 | 2.50 | 0 | 105 | 90 | 110 | | | |
| Chromium | 0.108 | 0.00500 | 0.100 | 0 | 108 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.101 | 0.00100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Molybdenum | 0.0968 | 0.00500 | 0.100 | 0 | 96.8 | 90 | 110 | | | |
| Selenium | 0.100 | 0.00500 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Thallium | 0.102 | 0.00150 | 0.100 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 10:36:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00217 | 0.00250 | 0.00200 | 0 | 108 | 70 | 130 | | | |
| Arsenic | 0.00534 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Barium | 0.00530 | 0.0100 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Beryllium | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 70 | 130 | | | |
| Boron | 0.0259 | 0.0300 | 0.0200 | 0 | 129 | 70 | 130 | | | |
| Cadmium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Calcium | 0.105 | 0.300 | 0.100 | 0 | 105 | 70 | 130 | | | |
| Chromium | 0.00547 | 0.00500 | 0.00500 | 0 | 109 | 70 | 130 | | | |
| Cobalt | 0.00550 | 0.00500 | 0.00500 | 0 | 110 | 70 | 130 | | | |
| Lead | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |
| Molybdenum | 0.00536 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Selenium | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Thallium | 0.00103 | 0.00150 | 0.00100 | 0 | 103 | 70 | 130 | | | |

| Sample ID **CCV1-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:20:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

| Sample ID **CCV1-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:20:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Boron | 0.219 | 0.0300 | 0.200 | 0 | 110 | 90 | 110 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Calcium | 4.85 | 0.300 | 5.00 | 0 | 97.0 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.207 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 90 | 110 | | | |
| Lithium | 0.198 | 0.0100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Molybdenum | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL1-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:27:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00209 | 0.00250 | 0.00200 | 0 | 104 | 70 | 130 | | | |
| Arsenic | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00528 | 0.0100 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Beryllium | 0.000921 | 0.00100 | 0.00100 | 0 | 92.1 | 70 | 130 | | | |
| Boron | 0.0236 | 0.0300 | 0.0200 | 0 | 118 | 70 | 130 | | | |
| Cadmium | 0.00107 | 0.00100 | 0.00100 | 0 | 107 | 70 | 130 | | | |
| Calcium | 0.111 | 0.300 | 0.100 | 0 | 111 | 70 | 130 | | | |
| Chromium | 0.00533 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Cobalt | 0.00534 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Lead | 0.000965 | 0.00100 | 0.00100 | 0 | 96.5 | 70 | 130 | | | |
| Lithium | 0.0103 | 0.0100 | 0.0100 | 0 | 103 | 70 | 130 | | | |
| Molybdenum | 0.00512 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00554 | 0.00500 | 0.00500 | 0 | 111 | 70 | 130 | | | |
| Thallium | 0.000957 | 0.00150 | 0.00100 | 0 | 95.7 | 70 | 130 | | | |

| Sample ID **CCV2-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:57:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.194 | 0.00500 | 0.200 | 0 | 97.2 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Boron | 0.205 | 0.0300 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

| Sample ID **CCV2-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:57:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.88 | 0.300 | 5.00 | 0 | 97.5 | 90 | 110 | | | |
| Chromium | 0.207 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 97.0 | 90 | 110 | | | |
| Lithium | 0.198 | 0.0100 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Selenium | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 90 | 110 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.4 | 90 | 110 | | | |

| Sample ID **LCVL2-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 12:01:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00211 | 0.00250 | 0.00200 | 0 | 106 | 70 | 130 | | | |
| Arsenic | 0.00509 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00507 | 0.0100 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Beryllium | 0.000874 | 0.00100 | 0.00100 | 0 | 87.4 | 70 | 130 | | | |
| Boron | 0.0232 | 0.0300 | 0.0200 | 0 | 116 | 70 | 130 | | | |
| Cadmium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Calcium | 0.104 | 0.300 | 0.100 | 0 | 104 | 70 | 130 | | | |
| Chromium | 0.00529 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Cobalt | 0.00536 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Lead | 0.000973 | 0.00100 | 0.00100 | 0 | 97.3 | 70 | 130 | | | |
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |
| Molybdenum | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Selenium | 0.00513 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Thallium | 0.000980 | 0.00150 | 0.00100 | 0 | 98.0 | 70 | 130 | | | |

| Sample ID **CCV3-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 12:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.92 | 0.300 | 5.00 | 0 | 98.4 | 90 | 110 | | | |

| Sample ID **LCVL3-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 12:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.109 | 0.300 | 0.100 | 0 | 109 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190815B**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **DCS2-92363** | Batch ID: **92363** | TestNo: **E300** | | Units: **mg/L** | |
| SampType: **DCS2** | Run ID: **IC4_190815B** | Analysis Date: **8/15/2019 2:55:31 PM** | | Prep Date: **8/15/2019** | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.490 | 1.00 | 0.5000 | 0 | 98.0 | 65 | 135 | 0 | 0 | |
| Fluoride | 0.244 | 0.400 | 0.2000 | 0 | 122 | 65 | 135 | 0 | 0 | |
| Sulfate | 1.57 | 3.00 | 1.500 | 0 | 104 | 65 | 135 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190822A**

The QC data in batch 92485 applies to the following samples: 1908215-01B, 1908215-02B, 1908215-03B, 1908215-04B, 1908215-05B, 1908215-06B, 1908215-07B, 1908215-08B, 1908215-09B, 1908215-10B, 1908215-11B, 1908215-12B

Sample ID **MB-92485** Batch ID: **92485** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_190822A** Analysis Date: **8/22/2019 11:01:32 AM** Prep Date: **8/22/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-92485** Batch ID: **92485** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_190822A** Analysis Date: **8/22/2019 11:17:32 AM** Prep Date: **8/22/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.76 | 1.00 | 10.00 | 0 | 97.6 | 90 | 110 | | | |
| Fluoride | 4.13 | 0.400 | 4.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | | | |

Sample ID **LCSD-92485** Batch ID: **92485** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_190822A** Analysis Date: **8/22/2019 11:33:32 AM** Prep Date: **8/22/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.69 | 1.00 | 10.00 | 0 | 96.9 | 90 | 110 | 0.732 | 20 | |
| Fluoride | 4.03 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | 2.46 | 20 | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 98.0 | 90 | 110 | 0.517 | 20 | |

Sample ID **1908215-01BMS** Batch ID: **92485** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_190822A** Analysis Date: **8/22/2019 8:06:15 PM** Prep Date: **8/22/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 343 | 10.0 | 200.0 | 158.1 | 92.5 | 90 | 110 | | | |
| Fluoride | 212 | 4.00 | 200.0 | 1.743 | 105 | 90 | 110 | | | |
| Sulfate | 248 | 30.0 | 200.0 | 59.02 | 94.7 | 90 | 110 | | | |

Sample ID **1908215-01BMSD** Batch ID: **92485** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_190822A** Analysis Date: **8/22/2019 8:22:15 PM** Prep Date: **8/22/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 342 | 10.0 | 200.0 | 158.1 | 92.0 | 90 | 110 | 0.283 | 20 | |
| Fluoride | 212 | 4.00 | 200.0 | 1.743 | 105 | 90 | 110 | 0.201 | 20 | |
| Sulfate | 249 | 30.0 | 200.0 | 59.02 | 94.8 | 90 | 110 | 0.020 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190822A**

| Sample ID **1908215-02BMS** | Batch ID: **92485** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_190822A** | Analysis Date: **8/22/2019 8:38:15 PM** | Prep Date: **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 276 | 10.0 | 200.0 | 84.87 | 95.7 | 90 | 110 | | | |
| Fluoride | 214 | 4.00 | 200.0 | 1.927 | 106 | 90 | 110 | | | |
| Sulfate | 340 | 30.0 | 200.0 | 149.7 | 95.3 | 90 | 110 | | | |

| Sample ID **1908215-02BMSD** | Batch ID: **92485** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_190822A** | Analysis Date: **8/22/2019 8:54:15 PM** | Prep Date: **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 277 | 10.0 | 200.0 | 84.87 | 96.0 | 90 | 110 | 0.164 | 20 | |
| Fluoride | 216 | 4.00 | 200.0 | 1.927 | 107 | 90 | 110 | 0.814 | 20 | |
| Sulfate | 340 | 30.0 | 200.0 | 149.7 | 95.2 | 90 | 110 | 0.093 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190822A**

| Sample ID **ICV-190822** | Batch ID: **R105997** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_190822A** | Analysis Date: **8/22/2019 10:29:32 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.0 | 1.00 | 25.00 | 0 | 100 | 90 | 110 | | | |
| Fluoride | 10.4 | 0.400 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 75.7 | 3.00 | 75.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **CCV1-190822** | Batch ID: **R105997** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190822A** | Analysis Date: **8/22/2019 3:23:51 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.66 | 1.00 | 10.00 | 0 | 96.6 | 90 | 110 | | | |
| Fluoride | 4.18 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 97.9 | 90 | 110 | | | |

| Sample ID **CCV2-190822** | Batch ID: **R105997** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190822A** | Analysis Date: **8/22/2019 7:34:15 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.74 | 1.00 | 10.00 | 0 | 97.4 | 90 | 110 | | | |
| Fluoride | 4.24 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 29.6 | 3.00 | 30.00 | 0 | 98.7 | 90 | 110 | | | |

| Sample ID **CCV3-190822** | Batch ID: **R105997** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190822A** | Analysis Date: **8/23/2019 12:22:15 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.66 | 1.00 | 10.00 | 0 | 96.6 | 90 | 110 | | | |
| Fluoride | 4.26 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 29.5 | 3.00 | 30.00 | 0 | 98.2 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190823A**

The QC data in batch 92504 applies to the following samples: 1908215-12B

| Sample ID | **MB-92504** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 11:05:54 AM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-92504** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 11:21:54 AM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.57 | 1.00 | 10.00 | 0 | 95.7 | 90 | 110 | | | |
| Fluoride | 4.12 | 0.400 | 4.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 29.1 | 3.00 | 30.00 | 0 | 97.0 | 90 | 110 | | | |

| Sample ID | **LCSD-92504** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 11:37:54 AM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.41 | 1.00 | 10.00 | 0 | 94.1 | 90 | 110 | 1.68 | 20 | |
| Fluoride | 4.06 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | 1.56 | 20 | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | 0.598 | 20 | |

| Sample ID | **1908215-12BMS** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 5:16:48 PM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2950 | 100 | 2000 | 1032 | 96.1 | 90 | 110 | | | |
| Fluoride | 2150 | 40.0 | 2000 | 0 | 108 | 90 | 110 | | | |
| Sulfate | 2880 | 300 | 2000 | 977.6 | 95.0 | 90 | 110 | | | |

| Sample ID | **1908215-12BMSD** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 5:32:48 PM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2930 | 100 | 2000 | 1032 | 95.0 | 90 | 110 | 0.718 | 20 | |
| Fluoride | 2130 | 40.0 | 2000 | 0 | 107 | 90 | 110 | 0.802 | 20 | |
| Sulfate | 2870 | 300 | 2000 | 977.6 | 94.4 | 90 | 110 | 0.414 | 20 | |

| Sample ID | **1908250-05EMS** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 5:48:48 PM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190823A**

| Sample ID **1908250-05EMS** | Batch ID: **92504** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_190823A** | Analysis Date: **8/23/2019 5:48:48 PM** | Prep Date: **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 50.8 | 1.00 | 20.00 | 34.64 | 80.6 | 90 | 110 | | | S |
| Fluoride | 23.5 | 0.400 | 20.00 | 2.518 | 105 | 90 | 110 | | | |
| Sulfate | 66.9 | 3.00 | 20.00 | 48.35 | 92.9 | 90 | 110 | | | |

| Sample ID **1908250-05EMSD** | Batch ID: **92504** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_190823A** | Analysis Date: **8/23/2019 6:04:48 PM** | Prep Date: **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 50.9 | 1.00 | 20.00 | 34.64 | 81.1 | 90 | 110 | 0.228 | 20 | S |
| Fluoride | 23.6 | 0.400 | 20.00 | 2.518 | 105 | 90 | 110 | 0.391 | 20 | |
| Sulfate | 66.8 | 3.00 | 20.00 | 48.35 | 92.4 | 90 | 110 | 0.148 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190823A**

| Sample ID **ICV-190823** | Batch ID: **R106018** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_190823A** | Analysis Date: **8/23/2019 10:33:55 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.4 | 1.00 | 25.00 | 0 | 97.8 | 90 | 110 | | | |
| Fluoride | 10.2 | 0.400 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 75.3 | 3.00 | 75.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV1-190823** | Batch ID: **R106018** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190823A** | Analysis Date: **8/23/2019 3:24:19 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.61 | 1.00 | 10.00 | 0 | 96.1 | 90 | 110 | | | |
| Fluoride | 4.23 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.6 | 90 | 110 | | | |

| Sample ID **CCV2-190823** | Batch ID: **R106018** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190823A** | Analysis Date: **8/23/2019 8:44:48 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.68 | 1.00 | 10.00 | 0 | 96.8 | 90 | 110 | | | |
| Fluoride | 4.26 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_190822A**

The QC data in batch 92494 applies to the following samples: 1908215-01B, 1908215-02B, 1908215-03B, 1908215-04B, 1908215-05B, 1908215-06B, 1908215-07B, 1908215-08B, 1908215-09B, 1908215-10B, 1908215-11B, 1908215-12B

| Sample ID | **MB-92944** | Batch ID: | **92494** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_190822A** | Analysis Date: | **8/22/2019 3:40:00 PM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-92494** | Batch ID: | **92494** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_190822A** | Analysis Date: | **8/22/2019 3:40:00 PM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 737 | 10.0 | 745.6 | 0 | 98.8 | 90 | 113 | | | |

| Sample ID | **1908215-03B-DUP** | Batch ID: | **92494** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190822A** | Analysis Date: | **8/22/2019 3:40:00 PM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1880 | 50.0 | 0 | 1885 | | | | 0.532 | 5 | |

| Sample ID | **1908215-06B-DUP** | Batch ID: | **92494** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190822A** | Analysis Date: | **8/22/2019 3:40:00 PM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 4530 | 50.0 | 0 | 4595 | | | | 1.42 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# MQL SUMMARY REPORT

| TestNo: E300 | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| TestNo: SW6020A | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Antimony | 0.000800 | 0.00250 |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Cadmium | 0.000300 | 0.00100 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Molybdenum | 0.00200 | 0.00500 |
| Selenium | 0.00200 | 0.00500 |
| Thallium | 0.000500 | 0.00150 |

| TestNo: SW7470A | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Mercury | 0.0000800 | 0.000200 |

| TestNo: M2540C | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

September 13, 2019

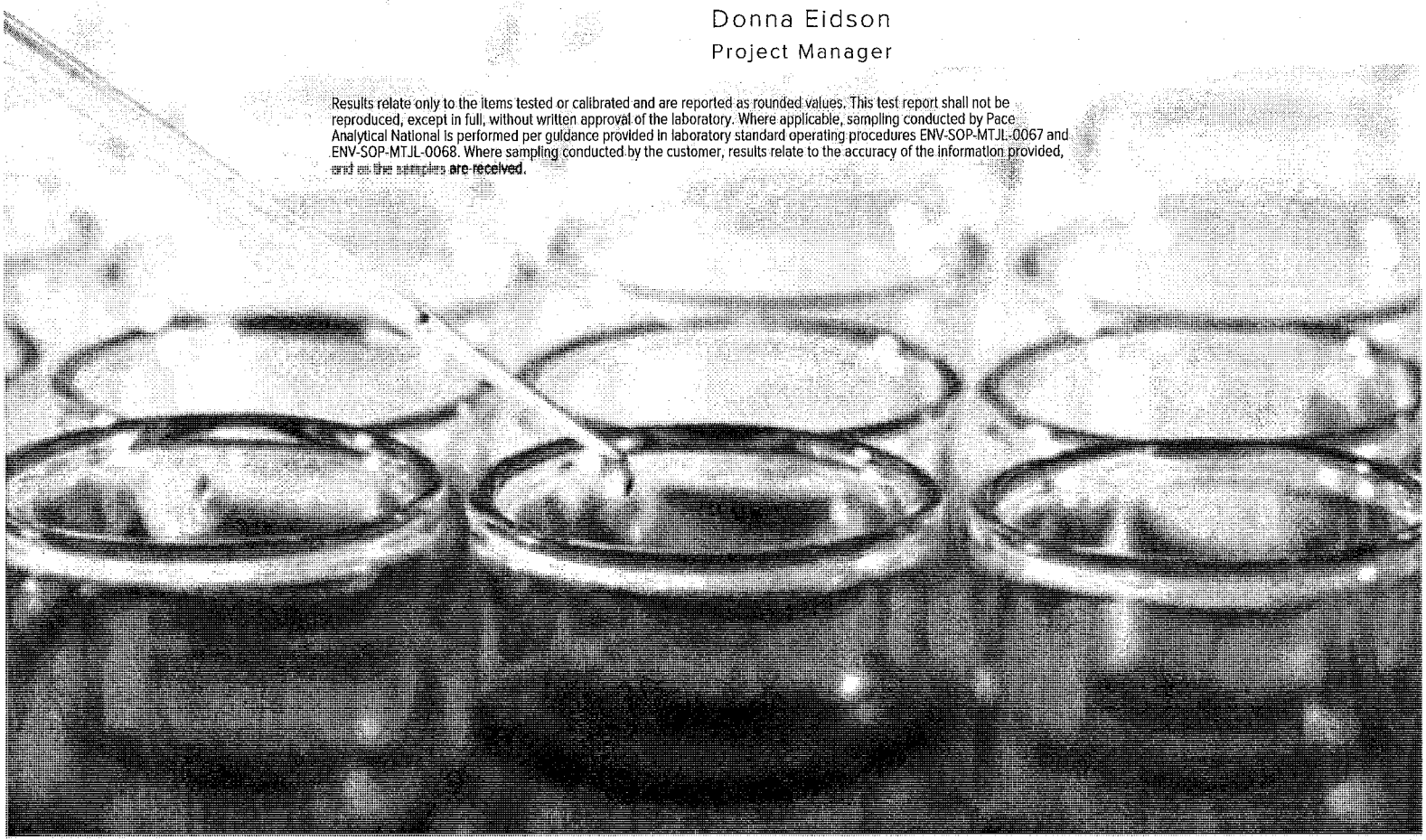
## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1133289 |
| Samples Received: | 08/27/2019 |
| Project Number: | 1908215 |
| Description: | |
| Report To: | John DuPont |
| | 2300 Double Creek Drive |
| | Round Rock, TX 78664 |

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and on the samples are received.



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## FGD-6 L1133289-01 Non-Potable Water

Collected by | Collected date/time 08/19/19 07:35 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-3 L1133289-02 Non-Potable Water

Collected by | Collected date/time 08/19/19 08:25 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-2 L1133289-03 Non-Potable Water

Collected by | Collected date/time 08/19/19 09:15 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-5 L1133289-04 Non-Potable Water

Collected by | Collected date/time 08/19/19 10:00 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## DUP-1 L1133289-05 Non-Potable Water

Collected by | Collected date/time 08/19/19 10:00 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-8 L1133289-06 Non-Potable Water

Collected by | Collected date/time 08/19/19 11:00 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 09/10/19 17:42 | RGT | Mt. Juliet, TN |

## FGD-1 L1133289-07 Non-Potable Water

Collected by | Collected date/time 08/19/19 12:05 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-14 L1133289-08 Non-Potable Water

Collected by | Collected date/time 08/19/19 13:15 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-4 L1133289-09 Non-Potable Water

Collected by | Collected date/time 08/19/19 14:15 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-11 L1133289-10 Non-Potable Water

Collected by | Collected date/time 08/19/19 15:20 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 09/03/19 11:00 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 09/03/19 11:00 | 09/04/19 17:23 | RGT | Mt. Juliet, TN |

## FGD-12 L1133289-11 Non-Potable Water

Collected by | Collected date/time 08/19/19 16:25 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:55 | RGT | Mt. Juliet, TN |

## FGD-15 L1133289-12 Non-Potable Water

Collected by | Collected date/time 08/19/19 17:30 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 09/04/19 12:00 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 09/04/19 12:00 | 09/04/19 17:23 | RGT | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 2.55 | | 0.597 | 0.902 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *98.1* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *109* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 2.93 | | 0.844 | 1.12 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.385 | | 0.247 | 0.214 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *95.1* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.858 | | 0.443 | 0.782 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *83.7* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *97.4* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 1.38 | | 0.748 | 1.05 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.523 | | 0.305 | 0.266 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *71.0* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 2.80 | | 0.477 | 0.761 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *87.3* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *101* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 3.26 | | 1.07 | 1.6 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.456 | | 0.596 | 0.841 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *35.3* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.659 | | 0.360 | 0.677 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *93.6* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *103* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 1.21 | | 0.874 | 1.27 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.551 | | 0.514 | 0.591 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *33.9* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.251 | | 0.441 | 0.67 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *92.3* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *106* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.251 | | 0.815 | 1.36 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | -0.130 | | 0.374 | 0.693 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *46.9* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 6.82 | | 0.503 | 0.674 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *85.4* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 8.61 | | 1.17 | 1.14 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 1.79 | | 0.667 | 0.467 | 09/10/2019 17:42 | WG1337055 |
| *(T) Barium-133* | *19.5* | C2 | | *30.0-143* | *09/10/2019 17:42* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 1.09 | | 0.429 | 0.686 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *89.6* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *111* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 1.57 | | 0.712 | 0.877 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.489 | | 0.283 | 0.191 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *76.6* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 2.22 | | 0.444 | 0.775 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *93.0* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *109* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 3.57 | | 0.893 | 1.01 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 1.35 | | 0.449 | 0.232 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *90.4* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 1.58 | | 0.406 | 0.601 | 09/11/2019 15:45 | WG1340987 |
| *(T) Barium* | *103* | | | *62.0-143* | *09/11/2019 15:45* | WG1340987 |
| *(T) Yttrium* | *106* | | | *79.0-136* | *09/11/2019 15:45* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 1.97 | | 0.752 | 1.03 | 09/11/2019 15:45 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.390 | | 0.346 | 0.429 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *79.3* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 2.55 | | 0.409 | 0.552 | 09/11/2019 15:45 | WG1340987 |
| *(T) Barium* | *99.4* | | | *62.0-143* | *09/11/2019 15:45* | WG1340987 |
| *(T) Yttrium* | *113* | | | *79.0-136* | *09/11/2019 15:45* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 3.95 | | 0.861 | 0.802 | 09/11/2019 15:45 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 1.39 | | 0.452 | 0.25 | 09/04/2019 17:23 | WG1337055 |
| *(T) Barium-133* | *97.1* | | | *30.0-143* | *09/04/2019 17:23* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 3.52 | | 0.491 | 0.672 | 09/11/2019 15:45 | WG1340987 |
| *(T) Barium* | *105* | | | *62.0-143* | *09/11/2019 15:45* | WG1340987 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *09/11/2019 15:45* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 4.64 | | 0.940 | 0.947 | 09/11/2019 15:45 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 1.12 | | 0.449 | 0.275 | 08/30/2019 14:55 | WG1337055 |
| *(T) Barium-133* | *82.2* | | | *30.0-143* | *08/30/2019 14:55* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 1.55 | | 0.414 | 0.707 | 09/11/2019 15:45 | WG1340987 |
| *(T) Barium* | *96.7* | | | *62.0-143* | *09/11/2019 15:45* | WG1340987 |
| *(T) Yttrium* | *111* | | | *79.0-136* | *09/11/2019 15:45* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 2.15 | | 0.757 | 1.04 | 09/11/2019 15:45 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.604 | | 0.343 | 0.332 | 09/04/2019 17:23 | WG1337055 |
| *(T) Barium-133* | *82.4* | | | *30.0-143* | *09/04/2019 17:23* | WG1337055 |

## Method Blank (MB)

(MB) R3449949-1 09/11/19 11:06

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | 0.176 | | 0.453 |
| *(T) Barium* | *92.6* | | |
| *(T) Yttrium* | *114* | | |

## L1133289-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1133289-01 09/11/19 11:06 • (DUP) R3449949-5 09/11/19 11:06

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-228 | 2.55 | 3.06 | 1 | 18.2 | 0.553 | | 20 | 3 |
| *(T) Barium* | *98.1* | *95.8* | | | | | | |
| *(T) Yttrium* | *109* | *88.5* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3449949-2 09/11/19 11:06

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 5.46 | 109 | 80.0-120 | |
| *(T) Barium* | | | *99.0* | | |
| *(T) Yttrium* | | | *106* | | |

## L1133317-11 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1133317-11 09/11/19 15:45 • (MS) R3449949-3 09/11/19 11:06 • (MSD) R3449949-4 09/11/19 11:06

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 10.0 | 1.25 | 9.53 | 11.1 | 82.8 | 98.9 | 1 | 70.0-130 | | | 15.6 | | 20 |
| *(T) Barium* | | *102* | | | *95.7* | *111* | | | | | | | |
| *(T) Yttrium* | | *111* | | | *108* | *97.9* | | | | | | | |

## Method Blank (MB)

(MB) R3447929-1 08/30/19 14:54

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-226 | 0.000 | | 0.0661 |
| *(T) Barium-133* | *83.8* | | |

## L1133289-08 Original Sample (OS) • Duplicate (DUP)

(OS) L1133289-08 08/30/19 14:54 • (DUP) R3447929-5 08/30/19 14:54

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.35 | 1.14 | 1 | 16.5 | 0.296 | | 20 | 3 |
| *(T) Barium-133* | *90.4* | *63.2* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3447929-2 08/30/19 14:54

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 5.02 | 4.81 | 95.8 | 80.0-120 | |
| *(T) Barium-133* | | | *63.8* | | |

## L1134015-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1134015-01 08/30/19 14:55 • (MS) R3447929-3 08/30/19 14:54 • (MSD) R3447929-4 08/30/19 14:54

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 20.1 | 0.290 | 21.5 | 20.4 | 105 | 100 | 1 | 75.0-125 | | | 5.06 | | 20 |
| *(T) Barium-133* | | *25.5* | | | *75.8* | *66.2* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| C2 | Tracer recovery limits have been exceeded; values are outside lower control limits. |

# ACCREDITATIONS & LOCATIONS

ONE LAB. NATIONWIDE.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.



## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LA000356 |
| Kentucky [16] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [14] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

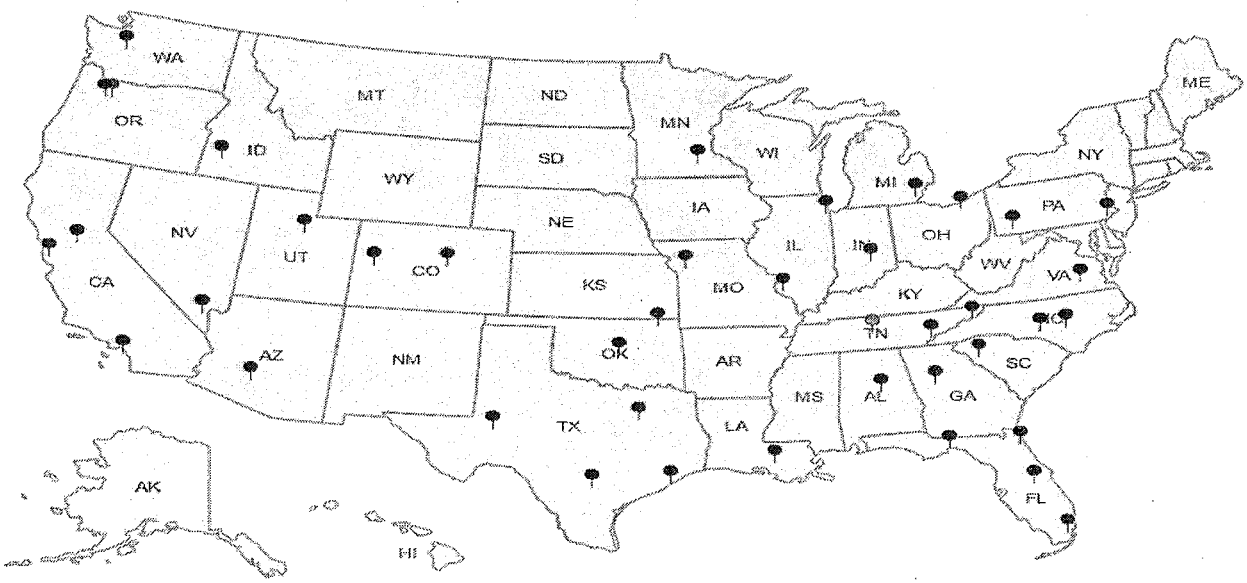
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



# Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | |
|---|---|---|
| Client: DHLRTX | SDG#: | 1135289 |
| Cooler Received/Opened On: 8/27/19 | Temperature: | Am5 |
| Received By: Lexxi Romero | | |
| Signature: | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | ✓ | | |
| COC Signed / Accurate? | | ✓ | |
| Bottles arrive intact? | | ✓ | |
| Correct bottles used? | | ✓ | |
| Sufficient volume sent? | | ✓ | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | | ✓ | |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



H008

Work Order: 1908215

Subcontractor:
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

11333289

21-Aug-19

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Ra 228 E904.0 | Ra 226 M7500 Ra B M | Requested Tests | |
|---|---|---|---|---|---|---|---|---|
| FGD-6 | Aqueous | -01C | 08/19/19 07:35 AM | 1LHDPEHNO3 | 1 | | | -01 |
| FGD-6 | Aqueous | -01D | 08/19/19 07:35 AM | 1LHDPEHNO3 | | 1 | | |
| FGD-3 | Aqueous | -02C | 08/19/19 08:25 AM | 1LHDPEHNO3 | 1 | | | 02 |
| FGD-3 | Aqueous | -02D | 08/19/19 08:25 AM | 1LHDPEHNO3 | | 1 | | |
| FGD-2 | Aqueous | -03C | 08/19/19 09:15 AM | 1LHDPEHNO3 | 1 | | | 03 |
| FGD-2 | Aqueous | -03D | 08/19/19 09:15 AM | 1LHDPEHNO3 | | 1 | | |
| FGD-5 | Aqueous | -04C | 08/19/19 10:00 AM | 1LHDPEHNO3 | 1 | | | 04 |
| FGD-5 | Aqueous | -04D | 08/19/19 10:00 AM | 1LHDPEHNO3 | | 1 | | |
| DUP-1 | Aqueous | -05C | 08/19/19 10:00 AM | 1LHDPEHNO3 | 1 | | | 05 |
| DUP-1 | Aqueous | -05D | 08/19/19 10:00 AM | 1LHDPEHNO3 | | 1 | | |
| FGD-8 | Aqueous | -06C | 08/19/19 11:00 AM | 1LHDPEHNO3 | 1 | | | 06 |
| FGD-8 | Aqueous | -06D | 08/19/19 11:00 AM | 1LHDPEHNO3 | | 1 | | |
| FGD-1 | Aqueous | -07C | 08/19/19 12:05 PM | 1LHDPEHNO3 | 1 | | | 07 |
| FGD-1 | Aqueous | -07D | 08/19/19 12:05 PM | 1LHDPEHNO3 | | 1 | | |
| FGD-14 | Aqueous | -08C | 08/19/19 01:15 PM | 1LHDPEHNO3 | 1 | | | 08 |
| FGD-14 | Aqueous | -08D | 08/19/19 01:15 PM | 1LHDPEHNO3 | | 1 | | |
| FGD-4 | Aqueous | -09C | 08/19/19 02:15 PM | 1LHDPEHNO3 | 1 | | | 09 |
| FGD-4 | Aqueous | -09D | 08/19/19 02:15 PM | 1LHDPEHNO3 | | 1 | | |

General Comments:
Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | Date/Time | | Date/Time |
|---|---|---|---|
| Relinquished by: | | Received by: | 8-21-19 10:30 |
| Relinquished by: | | Received by: | |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1908215

Subcontractor:
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

1133289

21-Aug-19

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Ra 228 E904.0 | Ra 226 M7500 Ra B M | Requested Tests | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-11 | Aqueous | -10C | 08/19/19 03:20 PM | 1LHDPEHNO3 | 1 | | | | | 10 |
| FGD-11 | Aqueous | -10D | 08/19/19 03:20 PM | 1LHDPEHNO3 | | 1 | | | | |
| FGD-12 | Aqueous | -11C | 08/19/19 04:25 PM | 1LHDPEHNO3 | 1 | | | | | 11 |
| FGD-12 | Aqueous | -11D | 08/19/19 04:25 PM | 1LHDPEHNO3 | | 1 | | | | |
| FGD-15 | Aqueous | -12C | 08/19/19 05:30 PM | 1LHDPEHNO3 | 1 | | | | | 12 |
| FGD-15 | Aqueous | -12D | 08/19/19 05:30 PM | 1LHDPEHNO3 | | 1 | | | | |

General Comments:
Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| Relinquished by: | | | Received by: | | 8-21-19 10:00 |
| Relinquished by: | | | Received by: | | |

June 10, 2020

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2005040

RE: Luminant-OGSES-CCR

Dear Will Vienne:

DHL Analytical, Inc. received 2 sample(s) on 5/7/2020 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-20-25

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**AnalyticalDatesReport 2005040** ..... 13

**Analytical Report 2005040** ..... 14

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**MQLSummaryReport 2005040** ..... 32

**Subcontract Report 2005040** ..... 33

DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 68301

# CHAIN-OF-CUSTODY

CLIENT: GOLDER ASSOCIATES
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-6-20 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 2005040
PROJECT LOCATION OR NAME: LUMINANT - DGSES - CCR
CLENT PROJECT #: 19122262 COLLECTOR:

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT
P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS ❑ | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | APPENDIX III & IV

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 01 | 5-6-20 | 1320 | W | | 4 | | X | | X | | X | |
| FGD-3 | 02 | 5-6-20 | 1420 | W | | 4 | | X | | X | | X | |

RELINQUISHED BY: (Signature) DATE/TIME 5-7-20/900 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME 5-7-20/1655 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

❑ DHL DISPOSAL @ $5.00 each ❑ Return

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑

**LABORATORY USE ONLY:**
RECEIVING TEMP: 0.9°C THERM #: 78
CUSTODY SEALS: ❑ BROKEN ☒ INTACT ❑ NOT USED
CARRIER: ❑ LONE STAR ❑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
☑ HAND DELIVERED

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

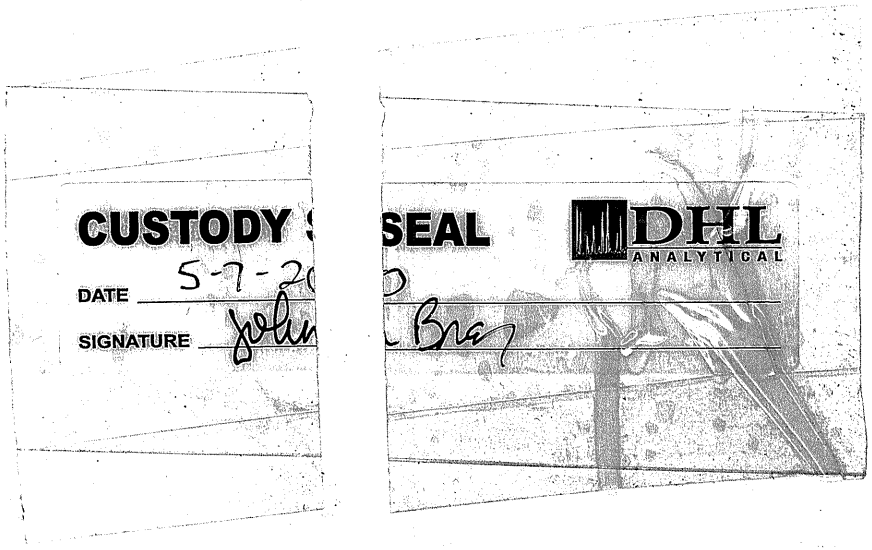
Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

---

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis


CUSTODY
SEAL
DHL
ANALYTICAL
DATE
5-7-2
SIGNATURE

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder** Date Received: **5/7/2020**

Work Order Number **2005040** Received by: **EL**

Checklist completed by: _____ 5/7/2020 Reviewed by DL 5/7/2020
Signature | Date | Initials | Date

Carrier name: Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **0.9** °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? no | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? _____ | | Checked by _____ |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

## Laboratory Name: DHL Analytical, Inc.

## Laboratory Review Checklist: Reportable Data

| | |
|---|---|
| **Project Name:** Luminant-OGSES-CCR | **LRC Date:** 6/10/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2005040 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | **X** | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | **X** | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | **X** | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | **X** | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | **X** | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | **X** | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | **X** | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | **X** | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | **X** | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | **X** | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | **X** | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | **X** | | |
| | | **9)** If required for the project, TICs reported? | | | **X** | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | **X** | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | **X** | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | **X** | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | **X** | | | | |
| | | **4)** Were blank concentrations < MDL? | **X** | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | **X** | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | **X** | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | **X** | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | **X** | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | **X** | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | **X** | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | **X** | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | **X** | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | **X** | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | **X** | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | **X** | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | **X** | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | **X** | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | **X** | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | **X** | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | **X** | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-CCR | **LRC Date:** 6/10/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2005040 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | X | | | S9-01 |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

06/10/20

Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *10-Jun-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES-CCR
**Lab Order:** 2005040

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis

Exception Report R1-01

The samples were received and log-in performed on 5/7/20. A total of 2 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report S9-01

For Metals analysis performed on 5/11/20 the RPD for the serial dilution was slightly above control limits for Boron. This is flagged accordingly in the QC summary report. The PDS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *10-Jun-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES-CCR
**Lab Order:** 2005040

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2005040-01 | FGD-6 | | 05/06/20 01:20 PM | 5/7/2020 |
| 2005040-02 | FGD-3 | | 05/06/20 02:20 PM | 5/7/2020 |

**Lab Order:** 2005040
**Client:** Golder
**Project:** Luminant-OGSES-CCR

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005040-01A | FGD-6 | 05/06/20 01:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/12/20 01:39 PM | 96317 |
| 2005040-01B | FGD-6 | 05/06/20 01:20 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | M2540C | TDS Preparation | 05/07/20 01:32 PM | 96250 |
| 2005040-02A | FGD-3 | 05/06/20 02:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/12/20 01:39 PM | 96317 |
| 2005040-02B | FGD-3 | 05/06/20 02:20 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | M2540C | TDS Preparation | 05/07/20 01:32 PM | 96250 |

**Lab Order:** 2005040
**Client:** Golder
**Project:** Luminant-OGSES-CCR

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005040-01A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 96317 | 1 | 05/13/20 12:19 PM | CETAC2_HG_200513 A |
| | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 5 | 05/11/20 04:08 PM | ICP-MS5_200511B |
| | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 1 | 05/11/20 02:50 PM | ICP-MS5_200511B |
| 2005040-01B | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 96213 | 1 | 05/07/20 08:25 PM | IC4_200507A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 96213 | 10 | 05/07/20 07:53 PM | IC4_200507A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 96250 | 1 | 05/07/20 04:50 PM | WC_200507D |
| 2005040-02A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 96317 | 1 | 05/13/20 12:21 PM | CETAC2_HG_200513 A |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 5 | 05/11/20 04:10 PM | ICP-MS5_200511B |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 1 | 05/11/20 02:52 PM | ICP-MS5_200511B |
| 2005040-02B | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 96213 | 1 | 05/07/20 08:41 PM | IC4_200507A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 96213 | 10 | 05/07/20 08:09 PM | IC4_200507A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 96250 | 1 | 05/07/20 04:50 PM | WC_200507D |

# DHL Analytical, Inc.

**Date:** *10-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES-CCR | **Lab ID:** | 2005040-01 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/06/20 01:20 PM |
| **Lab Order:** | 2005040 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/11/20 02:50 PM |
| Arsenic | 0.00286 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/11/20 02:50 PM |
| Barium | 0.0814 | 0.00300 | 0.0100 | | mg/L | 1 | 05/11/20 02:50 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:50 PM |
| Boron | 0.109 | 0.0100 | 0.0300 | | mg/L | 1 | 05/11/20 02:50 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:50 PM |
| Calcium | 27.4 | 0.500 | 1.50 | | mg/L | 5 | 05/11/20 04:08 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/11/20 02:50 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/11/20 02:50 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:50 PM |
| Lithium | 0.00877 | 0.00500 | 0.0100 | J | mg/L | 1 | 05/11/20 02:50 PM |
| Molybdenum | 0.00205 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/11/20 02:50 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/11/20 02:50 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/11/20 02:50 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/13/20 12:19 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 189 | 3.00 | 10.0 | | mg/L | 10 | 05/07/20 07:53 PM |
| Fluoride | 0.292 | 0.100 | 0.400 | J | mg/L | 1 | 05/07/20 08:25 PM |
| Sulfate | 70.7 | 1.00 | 3.00 | | mg/L | 1 | 05/07/20 08:25 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 746 | 10.0 | 10.0 | | mg/L | 1 | 05/07/20 04:50 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *10-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES-CCR | **Lab ID:** | 2005040-02 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/06/20 02:20 PM |
| **Lab Order:** | 2005040 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/11/20 02:52 PM |
| Arsenic | 0.00209 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/11/20 02:52 PM |
| Barium | 0.0353 | 0.00300 | 0.0100 | | mg/L | 1 | 05/11/20 02:52 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:52 PM |
| Boron | 0.152 | 0.0100 | 0.0300 | | mg/L | 1 | 05/11/20 02:52 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:52 PM |
| Calcium | 42.3 | 0.500 | 1.50 | | mg/L | 5 | 05/11/20 04:10 PM |
| Chromium | 0.0117 | 0.00200 | 0.00500 | | mg/L | 1 | 05/11/20 02:52 PM |
| Cobalt | 0.00332 | 0.00300 | 0.00500 | J | mg/L | 1 | 05/11/20 02:52 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:52 PM |
| Lithium | 0.0498 | 0.00500 | 0.0100 | | mg/L | 1 | 05/11/20 02:52 PM |
| Molybdenum | 0.00284 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/11/20 02:52 PM |
| Selenium | 0.00993 | 0.00200 | 0.00500 | | mg/L | 1 | 05/11/20 02:52 PM |
| Thallium | 0.000556 | 0.000500 | 0.00150 | J | mg/L | 1 | 05/11/20 02:52 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/13/20 12:21 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 70.2 | 3.00 | 10.0 | | mg/L | 10 | 05/07/20 08:09 PM |
| Fluoride | 0.800 | 0.100 | 0.400 | | mg/L | 1 | 05/07/20 08:41 PM |
| Sulfate | 129 | 1.00 | 3.00 | | mg/L | 1 | 05/07/20 08:41 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 777 | 10.0 | 10.0 | | mg/L | 1 | 05/07/20 04:50 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200304C**

Sample ID: **DCS-95289** Batch ID: **95289** TestNo: **SW7470A** Units: **mg/L**
SampType: **DCS** Run ID: **CETAC2_HG_200304C** Analysis Date: **3/4/2020 12:11:09 PM** Prep Date: **3/4/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.000175 | 0.000200 | 0.000200 | 0 | 87.5 | 82 | 119 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200513A**

The QC data in batch 96317 applies to the following samples: 2005040-01A, 2005040-02A

| Sample ID: **MB-96317** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:09:44 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID: **LCS-96317** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:14:44 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00195 | 0.000200 | 0.00200 | 0 | 97.5 | 85 | 115 | | | |

| Sample ID: **LCSD-96317** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:17:01 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00206 | 0.000200 | 0.00200 | 0 | 103 | 85 | 115 | 5.49 | 15 | |

| Sample ID: **2005048-02A MS** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:28:20 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0104 | 0.00100 | 0.0100 | 0 | 104 | 80 | 120 | | | |

| Sample ID: **2005048-02A MSD** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:30:36 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0105 | 0.00100 | 0.0100 | 0 | 104 | 80 | 120 | 0.480 | 15 | |

| Sample ID: **2005048-02A SD** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:32:52 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.00200 | 0.00500 | 0 | 0 | | | | 0 | 10 | |

| Sample ID: **2005048-02A PDS** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:35:07 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0124 | 0.00100 | 0.0125 | 0 | 99.2 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200513A**

| Sample ID: **ICV-200513** | Batch ID: **R110466** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 10:49:14 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00383 | 0.000200 | 0.00400 | 0 | 95.8 | 90 | 110 | | | |

| Sample ID: **CCV1-200513** | Batch ID: **R110466** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 1:06:55 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00202 | 0.000200 | 0.00200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200408C**

| Sample ID: **DCS1-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:16:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.000932 | 0.00250 | 0.00100 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Beryllium | 0.000472 | 0.00100 | 0.000500 | 0 | 94.4 | 70 | 130 | 0 | 0 | |
| Cadmium | 0.000492 | 0.00100 | 0.000500 | 0 | 98.4 | 70 | 130 | 0 | 0 | |
| Lead | 0.000496 | 0.00100 | 0.000500 | 0 | 99.2 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000468 | 0.00150 | 0.000500 | 0 | 93.6 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS2-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:19:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.310 | 0.300 | 0.300 | 0 | 103 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS3-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:21:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00466 | 0.00500 | 0.00500 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Barium | 0.00478 | 0.0100 | 0.00500 | 0 | 95.6 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00600 | 0.00500 | 0.00500 | 0 | 120 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00473 | 0.00500 | 0.00500 | 0 | 94.6 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00473 | 0.0100 | 0.00500 | 0 | 94.6 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00466 | 0.00500 | 0.00500 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:28:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0286 | 0.0300 | 0.0300 | 0 | 95.2 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS5_200511B**

The QC data in batch 96270 applies to the following samples: 2005040-01A, 2005040-02A

Sample ID: **MB-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:41:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID: **LCS-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:43:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.0 | 80 | 120 | | | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 80 | 120 | | | |
| Boron | 0.191 | 0.0300 | 0.200 | 0 | 95.7 | 80 | 120 | | | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Calcium | 5.10 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 80 | 120 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Lead | 0.191 | 0.00100 | 0.200 | 0 | 95.6 | 80 | 120 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Thallium | 0.190 | 0.00150 | 0.200 | 0 | 95.0 | 80 | 120 | | | |

Sample ID: **LCSD-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:45:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | 0.748 | 15 | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.625 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

Sample ID: **LCSD-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:45:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.3 | 80 | 120 | 0.306 | 15 | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | 0.891 | 15 | |
| Boron | 0.207 | 0.0300 | 0.200 | 0 | 104 | 80 | 120 | 7.99 | 15 | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.817 | 15 | |
| Calcium | 5.05 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.928 | 15 | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.855 | 15 | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.747 | 15 | |
| Lead | 0.190 | 0.00100 | 0.200 | 0 | 95.2 | 80 | 120 | 0.416 | 15 | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | 1.37 | 15 | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.702 | 15 | |
| Selenium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.402 | 15 | |
| Thallium | 0.189 | 0.00150 | 0.200 | 0 | 94.6 | 80 | 120 | 0.385 | 15 | |

Sample ID: **2005013-01B SD** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:52:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 20 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Barium | 0.0953 | 0.0500 | 0 | 0.0961 | | | | 0.857 | 20 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Boron | 0.287 | 0.150 | 0 | 0.221 | | | | 26.1 | 20 | R |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Calcium | 3.98 | 1.50 | 0 | 4.00 | | | | 0.590 | 20 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Lithium | 0.0284 | 0.0500 | 0 | 0.0274 | | | | 3.58 | 20 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 20 | |

Sample ID: **2005013-01B PDS** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 2:23:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 99.1 | 75 | 125 | | | |
| Arsenic | 0.193 | 0.00500 | 0.200 | 0 | 96.4 | 75 | 125 | | | |
| Barium | 0.292 | 0.0100 | 0.200 | 0.0961 | 97.9 | 75 | 125 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 99.8 | 75 | 125 | | | |
| Boron | 0.409 | 0.0300 | 0.200 | 0.221 | 94.2 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

| Sample ID: **2005013-01B PDS** | Batch ID: **96270** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 2:23:00 PM** | Prep Date: **5/8/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Calcium | 8.99 | 0.300 | 5.00 | 4.00 | 99.7 | 75 | 125 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Cobalt | 0.192 | 0.00500 | 0.200 | 0 | 96.2 | 75 | 125 | | | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.3 | 75 | 125 | | | |
| Lithium | 0.231 | 0.0100 | 0.200 | 0.0274 | 102 | 75 | 125 | | | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 75 | 125 | | | |
| Selenium | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 75 | 125 | | | |
| Thallium | 0.192 | 0.00150 | 0.200 | 0 | 95.9 | 75 | 125 | | | |

| Sample ID: **2005013-01B MS** | Batch ID: **96270** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 2:26:00 PM** | Prep Date: **5/8/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Arsenic | 0.193 | 0.00500 | 0.200 | 0 | 96.6 | 75 | 125 | | | |
| Barium | 0.294 | 0.0100 | 0.200 | 0.0961 | 99.0 | 75 | 125 | | | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 75 | 125 | | | |
| Boron | 0.442 | 0.0300 | 0.200 | 0.221 | 111 | 75 | 125 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 75 | 125 | | | |
| Calcium | 9.22 | 0.300 | 5.00 | 4.00 | 104 | 75 | 125 | | | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 98.0 | 75 | 125 | | | |
| Cobalt | 0.188 | 0.00500 | 0.200 | 0 | 94.1 | 75 | 125 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.5 | 75 | 125 | | | |
| Lithium | 0.235 | 0.0100 | 0.200 | 0.0274 | 104 | 75 | 125 | | | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Selenium | 0.193 | 0.00500 | 0.200 | 0 | 96.5 | 75 | 125 | | | |
| Thallium | 0.191 | 0.00150 | 0.200 | 0 | 95.3 | 75 | 125 | | | |

| Sample ID: **2005013-01B MSD** | Batch ID: **96270** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 2:28:00 PM** | Prep Date: **5/8/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 75 | 125 | 0.105 | 15 | |
| Arsenic | 0.194 | 0.00500 | 0.200 | 0 | 97.2 | 75 | 125 | 0.685 | 15 | |
| Barium | 0.296 | 0.0100 | 0.200 | 0.0961 | 100 | 75 | 125 | 0.795 | 15 | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.7 | 75 | 125 | 0.818 | 15 | |
| Boron | 0.441 | 0.0300 | 0.200 | 0.221 | 110 | 75 | 125 | 0.181 | 15 | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 75 | 125 | 0.312 | 15 | |
| Calcium | 9.09 | 0.300 | 5.00 | 4.00 | 102 | 75 | 125 | 1.39 | 15 | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 97.9 | 75 | 125 | 0.093 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

Sample ID: **2005013-01B MSD** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 2:28:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.190 | 0.00500 | 0.200 | 0 | 95.2 | 75 | 125 | 1.15 | 15 | |
| Lead | 0.195 | 0.00100 | 0.200 | 0 | 97.3 | 75 | 125 | 0.844 | 15 | |
| Lithium | 0.236 | 0.0100 | 0.200 | 0.0274 | 104 | 75 | 125 | 0.311 | 15 | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | 0.717 | 15 | |
| Selenium | 0.190 | 0.00500 | 0.200 | 0 | 95.2 | 75 | 125 | 1.42 | 15 | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.3 | 75 | 125 | 1.03 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

Sample ID: **ICV-200511** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **ICV** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 11:23:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.103 | 0.00250 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.0999 | 0.00500 | 0.100 | 0 | 99.9 | 90 | 110 | | | |
| Barium | 0.0995 | 0.0100 | 0.100 | 0 | 99.5 | 90 | 110 | | | |
| Beryllium | 0.0992 | 0.00100 | 0.100 | 0 | 99.2 | 90 | 110 | | | |
| Boron | 0.0999 | 0.0300 | 0.100 | 0 | 99.9 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.55 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |
| Chromium | 0.103 | 0.00500 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Cobalt | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.0990 | 0.00100 | 0.100 | 0 | 99.0 | 90 | 110 | | | |
| Lithium | 0.0991 | 0.0100 | 0.100 | 0 | 99.1 | 90 | 110 | | | |
| Molybdenum | 0.0981 | 0.00500 | 0.100 | 0 | 98.1 | 90 | 110 | | | |
| Selenium | 0.106 | 0.00500 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Thallium | 0.0964 | 0.00150 | 0.100 | 0 | 96.4 | 90 | 110 | | | |

Sample ID: **LCVL-200511** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 11:33:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00204 | 0.00250 | 0.00200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.00519 | 0.00500 | 0.00500 | 0 | 104 | 80 | 120 | | | |
| Barium | 0.00522 | 0.0100 | 0.00500 | 0 | 104 | 80 | 120 | | | |
| Beryllium | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 80 | 120 | | | |
| Boron | 0.0205 | 0.0300 | 0.0200 | 0 | 103 | 80 | 120 | | | |
| Cadmium | 0.000999 | 0.00100 | 0.00100 | 0 | 99.9 | 80 | 120 | | | |
| Calcium | 0.112 | 0.300 | 0.100 | 0 | 112 | 80 | 120 | | | |
| Chromium | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.00505 | 0.00500 | 0.00500 | 0 | 101 | 80 | 120 | | | |
| Lead | 0.000980 | 0.00100 | 0.00100 | 0 | 98.0 | 80 | 120 | | | |
| Lithium | 0.00989 | 0.0100 | 0.0100 | 0 | 98.9 | 80 | 120 | | | |
| Molybdenum | 0.00502 | 0.00500 | 0.00500 | 0 | 100 | 80 | 120 | | | |
| Selenium | 0.00584 | 0.00500 | 0.00500 | 0 | 117 | 80 | 120 | | | |
| Thallium | 0.000967 | 0.00150 | 0.00100 | 0 | 96.7 | 80 | 120 | | | |

Sample ID: **CCV2-200409** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:33:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Barium | 0.196 | 0.0100 | 0.200 | 0 | 97.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

Sample ID: **CCV2-200409** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:33:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 90 | 110 | | | |
| Boron | 0.197 | 0.0300 | 0.200 | 0 | 98.5 | 90 | 110 | | | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Calcium | 5.08 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 98.1 | 90 | 110 | | | |
| Cobalt | 0.195 | 0.00500 | 0.200 | 0 | 97.7 | 90 | 110 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 95.8 | 90 | 110 | | | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.5 | 90 | 110 | | | |
| Thallium | 0.190 | 0.00150 | 0.200 | 0 | 94.8 | 90 | 110 | | | |

Sample ID: **CCV3-200511** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 2:39:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.6 | 90 | 110 | | | |
| Boron | 0.196 | 0.0300 | 0.200 | 0 | 98.1 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 5.20 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.6 | 90 | 110 | | | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.192 | 0.00150 | 0.200 | 0 | 95.8 | 90 | 110 | | | |

Sample ID: **CCV4-200511** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 3:08:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Boron | 0.199 | 0.0300 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

| Sample ID: **CCV4-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 3:08:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 96.2 | 90 | 110 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.190 | 0.00150 | 0.200 | 0 | 95.1 | 90 | 110 | | | |

| Sample ID: **CCV5-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 3:41:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.18 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID: **CCV6-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 4:17:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.23 | 0.300 | 5.00 | 0 | 105 | 90 | 110 | | | |

**Qualifiers:**

| | |
|---|---|
| B | Analyte detected in the associated Method Blank |
| J | Analyte detected between MDL and RL |
| ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit |
| J | Analyte detected between SDL and RL |
| DF | Dilution Factor |
| MDL | Method Detection Limit |
| R | RPD outside accepted control limits |
| S | Spike Recovery outside control limits |
| N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200430A**

Sample ID: **DCS2-96153** Batch ID: **96153** TestNo: **E300** Units: **mg/L**
SampType: **DCS2** Run ID: **IC4_200430A** Analysis Date: **4/30/2020 11:31:49 AM** Prep Date: **4/30/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.473 | 1.00 | 0.5000 | 0 | 94.7 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.191 | 0.400 | 0.2000 | 0 | 95.6 | 70 | 130 | 0 | 0 | |
| Sulfate | 1.34 | 3.00 | 1.500 | 0 | 89.6 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200507A**

The QC data in batch 96213 applies to the following samples: 2005040-01B, 2005040-02B

Sample ID: **MB-96213** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 10:26:10 AM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-96213** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 10:42:10 AM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.97 | 1.00 | 10.00 | 0 | 99.7 | 90 | 110 | | | |
| Fluoride | 3.70 | 0.400 | 4.000 | 0 | 92.6 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | | | |

Sample ID: **LCSD-96213** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 10:58:10 AM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.95 | 1.00 | 10.00 | 0 | 99.5 | 90 | 110 | 0.142 | 20 | |
| Fluoride | 3.69 | 0.400 | 4.000 | 0 | 92.3 | 90 | 110 | 0.300 | 20 | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.7 | 90 | 110 | 0.199 | 20 | |

Sample ID: **2005032-01CMS** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 6:17:07 PM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2090 | 100 | 2000 | 152.7 | 97.0 | 90 | 110 | | | |
| Fluoride | 1990 | 40.0 | 2000 | 0 | 99.4 | 90 | 110 | | | |
| Sulfate | 2060 | 300 | 2000 | 104.8 | 97.7 | 90 | 110 | | | |

Sample ID: **2005032-01CMSD** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 6:33:07 PM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2100 | 100 | 2000 | 152.7 | 97.2 | 90 | 110 | 0.222 | 20 | |
| Fluoride | 2000 | 40.0 | 2000 | 0 | 100 | 90 | 110 | 0.595 | 20 | |
| Sulfate | 2050 | 300 | 2000 | 104.8 | 97.4 | 90 | 110 | 0.233 | 20 | |

Sample ID: **2005022-01BMS** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 6:49:07 PM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200507A**

| Sample ID: **2005022-01BMS** | Batch ID: **96213** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 6:49:07 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 243 | 10.0 | 200.0 | 46.49 | 98.2 | 90 | 110 | | | |
| Fluoride | 223 | 4.00 | 200.0 | 21.81 | 101 | 90 | 110 | | | |
| Sulfate | 458 | 30.0 | 200.0 | 267.4 | 95.5 | 90 | 110 | | | |

| Sample ID: **2005022-01BMSD** | Batch ID: **96213** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 7:05:07 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 240 | 10.0 | 200.0 | 46.49 | 97.0 | 90 | 110 | 0.970 | 20 | |
| Fluoride | 223 | 4.00 | 200.0 | 21.81 | 100 | 90 | 110 | 0.247 | 20 | |
| Sulfate | 458 | 30.0 | 200.0 | 267.4 | 95.1 | 90 | 110 | 0.187 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200507A**

| Sample ID: **ICV-200507** | Batch ID: **R110392** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 9:54:10 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.7 | 1.00 | 25.00 | 0 | 98.9 | 90 | 110 | | | |
| Fluoride | 9.55 | 0.400 | 10.00 | 0 | 95.5 | 90 | 110 | | | |
| Sulfate | 74.8 | 3.00 | 75.00 | 0 | 99.7 | 90 | 110 | | | |

| Sample ID: **CCV1-200507** | Batch ID: **R110392** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 5:29:07 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.94 | 1.00 | 10.00 | 0 | 99.4 | 90 | 110 | | | |
| Fluoride | 3.75 | 0.400 | 4.000 | 0 | 93.6 | 90 | 110 | | | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID: **CCV2-200507** | Batch ID: **R110392** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 10:33:07 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.0 | 1.00 | 10.00 | 0 | 100 | 90 | 110 | | | |
| Fluoride | 3.81 | 0.400 | 4.000 | 0 | 95.3 | 90 | 110 | | | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 98.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_200507D**

The QC data in batch 96250 applies to the following samples: 2005040-01B, 2005040-02B

| Sample ID: **MB-96250** | Batch ID: **96250** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_200507D** | Analysis Date: **5/7/2020 4:50:00 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-96250** | Batch ID: **96250** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_200507D** | Analysis Date: **5/7/2020 4:50:00 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 746 | 10.0 | 745.6 | 0 | 100 | 90 | 113 | | | |

| Sample ID: **2005023-01A-DUP** | Batch ID: **96250** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_200507D** | Analysis Date: **5/7/2020 4:50:00 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1040 | 50.0 | 0 | 1055 | | | | 1.43 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Antimony | 0.000800 | 0.00250 |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Cadmium | 0.000300 | 0.00100 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Molybdenum | 0.00200 | 0.00500 |
| Selenium | 0.00200 | 0.00500 |
| Thallium | 0.000500 | 0.00150 |

| **TestNo: SW7470A** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Mercury | 0.0000800 | 0.000200 |

| **TestNo: M2540C** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

June 10, 2020



## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1217407 |
| Samples Received: | 05/12/2020 |
| Project Number: | 2005040 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

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## FGD-6 L1217407-01 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time | |
|---|---|---|---|---|---|---|
| | | | | 05/06/20 13:20 | 05/12/20 10:30 | |
| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
| Radiochemistry by Method 904 | WG1475267 | 1 | 05/18/20 12:10 | 05/28/20 10:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1483326 | 1 | 05/28/20 11:33 | 06/04/20 13:38 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1483326 | 1 | 05/28/20 11:33 | 06/04/20 13:38 | RGT | Mt. Juliet, TN |

## FGD-3 L1217407-02 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time | |
|---|---|---|---|---|---|---|
| | | | | 05/06/20 14:20 | 05/12/20 10:30 | |
| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
| Radiochemistry by Method 904 | WG1475267 | 1 | 05/18/20 12:10 | 05/28/20 10:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1483326 | 1 | 05/28/20 11:33 | 05/29/20 15:55 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1483326 | 1 | 05/28/20 11:33 | 05/29/20 15:55 | RGT | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.845 | | 0.520 | 0.976 | 05/28/2020 10:30 | WG1475267 |
| *(T) Barium* | *87.4* | | | *62.0-143* | *05/28/2020 10:30* | WG1475267 |
| *(T) Yttrium* | *115* | | | *79.0-136* | *05/28/2020 10:30* | WG1475267 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.36 | | 0.765 | 1.13 | 06/04/2020 13:38 | WG1483326 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.513 | | 0.245 | 0.154 | 06/04/2020 13:38 | WG1483326 |
| *(T) Barium-133* | *120* | | | *30.0-143* | *06/04/2020 13:38* | WG1483326 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.463 | | 0.606 | 1.07 | 05/28/2020 10:30 | WG1475267 |
| *(T) Barium* | *90.5* | | | *62.0-143* | *05/28/2020 10:30* | WG1475267 |
| *(T) Yttrium* | *117* | | | *79.0-136* | *05/28/2020 10:30* | WG1475267 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 0.857 | | 0.859 | 1.31 | 05/29/2020 15:55 | WG1483326 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.394 | | 0.253 | 0.237 | 05/29/2020 15:55 | WG1483326 |
| *(T) Barium-133* | *116* | | | *30.0-143* | *05/29/2020 15:55* | WG1483326 |

## Method Blank (MB)

(MB) R3530968-1 05/22/20 10:30

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | 0.194 | | 0.455 |
| *(T) Barium* | *90.0* | | |
| *(T) Yttrium* | *108* | | |

## Laboratory Control Sample (LCS)

(LCS) R3530968-2 05/22/20 10:30

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 4.86 | 97.2 | 80.0-120 | |
| *(T) Barium* | | | *82.1* | | |
| *(T) Yttrium* | | | *106* | | |

## Method Blank (MB)

(MB) R3535339-1 06/03/20 14:24

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-226 | 0.000 | | 0.0602 |
| *(T) Barium-133* | *98.2* | | |

## Laboratory Control Sample (LCS)

(LCS) R3535339-2 06/03/20 14:24

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 5.02 | 5.19 | 103 | 80.0-120 | |
| *(T) Barium-133* | | | *102* | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| | The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG. |

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LAO00356 |
| Kentucky [1 6] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

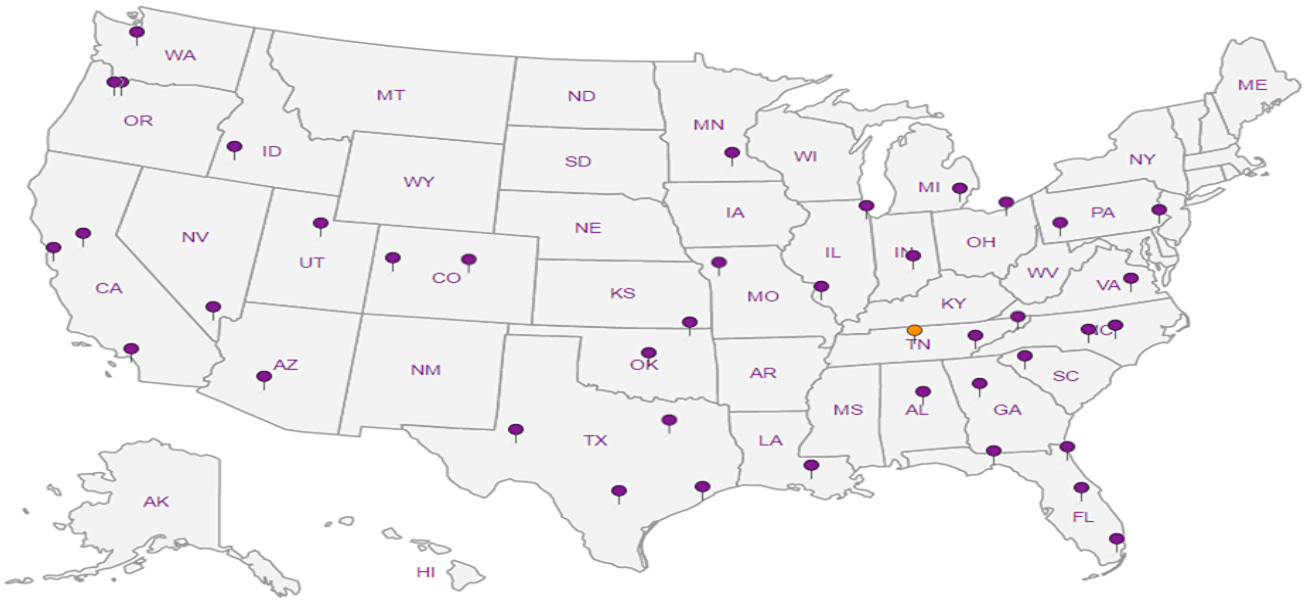
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



G138

Work Order: 2005040

1217467

07-May-20

**Subcontractor:**
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests: Ra-228 E904.0 (12) | Ra-226 M7500 Ra B M (12) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | Aqueous | 01C | 05/06/20 01:20 PM | 1LHDPEHNO3 | 1 | | | | | -01 |
| FGD-6 | Aqueous | 01D | 05/06/20 01:20 PM | 1LHDPEHNO3 | | 1 | | | | 1 |
| FGD-3 | Aqueous | 02C | 05/06/20 02:20 PM | 1LHDPEHNO3 | 1 | | | | | 02 |
| FGD-3 | Aqueous | 02D | 05/06/20 02:20 PM | 1LHDPEHNO3 | | 1 | | | | 1 |

General Comments:
Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| Relinquished by: | [signature] | 5/8/20 1700 | Received by: | Carol Kemp | 5/11/20 10:30 |
| Relinquished by: | | | Received by: | | |

Amb

# Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | |
|---|---|---|
| Client: DHLRRTX | 1217407 | |
| Cooler Received/Opened On: 5/12/20 Temperature: | Amb | |
| Received By: Carol Kemp | | |
| Signature: Carol Kemp | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | | | |
| COC Signed / Accurate? | | ✓ | |
| Bottles arrive intact? | | ✓ | |
| Correct bottles used? | | ✓ | |
| Sufficient volume sent? | | ✓ | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | ✓ | | |

June 12, 2020

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2005079

RE: Luminant-OGSES FGD PONDS

Dear Will Vienne:

DHL Analytical, Inc. received 7 sample(s) on 5/12/2020 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-20-25

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# CHAIN-OF-CUSTODY

№ 68289

CLIENT: GOLDER ASSOCIATES
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-11-20 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 2005079
PROJECT LOCATION OR NAME: LUMINANT - OGSES FGD PONDS
CLENT PROJECT #: 19122262 COLLECTOR: J. BEATON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | PRESERVATION HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-4 | 01 | 5-11-20 | 0745 | W | P | 4 | | X | | X | | X | |
| FGD-2 | 02 | | 0835 | W | P | 4 | | X | | X | | X | |
| FGD-5 | 03 | | 0925 | W | P | 4 | | X | | X | | X | |
| FGD-1 | 04 | | 1015 | W | P | 4 | | X | | X | | X | |
| FGD-8 | 05 | | 1110 | W | P | 4 | | X | | X | | X | |
| FGD-11 | 06 | | 1245 | W | P | 4 | | X | | X | | X | |
| FGD-12 | 07 | | 1345 | W | P | 4 | | X | | X | | X | |

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | APPENDIX III & IV

RELINQUISHED BY: (Signature) DATE/TIME 5-11-20 1730 RECEIVED BY: (Signature) FedEx
RELINQUISHED BY: (Signature) DATE/TIME 5.12.2020 0715 RECEIVED BY: (Signature)
FedEx
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

~~APPENDIX F Revision 1 November 21, 2022~~
❑ DHL DISPOSAL @ $5.00 each ❑ Return



**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☑
OTHER ❑

**LABORATORY USE ONLY:**
RECEIVING TEMP: 1.5, 1.8, 3.3, 1.3 THERM #: 78
CUSTODY SEALS: ❑ BROKEN ☑ INTACT ❑ NOT USED
CARRIER: ❑ LONE STAR ☑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED

DHL COC Rev 1 | FEB 2010

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

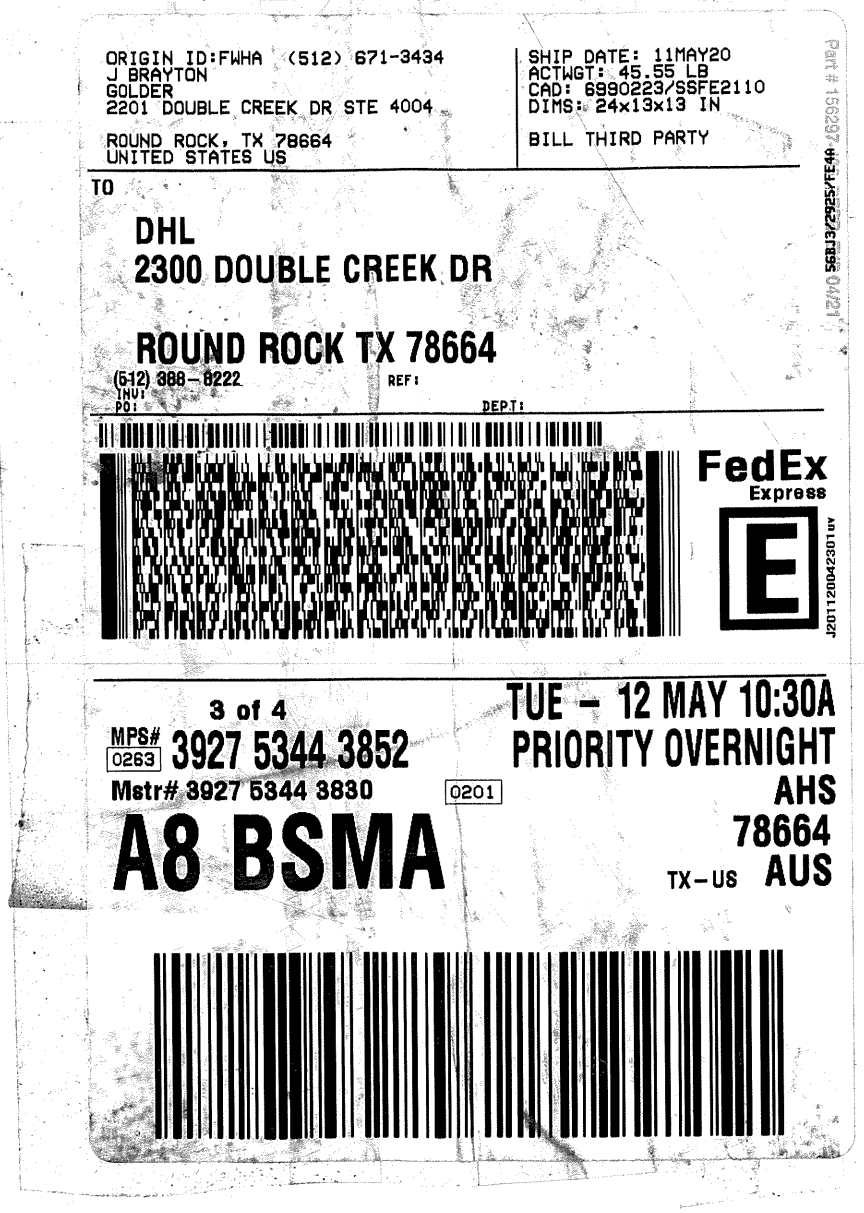
Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

---

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis



ORIGIN ID:FWHA (512) 671-3434
J BRAYTON
GOLDER
2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 11MAY20
ACTWGT: 45.55 LB
CAD: 6990223/SSFE2110
DIMS: 24x13x13 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx Express

J2D1120042301uv

3 of 4
MPS# 0263 3927 5344 3852
Mstr# 3927 5344 3830

0201

A8 BSMA

TUE - 12 MAY 10:30A
PRIORITY OVERNIGHT
AHS
78664
TX-US AUS

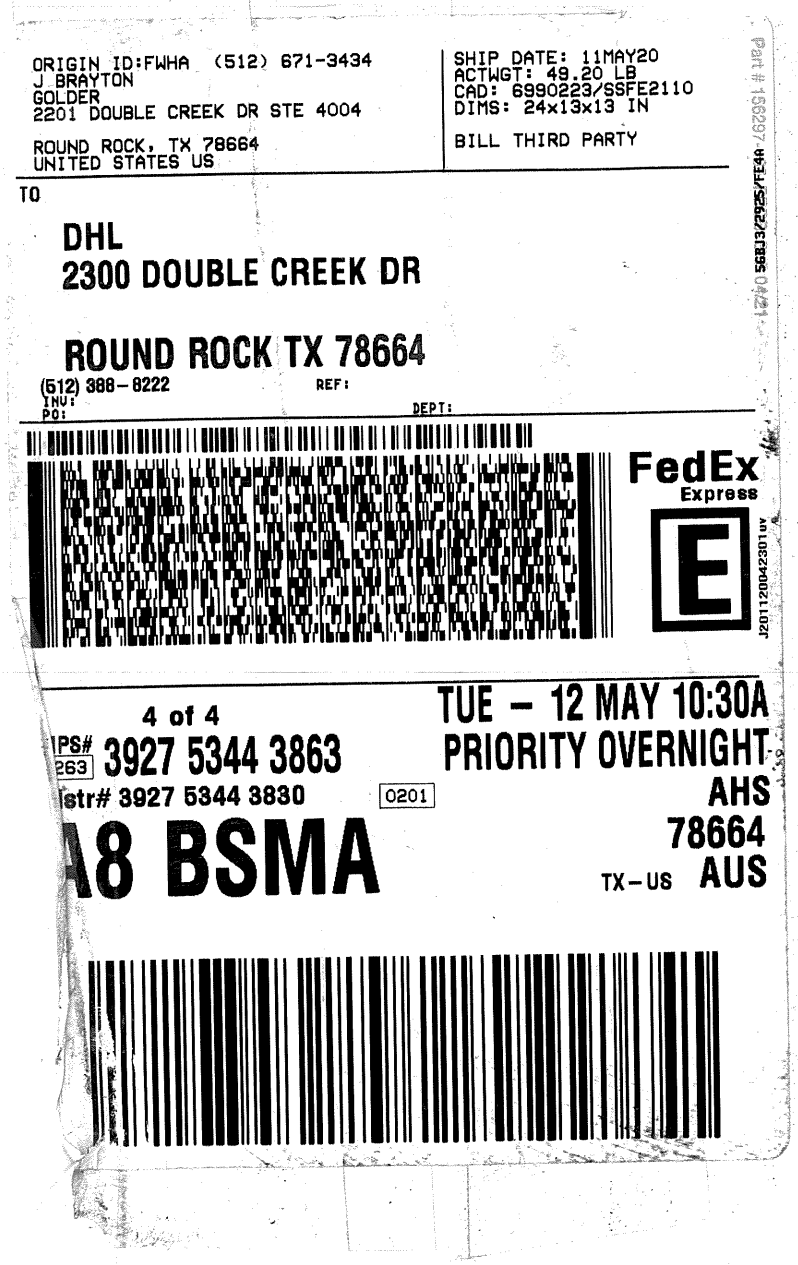
1.5
290

CUSTODY SEAL

DATE 5/11/20

SIGNATURE

DHL ANALYTICAL



ORIGIN ID:FWHA (512) 671-3434
J BRAYTON
GOLDER
2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 11MAY20
ACTWGT: 49.20 LB
CAD: 6990223/SSFE2110
DIMS: 24x13x13 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx Express

4 of 4
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str# 3927 5344 3830 0201

TUE - 12 MAY 10:30A
PRIORITY OVERNIGHT
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TX-US AUS

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**CUSTODY SEAL**

DATE 5-11-20

SIGNATURE

DHL ANALYTICAL

ORIGIN ID:FWHA (512) 671-3434
J BRAYTON
GOLDER
2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 11MAY20
ACTWGT: 45.55 LB
CAD: 5990223/SSFE2110
DIMS: 24x13x13 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(512) 388-8222
INV:
PO:
REF:
DEPT:

FedEx Express

2 of 4
MPS# 0263 3927 5344 3841
Mstr# 3927 5344 3830

0201

A8 BSMA

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CUSTODY SE AL

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CUSTODY S

EAL

DATE 5-14-21

SIGNATURE

DH

ANALY

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder**

Date Received: **5/12/2020**

Work Order Number **2005079**

Received by: **JH**

Checklist completed by: _____ 5/12/2020
Signature | Date

Reviewed by _____ 5/12/2020
Initials | Date

Carrier name: FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **1.5** °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? no | | Checked by Ec |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist: Reportable Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES FGD PONDS | **LRC Date:** 6/12/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2005079 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | X | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | X | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | X | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | X | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | X | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | X | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | X | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | X | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | X | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | X | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | X | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | X | | |
| | | **9)** If required for the project, TICs reported? | | | X | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | X | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | X | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | X | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | X | | | | |
| | | **4)** Were blank concentrations < MDL? | X | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | X | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | X | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | X | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | X | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | X | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | X | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | X | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | X | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | X | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | X | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | X | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | X | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | X | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | X | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | X | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | X | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | X | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | X | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES FGD PONDS | **LRC Date:** 6/12/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2005079 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | X | | | **S9-09** |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

06/12/20
Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *12-Jun-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD PONDS
**Lab Order:** 2005079

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis

Exception Report R1-01

The samples were received and log-in performed on 5/12/20. A total of 7 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Anions analysis performed on 5/13/20 (batch 96331) the matrix spikes and matrix spike duplicates recoveries (2005007-01 MS/MSD & 2005077-02 MS/MSD) were out of control limits for Chloride and/or Sulfate. This was due to matrix effect. These are flagged accordingly in the QC summary report. The samples selected for the matrix spikes and matrix spike duplicates were not from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

For Metals analysis performed on 5/20/20 the matrix spike and matrix spike duplicate recoveries were above control limits for Boron. These are flagged accordingly. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

Exception Report S9-01

For Metals analysis performed on 5/19/20 the PDS recovery was out of control limits for Calcium. This is flagged accordingly in the QC summary report. The serial dilution was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *12-Jun-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD PONDS
**Lab Order:** 2005079

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2005079-01 | FGD-4 | | 05/11/20 07:45 AM | 5/12/2020 |
| 2005079-02 | FGD-2 | | 05/11/20 08:35 AM | 5/12/2020 |
| 2005079-03 | FGD-5 | | 05/11/20 09:25 AM | 5/12/2020 |
| 2005079-04 | FGD-1 | | 05/11/20 10:15 AM | 5/12/2020 |
| 2005079-05 | FGD-8 | | 05/11/20 11:10 AM | 5/12/2020 |
| 2005079-06 | FGD-11 | | 05/11/20 12:45 PM | 5/12/2020 |
| 2005079-07 | FGD-12 | | 05/11/20 01:45 PM | 5/12/2020 |

**Lab Order:** 2005079
**Client:** Golder
**Project:** Luminant-OGSES FGD PONDS

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005079-01A | FGD-4 | 05/11/20 07:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-01B | FGD-4 | 05/11/20 07:45 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-02A | FGD-2 | 05/11/20 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-02B | FGD-2 | 05/11/20 08:35 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-03A | FGD-5 | 05/11/20 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-03B | FGD-5 | 05/11/20 09:25 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-04A | FGD-1 | 05/11/20 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-04B | FGD-1 | 05/11/20 10:15 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |

**Lab Order:** 2005079
**Client:** Golder
**Project:** Luminant-OGSES FGD PONDS

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005079-04B | FGD-1 | 05/11/20 10:15 AM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-05A | FGD-8 | 05/11/20 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-05B | FGD-8 | 05/11/20 11:10 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-06A | FGD-11 | 05/11/20 12:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-06B | FGD-11 | 05/11/20 12:45 PM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | E300 | Anion Preparation | 05/15/20 10:09 AM | 96363 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-07A | FGD-12 | 05/11/20 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-07B | FGD-12 | 05/11/20 01:45 PM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |

**Lab Order:** 2005079
**Client:** Golder
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005079-01A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 11:59 AM | CETAC2_HG_200519B |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 12:55 PM | ICP-MS5_200519B |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:27 PM | ICP-MS5_200520B |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 10 | 05/20/20 01:28 PM | ICP-MS5_200520B |
| 2005079-01B | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 08:08 PM | IC2_200513A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/13/20 11:20 PM | IC2_200513A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-02A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:10 PM | CETAC2_HG_200519B |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 12:57 PM | ICP-MS5_200519B |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:30 PM | ICP-MS5_200520B |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 20 | 05/20/20 01:30 PM | ICP-MS5_200520B |
| 2005079-02B | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 96331 | 100 | 05/13/20 06:48 PM | IC2_200513A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 08:24 PM | IC2_200513A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/13/20 11:36 PM | IC2_200513A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-03A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:12 PM | CETAC2_HG_200519B |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 01:00 PM | ICP-MS5_200519B |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:32 PM | ICP-MS5_200520B |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 10 | 05/20/20 01:33 PM | ICP-MS5_200520B |
| 2005079-03B | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 08:40 PM | IC2_200513A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/13/20 11:52 PM | IC2_200513A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-04A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:15 PM | CETAC2_HG_200519B |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 10 | 05/20/20 01:35 PM | ICP-MS5_200520B |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 01:02 PM | ICP-MS5_200519B |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:34 PM | ICP-MS5_200520B |

**Lab Order:** 2005079
**Client:** Golder
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005079-04B | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/14/20 12:08 AM | IC2_200513A |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 08:56 PM | IC2_200513A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-05A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:17 PM | CETAC2_HG_200519B |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 01:04 PM | ICP-MS5_200519B |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:36 PM | ICP-MS5_200520B |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 50 | 05/20/20 01:37 PM | ICP-MS5_200520B |
| 2005079-05B | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 96331 | 100 | 05/13/20 07:04 PM | IC2_200513A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 09:12 PM | IC2_200513A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/14/20 12:24 AM | IC2_200513A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-06A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:19 PM | CETAC2_HG_200519B |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 10 | 05/20/20 01:39 PM | ICP-MS5_200520B |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 01:06 PM | ICP-MS5_200519B |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:38 PM | ICP-MS5_200520B |
| 2005079-06B | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 10:48 PM | IC2_200513A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/14/20 12:40 AM | IC2_200513A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 96363 | 100 | 05/15/20 03:28 PM | IC2_200515A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-07A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:21 PM | CETAC2_HG_200519B |
| | FGD-12 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 01:09 PM | ICP-MS5_200519B |
| | FGD-12 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:41 PM | ICP-MS5_200520B |
| 2005079-07B | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 11:04 PM | IC2_200513A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/14/20 12:56 AM | IC2_200513A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-01 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 07:45 AM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 12:55 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:55 PM |
| Barium | 0.104 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 12:55 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:55 PM |
| Boron | 0.145 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:27 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:55 PM |
| Calcium | 40.6 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 01:28 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:55 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 12:55 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:55 PM |
| Lithium | 0.0166 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 12:55 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:55 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:55 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 12:55 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 11:59 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 198 | 3.00 | 10.0 | | mg/L | 10 | 05/13/20 08:08 PM |
| Fluoride | 0.300 | 0.100 | 0.400 | J | mg/L | 1 | 05/13/20 11:20 PM |
| Sulfate | 52.9 | 1.00 | 3.00 | | mg/L | 1 | 05/13/20 11:20 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 702 | 10.0 | 10.0 | | mg/L | 1 | 05/13/20 05:00 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
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- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-02 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 08:35 AM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 12:57 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:57 PM |
| Barium | 0.108 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 12:57 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:57 PM |
| Boron | 0.605 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:30 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:57 PM |
| Calcium | 217 | 2.00 | 6.00 | | mg/L | 20 | 05/20/20 01:30 PM |
| Chromium | 0.00234 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/19/20 12:57 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 12:57 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:57 PM |
| Lithium | 0.0280 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 12:57 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:57 PM |
| Selenium | 0.0208 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:57 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 12:57 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:10 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 1150 | 30.0 | 100 | | mg/L | 100 | 05/13/20 06:48 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/13/20 11:36 PM |
| Sulfate | 286 | 10.0 | 30.0 | | mg/L | 10 | 05/13/20 08:24 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 2300 | 50.0 | 50.0 | | mg/L | 1 | 05/13/20 05:00 PM |

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C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-03 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 09:25 AM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 01:00 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:00 PM |
| Barium | 0.0959 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 01:00 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:00 PM |
| Boron | 0.165 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:32 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:00 PM |
| Calcium | 100 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 01:33 PM |
| Chromium | 0.0374 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:00 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 01:00 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:00 PM |
| Lithium | 0.156 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 01:00 PM |
| Molybdenum | 0.00561 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:00 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:00 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 01:00 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:12 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 307 | 3.00 | 10.0 | | mg/L | 10 | 05/13/20 08:40 PM |
| Fluoride | 0.413 | 0.100 | 0.400 | | mg/L | 1 | 05/13/20 11:52 PM |
| Sulfate | 83.8 | 1.00 | 3.00 | | mg/L | 1 | 05/13/20 11:52 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 836 | 10.0 | 10.0 | | mg/L | 1 | 05/13/20 05:00 PM |

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C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-04 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 10:15 AM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 01:02 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:02 PM |
| Barium | 0.131 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 01:02 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:02 PM |
| Boron | 0.121 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:34 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:02 PM |
| Calcium | 37.8 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 01:35 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:02 PM |
| Cobalt | 0.0495 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 01:02 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:02 PM |
| Lithium | 0.0548 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 01:02 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:02 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:02 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 01:02 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:15 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 146 | 3.00 | 10.0 | | mg/L | 10 | 05/13/20 08:56 PM |
| Fluoride | 0.231 | 0.100 | 0.400 | J | mg/L | 1 | 05/14/20 12:08 AM |
| Sulfate | 79.5 | 1.00 | 3.00 | | mg/L | 1 | 05/14/20 12:08 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 448 | 10.0 | 10.0 | | mg/L | 1 | 05/13/20 05:00 PM |

**Qualifiers:**

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- DF- Dilution Factor
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- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-05 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 11:10 AM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 01:04 PM |
| Arsenic | 0.00663 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:04 PM |
| Barium | 0.732 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 01:04 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:04 PM |
| Boron | 0.129 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:36 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:04 PM |
| Calcium | 381 | 5.00 | 15.0 | | mg/L | 50 | 05/20/20 01:37 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:04 PM |
| Cobalt | 0.00840 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 01:04 PM |
| Lead | 0.000415 | 0.000300 | 0.00100 | J | mg/L | 1 | 05/19/20 01:04 PM |
| Lithium | 0.0152 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 01:04 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:04 PM |
| Selenium | 0.00210 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/19/20 01:04 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 01:04 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:17 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 2240 | 30.0 | 100 | | mg/L | 100 | 05/13/20 07:04 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/14/20 12:24 AM |
| Sulfate | 188 | 10.0 | 30.0 | | mg/L | 10 | 05/13/20 09:12 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 4090 | 50.0 | 50.0 | | mg/L | 1 | 05/13/20 05:00 PM |

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C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-06 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 12:45 PM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 01:06 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:06 PM |
| Barium | 0.347 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 01:06 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:06 PM |
| Boron | 0.166 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:38 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:06 PM |
| Calcium | 103 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 01:39 PM |
| Chromium | 0.0146 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:06 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 01:06 PM |
| Lead | 0.000658 | 0.000300 | 0.00100 | J | mg/L | 1 | 05/19/20 01:06 PM |
| Lithium | 0.0132 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 01:06 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:06 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:06 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 01:06 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:19 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 560 | 30.0 | 100 | | mg/L | 100 | 05/15/20 03:28 PM |
| Fluoride | 0.365 | 0.100 | 0.400 | J | mg/L | 1 | 05/14/20 12:40 AM |
| Sulfate | 43.3 | 1.00 | 3.00 | | mg/L | 1 | 05/14/20 12:40 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1300 | 50.0 | 50.0 | | mg/L | 1 | 05/13/20 05:00 PM |

**Qualifiers:**

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C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-07 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 01:45 PM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 01:09 PM |
| Arsenic | 0.0116 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:09 PM |
| Barium | 0.230 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 01:09 PM |
| Beryllium | 0.00166 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:09 PM |
| Boron | 0.149 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:41 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:09 PM |
| Calcium | 15.6 | 0.100 | 0.300 | | mg/L | 1 | 05/20/20 12:41 PM |
| Chromium | 0.0370 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:09 PM |
| Cobalt | 0.00883 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 01:09 PM |
| Lead | 0.0249 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:09 PM |
| Lithium | 0.0371 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 01:09 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:09 PM |
| Selenium | 0.00678 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:09 PM |
| Thallium | 0.000651 | 0.000500 | 0.00150 | J | mg/L | 1 | 05/19/20 01:09 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:21 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 19.3 | 0.300 | 1.00 | | mg/L | 1 | 05/14/20 12:56 AM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/14/20 12:56 AM |
| Sulfate | 19.9 | 1.00 | 3.00 | | mg/L | 1 | 05/14/20 12:56 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 198 | 10.0 | 10.0 | | mg/L | 1 | 05/13/20 05:00 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200304C**

Sample ID: **DCS-95289** Batch ID: **95289** TestNo: **SW7470A** Units: **mg/L**
SampType: **DCS** Run ID: **CETAC2_HG_200304C** Analysis Date: **3/4/2020 12:11:09 PM** Prep Date: **3/4/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.000175 | 0.000200 | 0.000200 | 0 | 87.5 | 82 | 119 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200519B**

The QC data in batch 96370 applies to the following samples: 2005079-01A, 2005079-02A, 2005079-03A, 2005079-04A, 2005079-05A, 2005079-06A, 2005079-07A

Sample ID: **MB-96370** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **MBLK** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 11:47:54 AM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

Sample ID: **LCS-96370** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **LCS** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 11:50:10 AM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00205 | 0.000200 | 0.00200 | 0 | 103 | 85 | 115 | | | |

Sample ID: **LCSD-96370** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **LCSD** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 11:52:26 AM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00194 | 0.000200 | 0.00200 | 0 | 97.0 | 85 | 115 | 5.51 | 15 | |

Sample ID: **2005079-01A MS** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **MS** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 12:01:30 PM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00191 | 0.000200 | 0.00200 | 0 | 95.5 | 80 | 120 | | | |

Sample ID: **2005079-01A MSD** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **MSD** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 12:03:46 PM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00209 | 0.000200 | 0.00200 | 0 | 104 | 80 | 120 | 9.00 | 15 | |

Sample ID: **2005079-01A SD** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **SD** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 12:06:02 PM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

Sample ID: **2005079-01A PDS** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **PDS** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 12:08:18 PM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00226 | 0.000200 | 0.00250 | 0 | 90.4 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200519B**

| Sample ID: **ICV-200519** | Batch ID: **R110550** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_200519B** | Analysis Date: **5/19/2020 10:31:55 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00391 | 0.000200 | 0.00400 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID: **CCV2-200519** | Batch ID: **R110550** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_200519B** | Analysis Date: **5/19/2020 11:42:21 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00213 | 0.000200 | 0.00200 | 0 | 106 | 90 | 110 | | | |

| Sample ID: **CCV3-200519** | Batch ID: **R110550** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_200519B** | Analysis Date: **5/19/2020 12:26:27 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00214 | 0.000200 | 0.00200 | 0 | 107 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200408C**

| Sample ID: **DCS1-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:16:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.000932 | 0.00250 | 0.00100 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Beryllium | 0.000472 | 0.00100 | 0.000500 | 0 | 94.4 | 70 | 130 | 0 | 0 | |
| Cadmium | 0.000492 | 0.00100 | 0.000500 | 0 | 98.4 | 70 | 130 | 0 | 0 | |
| Lead | 0.000496 | 0.00100 | 0.000500 | 0 | 99.2 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000468 | 0.00150 | 0.000500 | 0 | 93.6 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS2-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:19:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.310 | 0.300 | 0.300 | 0 | 103 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS3-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:21:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00466 | 0.00500 | 0.00500 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Barium | 0.00478 | 0.0100 | 0.00500 | 0 | 95.6 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00600 | 0.00500 | 0.00500 | 0 | 120 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00473 | 0.00500 | 0.00500 | 0 | 94.6 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00473 | 0.0100 | 0.00500 | 0 | 94.6 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00466 | 0.00500 | 0.00500 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:28:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0286 | 0.0300 | 0.0300 | 0 | 95.2 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200519B**

The QC data in batch 96359 applies to the following samples: 2005079-01A, 2005079-02A, 2005079-03A, 2005079-04A, 2005079-05A, 2005079-06A, 2005079-07A

Sample ID: **MB-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 12:37:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID: **LCS-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 12:40:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Barium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Cadmium | 0.206 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Calcium | 5.42 | 0.300 | 5.00 | 0 | 108 | 80 | 120 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lead | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 80 | 120 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 99.9 | 80 | 120 | | | |

Sample ID: **LCSD-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 12:42:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | 0.135 | 15 | |
| Arsenic | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.366 | 15 | |
| Barium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 1.84 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200519B**

| Sample ID: **LCSD-96359** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 12:42:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.541 | 15 | |
| Cadmium | 0.209 | 0.00100 | 0.200 | 0 | 104 | 80 | 120 | 1.41 | 15 | |
| Calcium | 5.32 | 0.300 | 5.00 | 0 | 106 | 80 | 120 | 2.00 | 15 | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.209 | 15 | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.548 | 15 | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.6 | 80 | 120 | 0.766 | 15 | |
| Lithium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 80 | 120 | 1.71 | 15 | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.262 | 15 | |
| Selenium | 0.212 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | 0.751 | 15 | |
| Thallium | 0.198 | 0.00150 | 0.200 | 0 | 99.2 | 80 | 120 | 0.704 | 15 | |

| Sample ID: **2005111-01B SD** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 12:53:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 20 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0.00893 | | | | 0 | 20 | |
| Barium | 0.0171 | 0.0500 | 0 | 0.0170 | | | | 0.492 | 20 | |
| Beryllium | 0.0169 | 0.00500 | 0 | 0.0164 | | | | 3.12 | 20 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Calcium | 260 | 1.50 | 0 | 257 | | | | 0.815 | 20 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0.00205 | | | | 0 | 20 | |
| Cobalt | 0.449 | 0.0250 | 0 | 0.439 | | | | 2.12 | 20 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Lithium | 0.248 | 0.0500 | 0 | 0.249 | | | | 0.282 | 20 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Selenium | 0.0328 | 0.0250 | 0 | 0.0299 | | | | 9.36 | 20 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 20 | |

| Sample ID: **2005111-01B PDS** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 1:20:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0.00893 | 95.3 | 75 | 125 | | | |
| Barium | 0.225 | 0.0100 | 0.200 | 0.0170 | 104 | 75 | 125 | | | |
| Beryllium | 0.203 | 0.00100 | 0.200 | 0.0164 | 93.4 | 75 | 125 | | | |
| Cadmium | 0.195 | 0.00100 | 0.200 | 0 | 97.5 | 75 | 125 | | | |
| Calcium | 248 | 0.300 | 5.00 | 257 | -182 | 75 | 125 | | | S |
| Chromium | 0.202 | 0.00500 | 0.200 | 0.00205 | 99.7 | 75 | 125 | | | |
| Cobalt | 0.606 | 0.00500 | 0.200 | 0.439 | 83.3 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200519B**

| Sample ID: **2005111-01B PDS** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 1:20:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.203 | 0.00100 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Lithium | 0.417 | 0.0100 | 0.200 | 0.249 | 84.4 | 75 | 125 | | | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 103 | 75 | 125 | | | |
| Selenium | 0.217 | 0.00500 | 0.200 | 0.0299 | 93.6 | 75 | 125 | | | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 101 | 75 | 125 | | | |

| Sample ID: **2005111-01B MS** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 1:22:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0.00893 | 97.3 | 75 | 125 | | | |
| Barium | 0.223 | 0.0100 | 0.200 | 0.0170 | 103 | 75 | 125 | | | |
| Beryllium | 0.206 | 0.00100 | 0.200 | 0.0164 | 94.7 | 75 | 125 | | | |
| Cadmium | 0.194 | 0.00100 | 0.200 | 0 | 96.8 | 75 | 125 | | | |
| Calcium | 263 | 0.300 | 5.00 | 257 | 118 | 75 | 125 | | | |
| Chromium | 0.194 | 0.00500 | 0.200 | 0.00205 | 96.1 | 75 | 125 | | | |
| Cobalt | 0.633 | 0.00500 | 0.200 | 0.439 | 96.8 | 75 | 125 | | | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 75 | 125 | | | |
| Lithium | 0.430 | 0.0100 | 0.200 | 0.249 | 90.6 | 75 | 125 | | | |
| Molybdenum | 0.211 | 0.00500 | 0.200 | 0 | 106 | 75 | 125 | | | |
| Selenium | 0.225 | 0.00500 | 0.200 | 0.0299 | 97.4 | 75 | 125 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.4 | 75 | 125 | | | |

| Sample ID: **2005111-01B MSD** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 1:24:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 75 | 125 | 0.929 | 15 | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0.00893 | 97.0 | 75 | 125 | 0.261 | 15 | |
| Barium | 0.219 | 0.0100 | 0.200 | 0.0170 | 101 | 75 | 125 | 2.08 | 15 | |
| Beryllium | 0.206 | 0.00100 | 0.200 | 0.0164 | 95.0 | 75 | 125 | 0.323 | 15 | |
| Cadmium | 0.193 | 0.00100 | 0.200 | 0 | 96.5 | 75 | 125 | 0.269 | 15 | |
| Calcium | 262 | 0.300 | 5.00 | 257 | 92.8 | 75 | 125 | 0.471 | 15 | |
| Chromium | 0.193 | 0.00500 | 0.200 | 0.00205 | 95.7 | 75 | 125 | 0.411 | 15 | |
| Cobalt | 0.632 | 0.00500 | 0.200 | 0.439 | 96.4 | 75 | 125 | 0.138 | 15 | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 100 | 75 | 125 | 1.06 | 15 | |
| Lithium | 0.437 | 0.0100 | 0.200 | 0.249 | 94.3 | 75 | 125 | 1.66 | 15 | |
| Molybdenum | 0.208 | 0.00500 | 0.200 | 0 | 104 | 75 | 125 | 1.36 | 15 | |
| Selenium | 0.227 | 0.00500 | 0.200 | 0.0299 | 98.3 | 75 | 125 | 0.785 | 15 | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 100 | 75 | 125 | 0.951 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200519B**

Sample ID: **ICV-200519** Batch ID: **R110549** TestNo: **SW6020B** Units: **mg/L**
SampType: **ICV** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 10:48:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.101 | 0.00250 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.0990 | 0.00500 | 0.100 | 0 | 99.0 | 90 | 110 | | | |
| Barium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Beryllium | 0.0981 | 0.00100 | 0.100 | 0 | 98.1 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.60 | 0.300 | 2.50 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.100 | 0.00500 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Lead | 0.0993 | 0.00100 | 0.100 | 0 | 99.3 | 90 | 110 | | | |
| Lithium | 0.0998 | 0.0100 | 0.100 | 0 | 99.8 | 90 | 110 | | | |
| Molybdenum | 0.0975 | 0.00500 | 0.100 | 0 | 97.5 | 90 | 110 | | | |
| Selenium | 0.103 | 0.00500 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.0973 | 0.00150 | 0.100 | 0 | 97.3 | 90 | 110 | | | |

Sample ID: **LCVL-200519** Batch ID: **R110549** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 11:00:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00203 | 0.00250 | 0.00200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 80 | 120 | | | |
| Barium | 0.00527 | 0.0100 | 0.00500 | 0 | 105 | 80 | 120 | | | |
| Beryllium | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 80 | 120 | | | |
| Cadmium | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 80 | 120 | | | |
| Calcium | 0.115 | 0.300 | 0.100 | 0 | 115 | 80 | 120 | | | |
| Chromium | 0.00502 | 0.00500 | 0.00500 | 0 | 100 | 80 | 120 | | | |
| Cobalt | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 80 | 120 | | | |
| Lead | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 80 | 120 | | | |
| Lithium | 0.0100 | 0.0100 | 0.0100 | 0 | 100 | 80 | 120 | | | |
| Molybdenum | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 80 | 120 | | | |
| Selenium | 0.00565 | 0.00500 | 0.00500 | 0 | 113 | 80 | 120 | | | |
| Thallium | 0.000986 | 0.00150 | 0.00100 | 0 | 98.6 | 80 | 120 | | | |

Sample ID: **CCV2-200519** Batch ID: **R110549** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 12:26:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200519B**

| Sample ID: **CCV2-200519** | Batch ID: **R110549** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 12:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.20 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 99.1 | 90 | 110 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.3 | 90 | 110 | | | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Selenium | 0.214 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID: **CCV3-200519** | Batch ID: **R110549** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 1:44:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.206 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Calcium | 5.19 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 98.0 | 90 | 110 | | | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Selenium | 0.215 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 97.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200520B**

The QC data in batch 96359 applies to the following samples: 2005079-01A, 2005079-02A, 2005079-03A, 2005079-04A, 2005079-05A, 2005079-06A, 2005079-07A

Sample ID: **MB-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:10:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

Sample ID: **LCS-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:13:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.193 | 0.0300 | 0.200 | 0 | 96.4 | 80 | 120 | | | |

Sample ID: **LCSD-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:15:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.208 | 0.0300 | 0.200 | 0 | 104 | 80 | 120 | 7.81 | 15 | |

Sample ID: **2005111-01B SD** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:26:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 20.5 | 7.50 | 0 | 19.0 | | | | 7.43 | 20 | |

Sample ID: **2005111-01B PDS** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:53:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 28.5 | 1.50 | 10.0 | 19.0 | 95.5 | 75 | 125 | | | |

Sample ID: **2005111-01B MS** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:55:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 21.0 | 1.50 | 0.200 | 19.0 | 1020 | 75 | 125 | | | S |

Sample ID: **2005111-01B MSD** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:57:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 21.3 | 1.50 | 0.200 | 19.0 | 1160 | 75 | 125 | 1.40 | 15 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200520B**

| Sample ID: **ICV-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 10:52:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0987 | 0.0300 | 0.100 | 0 | 98.7 | 90 | 110 | | | |
| Calcium | 2.60 | 0.300 | 2.50 | 0 | 104 | 90 | 110 | | | |

| Sample ID: **LCVL-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 11:04:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0216 | 0.0300 | 0.0200 | 0 | 108 | 80 | 120 | | | |
| Calcium | 0.106 | 0.300 | 0.100 | 0 | 106 | 80 | 120 | | | |

| Sample ID: **CCV1-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 12:00:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.200 | 0.0300 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Calcium | 4.94 | 0.300 | 5.00 | 0 | 98.9 | 90 | 110 | | | |

| Sample ID: **CCV2-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 12:52:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.195 | 0.0300 | 0.200 | 0 | 97.3 | 90 | 110 | | | |
| Calcium | 4.98 | 0.300 | 5.00 | 0 | 99.7 | 90 | 110 | | | |

| Sample ID: **CCV3-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 2:09:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.198 | 0.0300 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Calcium | 5.09 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200421A**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS2-96036** | Batch ID: **96036** | TestNo: **E300** | | Units: **mg/L** | |
| SampType: **DCS2** | Run ID: **IC2_200421A** | Analysis Date: **4/21/2020 11:47:08 AM** | | Prep Date: **4/21/2020** | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.420 | 1.00 | 0.5000 | 0 | 84.1 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.154 | 0.400 | 0.2000 | 0 | 77.1 | 70 | 130 | 0 | 0 | |
| Sulfate | 1.43 | 3.00 | 1.500 | 0 | 95.3 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200513A**

The QC data in batch 96331 applies to the following samples: 2005079-01B, 2005079-02B, 2005079-03B, 2005079-04B, 2005079-05B, 2005079-06B, 2005079-07B

Sample ID: **MB-96331** Batch ID: **96331** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_200513A** Analysis Date: **5/13/2020 12:03:31 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-96331** Batch ID: **96331** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_200513A** Analysis Date: **5/13/2020 12:19:31 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Fluoride | 3.73 | 0.400 | 4.000 | 0 | 93.2 | 90 | 110 | | | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

Sample ID: **LCSD-96331** Batch ID: **96331** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_200513A** Analysis Date: **5/13/2020 12:35:31 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | 0.114 | 20 | |
| Fluoride | 3.75 | 0.400 | 4.000 | 0 | 93.8 | 90 | 110 | 0.683 | 20 | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | 0.039 | 20 | |

Sample ID: **2005077-02BMS** Batch ID: **96331** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_200513A** Analysis Date: **5/14/2020 1:28:07 AM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 825 | 10.0 | 200.0 | 800.5 | 12.5 | 90 | 110 | | | S |
| Fluoride | 216 | 4.00 | 200.0 | 0 | 108 | 90 | 110 | | | |
| Sulfate | 494 | 30.0 | 200.0 | 288.5 | 103 | 90 | 110 | | | |

Sample ID: **2005077-02BMSD** Batch ID: **96331** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_200513A** Analysis Date: **5/14/2020 1:44:07 AM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 822 | 10.0 | 200.0 | 800.5 | 10.6 | 90 | 110 | 0.450 | 20 | S |
| Fluoride | 217 | 4.00 | 200.0 | 0 | 108 | 90 | 110 | 0.480 | 20 | |
| Sulfate | 494 | 30.0 | 200.0 | 288.5 | 103 | 90 | 110 | 0.008 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200513A**

| Sample ID: **2005077-01BMS** | Batch ID: **96331** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_200513A** | Analysis Date: **5/14/2020 2:00:07 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 105 | 1.00 | 20.00 | 108.6 | -16.4 | 90 | 110 | | | S |
| Fluoride | 19.4 | 0.400 | 20.00 | 0.2859 | 95.7 | 90 | 110 | | | |
| Sulfate | 70.1 | 3.00 | 20.00 | 52.44 | 88.2 | 90 | 110 | | | S |

| Sample ID: **2005077-01BMSD** | Batch ID: **96331** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_200513A** | Analysis Date: **5/14/2020 2:16:07 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | 20.00 | 108.6 | -543 | 90 | 110 | 0 | 20 | S |
| Fluoride | 19.4 | 0.400 | 20.00 | 0.2859 | 95.7 | 90 | 110 | 0.065 | 20 | |
| Sulfate | 70.1 | 3.00 | 20.00 | 52.44 | 88.5 | 90 | 110 | 0.074 | 20 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200513A**

| Sample ID: **ICV-200513** | Batch ID: **R110479** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_200513A** | Analysis Date: **5/13/2020 11:31:31 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 26.2 | 1.00 | 25.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 9.86 | 0.400 | 10.00 | 0 | 98.6 | 90 | 110 | | | |
| Sulfate | 78.8 | 3.00 | 75.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID: **CCV1-200513** | Batch ID: **R110479** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200513A** | Analysis Date: **5/13/2020 6:16:07 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | | | |
| Fluoride | 3.88 | 0.400 | 4.000 | 0 | 97.0 | 90 | 110 | | | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **CCV2-200513** | Batch ID: **R110479** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200513A** | Analysis Date: **5/13/2020 10:16:07 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Fluoride | 3.87 | 0.400 | 4.000 | 0 | 96.8 | 90 | 110 | | | |
| Sulfate | 30.1 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID: **CCV3-200513** | Batch ID: **R110479** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200513A** | Analysis Date: **5/14/2020 3:20:07 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.96 | 0.400 | 4.000 | 0 | 99.0 | 90 | 110 | | | |
| Sulfate | 30.6 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200515A**

The QC data in batch 96363 applies to the following samples: 2005079-06B

| Sample ID: **MB-96363** | Batch ID: **96363** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 11:51:21 AM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |

| Sample ID: **LCS-96363** | Batch ID: **96363** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 12:07:21 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **LCSD-96363** | Batch ID: **96363** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 12:23:21 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | 0.117 | 20 | |

| Sample ID: **2005112-01BMS** | Batch ID: **96363** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 4:00:25 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2220 | 100 | 2000 | 206.2 | 101 | 90 | 110 | | | |

| Sample ID: **2005112-01BMSD** | Batch ID: **96363** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 4:16:25 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2230 | 100 | 2000 | 206.2 | 101 | 90 | 110 | 0.373 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200515A**

| Sample ID: **ICV-200515** | Batch ID: **R110519** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 11:19:21 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 26.2 | 1.00 | 25.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID: **CCV1-200515** | Batch ID: **R110519** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 7:12:25 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_200513A**

The QC data in batch 96333 applies to the following samples: 2005079-01B, 2005079-02B, 2005079-03B, 2005079-04B, 2005079-05B, 2005079-06B, 2005079-07B

Sample ID: **MB-96333** Batch ID: **96333** TestNo: **M2540C** Units: **mg/L**
SampType: **MBLK** Run ID: **WC_200513A** Analysis Date: **5/13/2020 5:00:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

Sample ID: **LCS-96333** Batch ID: **96333** TestNo: **M2540C** Units: **mg/L**
SampType: **LCS** Run ID: **WC_200513A** Analysis Date: **5/13/2020 5:00:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 756 | 10.0 | 745.6 | 0 | 101 | 90 | 113 | | | |

Sample ID: **2005079-05B-DUP** Batch ID: **96333** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_200513A** Analysis Date: **5/13/2020 5:00:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 4120 | 50.0 | 0 | 4090 | | | | 0.609 | 5 | |

Sample ID: **2005079-06B-DUP** Batch ID: **96333** TestNo: **M2540C** Units: **mg/L**
SampType: **DUP** Run ID: **WC_200513A** Analysis Date: **5/13/2020 5:00:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1250 | 50.0 | 0 | 1295 | | | | 3.94 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Antimony | 0.000800 | 0.00250 |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Cadmium | 0.000300 | 0.00100 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Molybdenum | 0.00200 | 0.00500 |
| Selenium | 0.00200 | 0.00500 |
| Thallium | 0.000500 | 0.00150 |

| **TestNo: SW7470A** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Mercury | 0.0000800 | 0.000200 |

| **TestNo: M2540C** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

June 10, 2020



## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1219695 |
| Samples Received: | 05/18/2020 |
| Project Number: | 2005079 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

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## FGD-4 L1219695-01 Non-Potable Water

Collected by | Collected date/time 05/11/20 07:45 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/27/20 16:43 | RGT | Mt. Juliet, TN |

## FGD-2 L1219695-02 Non-Potable Water

Collected by | Collected date/time 05/11/20 08:35 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/04/20 10:10 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/04/20 10:10 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/27/20 16:43 | RGT | Mt. Juliet, TN |

## FGD-5 L1219695-03 Non-Potable Water

Collected by | Collected date/time 05/11/20 09:25 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/27/20 16:43 | RGT | Mt. Juliet, TN |

## FGD-1 L1219695-04 Non-Potable Water

Collected by | Collected date/time 05/11/20 10:15 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/28/20 13:43 | RGT | Mt. Juliet, TN |

## FGD-8 L1219695-05 Non-Potable Water

Collected by | Collected date/time 05/11/20 11:10 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/28/20 13:43 | RGT | Mt. Juliet, TN |

## FGD-11 L1219695-06 Non-Potable Water

Collected by | Collected date/time 05/11/20 12:45 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/28/20 13:43 | RGT | Mt. Juliet, TN |

| | Collected by | Collected date/time | Received date/time |
|---|---|---|---|
| FGD-12 L1219695-07 Non-Potable Water | | 05/11/20 13:45 | 05/18/20 09:45 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/28/20 13:43 | RGT | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 1.20 | | 0.681 | 1.49 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *70.1* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *104* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.35 | | 1.14 | 2.17 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.150 | | 0.462 | 0.679 | 05/27/2020 16:43 | WG1480228 |
| *(T) Barium-133* | *91.9* | | | *30.0-143* | *05/27/2020 16:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 2.08 | | 0.643 | 1.34 | 06/04/2020 10:10 | WG1479430 |
| *(T) Barium* | *78.1* | | | *62.0-143* | *06/04/2020 10:10* | WG1479430 |
| *(T) Yttrium* | *112* | | | *79.0-136* | *06/04/2020 10:10* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 2.76 | | 0.993 | 1.55 | 06/04/2020 10:10 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.677 | | 0.350 | 0.211 | 05/27/2020 16:43 | WG1480228 |
| *(T) Barium-133* | *89.7* | | | *30.0-143* | *05/27/2020 16:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 5.18 | | 0.667 | 1.35 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *73.7* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *110* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 5.28 | | 0.860 | 1.67 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.0983 | | 0.193 | 0.324 | 05/27/2020 16:43 | WG1480228 |
| *(T) Barium-133* | *83.4* | | | *30.0-143* | *05/27/2020 16:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.808 | | 0.616 | 1.03 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *83.8* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.89 | | 1.03 | 1.29 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 1.08 | | 0.415 | 0.256 | 05/28/2020 13:43 | WG1480228 |
| *(T) Barium-133* | *91.4* | | | *30.0-143* | *05/28/2020 13:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 6.58 | | 0.683 | 1.25 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *68.3* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *105* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 8.65 | | 1.18 | 1.57 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 2.07 | | 0.499 | 0.323 | 05/28/2020 13:43 | WG1480228 |
| *(T) Barium-133* | *96.8* | | | *30.0-143* | *05/28/2020 13:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 4.00 | | 0.583 | 0.835 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *87.2* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 6.40 | | 1.17 | 1.08 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 2.39 | | 0.591 | 0.243 | 05/28/2020 13:43 | WG1480228 |
| *(T) Barium-133* | *89.3* | | | *30.0-143* | *05/28/2020 13:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 10.7 | | 0.708 | 1.03 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *81.0* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *110* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 16.6 | | 1.65 | 1.27 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 5.96 | | 0.946 | 0.241 | 05/28/2020 13:43 | WG1480228 |
| *(T) Barium-133* | *84.7* | | | *30.0-143* | *05/28/2020 13:43* | WG1480228 |

## Method Blank (MB)

(MB) R3534480-6 06/04/20 10:10

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | -0.637 | | 0.528 |
| *(T) Barium* | *89.8* | | |
| *(T) Yttrium* | *105* | | |

## L1219695-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1219695-02 06/04/20 10:10 • (DUP) R3534480-10 06/04/20 10:10

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-228 | 2.08 | 1.67 | 1 | 22.0 | 0.453 | | 20 | 3 |
| *(T) Barium* | *78.1* | *83.8* | | | | | | |
| *(T) Yttrium* | *112* | *110* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3534480-7 06/04/20 10:10

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 5.60 | 112 | 80.0-120 | |
| *(T) Barium* | | | *84.5* | | |
| *(T) Yttrium* | | | *110* | | |

## Method Blank (MB)

(MB) R3533718-5 05/28/20 17:55

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-226 | 0.0282 | | 0.0620 |
| *(T) Barium-133* | *95.4* | | |

## L1219695-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1219695-01 05/27/20 16:43 • (DUP) R3533718-1 05/27/20 16:45

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.150 | 0.477 | 1 | 104 | 0.622 | | 20 | 3 |
| *(T) Barium-133* | *91.9* | *89.3* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3533718-2 05/28/20 13:53

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 5.02 | 5.42 | 108 | 80.0-120 | |
| *(T) Barium-133* | | | *92.9* | | |

## L1219695-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1219695-04 05/28/20 13:43 • (MS) R3533718-3 05/28/20 13:53 • (MSD) R3533718-4 05/28/20 13:53

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 20.1 | 1.08 | 22.8 | 23.6 | 108 | 112 | 1 | 75.0-125 | | | 3.32 | | 20 |
| *(T) Barium-133* | | *91.4* | | | *84.6* | *87.2* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.



## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LAO00356 |
| Kentucky [1 6] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

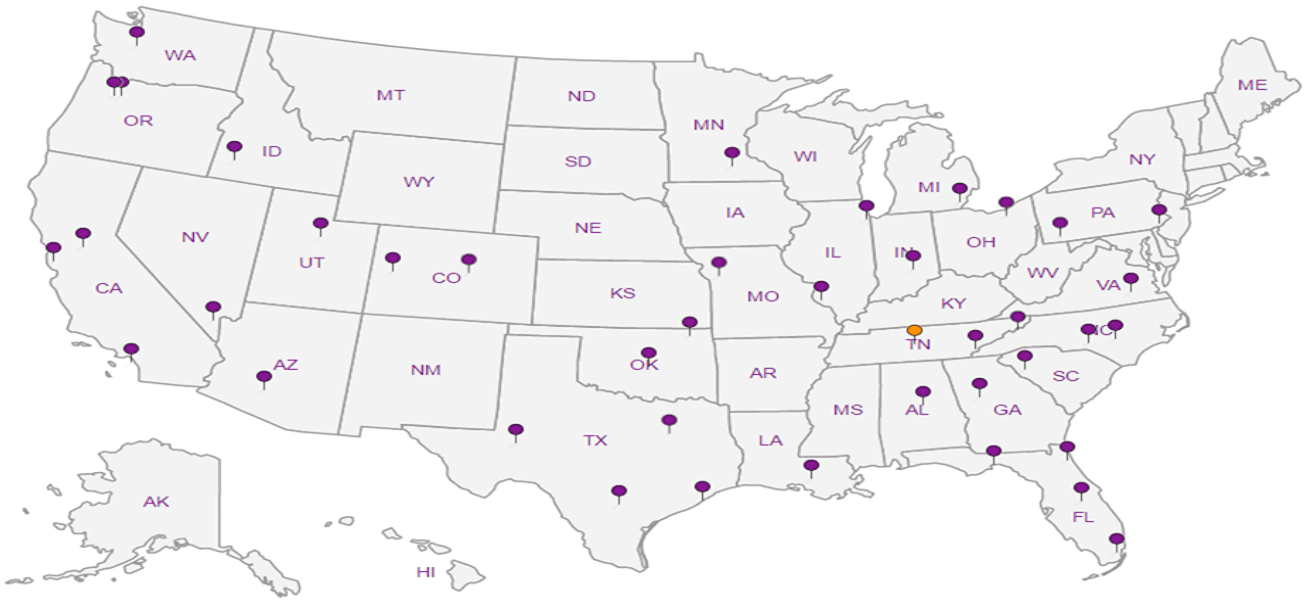
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



G108

Work Order: 2005079

**Subcontractor:**

Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

12/1968

**12-May-20**

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ra-228 | Ra-226 | | | | |
| | | | | | E904.0 | M7500 Ra B M | | | | |
| FGD-4 | Aqueous | 01C | 05/11/20 07:45 AM | 1LHDPEHNO3 | 1 | | | | | 01 |
| FGD-4 | Aqueous | 01D | 05/11/20 07:45 AM | 1LHDPEHNO3 | | 1 | | | | 01 |
| FGD-2 | Aqueous | 02C | 05/11/20 08:35 AM | 1LHDPEHNO3 | 1 | | | | | 02 |
| FGD-2 | Aqueous | 02D | 05/11/20 08:35 AM | 1LHDPEHNO3 | | 1 | | | | 02 |
| FGD-5 | Aqueous | 03C | 05/11/20 09:25 AM | 1LHDPEHNO3 | 1 | | | | | 03 |
| FGD-5 | Aqueous | 03D | 05/11/20 09:25 AM | 1LHDPEHNO3 | | 1 | | | | 03 |
| FGD-1 | Aqueous | 04C | 05/11/20 10:15 AM | 1LHDPEHNO3 | 1 | | | | | 04 |
| FGD-1 | Aqueous | 04D | 05/11/20 10:15 AM | 1LHDPEHNO3 | | 1 | | | | 04 |
| FGD-8 | Aqueous | 05C | 05/11/20 11:10 AM | 1LHDPEHNO3 | 1 | | | | | 05 |
| FGD-8 | Aqueous | 05D | 05/11/20 11:10 AM | 1LHDPEHNO3 | | 1 | | | | 05 |
| FGD-11 | Aqueous | 06C | 05/11/20 12:45 PM | 1LHDPEHNO3 | 1 | | | | | 06 |
| FGD-11 | Aqueous | 06D | 05/11/20 12:45 PM | 1LHDPEHNO3 | | 1 | | | | 06 |
| FGD-12 | Aqueous | 07C | 05/11/20 01:45 PM | 1LHDPEHNO3 | 1 | | | | | 07 |
| FGD-12 | Aqueous | 07D | 05/11/20 01:45 PM | 1LHDPEHNO3 | | 1 | | | | 07 |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | [signature] | 5/14/20 1700 | **Received by:** | Carol Kemp | 5/18/20 9:45 |
| **Relinquished by:** | | | **Received by:** | | |

# Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | |
|---|---|---|
| Client: PHLRRZ | 1219695 | |
| Cooler Received/Opened On: 5 / 18 / 20 Temperature: | Amb | |
| Received By: Carol Kemp | | |
| Signature: Carol Kemp | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | ✓ | | |
| COC Signed / Accurate? | | ✓ | |
| Bottles arrive intact? | | ✓ | |
| Correct bottles used? | | ✓ | |
| Sufficient volume sent? | | ✓ | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | | ✓ | |

October 09, 2020

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2009086

RE: LUMINANT-OGSES FGD PONDS (CCR)

Dear Will Vienne:

DHL Analytical, Inc. received 4 sample(s) on 9/11/2020 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-20-25

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 71138

# CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENAU
ADDITIONAL REPORT COPIES TO:

DATE: 9-10-20 PAGE 1 OF 1
PO #: 19122262 DHL WORK ORDER #: 2009086
PROJECT LOCATION OR NAME: LUMINANT-OGSES FGD PONDS (CCR)
CLENT PROJECT #: 19122262 COLLECTOR: JOHN BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS ❑ | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | APPENDIX III | APPENDIX IV | FIELD NOTES

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | TDS | TSS | APPENDIX III | APPENDIX IV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-5 | 01 | 9-10-20 | 0750 | W | P | 4 | | X | | X | X | | | X | X |
| FGD-2 | 02 | ↓ | 0845 | W | P | 4 | | X | | X | X | | | X | X |
| FGD-11 | 03 | | 0940 | W | P | 4 | | X | | X | X | | | X | X |
| FGD-12 | 04 | ↓ | 1040 | W | P | 4 | | X | | X | X | | | X | X |

RELINQUISHED BY: (Signature) DATE/TIME 9-10-20 1630 RECEIVED BY: (Signature) FedEx
RELINQUISHED BY: (Signature) FedEx DATE/TIME 9/11/20 0927 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

❑ DHL DISPOSAL @ $5.00 each ❑ Return

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑

**LABORATORY USE ONLY:**
RECEIVING TEMP: 0.9°C THERM #: 78
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ☑ NOT USED
CARRIER: ❑ LONE STAR ☑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Exclude Sb, Cd, & Hg
Per Will V. 9/17/20

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

---

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis

ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON
19122262
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DATE: 10SEP20
ACTWGT: 56.25 LB
CAD: 6995323/SSF02110
DIMS: 26x14x14 IN
BILL THIRD PARTY
TO DHL ANALYTICAL
DHL ANALYTICAL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
REF:
INV:
PO:
DEPT:
FedEx
Express
1 of 3
TRK# 0201 3967 0595 5522
## MASTER ##
A8 BSMA
FRI - 11 SEP 10:30A
PRIORITY OVERNIGHT
AHS
78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder** Date Received: **9/11/2020**

Work Order Number **2009086** Received by: **RA**

Checklist completed by: _____ 9/11/2020 Reviewed by _____ 9/11/2020
Signature | Date | Initials | Date

Carrier name: FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **0.9** °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? no | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action: _____

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist: Reportable Data**

| | |
|---|---|
| **Project Name:** LUMINANT-OGSES FGD PONDS (CCR) | **LRC Date:** 10/9/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2009086 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | X | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | X | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | X | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | X | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | X | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | X | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | X | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | X | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | X | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | X | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | X | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | X | | |
| | | **9)** If required for the project, TICs reported? | | | X | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | X | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | X | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | X | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | X | | | | |
| | | **4)** Were blank concentrations < MDL? | X | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | X | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | X | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | X | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | X | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | X | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | X | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | X | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | X | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | X | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | X | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | X | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | X | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | X | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | X | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | X | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | X | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | X | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | X | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** LUMINANT-OGSES FGD PONDS (CCR) | **LRC Date:** 10/9/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2009086 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | X | | | | |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

10/09/20
Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *09-Oct-20*

**CLIENT:** Golder
**Project:** LUMINANT-OGSES FGD PONDS (CCR)
**Lab Order:** 2009086

## CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904 and SM 7500 Ra B M. Analyzed at Pace Analytical.

Exception Report R1-01

The samples were received and log-in performed on 9/11/20. A total of 4 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Anions analysis performed on 9/14/20 the matrix spike recovery (2009093-01 MS) was slightly below control limits for Sulfate. This is flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *09-Oct-20*

**CLIENT:** Golder
**Project:** LUMINANT-OGSES FGD PONDS (CCR)
**Lab Order:** 2009086

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2009086-01 | FGD-5 | | 09/10/20 07:50 AM | 9/11/2020 |
| 2009086-02 | FGD-2 | | 09/10/20 08:45 AM | 9/11/2020 |
| 2009086-03 | FGD-11 | | 09/10/20 09:40 AM | 9/11/2020 |
| 2009086-04 | FGD-12 | | 09/10/20 10:40 AM | 9/11/2020 |

**Lab Order:** 2009086
**Client:** Golder
**Project:** LUMINANT-OGSES FGD POND

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2009086-01A | FGD-5 | 09/10/20 07:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/14/20 08:52 AM | 97889 |
| | FGD-5 | 09/10/20 07:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/14/20 08:52 AM | 97889 |
| 2009086-01B | FGD-5 | 09/10/20 07:50 AM | Aqueous | E300 | Anion Preparation | 09/14/20 09:39 AM | 97893 |
| | FGD-5 | 09/10/20 07:50 AM | Aqueous | E300 | Anion Preparation | 09/14/20 09:39 AM | 97893 |
| | FGD-5 | 09/10/20 07:50 AM | Aqueous | M2540C | TDS Preparation | 09/11/20 10:35 AM | 97882 |
| 2009086-02A | FGD-2 | 09/10/20 08:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/14/20 08:52 AM | 97889 |
| | FGD-2 | 09/10/20 08:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/14/20 08:52 AM | 97889 |
| 2009086-02B | FGD-2 | 09/10/20 08:45 AM | Aqueous | E300 | Anion Preparation | 09/14/20 09:39 AM | 97893 |
| | FGD-2 | 09/10/20 08:45 AM | Aqueous | E300 | Anion Preparation | 09/14/20 09:39 AM | 97893 |
| | FGD-2 | 09/10/20 08:45 AM | Aqueous | E300 | Anion Preparation | 09/14/20 09:39 AM | 97893 |
| | FGD-2 | 09/10/20 08:45 AM | Aqueous | M2540C | TDS Preparation | 09/11/20 10:35 AM | 97882 |
| 2009086-03A | FGD-11 | 09/10/20 09:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/14/20 08:52 AM | 97889 |
| | FGD-11 | 09/10/20 09:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/14/20 08:52 AM | 97889 |
| 2009086-03B | FGD-11 | 09/10/20 09:40 AM | Aqueous | E300 | Anion Preparation | 09/14/20 09:39 AM | 97893 |
| | FGD-11 | 09/10/20 09:40 AM | Aqueous | E300 | Anion Preparation | 09/14/20 09:39 AM | 97893 |
| | FGD-11 | 09/10/20 09:40 AM | Aqueous | E300 | Anion Preparation | 09/14/20 09:39 AM | 97893 |
| | FGD-11 | 09/10/20 09:40 AM | Aqueous | M2540C | TDS Preparation | 09/11/20 10:35 AM | 97882 |
| 2009086-04A | FGD-12 | 09/10/20 10:40 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/14/20 08:52 AM | 97889 |
| 2009086-04B | FGD-12 | 09/10/20 10:40 AM | Aqueous | E300 | Anion Preparation | 09/14/20 09:39 AM | 97893 |
| | FGD-12 | 09/10/20 10:40 AM | Aqueous | M2540C | TDS Preparation | 09/11/20 10:35 AM | 97882 |

**Lab Order:** 2009086
**Client:** Golder
**Project:** LUMINANT-OGSES FGD POND

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2009086-01A | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97889 | 10 | 09/15/20 02:19 PM | ICP-MS4_200915A |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97889 | 1 | 09/15/20 12:16 PM | ICP-MS4_200915A |
| 2009086-01B | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 97893 | 10 | 09/14/20 02:13 PM | IC2_200914A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 97893 | 1 | 09/14/20 10:53 PM | IC2_200914A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 97882 | 1 | 09/11/20 04:45 PM | WC_200911D |
| 2009086-02A | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97889 | 1 | 09/15/20 12:18 PM | ICP-MS4_200915A |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97889 | 10 | 09/15/20 02:21 PM | ICP-MS4_200915A |
| 2009086-02B | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 97893 | 1 | 09/14/20 11:09 PM | IC2_200914A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 97893 | 10 | 09/14/20 02:29 PM | IC2_200914A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 97893 | 100 | 09/14/20 05:33 PM | IC2_200914A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 97882 | 1 | 09/11/20 04:45 PM | WC_200911D |
| 2009086-03A | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97889 | 1 | 09/15/20 12:20 PM | ICP-MS4_200915A |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97889 | 10 | 09/15/20 02:23 PM | ICP-MS4_200915A |
| 2009086-03B | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 97893 | 10 | 09/14/20 02:45 PM | IC2_200914A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 97893 | 100 | 09/14/20 05:49 PM | IC2_200914A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 97893 | 1 | 09/14/20 11:25 PM | IC2_200914A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 97882 | 1 | 09/11/20 04:45 PM | WC_200911D |
| 2009086-04A | FGD-12 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97889 | 1 | 09/15/20 12:22 PM | ICP-MS4_200915A |
| 2009086-04B | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 97893 | 1 | 09/14/20 11:41 PM | IC2_200914A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 97882 | 1 | 09/11/20 04:45 PM | WC_200911D |

# DHL Analytical, Inc.

**Date:** *09-Oct-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | LUMINANT-OGSES FGD PONDS (CCR) | **Lab ID:** | 2009086-01 |
| **Project No:** | 19122262 | **Collection Date:** | 09/10/20 07:50 AM |
| **Lab Order:** | 2009086 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:16 PM |
| Barium | 0.0929 | 0.00300 | 0.0100 | | mg/L | 1 | 09/15/20 12:16 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/15/20 12:16 PM |
| Boron | 0.154 | 0.0100 | 0.0300 | | mg/L | 1 | 09/15/20 12:16 PM |
| Calcium | 96.6 | 1.00 | 3.00 | | mg/L | 10 | 09/15/20 02:19 PM |
| Chromium | 0.0307 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:16 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/15/20 12:16 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/15/20 12:16 PM |
| Lithium | 0.150 | 0.00500 | 0.0100 | | mg/L | 1 | 09/15/20 12:16 PM |
| Molybdenum | 0.00362 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/15/20 12:16 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:16 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/15/20 12:16 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 310 | 3.00 | 10.0 | | mg/L | 10 | 09/14/20 02:13 PM |
| Fluoride | 0.617 | 0.100 | 0.400 | | mg/L | 1 | 09/14/20 10:53 PM |
| Sulfate | 95.9 | 1.00 | 3.00 | | mg/L | 1 | 09/14/20 10:53 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 845 | 10.0 | 10.0 | | mg/L | 1 | 09/11/20 04:45 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *09-Oct-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | LUMINANT-OGSES FGD PONDS (CCR) | **Lab ID:** | 2009086-02 |
| **Project No:** | 19122262 | **Collection Date:** | 09/10/20 08:45 AM |
| **Lab Order:** | 2009086 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:18 PM |
| Barium | 0.104 | 0.00300 | 0.0100 | | mg/L | 1 | 09/15/20 12:18 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/15/20 12:18 PM |
| Boron | 0.567 | 0.0100 | 0.0300 | | mg/L | 1 | 09/15/20 12:18 PM |
| Calcium | 193 | 1.00 | 3.00 | | mg/L | 10 | 09/15/20 02:21 PM |
| Chromium | 0.00239 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/15/20 12:18 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/15/20 12:18 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/15/20 12:18 PM |
| Lithium | 0.0250 | 0.00500 | 0.0100 | | mg/L | 1 | 09/15/20 12:18 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:18 PM |
| Selenium | 0.0217 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:18 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/15/20 12:18 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 1030 | 30.0 | 100 | | mg/L | 100 | 09/14/20 05:33 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 09/14/20 11:09 PM |
| Sulfate | 301 | 10.0 | 30.0 | | mg/L | 10 | 09/14/20 02:29 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 2150 | 50.0 | 50.0 | | mg/L | 1 | 09/11/20 04:45 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *09-Oct-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | LUMINANT-OGSES FGD PONDS (CCR) | **Lab ID:** | 2009086-03 |
| **Project No:** | 19122262 | **Collection Date:** | 09/10/20 09:40 AM |
| **Lab Order:** | 2009086 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:20 PM |
| Barium | 0.330 | 0.00300 | 0.0100 | | mg/L | 1 | 09/15/20 12:20 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/15/20 12:20 PM |
| Boron | 0.242 | 0.0100 | 0.0300 | | mg/L | 1 | 09/15/20 12:20 PM |
| Calcium | 101 | 1.00 | 3.00 | | mg/L | 10 | 09/15/20 02:23 PM |
| Chromium | 0.0158 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:20 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/15/20 12:20 PM |
| Lead | 0.000706 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/15/20 12:20 PM |
| Lithium | 0.0121 | 0.00500 | 0.0100 | | mg/L | 1 | 09/15/20 12:20 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:20 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:20 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/15/20 12:20 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 573 | 30.0 | 100 | | mg/L | 100 | 09/14/20 05:49 PM |
| Fluoride | 0.575 | 0.100 | 0.400 | | mg/L | 1 | 09/14/20 11:25 PM |
| Sulfate | 44.0 | 1.00 | 3.00 | | mg/L | 1 | 09/14/20 11:25 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1320 | 50.0 | 50.0 | | mg/L | 1 | 09/11/20 04:45 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *09-Oct-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | LUMINANT-OGSES FGD PONDS (CCR) | **Lab ID:** | 2009086-04 |
| **Project No:** | 19122262 | **Collection Date:** | 09/10/20 10:40 AM |
| **Lab Order:** | 2009086 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Arsenic | 0.00252 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/15/20 12:22 PM |
| Barium | 0.0922 | 0.00300 | 0.0100 | | mg/L | 1 | 09/15/20 12:22 PM |
| Beryllium | 0.000375 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/15/20 12:22 PM |
| Boron | 0.120 | 0.0100 | 0.0300 | | mg/L | 1 | 09/15/20 12:22 PM |
| Calcium | 9.34 | 0.100 | 0.300 | | mg/L | 1 | 09/15/20 12:22 PM |
| Chromium | 0.00723 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:22 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/15/20 12:22 PM |
| Lead | 0.00402 | 0.000300 | 0.00100 | | mg/L | 1 | 09/15/20 12:22 PM |
| Lithium | 0.0235 | 0.00500 | 0.0100 | | mg/L | 1 | 09/15/20 12:22 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/15/20 12:22 PM |
| Selenium | 0.00254 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/15/20 12:22 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/15/20 12:22 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 13.0 | 0.300 | 1.00 | | mg/L | 1 | 09/14/20 11:41 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 09/14/20 11:41 PM |
| Sulfate | 14.1 | 1.00 | 3.00 | | mg/L | 1 | 09/14/20 11:41 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 166 | 10.0 | 10.0 | | mg/L | 1 | 09/11/20 04:45 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200803A**

| Sample ID: **DCS1-97152** | Batch ID: **97152** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS4_200803A** | Analysis Date: **8/3/2020 12:35:00 PM** | Prep Date: **7/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.000428 | 0.00100 | 0.000500 | 0 | 85.6 | 70 | 130 | 0 | 0 | |
| Lead | 0.000490 | 0.00100 | 0.000500 | 0 | 98.0 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000482 | 0.00150 | 0.000500 | 0 | 96.4 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS2-97152** | Batch ID: **97152** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS4_200803A** | Analysis Date: **8/3/2020 12:37:00 PM** | Prep Date: **7/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.342 | 0.300 | 0.300 | 0 | 114 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS3-97152** | Batch ID: **97152** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS4_200803A** | Analysis Date: **8/3/2020 12:40:00 PM** | Prep Date: **7/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00503 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | 0 | 0 | |
| Barium | 0.00508 | 0.0100 | 0.00500 | 0 | 102 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00532 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00427 | 0.0100 | 0.00500 | 0 | 85.4 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00506 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00597 | 0.00500 | 0.00500 | 0 | 119 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-97152** | Batch ID: **97152** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS4_200803A** | Analysis Date: **8/3/2020 12:43:00 PM** | Prep Date: **7/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0277 | 0.0300 | 0.0300 | 0 | 92.4 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS4_200915A**

The QC data in batch 97889 applies to the following samples: 2009086-01A, 2009086-02A, 2009086-03A, 2009086-04A

Sample ID: **MB-97889** Batch ID: **97889** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_200915A** Analysis Date: **9/15/2020 11:09:00 AM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID: **LCS-97889** Batch ID: **97889** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_200915A** Analysis Date: **9/15/2020 11:11:00 AM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Beryllium | 0.209 | 0.00100 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Boron | 0.203 | 0.0300 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Calcium | 5.01 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | | | |
| Chromium | 0.207 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Lithium | 0.215 | 0.0100 | 0.200 | 0 | 108 | 80 | 120 | | | |
| Molybdenum | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Selenium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Thallium | 0.204 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | | | |

Sample ID: **LCSD-97889** Batch ID: **97889** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_200915A** Analysis Date: **9/15/2020 11:13:00 AM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.897 | 15 | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 80 | 120 | 1.15 | 15 | |
| Beryllium | 0.210 | 0.00100 | 0.200 | 0 | 105 | 80 | 120 | 0.296 | 15 | |
| Boron | 0.215 | 0.0300 | 0.200 | 0 | 108 | 80 | 120 | 5.93 | 15 | |
| Calcium | 5.03 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.264 | 15 | |
| Chromium | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 0.474 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200915A**

Sample ID: **LCSD-97889** Batch ID: **97889** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_200915A** Analysis Date: **9/15/2020 11:13:00 AM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.141 | 15 | |
| Lead | 0.201 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.512 | 15 | |
| Lithium | 0.217 | 0.0100 | 0.200 | 0 | 108 | 80 | 120 | 0.555 | 15 | |
| Molybdenum | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.955 | 15 | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 80 | 120 | 1.72 | 15 | |
| Thallium | 0.204 | 0.00150 | 0.200 | 0 | 102 | 80 | 120 | 0.247 | 15 | |

Sample ID: **2009082-02A SD** Batch ID: **97889** TestNo: **SW6020B** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_200915A** Analysis Date: **9/15/2020 11:23:00 AM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Barium | 0.0455 | 0.0500 | 0 | 0.0444 | | | | 2.55 | 20 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Boron | 0.0878 | 0.150 | 0 | 0.0847 | | | | 3.60 | 20 | |
| Calcium | 14.7 | 1.50 | 0 | 14.5 | | | | 1.60 | 20 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.00839 | | | | 0 | 20 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 20 | |

Sample ID: **2009082-02A PDS** Batch ID: **97889** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_200915A** Analysis Date: **9/15/2020 11:47:00 AM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.197 | 0.00500 | 0.200 | 0 | 98.3 | 75 | 125 | | | |
| Barium | 0.248 | 0.0100 | 0.200 | 0.0444 | 102 | 75 | 125 | | | |
| Beryllium | 0.206 | 0.00100 | 0.200 | 0 | 103 | 75 | 125 | | | |
| Boron | 0.294 | 0.0300 | 0.200 | 0.0847 | 105 | 75 | 125 | | | |
| Calcium | 18.7 | 0.300 | 5.00 | 14.5 | 84.4 | 75 | 125 | | | |
| Chromium | 0.211 | 0.00500 | 0.200 | 0 | 105 | 75 | 125 | | | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Lead | 0.208 | 0.00100 | 0.200 | 0 | 104 | 75 | 125 | | | |
| Lithium | 0.223 | 0.0100 | 0.200 | 0.00839 | 107 | 75 | 125 | | | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 98.8 | 75 | 125 | | | |
| Selenium | 0.194 | 0.00500 | 0.200 | 0 | 96.9 | 75 | 125 | | | |
| Thallium | 0.207 | 0.00150 | 0.200 | 0 | 104 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200915A**

| Sample ID: **2009082-02A MS** | Batch ID: **97889** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_200915A** | Analysis Date: **9/15/2020 11:48:00 AM** | Prep Date: **9/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.202 | 0.00500 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Barium | 0.245 | 0.0100 | 0.200 | 0.0444 | 100 | 75 | 125 | | | |
| Beryllium | 0.208 | 0.00100 | 0.200 | 0 | 104 | 75 | 125 | | | |
| Boron | 0.295 | 0.0300 | 0.200 | 0.0847 | 105 | 75 | 125 | | | |
| Calcium | 19.5 | 0.300 | 5.00 | 14.5 | 100 | 75 | 125 | | | |
| Chromium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Lithium | 0.220 | 0.0100 | 0.200 | 0.00839 | 106 | 75 | 125 | | | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 75 | 125 | | | |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 102 | 75 | 125 | | | |

| Sample ID: **2009082-02A MSD** | Batch ID: **97889** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_200915A** | Analysis Date: **9/15/2020 11:50:00 AM** | Prep Date: **9/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.205 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | 1.51 | 15 | |
| Barium | 0.247 | 0.0100 | 0.200 | 0.0444 | 101 | 75 | 125 | 0.847 | 15 | |
| Beryllium | 0.208 | 0.00100 | 0.200 | 0 | 104 | 75 | 125 | 0.007 | 15 | |
| Boron | 0.307 | 0.0300 | 0.200 | 0.0847 | 111 | 75 | 125 | 3.97 | 15 | |
| Calcium | 19.3 | 0.300 | 5.00 | 14.5 | 97.0 | 75 | 125 | 0.864 | 15 | |
| Chromium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | 0.231 | 15 | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | 0.153 | 15 | |
| Lead | 0.208 | 0.00100 | 0.200 | 0 | 104 | 75 | 125 | 1.43 | 15 | |
| Lithium | 0.222 | 0.0100 | 0.200 | 0.00839 | 107 | 75 | 125 | 0.737 | 15 | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | 1.02 | 15 | |
| Selenium | 0.198 | 0.00500 | 0.200 | 0 | 98.8 | 75 | 125 | 1.66 | 15 | |
| Thallium | 0.205 | 0.00150 | 0.200 | 0 | 102 | 75 | 125 | 0.784 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200915A**

| Sample ID: **ICV-200915** | Batch ID: **R112294** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_200915A** | Analysis Date: **9/15/2020 10:55:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.0978 | 0.00500 | 0.100 | 0 | 97.8 | 90 | 110 | | | |
| Barium | 0.0978 | 0.0100 | 0.100 | 0 | 97.8 | 90 | 110 | | | |
| Beryllium | 0.103 | 0.00100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Boron | 0.106 | 0.0300 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Calcium | 2.39 | 0.300 | 2.50 | 0 | 95.7 | 90 | 110 | | | |
| Chromium | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.103 | 0.00100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.107 | 0.0100 | 0.100 | 0 | 107 | 90 | 110 | | | |
| Molybdenum | 0.0966 | 0.00500 | 0.100 | 0 | 96.6 | 90 | 110 | | | |
| Selenium | 0.0949 | 0.00500 | 0.100 | 0 | 94.9 | 90 | 110 | | | |
| Thallium | 0.102 | 0.00150 | 0.100 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **LCVL-200915** | Batch ID: **R112294** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_200915A** | Analysis Date: **9/15/2020 11:02:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00505 | 0.00500 | 0.00500 | 0 | 101 | 80 | 120 | | | |
| Barium | 0.00535 | 0.0100 | 0.00500 | 0 | 107 | 80 | 120 | | | |
| Beryllium | 0.00105 | 0.00100 | 0.00100 | 0 | 105 | 80 | 120 | | | |
| Boron | 0.0226 | 0.0300 | 0.0200 | 0 | 113 | 80 | 120 | | | |
| Calcium | 0.109 | 0.300 | 0.100 | 0 | 109 | 80 | 120 | | | |
| Chromium | 0.00538 | 0.00500 | 0.00500 | 0 | 108 | 80 | 120 | | | |
| Cobalt | 0.00541 | 0.00500 | 0.00500 | 0 | 108 | 80 | 120 | | | |
| Lead | 0.00106 | 0.00100 | 0.00100 | 0 | 106 | 80 | 120 | | | |
| Lithium | 0.0104 | 0.0100 | 0.0100 | 0 | 104 | 80 | 120 | | | |
| Molybdenum | 0.00526 | 0.00500 | 0.00500 | 0 | 105 | 80 | 120 | | | |
| Selenium | 0.00518 | 0.00500 | 0.00500 | 0 | 104 | 80 | 120 | | | |
| Thallium | 0.00105 | 0.00150 | 0.00100 | 0 | 105 | 80 | 120 | | | |

| Sample ID: **CCV1-200915** | Batch ID: **R112294** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_200915A** | Analysis Date: **9/15/2020 12:00:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Boron | 0.204 | 0.0300 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Calcium | 4.83 | 0.300 | 5.00 | 0 | 96.6 | 90 | 110 | | | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200915A**

| Sample ID: **CCV1-200915** | Batch ID: **R112294** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_200915A** | Analysis Date: **9/15/2020 12:00:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.201 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.3 | 90 | 110 | | | |
| Selenium | 0.194 | 0.00500 | 0.200 | 0 | 97.1 | 90 | 110 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.3 | 90 | 110 | | | |

| Sample ID: **CCV2-200915** | Batch ID: **R112294** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_200915A** | Analysis Date: **9/15/2020 12:32:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 90 | 110 | | | |
| Barium | 0.194 | 0.0100 | 0.200 | 0 | 97.2 | 90 | 110 | | | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.77 | 0.300 | 5.00 | 0 | 95.4 | 90 | 110 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Cobalt | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Lithium | 0.210 | 0.0100 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Molybdenum | 0.193 | 0.00500 | 0.200 | 0 | 96.7 | 90 | 110 | | | |
| Selenium | 0.195 | 0.00500 | 0.200 | 0 | 97.7 | 90 | 110 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 90 | 110 | | | |

| Sample ID: **CCV4-200915** | Batch ID: **R112294** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_200915A** | Analysis Date: **9/15/2020 2:14:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.73 | 0.300 | 5.00 | 0 | 94.5 | 90 | 110 | | | |

| Sample ID: **CCV5-200915** | Batch ID: **R112294** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_200915A** | Analysis Date: **9/15/2020 2:39:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.66 | 0.300 | 5.00 | 0 | 93.1 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200729A**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS2-97333** | Batch ID: **97333** | TestNo: **E300** | | Units: **mg/L** | |
| SampType: **DCS2** | Run ID: **IC2_200729A** | Analysis Date: **7/29/2020 12:57:41 PM** | | Prep Date: **7/29/2020** | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.468 | 1.00 | 0.5000 | 0 | 93.7 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.214 | 0.400 | 0.2000 | 0 | 107 | 70 | 130 | 0 | 0 | |
| Sulfate | 1.51 | 3.00 | 1.500 | 0 | 101 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200914A**

The QC data in batch 97893 applies to the following samples: 2009086-01B, 2009086-02B, 2009086-03B, 2009086-04B

Sample ID: **MB-97893** Batch ID: **97893** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_200914A** Analysis Date: **9/14/2020 11:03:37 AM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-97893** Batch ID: **97893** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_200914A** Analysis Date: **9/14/2020 11:19:37 AM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.6 | 1.00 | 10.00 | 0 | 106 | 90 | 110 | | | |
| Fluoride | 3.97 | 0.400 | 4.000 | 0 | 99.2 | 90 | 110 | | | |
| Sulfate | 30.4 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

Sample ID: **LCSD-97893** Batch ID: **97893** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_200914A** Analysis Date: **9/14/2020 11:35:37 AM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.6 | 1.00 | 10.00 | 0 | 106 | 90 | 110 | 0.503 | 20 | |
| Fluoride | 3.90 | 0.400 | 4.000 | 0 | 97.5 | 90 | 110 | 1.69 | 20 | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | 0.804 | 20 | |

Sample ID: **2009093-01AMS** Batch ID: **97893** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_200914A** Analysis Date: **9/14/2020 6:21:33 PM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 347 | 10.0 | 200.0 | 158.7 | 94.4 | 90 | 110 | | | |
| Fluoride | 193 | 4.00 | 200.0 | 0 | 96.6 | 90 | 110 | | | |
| Sulfate | 228 | 30.0 | 200.0 | 51.68 | 88.3 | 90 | 110 | | | S |

Sample ID: **2009093-01AMSD** Batch ID: **97893** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_200914A** Analysis Date: **9/14/2020 6:37:33 PM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 370 | 10.0 | 200.0 | 158.7 | 105 | 90 | 110 | 6.16 | 20 | |
| Fluoride | 217 | 4.00 | 200.0 | 0 | 108 | 90 | 110 | 11.4 | 20 | |
| Sulfate | 254 | 30.0 | 200.0 | 51.68 | 101 | 90 | 110 | 10.7 | 20 | |

Sample ID: **2009084-01BMS** Batch ID: **97893** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_200914A** Analysis Date: **9/14/2020 6:53:33 PM** Prep Date: **9/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200914A**

| Sample ID: **2009084-01BMS** | Batch ID: **97893** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_200914A** | Analysis Date: **9/14/2020 6:53:33 PM** | Prep Date: **9/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 403 | 10.0 | 200.0 | 210.3 | 96.3 | 90 | 110 | | | |
| Fluoride | 210 | 4.00 | 200.0 | 0 | 105 | 90 | 110 | | | |
| Sulfate | 293 | 30.0 | 200.0 | 96.62 | 98.1 | 90 | 110 | | | |

| Sample ID: **2009084-01BMSD** | Batch ID: **97893** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_200914A** | Analysis Date: **9/14/2020 7:09:33 PM** | Prep Date: **9/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 404 | 10.0 | 200.0 | 210.3 | 96.6 | 90 | 110 | 0.174 | 20 | |
| Fluoride | 210 | 4.00 | 200.0 | 0 | 105 | 90 | 110 | 0.153 | 20 | |
| Sulfate | 289 | 30.0 | 200.0 | 96.62 | 96.4 | 90 | 110 | 1.22 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200914A**

| Sample ID: **ICV-200914** | Batch ID: **R112286** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_200914A** | Analysis Date: **9/14/2020 10:31:37 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 27.2 | 1.00 | 25.00 | 0 | 109 | 90 | 110 | | | |
| Fluoride | 10.4 | 0.400 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 79.7 | 3.00 | 75.00 | 0 | 106 | 90 | 110 | | | |

| Sample ID: **CCV1-200914** | Batch ID: **R112286** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200914A** | Analysis Date: **9/14/2020 5:01:33 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.6 | 1.00 | 10.00 | 0 | 106 | 90 | 110 | | | |
| Fluoride | 4.07 | 0.400 | 4.000 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 30.7 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **CCV2-200914** | Batch ID: **R112286** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200914A** | Analysis Date: **9/14/2020 10:05:33 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.6 | 1.00 | 10.00 | 0 | 106 | 90 | 110 | | | |
| Fluoride | 4.09 | 0.400 | 4.000 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **CCV3-200914** | Batch ID: **R112286** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200914A** | Analysis Date: **9/15/2020 12:45:33 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.6 | 1.00 | 10.00 | 0 | 106 | 90 | 110 | | | |
| Fluoride | 4.12 | 0.400 | 4.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 30.5 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_200911D**

The QC data in batch 97882 applies to the following samples: 2009086-01B, 2009086-02B, 2009086-03B, 2009086-04B

| Sample ID: **MB-97882** | Batch ID: **97882** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_200911D** | Analysis Date: **9/11/2020 4:45:00 PM** | Prep Date: **9/11/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-97882** | Batch ID: **97882** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_200911D** | Analysis Date: **9/11/2020 4:45:00 PM** | Prep Date: **9/11/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 749 | 10.0 | 745.6 | 0 | 100 | 90 | 113 | | | |

| Sample ID: **2009053-01A-DUP** | Batch ID: **97882** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_200911D** | Analysis Date: **9/11/2020 4:45:00 PM** | Prep Date: **9/11/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1180 | 50.0 | 0 | 1160 | | | | 1.28 | 5 | |

| Sample ID: **2009053-02A-DUP** | Batch ID: **97882** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_200911D** | Analysis Date: **9/11/2020 4:45:00 PM** | Prep Date: **9/11/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1230 | 50.0 | 0 | 1225 | | | | 0.407 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009086
**Project:** LUMINANT-OGSES FGD PONDS (CCR)

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Molybdenum | 0.00200 | 0.00500 |
| Selenium | 0.00200 | 0.00500 |
| Thallium | 0.000500 | 0.00150 |

| **TestNo: M2540C** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

October 08, 2020



## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1263069 |
| Samples Received: | 09/17/2020 |
| Project Number: | 2009086 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

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## FGD-5 L1263069-01 Non-Potable Water

Collected by | Collected date/time 09/10/20 07:50 | Received date/time 09/17/20 10:30

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1546570 | 1 | 09/21/20 14:49 | 10/01/20 09:50 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1548584 | 1 | 09/25/20 15:57 | 10/01/20 09:50 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1548584 | 1 | 09/25/20 15:57 | 09/28/20 16:08 | RGT | Mt. Juliet, TN |

## FGD-2 L1263069-02 Non-Potable Water

Collected by | Collected date/time 09/10/20 08:45 | Received date/time 09/17/20 10:30

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1546570 | 1 | 09/21/20 14:49 | 10/01/20 09:50 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1548584 | 1 | 09/25/20 15:57 | 10/01/20 09:50 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1548584 | 1 | 09/25/20 15:57 | 09/28/20 16:08 | RGT | Mt. Juliet, TN |

## FGD-11 L1263069-03 Non-Potable Water

Collected by | Collected date/time 09/10/20 09:40 | Received date/time 09/17/20 10:30

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1546570 | 1 | 09/21/20 14:49 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1548584 | 1 | 09/25/20 15:57 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1548584 | 1 | 09/25/20 15:57 | 09/28/20 16:08 | RGT | Mt. Juliet, TN |

## FGD-12 L1263069-04 Non-Potable Water

Collected by | Collected date/time 09/10/20 10:40 | Received date/time 09/17/20 10:30

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1546570 | 1 | 09/21/20 14:49 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1548584 | 1 | 09/25/20 15:57 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1548584 | 1 | 09/25/20 15:57 | 09/29/20 08:57 | RGT | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | -0.0787 | | 0.595 | 1.11 | 10/01/2020 09:50 | WG1546570 |
| *(T) Barium* | *83.4* | | | *62.0-143* | *10/01/2020 09:50* | WG1546570 |
| *(T) Yttrium* | *93.8* | | | *79.0-136* | *10/01/2020 09:50* | WG1546570 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.132 | | 0.754 | 1.33 | 10/01/2020 09:50 | WG1548584 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.132 | | 0.159 | 0.219 | 09/28/2020 16:08 | WG1548584 |
| *(T) Barium-133* | *90.7* | | | *30.0-143* | *09/28/2020 16:08* | WG1548584 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.290 | | 0.675 | 1.25 | 10/01/2020 09:50 | WG1546570 |
| *(T) Barium* | *85.5* | | | *62.0-143* | *10/01/2020 09:50* | WG1546570 |
| *(T) Yttrium* | *91.3* | | | *79.0-136* | *10/01/2020 09:50* | WG1546570 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.03 | | 1.03 | 1.6 | 10/01/2020 09:50 | WG1548584 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.744 | | 0.359 | 0.351 | 09/28/2020 16:08 | WG1548584 |
| *(T) Barium-133* | *90.1* | | | *30.0-143* | *09/28/2020 16:08* | WG1548584 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 4.69 | | 0.594 | 0.99 | 10/02/2020 09:55 | WG1546570 |
| *(T) Barium* | *84.1* | | | *62.0-143* | *10/02/2020 09:55* | WG1546570 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *10/02/2020 09:55* | WG1546570 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 8.04 | | 1.30 | 1.24 | 10/02/2020 09:55 | WG1548584 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 3.35 | | 0.707 | 0.251 | 09/28/2020 16:08 | WG1548584 |
| *(T) Barium-133* | *96.3* | | | *30.0-143* | *09/28/2020 16:08* | WG1548584 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 6.72 | | 0.600 | 0.956 | 10/02/2020 09:55 | WG1546570 |
| *(T) Barium* | *89.6* | | | *62.0-143* | *10/02/2020 09:55* | WG1546570 |
| *(T) Yttrium* | *111* | | | *79.0-136* | *10/02/2020 09:55* | WG1546570 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 9.31 | | 1.25 | 1.17 | 10/02/2020 09:55 | WG1548584 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 2.59 | | 0.646 | 0.218 | 09/29/2020 08:57 | WG1548584 |
| *(T) Barium-133* | *89.9* | | | *30.0-143* | *09/29/2020 08:57* | WG1548584 |

## Method Blank (MB)

(MB) R3578670-1 10/01/20 09:50

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | 0.0699 | | 0.519 |
| *(T) Barium* | *88.4* | | |
| *(T) Yttrium* | *91.9* | | |

## L1262467-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1262467-01 10/01/20 09:50 • (DUP) R3578670-5 10/01/20 09:50

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.000 | 0.159 | 1 | 200 | 0.193 | | 20 | 3 |
| *(T) Barium* | *86.3* | *88.9* | | | | | | |
| *(T) Yttrium* | *93.3* | *95.4* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3578670-2 10/01/20 09:50

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 5.80 | 116 | 80.0-120 | |
| *(T) Barium* | | | *83.7* | | |
| *(T) Yttrium* | | | *91.3* | | |

## L1262469-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1262469-01 10/01/20 09:50 • (MS) R3578670-3 10/01/20 09:50 • (MSD) R3578670-4 10/01/20 09:50

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 10.0 | 0.898 | 12.5 | 11.7 | 116 | 108 | 1 | 70.0-130 | | | 7.19 | | 20 |
| *(T) Barium* | | *89.9* | | | *90.3* | *87.8* | | | | | | | |
| *(T) Yttrium* | | *93.7* | | | *91.5* | *96.7* | | | | | | | |

## Method Blank (MB)

(MB) R3576636-1 09/28/20 16:08

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-226 | 0.0203 | | 0.0669 |
| *(T) Barium-133* | *96.7* | | |

## L1263701-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1263701-04 09/28/20 16:08 • (DUP) R3576636-5 09/28/20 16:08

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.0953 | 0.179 | 1 | 61.0 | 0.309 | | 20 | 3 |
| *(T) Barium-133* | *88.1* | *95.7* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3576636-2 09/28/20 16:08

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 5.02 | 5.37 | 107 | 80.0-120 | |
| *(T) Barium-133* | | | *96.3* | | |

## L1263682-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1263682-05 09/28/20 16:08 • (MS) R3576636-3 09/28/20 16:08 • (MSD) R3576636-4 09/28/20 16:08

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 20.1 | 0.0611 | 23.2 | 20.5 | 115 | 102 | 1 | 75.0-125 | | | 12.2 | | 20 |
| *(T) Barium-133* | | *90.3* | | | *89.2* | *95.7* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.



## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LAO00356 |
| Kentucky [1 6] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

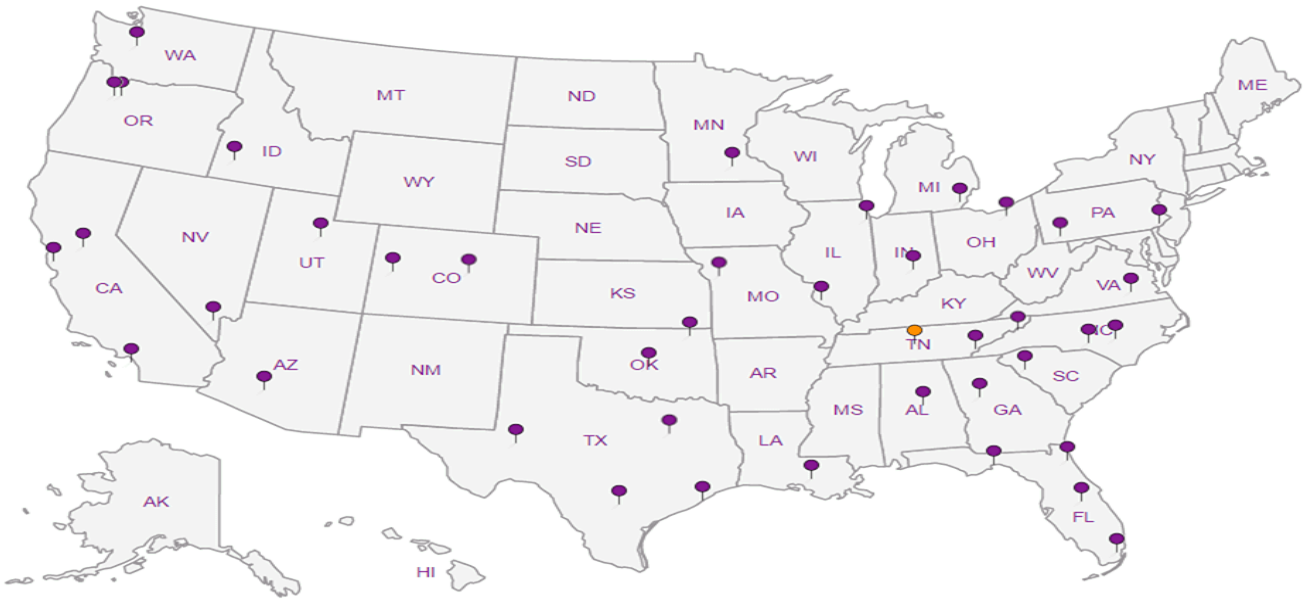
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



G160

Work Order: 2009086

**Subcontractor:**

Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

pg 3 of 9

11-Sep-20

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 11 Ra-228 E904.0 | 11 Ra-226 M7500 Ra B M | | | | |
| FGD-5 | Aqueous | 01C | 09/10/20 07:50 AM | 1LHDPEHNO3 | 1 | | | | | 01 |
| FGD-5 | Aqueous | 01D | 09/10/20 07:50 AM | 1LHDPEHNO3 | | 1 | | | | |
| FGD-2 | Aqueous | 02C | 09/10/20 08:45 AM | 1LHDPEHNO3 | 1 | | | | | 02 |
| FGD-2 | Aqueous | 02D | 09/10/20 08:45 AM | 1LHDPEHNO3 | | 1 | | | | |
| FGD-11 | Aqueous | 03C | 09/10/20 09:40 AM | 1LHDPEHNO3 | 1 | | | | | 03 |
| FGD-11 | Aqueous | 03D | 09/10/20 09:40 AM | 1LHDPEHNO3 | | 1 | | | | |
| FGD-12 | Aqueous | 04C | 09/10/20 10:40 AM | 1LHDPEHNO3 | 1 | | | | | 04 |
| FGD-12 | Aqueous | 04D | 09/10/20 10:40 AM | 1LHDPEHNO3 | | 1 | | | | |

Sample Receipt Checklist

| | | | |
|---|---|---|---|
| COC Seal Present/Intact: | Y ✓ N | If Applicable | |
| COC Signed/Accurate: | ✓ Y N | VOA Zero Headspace: | Y N |
| Bottles arrive intact: | ✓ Y N | Pres.Correct/Check: | ✓ Y N |
| Correct bottles used: | ✓ Y N | | |
| Sufficient volume sent: | ✓ Y N | | |
| RAD Screen <0.5 mR/hr: | ✓ Y N | | |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | [signature] | 9/14/20 1700 | **Received by:** | Carol Kemp | 9/17/20 10:30 |
| **Relinquished by:** | | | **Received by:** | | |

October 12, 2020

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2009111

RE: LUMINANT-OGSES-FGD PONDS (CCR)

Dear Will Vienne:

DHL Analytical, Inc. received 6 sample(s) on 9/16/2020 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-20-25

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 71136

# CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 9-15-20 19122262-F2020 PAGE 1 OF 1
PO #: ~~19116549~~ Per Will V. EL 9/17/20 DHL WORK ORDER #: 2009111
PROJECT LOCATION OR NAME: LUMINANT - OGSES - FGD PONDS (CCR) 19122262-F2020
CLENT PROJECT #: ~~19116549~~ Per Will V. EL 9/17/20 COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ IMETHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO IMETHOD 8015] ❑ DRO IMETHOD 8015] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | APPENDIX III AND IV | FIELD NOTES

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | APPENDIX III AND IV | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 01 | 9-15-20 | 0805 | W | P | 4 | | X | | X | X | X | |
| FGD-4 | 02 | ↓ | 0855 | W | P | 4 | | X | | X | X | X | |
| FGD-3 | 03 | | 0945 | W | P | 4 | | X | | X | X | X | |
| FGD-8 | 04 | | 1045 | W | P | 4 | | X | | X | X | X | |
| FGD-1 | 05 | | 1235 | W | P | 4 | | X | | X | X | X | |
| DUP-01 | 06 | ↓ | 1235 | W | P | 4 | | X | | X | X | X | |

RELINQUISHED BY: (Signature) DATE/TIME 9-15-20 1630 RECEIVED BY: (Signature) FedEx
RELINQUISHED BY: (Signature) DATE/TIME 9/16/20 0948 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

❑ DHL DISPOSAL @ $5.00 each ❑ Return

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑

**LABORATORY USE ONLY:**
RECEIVING TEMP: 3.0°C/0.7°C THERM #: 78
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ☒ NOT USED
CARRIER: ❑ LONE STAR ☒ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

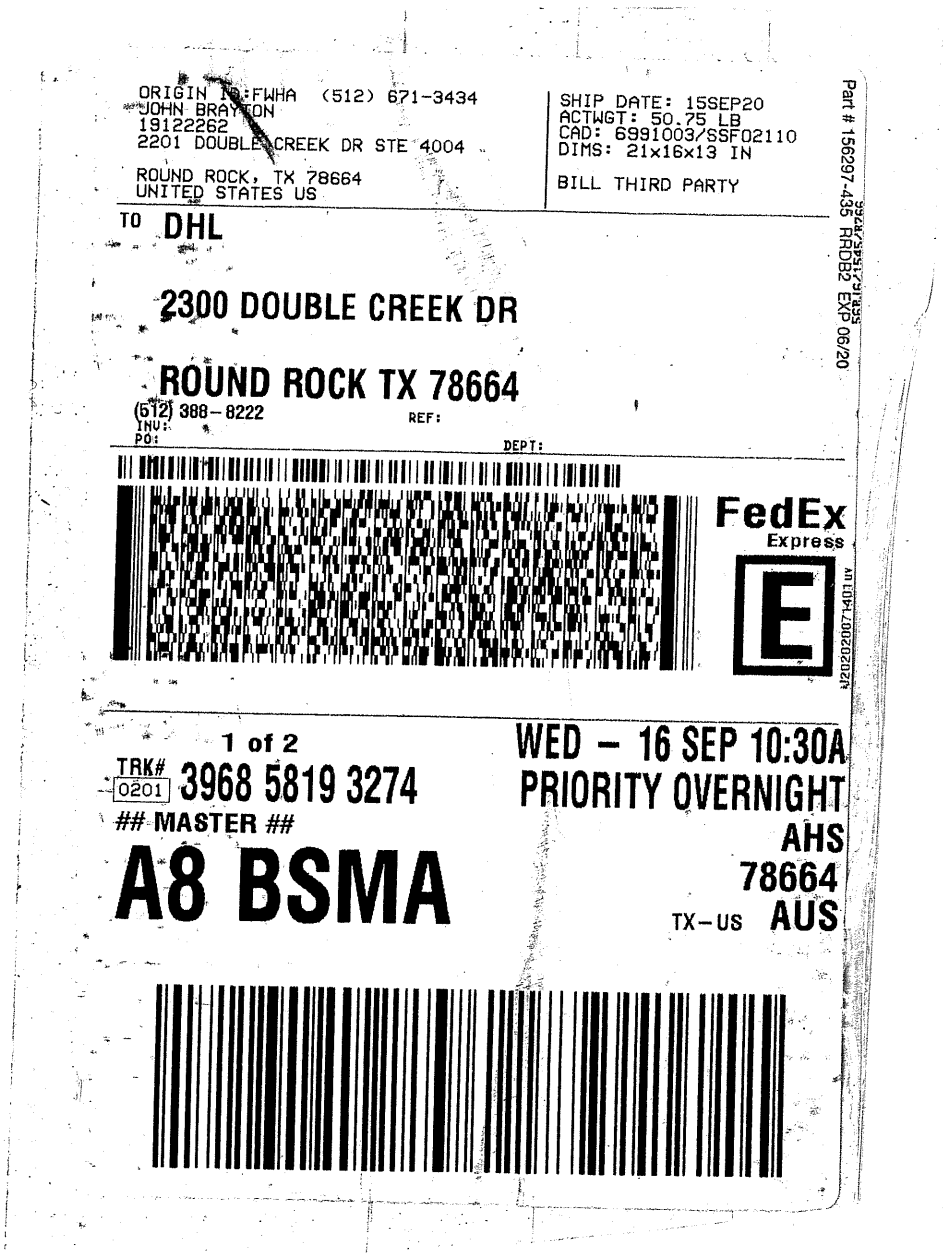
Exclude Sb, Cd, & Hg
Per Will V. 9/17/20

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

---

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis


ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON
19122262
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DATE: 15SEP20
ACTWGT: 50.75 LB
CAD: 6991003/SSF02110
DIMS: 21x16x13 IN
BILL THIRD PARTY
Part # 156297-435 RRDB2 EXP 06/20
TO DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
INV:
PO:
REF:
DEPT:
FedEx
Express
1 of 2
TRK# 0201 3968 5819 3274
## MASTER ##
A8 BSMA
WED - 16 SEP 10:30A
PRIORITY OVERNIGHT
AHS
78664
TX-US AUS

ORIGIN ID:FWHA (512) 671-3434
JOHN BRAYTON
19122262
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DAT
ACTWGT:
CAD:
DIMS: 24x14x14 IN
BILL THIRD PARTY
TO DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
INV:
PO:
REF:
DEPT:
FedEx
Express
2 of 2
MPS# 0263 3968 5819 3285
Mstr# 3968 5819 3274
0201
A8 BSMA
WED - 16 SEP 10:30A
PRIORITY OVERNIGHT
AHS
78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder** Date Received: **9/16/2020**

Work Order Number **2009111** Received by: **RA**

Checklist completed by: _____ 9/16/2020 Reviewed by _____ 9/16/2020
Signature | Date — Initials | Date

Carrier name: FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **3.0** °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? no | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action: _____

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist: Reportable Data**

| | |
|---|---|
| **Project Name:** LUMINANT-OGSES-FGD PONDS (CCR) | **LRC Date:** 10/12/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2009111 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | X | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | X | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | X | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | X | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | X | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | X | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | X | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | X | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | X | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | X | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | X | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | X | | |
| | | **9)** If required for the project, TICs reported? | | | X | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | X | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | X | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | X | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | X | | | | |
| | | **4)** Were blank concentrations < MDL? | | X | | | **R5-04** |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | X | | | **R5-05** |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | X | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | X | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | X | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | X | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | X | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | X | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | X | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | X | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | X | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | X | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | X | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | X | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | X | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | X | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | X | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | X | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | X | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** LUMINANT-OGSES-FGD PONDS (CCR) | **LRC Date:** 10/12/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2009111 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | | X | | | **S2-04** |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | X | | | **S9-01** |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

10/12/20

Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *12-Oct-20*

**CLIENT:** Golder
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)
**Lab Order:** 2009111

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis

Exception Report R1-01

The samples were received and log-in performed on 9/16/20. A total of 6 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report R5-04

For Metals analysis performed on 9/21/20 Boron was detected below the reporting limit in the method blank (MB-97920).

Exception Report R5-05

For Metals analysis performed on 9/21/20 all samples may be biased high for Boron. No further corrective actions were taken.

Exception Report R7-03

For Metals analysis performed on 9/21/20 the matrix spike and matrix spike duplicate recoveries were out of control limits for Calcium. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

Exception Report S2-04

For Metals analysis performed on 9/21/20 Boron was detected below the reporting limit in CCB4-200921. This was due to carryover from the previous samples. The associated samples may be biased high for this analyte. No further corrective actions were taken.

Exception Report S9-01

For Metals analysis performed on 9/21/20 the RPD for the serial dilution was slightly above control limits for Boron. This is flagged accordingly in the QC summary report. The PDS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *12-Oct-20*

**CLIENT:** Golder
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)
**Lab Order:** 2009111

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2009111-01 | FGD-6 | | 09/15/20 08:05 AM | 9/16/2020 |
| 2009111-02 | FGD-4 | | 09/15/20 08:55 AM | 9/16/2020 |
| 2009111-03 | FGD-3 | | 09/15/20 09:45 AM | 9/16/2020 |
| 2009111-04 | FGD-8 | | 09/15/20 10:45 AM | 9/16/2020 |
| 2009111-05 | FGD-1 | | 09/15/20 12:35 PM | 9/16/2020 |
| 2009111-06 | DUP-01 | | 09/15/20 12:35 PM | 9/16/2020 |

**Lab Order:** 2009111
**Client:** Golder
**Project:** LUMINANT-OGSES-FGD POND

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2009111-01A | FGD-6 | 09/15/20 08:05 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| 2009111-01B | FGD-6 | 09/15/20 08:05 AM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | FGD-6 | 09/15/20 08:05 AM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | FGD-6 | 09/15/20 08:05 AM | Aqueous | M2540C | TDS Preparation | 09/16/20 11:25 AM | 97914 |
| 2009111-02A | FGD-4 | 09/15/20 08:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| | FGD-4 | 09/15/20 08:55 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| 2009111-02B | FGD-4 | 09/15/20 08:55 AM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | FGD-4 | 09/15/20 08:55 AM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | FGD-4 | 09/15/20 08:55 AM | Aqueous | M2540C | TDS Preparation | 09/16/20 11:25 AM | 97914 |
| 2009111-03A | FGD-3 | 09/15/20 09:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| | FGD-3 | 09/15/20 09:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| 2009111-03B | FGD-3 | 09/15/20 09:45 AM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | FGD-3 | 09/15/20 09:45 AM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | FGD-3 | 09/15/20 09:45 AM | Aqueous | M2540C | TDS Preparation | 09/16/20 11:25 AM | 97914 |
| 2009111-04A | FGD-8 | 09/15/20 10:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| | FGD-8 | 09/15/20 10:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| 2009111-04B | FGD-8 | 09/15/20 10:45 AM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | FGD-8 | 09/15/20 10:45 AM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | FGD-8 | 09/15/20 10:45 AM | Aqueous | E300 | Anion Preparation | 09/18/20 11:27 AM | 97950 |
| | FGD-8 | 09/15/20 10:45 AM | Aqueous | M2540C | TDS Preparation | 09/16/20 11:25 AM | 97914 |
| 2009111-05A | FGD-1 | 09/15/20 12:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| | FGD-1 | 09/15/20 12:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| 2009111-05B | FGD-1 | 09/15/20 12:35 PM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | FGD-1 | 09/15/20 12:35 PM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | FGD-1 | 09/15/20 12:35 PM | Aqueous | M2540C | TDS Preparation | 09/16/20 11:25 AM | 97914 |
| 2009111-06A | DUP-01 | 09/15/20 12:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| | DUP-01 | 09/15/20 12:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 09/17/20 08:04 AM | 97920 |
| 2009111-06B | DUP-01 | 09/15/20 12:35 PM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |

**Lab Order:** 2009111
**Client:** Golder
**Project:** LUMINANT-OGSES-FGD POND

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2009111-06B | DUP-01 | 09/15/20 12:35 PM | Aqueous | E300 | Anion Preparation | 09/17/20 09:43 AM | 97928 |
| | DUP-01 | 09/15/20 12:35 PM | Aqueous | M2540C | TDS Preparation | 09/16/20 11:25 AM | 97914 |

**Lab Order:** 2009111
**Client:** Golder
**Project:** LUMINANT-OGSES-FGD POND

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2009111-01A | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 1 | 09/21/20 02:47 PM | ICP-MS4_200921C |
| 2009111-01B | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 97928 | 10 | 09/17/20 04:06 PM | IC4_200917A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 97928 | 1 | 09/17/20 09:16 PM | IC4_200917A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 97914 | 1 | 09/16/20 04:45 PM | WC_200916D |
| 2009111-02A | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 1 | 09/21/20 02:49 PM | ICP-MS4_200921C |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 10 | 09/22/20 11:05 AM | ICP-MS4_200922A |
| 2009111-02B | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 97928 | 10 | 09/17/20 05:16 PM | IC4_200917A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 97928 | 1 | 09/17/20 09:32 PM | IC4_200917A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 97914 | 1 | 09/16/20 04:45 PM | WC_200916D |
| 2009111-03A | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 1 | 09/21/20 02:51 PM | ICP-MS4_200921C |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 10 | 09/22/20 11:07 AM | ICP-MS4_200922A |
| 2009111-03B | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 97928 | 10 | 09/17/20 05:32 PM | IC4_200917A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 97928 | 1 | 09/17/20 09:48 PM | IC4_200917A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 97914 | 1 | 09/16/20 04:45 PM | WC_200916D |
| 2009111-04A | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 50 | 09/22/20 11:09 AM | ICP-MS4_200922A |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 1 | 09/21/20 02:53 PM | ICP-MS4_200921C |
| 2009111-04B | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 97928 | 10 | 09/17/20 05:48 PM | IC4_200917A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 97928 | 1 | 09/17/20 10:04 PM | IC4_200917A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 97950 | 100 | 09/18/20 05:53 PM | IC4_200918A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 97914 | 1 | 09/16/20 04:45 PM | WC_200916D |
| 2009111-05A | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 1 | 09/21/20 02:55 PM | ICP-MS4_200921C |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 10 | 09/22/20 11:11 AM | ICP-MS4_200922A |
| 2009111-05B | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 97928 | 10 | 09/17/20 06:04 PM | IC4_200917A |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 97928 | 1 | 09/17/20 10:20 PM | IC4_200917A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 97914 | 1 | 09/16/20 04:45 PM | WC_200916D |
| 2009111-06A | DUP-01 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 1 | 09/21/20 02:57 PM | ICP-MS4_200921C |
| | DUP-01 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 97920 | 10 | 09/22/20 11:13 AM | ICP-MS4_200922A |
| 2009111-06B | DUP-01 | Aqueous | E300 | Anions by IC method - Water | 97928 | 10 | 09/17/20 06:20 PM | IC4_200917A |

**Lab Order:** 2009111
**Client:** Golder
**Project:** LUMINANT-OGSES-FGD POND

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2009111-06B | DUP-01 | Aqueous | E300 | Anions by IC method - Water | 97928 | 1 | 09/17/20 10:36 PM | IC4_200917A |
| | DUP-01 | Aqueous | M2540C | Total Dissolved Solids | 97914 | 1 | 09/16/20 04:45 PM | WC_200916D |

# DHL Analytical, Inc.

**Date:** *12-Oct-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | LUMINANT-OGSES-FGD PONDS (CCR) | **Lab ID:** | 2009111-01 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 09/15/20 08:05 AM |
| **Lab Order:** | 2009111 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Arsenic | 0.00651 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:47 PM |
| Barium | 0.0695 | 0.00300 | 0.0100 | | mg/L | 1 | 09/21/20 02:47 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/21/20 02:47 PM |
| Boron | 0.112 | 0.0100 | 0.0300 | | mg/L | 1 | 09/21/20 02:47 PM |
| Calcium | 20.2 | 0.100 | 0.300 | | mg/L | 1 | 09/21/20 02:47 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:47 PM |
| Cobalt | 0.00615 | 0.00300 | 0.00500 | | mg/L | 1 | 09/21/20 02:47 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/21/20 02:47 PM |
| Lithium | 0.00669 | 0.00500 | 0.0100 | J | mg/L | 1 | 09/21/20 02:47 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:47 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:47 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/21/20 02:47 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 144 | 3.00 | 10.0 | | mg/L | 10 | 09/17/20 04:06 PM |
| Fluoride | 0.354 | 0.100 | 0.400 | J | mg/L | 1 | 09/17/20 09:16 PM |
| Sulfate | 89.6 | 1.00 | 3.00 | | mg/L | 1 | 09/17/20 09:16 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 688 | 10.0 | 10.0 | | mg/L | 1 | 09/16/20 04:45 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Oct-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | LUMINANT-OGSES-FGD PONDS (CCR) | **Lab ID:** | 2009111-02 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 09/15/20 08:55 AM |
| **Lab Order:** | 2009111 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:49 PM |
| Barium | 0.0899 | 0.00300 | 0.0100 | | mg/L | 1 | 09/21/20 02:49 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/21/20 02:49 PM |
| Boron | 0.109 | 0.0100 | 0.0300 | | mg/L | 1 | 09/21/20 02:49 PM |
| Calcium | 33.6 | 1.00 | 3.00 | | mg/L | 10 | 09/22/20 11:05 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:49 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/21/20 02:49 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/21/20 02:49 PM |
| Lithium | 0.0140 | 0.00500 | 0.0100 | | mg/L | 1 | 09/21/20 02:49 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:49 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:49 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/21/20 02:49 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 197 | 3.00 | 10.0 | | mg/L | 10 | 09/17/20 05:16 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 09/17/20 09:32 PM |
| Sulfate | 50.1 | 1.00 | 3.00 | | mg/L | 1 | 09/17/20 09:32 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 674 | 10.0 | 10.0 | | mg/L | 1 | 09/16/20 04:45 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Oct-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | LUMINANT-OGSES-FGD PONDS (CCR) | **Lab ID:** | 2009111-03 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 09/15/20 09:45 AM |
| **Lab Order:** | 2009111 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Arsenic | 0.00225 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/21/20 02:51 PM |
| Barium | 0.0326 | 0.00300 | 0.0100 | | mg/L | 1 | 09/21/20 02:51 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/21/20 02:51 PM |
| Boron | 0.130 | 0.0100 | 0.0300 | | mg/L | 1 | 09/21/20 02:51 PM |
| Calcium | 36.8 | 1.00 | 3.00 | | mg/L | 10 | 09/22/20 11:07 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:51 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/21/20 02:51 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/21/20 02:51 PM |
| Lithium | 0.0416 | 0.00500 | 0.0100 | | mg/L | 1 | 09/21/20 02:51 PM |
| Molybdenum | 0.00245 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/21/20 02:51 PM |
| Selenium | 0.00646 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:51 PM |
| Thallium | 0.000534 | 0.000500 | 0.00150 | J | mg/L | 1 | 09/21/20 02:51 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 58.5 | 3.00 | 10.0 | | mg/L | 10 | 09/17/20 05:32 PM |
| Fluoride | 0.772 | 0.100 | 0.400 | | mg/L | 1 | 09/17/20 09:48 PM |
| Sulfate | 122 | 1.00 | 3.00 | | mg/L | 1 | 09/17/20 09:48 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 709 | 10.0 | 10.0 | | mg/L | 1 | 09/16/20 04:45 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Oct-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | LUMINANT-OGSES-FGD PONDS (CCR) | **Lab ID:** | 2009111-04 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 09/15/20 10:45 AM |
| **Lab Order:** | 2009111 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Arsenic | 0.00796 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:53 PM |
| Barium | 0.777 | 0.00300 | 0.0100 | | mg/L | 1 | 09/21/20 02:53 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/21/20 02:53 PM |
| Boron | 0.101 | 0.0100 | 0.0300 | | mg/L | 1 | 09/21/20 02:53 PM |
| Calcium | 329 | 5.00 | 15.0 | | mg/L | 50 | 09/22/20 11:09 AM |
| Chromium | 0.00287 | 0.00200 | 0.00500 | J | mg/L | 1 | 09/21/20 02:53 PM |
| Cobalt | 0.00379 | 0.00300 | 0.00500 | J | mg/L | 1 | 09/21/20 02:53 PM |
| Lead | 0.00107 | 0.000300 | 0.00100 | | mg/L | 1 | 09/21/20 02:53 PM |
| Lithium | 0.00864 | 0.00500 | 0.0100 | J | mg/L | 1 | 09/21/20 02:53 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:53 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:53 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/21/20 02:53 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 2220 | 30.0 | 100 | | mg/L | 100 | 09/18/20 05:53 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 09/17/20 10:04 PM |
| Sulfate | 58.9 | 1.00 | 3.00 | | mg/L | 1 | 09/17/20 10:04 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 3890 | 50.0 | 50.0 | | mg/L | 1 | 09/16/20 04:45 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Oct-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | LUMINANT-OGSES-FGD PONDS (CCR) | **Lab ID:** | 2009111-05 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 09/15/20 12:35 PM |
| **Lab Order:** | 2009111 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:55 PM |
| Barium | 0.162 | 0.00300 | 0.0100 | | mg/L | 1 | 09/21/20 02:55 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/21/20 02:55 PM |
| Boron | 0.0871 | 0.0100 | 0.0300 | | mg/L | 1 | 09/21/20 02:55 PM |
| Calcium | 36.0 | 1.00 | 3.00 | | mg/L | 10 | 09/22/20 11:11 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:55 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/21/20 02:55 PM |
| Lead | 0.000342 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/21/20 02:55 PM |
| Lithium | 0.0233 | 0.00500 | 0.0100 | | mg/L | 1 | 09/21/20 02:55 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:55 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:55 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/21/20 02:55 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 320 | 3.00 | 10.0 | | mg/L | 10 | 09/17/20 06:04 PM |
| Fluoride | 0.215 | 0.100 | 0.400 | J | mg/L | 1 | 09/17/20 10:20 PM |
| Sulfate | 158 | 10.0 | 30.0 | | mg/L | 10 | 09/17/20 06:04 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 875 | 50.0 | 50.0 | | mg/L | 1 | 09/16/20 04:45 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Oct-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | DUP-01 |
| **Project:** | LUMINANT-OGSES-FGD PONDS (CCR) | **Lab ID:** | 2009111-06 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 09/15/20 12:35 PM |
| **Lab Order:** | 2009111 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:57 PM |
| Barium | 0.161 | 0.00300 | 0.0100 | | mg/L | 1 | 09/21/20 02:57 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 09/21/20 02:57 PM |
| Boron | 0.0981 | 0.0100 | 0.0300 | | mg/L | 1 | 09/21/20 02:57 PM |
| Calcium | 36.3 | 1.00 | 3.00 | | mg/L | 10 | 09/22/20 11:13 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:57 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 09/21/20 02:57 PM |
| Lead | 0.000388 | 0.000300 | 0.00100 | J | mg/L | 1 | 09/21/20 02:57 PM |
| Lithium | 0.0252 | 0.00500 | 0.0100 | | mg/L | 1 | 09/21/20 02:57 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:57 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 09/21/20 02:57 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 09/21/20 02:57 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 316 | 3.00 | 10.0 | | mg/L | 10 | 09/17/20 06:20 PM |
| Fluoride | 0.239 | 0.100 | 0.400 | J | mg/L | 1 | 09/17/20 10:36 PM |
| Sulfate | 156 | 10.0 | 30.0 | | mg/L | 10 | 09/17/20 06:20 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 940 | 50.0 | 50.0 | | mg/L | 1 | 09/16/20 04:45 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200803A**

| Sample ID: **DCS1-97152** | Batch ID: **97152** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS4_200803A** | Analysis Date: **8/3/2020 12:35:00 PM** | Prep Date: **7/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.000428 | 0.00100 | 0.000500 | 0 | 85.6 | 70 | 130 | 0 | 0 | |
| Lead | 0.000490 | 0.00100 | 0.000500 | 0 | 98.0 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000482 | 0.00150 | 0.000500 | 0 | 96.4 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS2-97152** | Batch ID: **97152** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS4_200803A** | Analysis Date: **8/3/2020 12:37:00 PM** | Prep Date: **7/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.342 | 0.300 | 0.300 | 0 | 114 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS3-97152** | Batch ID: **97152** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS4_200803A** | Analysis Date: **8/3/2020 12:40:00 PM** | Prep Date: **7/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00503 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | 0 | 0 | |
| Barium | 0.00508 | 0.0100 | 0.00500 | 0 | 102 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00532 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00427 | 0.0100 | 0.00500 | 0 | 85.4 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00506 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00597 | 0.00500 | 0.00500 | 0 | 119 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-97152** | Batch ID: **97152** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS4_200803A** | Analysis Date: **8/3/2020 12:43:00 PM** | Prep Date: **7/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0277 | 0.0300 | 0.0300 | 0 | 92.4 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS4_200921C**

The QC data in batch 97920 applies to the following samples: 2009111-01A, 2009111-02A, 2009111-03A, 2009111-04A, 2009111-05A, 2009111-06A

Sample ID: **MB-97920** Batch ID: **97920** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_200921C** Analysis Date: **9/21/2020 2:31:00 PM** Prep Date: **9/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | 0.0102 | 0.0300 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID: **LCS-97920** Batch ID: **97920** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_200921C** Analysis Date: **9/21/2020 2:33:00 PM** Prep Date: **9/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.198 | 0.00500 | 0.200 | 0 | 99.2 | 80 | 120 | | | |
| Barium | 0.196 | 0.0100 | 0.200 | 0 | 97.9 | 80 | 120 | | | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Boron | 0.199 | 0.0300 | 0.200 | 0 | 99.7 | 80 | 120 | | | |
| Calcium | 4.75 | 0.300 | 5.00 | 0 | 95.0 | 80 | 120 | | | |
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.7 | 80 | 120 | | | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.4 | 80 | 120 | | | |
| Molybdenum | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Selenium | 0.196 | 0.00500 | 0.200 | 0 | 97.8 | 80 | 120 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 80 | 120 | | | |

Sample ID: **LCSD-97920** Batch ID: **97920** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_200921C** Analysis Date: **9/21/2020 2:35:00 PM** Prep Date: **9/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | 0.597 | 15 | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.7 | 80 | 120 | 1.79 | 15 | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.171 | 15 | |
| Boron | 0.208 | 0.0300 | 0.200 | 0 | 104 | 80 | 120 | 4.40 | 15 | |
| Calcium | 4.75 | 0.300 | 5.00 | 0 | 95.1 | 80 | 120 | 0.127 | 15 | |
| Chromium | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 0.743 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200921C**

| Sample ID: **LCSD-97920** | Batch ID: **97920** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_200921C** | Analysis Date: **9/21/2020 2:35:00 PM** | Prep Date: **9/17/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.005 | 15 | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 99.9 | 80 | 120 | 1.17 | 15 | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 3.63 | 15 | |
| Molybdenum | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 1.42 | 15 | |
| Selenium | 0.193 | 0.00500 | 0.200 | 0 | 96.5 | 80 | 120 | 1.39 | 15 | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.4 | 80 | 120 | 0.579 | 15 | |

| Sample ID: **2009097-05B SD** | Batch ID: **97920** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_200921C** | Analysis Date: **9/21/2020 2:45:00 PM** | Prep Date: **9/17/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Barium | <0.0150 | 0.0500 | 0 | 0.0115 | | | | 0 | 20 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Boron | 0.105 | 0.150 | 0 | 0.0818 | | | | 24.8 | 20 | R |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Lead | <0.00150 | 0.00500 | 0 | 0.000311 | | | | 0 | 20 | |
| Lithium | 0.0687 | 0.0500 | 0 | 0.0662 | | | | 3.66 | 20 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 20 | |

| Sample ID: **2009097-05B PDS** | Batch ID: **97920** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_200921C** | Analysis Date: **9/21/2020 3:09:00 PM** | Prep Date: **9/17/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.210 | 0.00500 | 0.200 | 0 | 105 | 75 | 125 | | | |
| Barium | 0.220 | 0.0100 | 0.200 | 0.0115 | 104 | 75 | 125 | | | |
| Beryllium | 0.190 | 0.00100 | 0.200 | 0 | 95.0 | 75 | 125 | | | |
| Boron | 0.260 | 0.0300 | 0.200 | 0.0818 | 88.9 | 75 | 125 | | | |
| Chromium | 0.211 | 0.00500 | 0.200 | 0 | 105 | 75 | 125 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Lead | 0.211 | 0.00100 | 0.200 | 0.000311 | 105 | 75 | 125 | | | |
| Lithium | 0.258 | 0.0100 | 0.200 | 0.0662 | 95.8 | 75 | 125 | | | |
| Molybdenum | 0.206 | 0.00500 | 0.200 | 0 | 103 | 75 | 125 | | | |
| Selenium | 0.218 | 0.00500 | 0.200 | 0 | 109 | 75 | 125 | | | |
| Thallium | 0.214 | 0.00150 | 0.200 | 0 | 107 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS4_200921C**

| Sample ID: **2009097-05B MS** | Batch ID: **97920** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_200921C** | Analysis Date: **9/21/2020 3:11:00 PM** | Prep Date: **9/17/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.215 | 0.00500 | 0.200 | 0 | 107 | 75 | 125 | | | |
| Barium | 0.215 | 0.0100 | 0.200 | 0.0115 | 102 | 75 | 125 | | | |
| Beryllium | 0.189 | 0.00100 | 0.200 | 0 | 94.7 | 75 | 125 | | | |
| Boron | 0.265 | 0.0300 | 0.200 | 0.0818 | 91.8 | 75 | 125 | | | |
| Calcium | 499 | 0.300 | 5.00 | 495 | 73.7 | 75 | 125 | | | S |
| Chromium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Lead | 0.205 | 0.00100 | 0.200 | 0.000311 | 102 | 75 | 125 | | | |
| Lithium | 0.265 | 0.0100 | 0.200 | 0.0662 | 99.6 | 75 | 125 | | | |
| Molybdenum | 0.213 | 0.00500 | 0.200 | 0 | 107 | 75 | 125 | | | |
| Selenium | 0.215 | 0.00500 | 0.200 | 0 | 108 | 75 | 125 | | | |
| Thallium | 0.208 | 0.00150 | 0.200 | 0 | 104 | 75 | 125 | | | |

| Sample ID: **2009097-05B MSD** | Batch ID: **97920** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_200921C** | Analysis Date: **9/21/2020 3:13:00 PM** | Prep Date: **9/17/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.210 | 0.00500 | 0.200 | 0 | 105 | 75 | 125 | 2.09 | 15 | |
| Barium | 0.214 | 0.0100 | 0.200 | 0.0115 | 101 | 75 | 125 | 0.392 | 15 | |
| Beryllium | 0.186 | 0.00100 | 0.200 | 0 | 93.0 | 75 | 125 | 1.88 | 15 | |
| Boron | 0.263 | 0.0300 | 0.200 | 0.0818 | 90.6 | 75 | 125 | 0.842 | 15 | |
| Calcium | 495 | 0.300 | 5.00 | 495 | -11.6 | 75 | 125 | 0.859 | 15 | S |
| Chromium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | 0.245 | 15 | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 75 | 125 | 1.60 | 15 | |
| Lead | 0.203 | 0.00100 | 0.200 | 0.000311 | 102 | 75 | 125 | 0.724 | 15 | |
| Lithium | 0.260 | 0.0100 | 0.200 | 0.0662 | 96.8 | 75 | 125 | 2.17 | 15 | |
| Molybdenum | 0.212 | 0.00500 | 0.200 | 0 | 106 | 75 | 125 | 0.575 | 15 | |
| Selenium | 0.211 | 0.00500 | 0.200 | 0 | 105 | 75 | 125 | 1.99 | 15 | |
| Thallium | 0.209 | 0.00150 | 0.200 | 0 | 104 | 75 | 125 | 0.285 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200921C**

Sample ID: **ICV-200921** Batch ID: **R112367** TestNo: **SW6020B** Units: **mg/L**
SampType: **ICV** Run ID: **ICP-MS4_200921C** Analysis Date: **9/21/2020 10:51:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.0951 | 0.00500 | 0.100 | 0 | 95.1 | 90 | 110 | | | |
| Barium | 0.0994 | 0.0100 | 0.100 | 0 | 99.4 | 90 | 110 | | | |
| Beryllium | 0.0998 | 0.00100 | 0.100 | 0 | 99.8 | 90 | 110 | | | |
| Boron | 0.102 | 0.0300 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.46 | 0.300 | 2.50 | 0 | 98.6 | 90 | 110 | | | |
| Chromium | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.0992 | 0.00500 | 0.100 | 0 | 99.2 | 90 | 110 | | | |
| Lead | 0.0985 | 0.00100 | 0.100 | 0 | 98.5 | 90 | 110 | | | |
| Lithium | 0.0995 | 0.0100 | 0.100 | 0 | 99.5 | 90 | 110 | | | |
| Molybdenum | 0.0949 | 0.00500 | 0.100 | 0 | 94.9 | 90 | 110 | | | |
| Selenium | 0.0940 | 0.00500 | 0.100 | 0 | 94.0 | 90 | 110 | | | |
| Thallium | 0.0976 | 0.00150 | 0.100 | 0 | 97.6 | 90 | 110 | | | |

Sample ID: **LCVL-200921** Batch ID: **R112367** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_200921C** Analysis Date: **9/21/2020 10:58:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 80 | 120 | | | |
| Barium | 0.00513 | 0.0100 | 0.00500 | 0 | 103 | 80 | 120 | | | |
| Beryllium | 0.00117 | 0.00100 | 0.00100 | 0 | 117 | 80 | 120 | | | |
| Boron | 0.0204 | 0.0300 | 0.0200 | 0 | 102 | 80 | 120 | | | |
| Calcium | 0.106 | 0.300 | 0.100 | 0 | 106 | 80 | 120 | | | |
| Chromium | 0.00534 | 0.00500 | 0.00500 | 0 | 107 | 80 | 120 | | | |
| Cobalt | 0.00521 | 0.00500 | 0.00500 | 0 | 104 | 80 | 120 | | | |
| Lead | 0.00107 | 0.00100 | 0.00100 | 0 | 107 | 80 | 120 | | | |
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 80 | 120 | | | |
| Molybdenum | 0.00530 | 0.00500 | 0.00500 | 0 | 106 | 80 | 120 | | | |
| Selenium | 0.00472 | 0.00500 | 0.00500 | 0 | 94.5 | 80 | 120 | | | |
| Thallium | 0.00104 | 0.00150 | 0.00100 | 0 | 104 | 80 | 120 | | | |

Sample ID: **CCV4-200921** Batch ID: **R112367** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS4_200921C** Analysis Date: **9/21/2020 2:20:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.198 | 0.00500 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Barium | 0.196 | 0.0100 | 0.200 | 0 | 98.0 | 90 | 110 | | | |
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Boron | 0.193 | 0.0300 | 0.200 | 0 | 96.4 | 90 | 110 | | | |
| Calcium | 4.78 | 0.300 | 5.00 | 0 | 95.5 | 90 | 110 | | | |
| Chromium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200921C**

| Sample ID: **CCV4-200921** | Batch ID: **R112367** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_200921C** | Analysis Date: **9/21/2020 2:20:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.4 | 90 | 110 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Selenium | 0.192 | 0.00500 | 0.200 | 0 | 96.1 | 90 | 110 | | | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 100 | 90 | 110 | | | |

| Sample ID: **CCV5-200921** | Batch ID: **R112367** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_200921C** | Analysis Date: **9/21/2020 3:19:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.196 | 0.00500 | 0.200 | 0 | 97.8 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Boron | 0.199 | 0.0300 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Calcium | 4.71 | 0.300 | 5.00 | 0 | 94.3 | 90 | 110 | | | |
| Chromium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.195 | 0.00100 | 0.200 | 0 | 97.6 | 90 | 110 | | | |
| Lithium | 0.212 | 0.0100 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Selenium | 0.193 | 0.00500 | 0.200 | 0 | 96.5 | 90 | 110 | | | |
| Thallium | 0.205 | 0.00150 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200922A**

The QC data in batch 97920 applies to the following samples: 2009111-01A, 2009111-02A, 2009111-03A, 2009111-04A, 2009111-05A, 2009111-06A

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID: **2009097-05B SD** | Batch ID: **97920** | TestNo: **SW6020B** | Units: **mg/L** | | | | |
| SampType: **SD** | Run ID: **ICP-MS4_200922A** | Analysis Date: **9/22/2020 11:03:00 AM** | Prep Date: **9/17/2020** | | | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 524 | 75.0 | 0 | 523 | | | | 0.145 | 20 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID: **2009097-05B PDS** | Batch ID: **97920** | TestNo: **SW6020B** | Units: **mg/L** | | | | |
| SampType: **PDS** | Run ID: **ICP-MS4_200922A** | Analysis Date: **9/22/2020 11:23:00 AM** | Prep Date: **9/17/2020** | | | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 782 | 15.0 | 250 | 523 | 103 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_200922A**

| Sample ID: **ICV-200922** | Batch ID: **R112373** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_200922A** | Analysis Date: **9/22/2020 10:30:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.48 | 0.300 | 2.50 | 0 | 99.1 | 90 | 110 | | | |

| Sample ID: **LCVL-200922** | Batch ID: **R112373** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_200922A** | Analysis Date: **9/22/2020 10:36:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.106 | 0.300 | 0.100 | 0 | 106 | 80 | 120 | | | |

| Sample ID: **CCV1-200922** | Batch ID: **R112373** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_200922A** | Analysis Date: **9/22/2020 10:56:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.91 | 0.300 | 5.00 | 0 | 98.2 | 90 | 110 | | | |

| Sample ID: **CCV2-200922** | Batch ID: **R112373** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_200922A** | Analysis Date: **9/22/2020 11:24:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.04 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200826A**

Sample ID: **DCS2-97742** Batch ID: **97742** TestNo: **E300** Units: **mg/L**
SampType: **DCS2** Run ID: **IC4_200826A** Analysis Date: **8/26/2020 1:19:59 PM** Prep Date: **8/26/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.477 | 1.00 | 0.5000 | 0 | 95.3 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.216 | 0.400 | 0.2000 | 0 | 108 | 70 | 130 | 0 | 0 | |
| Sulfate | 1.47 | 3.00 | 1.500 | 0 | 98.1 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200917A**

The QC data in batch 97928 applies to the following samples: 2009111-01B, 2009111-02B, 2009111-03B, 2009111-04B, 2009111-05B, 2009111-06B

Sample ID: **MB-97928** Batch ID: **97928** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_200917A** Analysis Date: **9/17/2020 11:46:53 AM** Prep Date: **9/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-97928** Batch ID: **97928** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_200917A** Analysis Date: **9/17/2020 12:02:53 PM** Prep Date: **9/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.81 | 1.00 | 10.00 | 0 | 98.1 | 90 | 110 | | | |
| Fluoride | 3.84 | 0.400 | 4.000 | 0 | 96.0 | 90 | 110 | | | |
| Sulfate | 30.5 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | | | |

Sample ID: **LCSD-97928** Batch ID: **97928** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_200917A** Analysis Date: **9/17/2020 12:18:53 PM** Prep Date: **9/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.77 | 1.00 | 10.00 | 0 | 97.7 | 90 | 110 | 0.428 | 20 | |
| Fluoride | 3.82 | 0.400 | 4.000 | 0 | 95.6 | 90 | 110 | 0.430 | 20 | |
| Sulfate | 30.4 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | 0.404 | 20 | |

Sample ID: **2009111-01BMS** Batch ID: **97928** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_200917A** Analysis Date: **9/17/2020 4:44:31 PM** Prep Date: **9/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 328 | 10.0 | 200.0 | 144.0 | 92.0 | 90 | 110 | | | |
| Fluoride | 209 | 4.00 | 200.0 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 297 | 30.0 | 200.0 | 84.03 | 107 | 90 | 110 | | | |

Sample ID: **2009111-01BMSD** Batch ID: **97928** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_200917A** Analysis Date: **9/17/2020 5:00:31 PM** Prep Date: **9/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 325 | 10.0 | 200.0 | 144.0 | 90.4 | 90 | 110 | 0.935 | 20 | |
| Fluoride | 207 | 4.00 | 200.0 | 0 | 103 | 90 | 110 | 0.995 | 20 | |
| Sulfate | 297 | 30.0 | 200.0 | 84.03 | 107 | 90 | 110 | 0.083 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200917A**

| Sample ID: **ICV-200917** | Batch ID: **R112331** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_200917A** | Analysis Date: **9/17/2020 11:14:53 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.4 | 1.00 | 25.00 | 0 | 97.5 | 90 | 110 | | | |
| Fluoride | 9.78 | 0.400 | 10.00 | 0 | 97.8 | 90 | 110 | | | |
| Sulfate | 77.8 | 3.00 | 75.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID: **CCV1-200917** | Batch ID: **R112331** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_200917A** | Analysis Date: **9/17/2020 8:28:31 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.70 | 1.00 | 10.00 | 0 | 97.0 | 90 | 110 | | | |
| Fluoride | 3.91 | 0.400 | 4.000 | 0 | 97.7 | 90 | 110 | | | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **CCV2-200917** | Batch ID: **R112331** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_200917A** | Analysis Date: **9/17/2020 11:40:31 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 4.01 | 0.400 | 4.000 | 0 | 100 | 90 | 110 | | | |
| Sulfate | 30.4 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200918A**

The QC data in batch 97950 applies to the following samples: 2009111-04B

| Sample ID: **MB-97950** | Batch ID: **97950** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **IC4_200918A** | Analysis Date: **9/18/2020 12:52:56 PM** | Prep Date: **9/18/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |

| Sample ID: **LCS-97950** | Batch ID: **97950** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **IC4_200918A** | Analysis Date: **9/18/2020 1:08:56 PM** | Prep Date: **9/18/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.73 | 1.00 | 10.00 | 0 | 97.3 | 90 | 110 | | | |

| Sample ID: **LCSD-97950** | Batch ID: **97950** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **IC4_200918A** | Analysis Date: **9/18/2020 1:24:56 PM** | Prep Date: **9/18/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.85 | 1.00 | 10.00 | 0 | 98.5 | 90 | 110 | 1.23 | 20 | |

| Sample ID: **2009138-01BMS** | Batch ID: **97950** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_200918A** | Analysis Date: **9/18/2020 3:29:16 PM** | Prep Date: **9/18/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 302 | 10.0 | 200.0 | 113.8 | 94.0 | 90 | 110 | | | |

| Sample ID: **2009138-01BMSD** | Batch ID: **97950** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_200918A** | Analysis Date: **9/18/2020 3:45:16 PM** | Prep Date: **9/18/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 297 | 10.0 | 200.0 | 113.8 | 91.6 | 90 | 110 | 1.61 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200918A**

| Sample ID: **ICV-200918** | Batch ID: **R112344** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_200918A** | Analysis Date: **9/18/2020 12:20:56 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.0 | 1.00 | 25.00 | 0 | 96.1 | 90 | 110 | | | |

| Sample ID: **CCV1-200918** | Batch ID: **R112344** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_200918A** | Analysis Date: **9/18/2020 6:57:16 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.1 | 1.00 | 10.00 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_200916D**

The QC data in batch 97914 applies to the following samples: 2009111-01B, 2009111-02B, 2009111-03B, 2009111-04B, 2009111-05B, 2009111-06B

| Sample ID: **MB-97914** | Batch ID: **97914** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_200916D** | Analysis Date: **9/16/2020 4:45:00 PM** | Prep Date: **9/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-97914** | Batch ID: **97914** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_200916D** | Analysis Date: **9/16/2020 4:45:00 PM** | Prep Date: **9/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 774 | 10.0 | 745.6 | 0 | 104 | 90 | 113 | | | |

| Sample ID: **2009097-01E-DUP** | Batch ID: **97914** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_200916D** | Analysis Date: **9/16/2020 4:45:00 PM** | Prep Date: **9/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 2860 | 50.0 | 0 | 2860 | | | | 0.175 | 5 | |

| Sample ID: **2009097-02E-DUP** | Batch ID: **97914** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_200916D** | Analysis Date: **9/16/2020 4:45:00 PM** | Prep Date: **9/16/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 3990 | 50.0 | 0 | 3980 | | | | 0.126 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2009111
**Project:** LUMINANT-OGSES-FGD PONDS (CCR)

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Molybdenum | 0.00200 | 0.00500 |
| Selenium | 0.00200 | 0.00500 |
| Thallium | 0.000500 | 0.00150 |

| **TestNo: M2540C** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

October 08, 2020



## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1263680 |
| Samples Received: | 09/18/2020 |
| Project Number: | 2009111 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

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## FGD-6 L1263680-01 Non-Potable Water

| Collected by | Collected date/time | Received date/time |
|---|---|---|
| | 09/15/20 08:05 | 09/18/20 09:00 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1546570 | 1 | 09/21/20 14:49 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1548584 | 1 | 09/25/20 15:57 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1548584 | 1 | 09/25/20 15:57 | 09/29/20 08:57 | RGT | Mt. Juliet, TN |

## FGD-4 L1263680-02 Non-Potable Water

| Collected by | Collected date/time | Received date/time |
|---|---|---|
| | 09/15/20 08:05 | 09/18/20 09:00 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1546570 | 1 | 09/21/20 14:49 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1548584 | 1 | 09/25/20 15:57 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1548584 | 1 | 09/25/20 15:57 | 09/29/20 08:57 | RGT | Mt. Juliet, TN |

## FGD-3 L1263680-03 Non-Potable Water

| Collected by | Collected date/time | Received date/time |
|---|---|---|
| | 09/15/20 08:05 | 09/18/20 09:00 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1546570 | 1 | 09/21/20 14:49 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1548584 | 1 | 09/25/20 15:57 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1548584 | 1 | 09/25/20 15:57 | 09/29/20 08:57 | RGT | Mt. Juliet, TN |

## FGD-8 L1263680-04 Non-Potable Water

| Collected by | Collected date/time | Received date/time |
|---|---|---|
| | 09/15/20 08:05 | 09/18/20 09:00 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1546570 | 1 | 09/21/20 14:49 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1548584 | 1 | 09/25/20 15:57 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1548584 | 1 | 09/25/20 15:57 | 09/29/20 08:57 | RGT | Mt. Juliet, TN |

## FGD-1 L1263680-05 Non-Potable Water

| Collected by | Collected date/time | Received date/time |
|---|---|---|
| | 09/15/20 08:05 | 09/18/20 09:00 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1546570 | 1 | 09/21/20 14:49 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1548584 | 1 | 09/25/20 15:57 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1548584 | 1 | 09/25/20 15:57 | 09/29/20 08:57 | RGT | Mt. Juliet, TN |

## DUP-01 L1263680-06 Non-Potable Water

| Collected by | Collected date/time | Received date/time |
|---|---|---|
| | 09/15/20 08:05 | 09/18/20 09:00 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1546570 | 1 | 09/21/20 14:49 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1548584 | 1 | 09/25/20 15:57 | 10/02/20 09:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1548584 | 1 | 09/25/20 15:57 | 09/28/20 16:08 | RGT | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 1.08 | | 0.630 | 1.16 | 10/02/2020 09:55 | WG1546570 |
| *(T) Barium* | *92.1* | | | *62.0-143* | *10/02/2020 09:55* | WG1546570 |
| *(T) Yttrium* | *113* | | | *79.0-136* | *10/02/2020 09:55* | WG1546570 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 1.57 | | 0.938 | 1.5 | 10/02/2020 09:55 | WG1548584 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.485 | | 0.308 | 0.344 | 09/29/2020 08:57 | WG1548584 |
| *(T) Barium-133* | *91.8* | | | *30.0-143* | *09/29/2020 08:57* | WG1548584 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | -0.0258 | | 0.672 | 1.27 | 10/02/2020 09:55 | WG1546570 |
| *(T) Barium* | *86.0* | | | *62.0-143* | *10/02/2020 09:55* | WG1546570 |
| *(T) Yttrium* | *109* | | | *79.0-136* | *10/02/2020 09:55* | WG1546570 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.498 | | 0.977 | 1.54 | 10/02/2020 09:55 | WG1548584 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.498 | | 0.305 | 0.274 | 09/29/2020 08:57 | WG1548584 |
| *(T) Barium-133* | *88.2* | | | *30.0-143* | *09/29/2020 08:57* | WG1548584 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.454 | | 0.770 | 1.44 | 10/02/2020 09:55 | WG1546570 |
| *(T) Barium* | *80.4* | | | *62.0-143* | *10/02/2020 09:55* | WG1546570 |
| *(T) Yttrium* | *102* | | | *79.0-136* | *10/02/2020 09:55* | WG1546570 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.711 | | 0.978 | 1.65 | 10/02/2020 09:55 | WG1548584 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.257 | | 0.208 | 0.206 | 09/29/2020 08:57 | WG1548584 |
| *(T) Barium-133* | *88.5* | | | *30.0-143* | *09/29/2020 08:57* | WG1548584 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 6.20 | | 0.766 | 1.28 | 10/02/2020 09:55 | WG1546570 |
| *(T) Barium* | *82.2* | | | *62.0-143* | *10/02/2020 09:55* | WG1546570 |
| *(T) Yttrium* | *112* | | | *79.0-136* | *10/02/2020 09:55* | WG1546570 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 8.70 | | 1.39 | 1.53 | 10/02/2020 09:55 | WG1548584 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 2.50 | | 0.624 | 0.246 | 09/29/2020 08:57 | WG1548584 |
| *(T) Barium-133* | *84.9* | | | *30.0-143* | *09/29/2020 08:57* | WG1548584 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 1.66 | | 0.563 | 1.01 | 10/02/2020 09:55 | WG1546570 |
| *(T) Barium* | *84.4* | | | *62.0-143* | *10/02/2020 09:55* | WG1546570 |
| *(T) Yttrium* | *111* | | | *79.0-136* | *10/02/2020 09:55* | WG1546570 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 2.32 | | 0.890 | 1.22 | 10/02/2020 09:55 | WG1548584 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.664 | | 0.327 | 0.211 | 09/29/2020 08:57 | WG1548584 |
| *(T) Barium-133* | *88.6* | | | *30.0-143* | *09/29/2020 08:57* | WG1548584 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.984 | | 0.697 | 1.29 | 10/02/2020 09:55 | WG1546570 |
| *(T) Barium* | *86.5* | | | *62.0-143* | *10/02/2020 09:55* | WG1546570 |
| *(T) Yttrium* | *111* | | | *79.0-136* | *10/02/2020 09:55* | WG1546570 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 1.89 | | 1.11 | 1.51 | 10/02/2020 09:55 | WG1548584 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.901 | | 0.412 | 0.221 | 09/28/2020 16:08 | WG1548584 |
| *(T) Barium-133* | *74.3* | | | *30.0-143* | *09/28/2020 16:08* | WG1548584 |

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

## Method Blank (MB)

(MB) R3578670-1 10/01/20 09:50

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | 0.0699 | | 0.519 |
| *(T) Barium* | *88.4* | | |
| *(T) Yttrium* | *91.9* | | |

## L1262467-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1262467-01 10/01/20 09:50 • (DUP) R3578670-5 10/01/20 09:50

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.000 | 0.159 | 1 | 200 | 0.193 | | 20 | 3 |
| *(T) Barium* | *86.3* | *88.9* | | | | | | |
| *(T) Yttrium* | *93.3* | *95.4* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3578670-2 10/01/20 09:50

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 5.80 | 116 | 80.0-120 | |
| *(T) Barium* | | | *83.7* | | |
| *(T) Yttrium* | | | *91.3* | | |

## L1262469-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1262469-01 10/01/20 09:50 • (MS) R3578670-3 10/01/20 09:50 • (MSD) R3578670-4 10/01/20 09:50

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 10.0 | 0.898 | 12.5 | 11.7 | 116 | 108 | 1 | 70.0-130 | | | 7.19 | | 20 |
| *(T) Barium* | | *89.9* | | | *90.3* | *87.8* | | | | | | | |
| *(T) Yttrium* | | *93.7* | | | *91.5* | *96.7* | | | | | | | |

## Method Blank (MB)

(MB) R3576636-1 09/28/20 16:08

| Analyte | MB Result | MB Qualifier | MB MDA |
|---|---|---|---|
| | pCi/l | | pCi/l |
| Radium-226 | 0.0203 | | 0.0669 |
| *(T) Barium-133* | *96.7* | | |

## L1263701-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1263701-04 09/28/20 16:08 • (DUP) R3576636-5 09/28/20 16:08

| Analyte | Original Result | DUP Result | Dilution | DUP RPD | DUP RER | DUP Qualifier | DUP RPD Limits | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| | pCi/l | pCi/l | | % | | | % | |
| Radium-226 | 0.0953 | 0.179 | 1 | 61.0 | 0.309 | | 20 | 3 |
| *(T) Barium-133* | *88.1* | *95.7* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3576636-2 09/28/20 16:08

| Analyte | Spike Amount | LCS Result | LCS Rec. | Rec. Limits | LCS Qualifier |
|---|---|---|---|---|---|
| | pCi/l | pCi/l | % | % | |
| Radium-226 | 5.02 | 5.37 | 107 | 80.0-120 | |
| *(T) Barium-133* | | | *96.3* | | |

## L1263682-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1263682-05 09/28/20 16:08 • (MS) R3576636-3 09/28/20 16:08 • (MSD) R3576636-4 09/28/20 16:08

| Analyte | Spike Amount | Original Result | MS Result | MSD Result | MS Rec. | MSD Rec. | Dilution | Rec. Limits | MS Qualifier | MSD Qualifier | RPD | MS RER | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pCi/l | pCi/l | pCi/l | pCi/l | % | % | | % | | | % | | % |
| Radium-226 | 20.1 | 0.0611 | 23.2 | 20.5 | 115 | 102 | 1 | 75.0-125 | | | 12.2 | | 20 |
| *(T) Barium-133* | | *90.3* | | | *89.2* | *95.7* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| | The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG. |

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LAO00356 |
| Kentucky [1 6] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

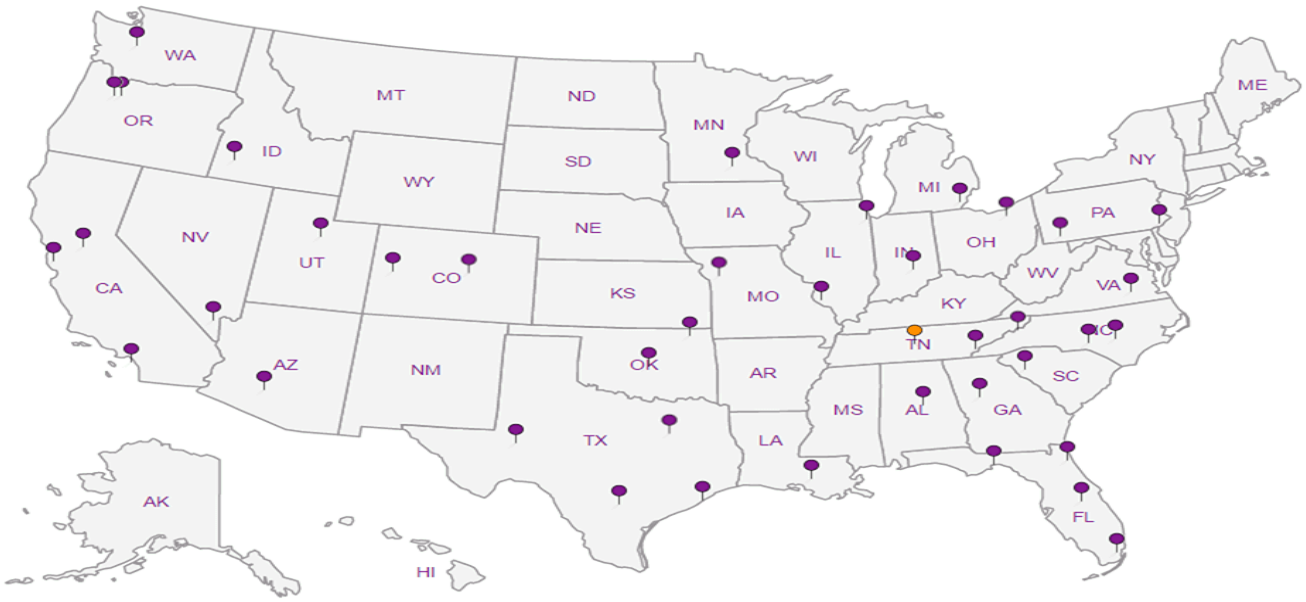
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



G193

Work Order: 2009111

L1263680

**Subcontractor:**
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

16-Sep-20

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ra-228 | Ra-226 | | | | |
| | | | | | E904.0 | M7500 Ra B M | | | | |
| FGD-6 | Aqueous | 01C | 09/15/20 08:05 AM | 1LHDPEHNO3 | 1 | | | | | -01 |
| FGD-6 | Aqueous | 01D | 09/15/20 08:05 AM | 1LHDPEHNO3 | | 1 | | | | -01 |
| FGD-4 | Aqueous | 02C | 09/15/20 08:55 AM | 1LHDPEHNO3 | 1 | | | | | -02 |
| FGD-4 | Aqueous | 02D | 09/15/20 08:55 AM | 1LHDPEHNO3 | | 1 | | | | -02 |
| FGD-3 | Aqueous | 03C | 09/15/20 09:45 AM | 1LHDPEHNO3 | 1 | | | | | -03 |
| FGD-3 | Aqueous | 03D | 09/15/20 09:45 AM | 1LHDPEHNO3 | | 1 | | | | -03 |
| FGD-8 | Aqueous | 04C | 09/15/20 10:45 AM | 1LHDPEHNO3 | 1 | | | | | -04 |
| FGD-8 | Aqueous | 04D | 09/15/20 10:45 AM | 1LHDPEHNO3 | | 1 | | | | -04 |
| FGD-1 | Aqueous | 05C | 09/15/20 12:35 PM | 1LHDPEHNO3 | 1 | | | | | -05 |
| FGD-1 | Aqueous | 05D | 09/15/20 12:35 PM | 1LHDPEHNO3 | | 1 | | | | -05 |
| DUP-01 | Aqueous | 06C | 09/15/20 12:35 PM | 1LHDPEHNO3 | 1 | | | | | -06 |
| DUP-01 | Aqueous | 06D | 09/15/20 12:35 PM | 1LHDPEHNO3 | | 1 | | | | -06 |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

OK

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | | 9/16/20 1700 | **Received by:** | | 9/18/20 10:00 |
| **Relinquished by:** | | | **Received by:** | | |

## Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | |
|---|---|---|
| Client: DHLRTX | L1263680 | |
| Cooler Received/Opened On: 9/18/20 Temperature: | Amb | |
| Received By: Carol Kemp | | |
| Signature: Carol Kemp | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | ✓ | | |
| COC Signed / Accurate? | | ✓ | |
| Bottles arrive intact? | | ✓ | |
| Correct bottles used? | | ✓ | |
| Sufficient volume sent? | | ✓ | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | | ✓ | |

## Quantitative X-Ray Diffraction by Rietveld Refinement

| | |
|---|---|
| ***Report Prepared for:*** | *Golder Associates* |
| ***Project Number/ LIMS No.*** | *17431-01 / MI7024-MAY19* |
| ***Batch:*** | *Oak Grove FDG Ponds* |
| ***Sample Receipt:*** | *May 30, 2019* |
| ***Sample Analysis:*** | *June 12, 2019* |
| ***Reporting Date:*** | *June 14, 2019* |
| ***Instrument:*** | Panalytical X'pert Pro Diffractometer |
| ***Test Conditions:*** | Co radiation, 40 kV, 45 mA<br>Regular Scanning: Step: 0.033°, Step time:0.15s, 2θ range: 6-70° |
| ***Interpretations*** : | HighScore Plus software using Crystallography Open Database (COD) and Joint Committee on Powder Diffraction Standards -International Center for Diffraction Data (JCPDS-ICDD). |
| ***Detection Limit*** : | 0.5-2%. Strongly dependent on crystallinity. |

***Contents:***


1) Method Summary
2) Summary of Mineral Assemblages
3) Quantitative XRD Results
4) XRD Pattern(s)



Lain Glossop H.B.Sc / Ben Eaton
Senior Mineralogist / Junior Mineralogist

Sarah Prout, Ph.D.,
Manager: Metallurgy

# Method Summary

***Mineral Identification and Interpretation:***

Mineral identification and interpretation involve matching the diffraction pattern of a test sample material to patterns of single-phase reference materials. The reference patterns from the Crystallography Open Database (COD) and the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards have been added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Mineral or compound identification and quantitative analysis results should be accompanied by supporting chemical assay data or other additional tests.

***Quantitative Rietveld Analysis:***

Panalytcal Highscore Plus software was used to perform the quantitative Rietveld Analysis. This software uses a graphics based profile analysis program built around a non-linear least squares fitting system, to quantitatively determine the amount of different phases present in a multicomponent sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental and specimen factors. Unlike other peak intensity-based methods, the Rietveld method uses a least squares approach to refine a theoretical line profile (shown as a blue pattern in the analyses plots) until it matches the obtained experimental patterns (shown as the coloured pattern in the analyses plots).

Rietveld refinement is completed with a set of minerals specifically identified for the sample. Zero values indicate that the mineral was included in the refinement calculations, but the calculated concentration was less than 0.5 wt%. Minerals not identified by the analyst are not included in refinement calculations for specific samples and are indicated with a dash.

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**WARNING:** The sample(s) to which the findings recorded herein (the "Findings") relate was(were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted.

SGS Minerals
a division of SGS Canada Inc.
3260 Production Way, Burnaby, British Columbia, Canada V5A 4W4
Tel: (604) 638-2349 Fax: (604) 444-5486 www.sgs.com www.sgs.com/met
Member of the SGS Group (SGS SA)

## Summary of Rietveld Quantitative Analysis X-ray Diffraction Results

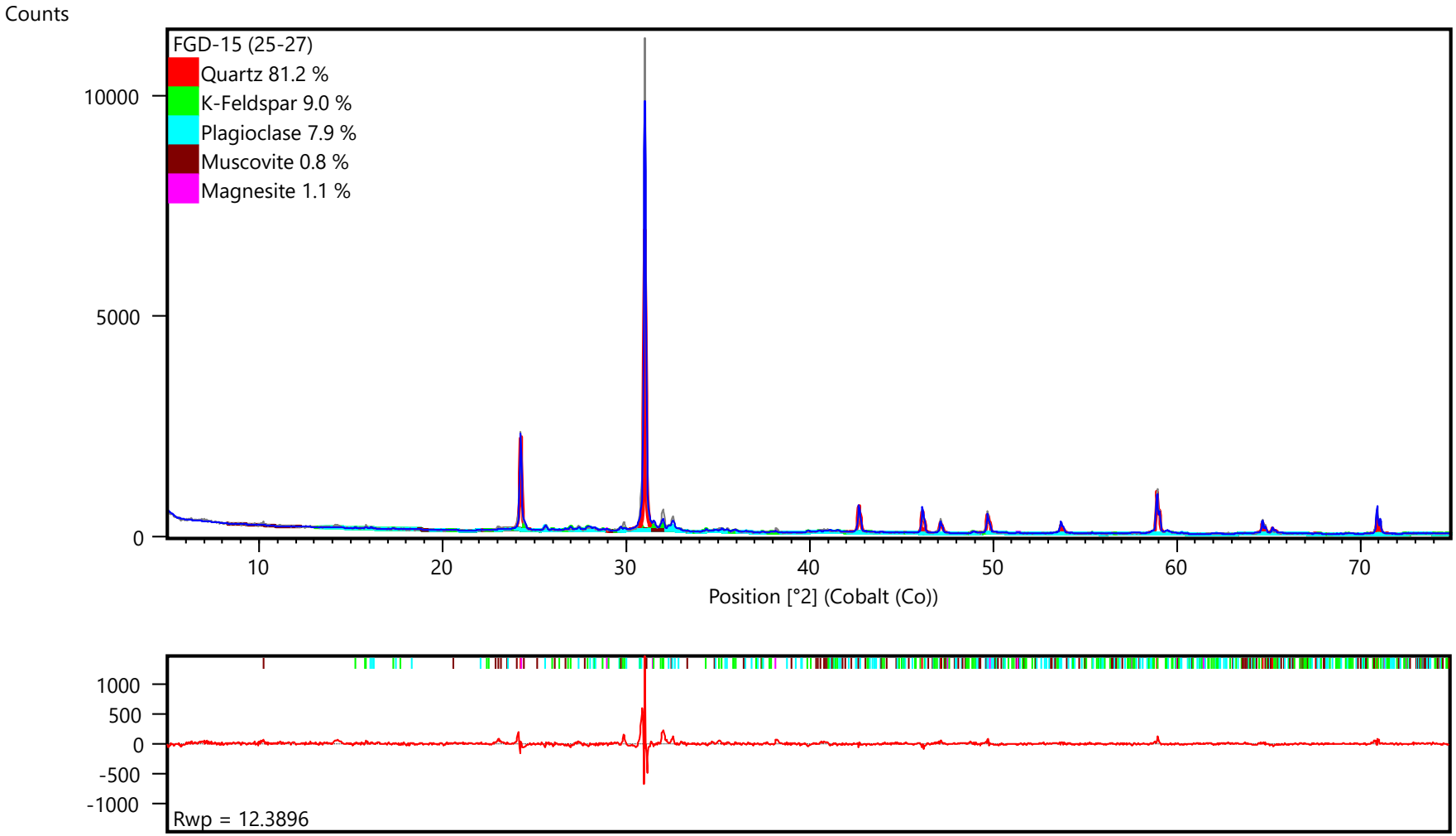
### Quantitative X-ray Diffraction Results

| Mineral/Compound | 1<br>FGD-15 (25-27) | 2<br>FGD-16 (30-32) | 3<br>FGD-2019-1 (23-25) |
|---|---|---|---|
| | (wt %) | (wt %) | (wt %) |
| Quartz | 81.2 | 80.5 | 84.9 |
| K-feldspar | 9.0 | 10.4 | 6.8 |
| Plagioclase | 7.9 | 9.0 | 7.3 |
| Muscovite | 0.8 | 0.1 | 1.0 |
| Magnesite | 1.1 | -- | -- |
| TOTAL | 100 | 100 | 100 |

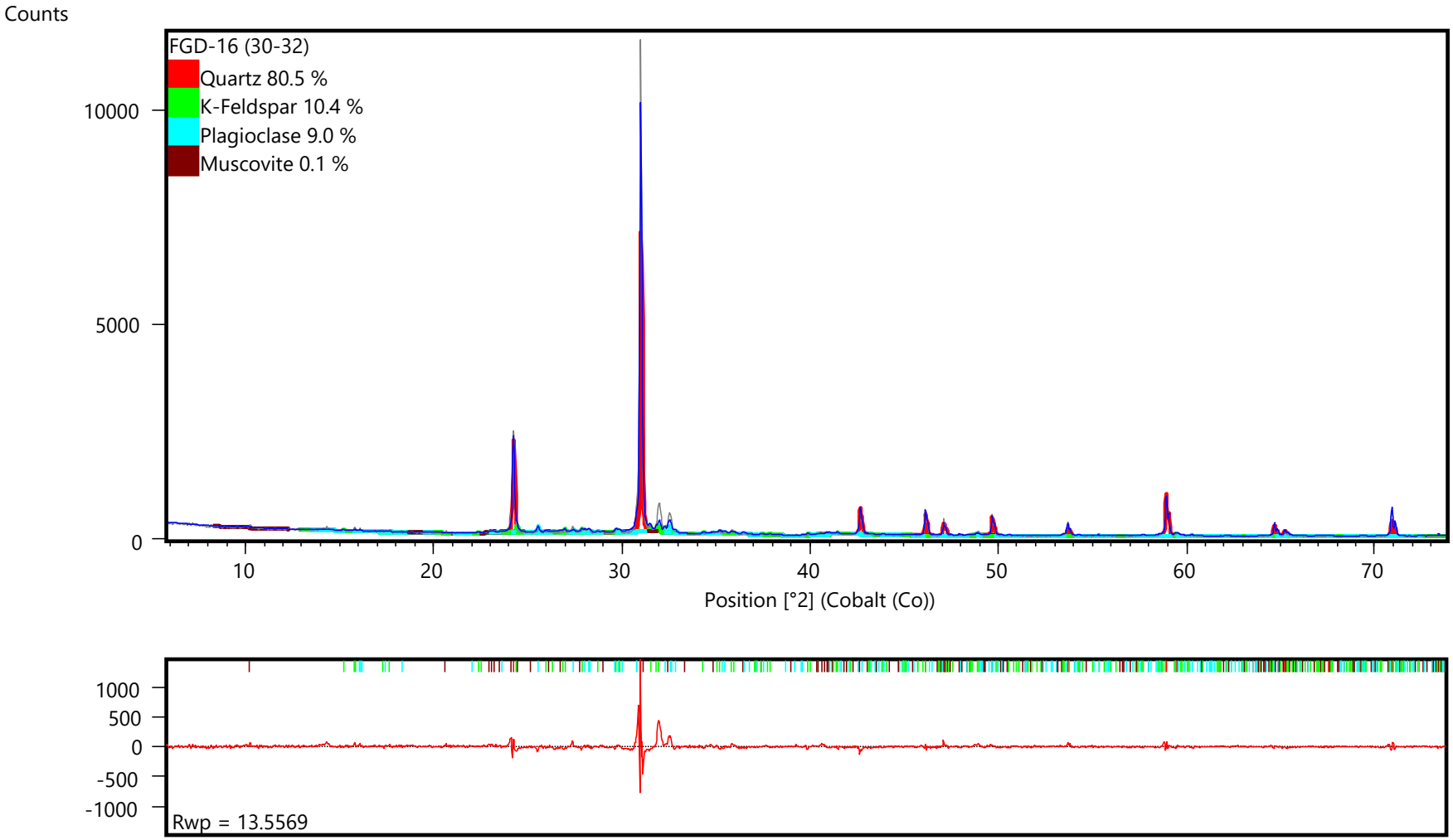
*Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.*

*Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.*

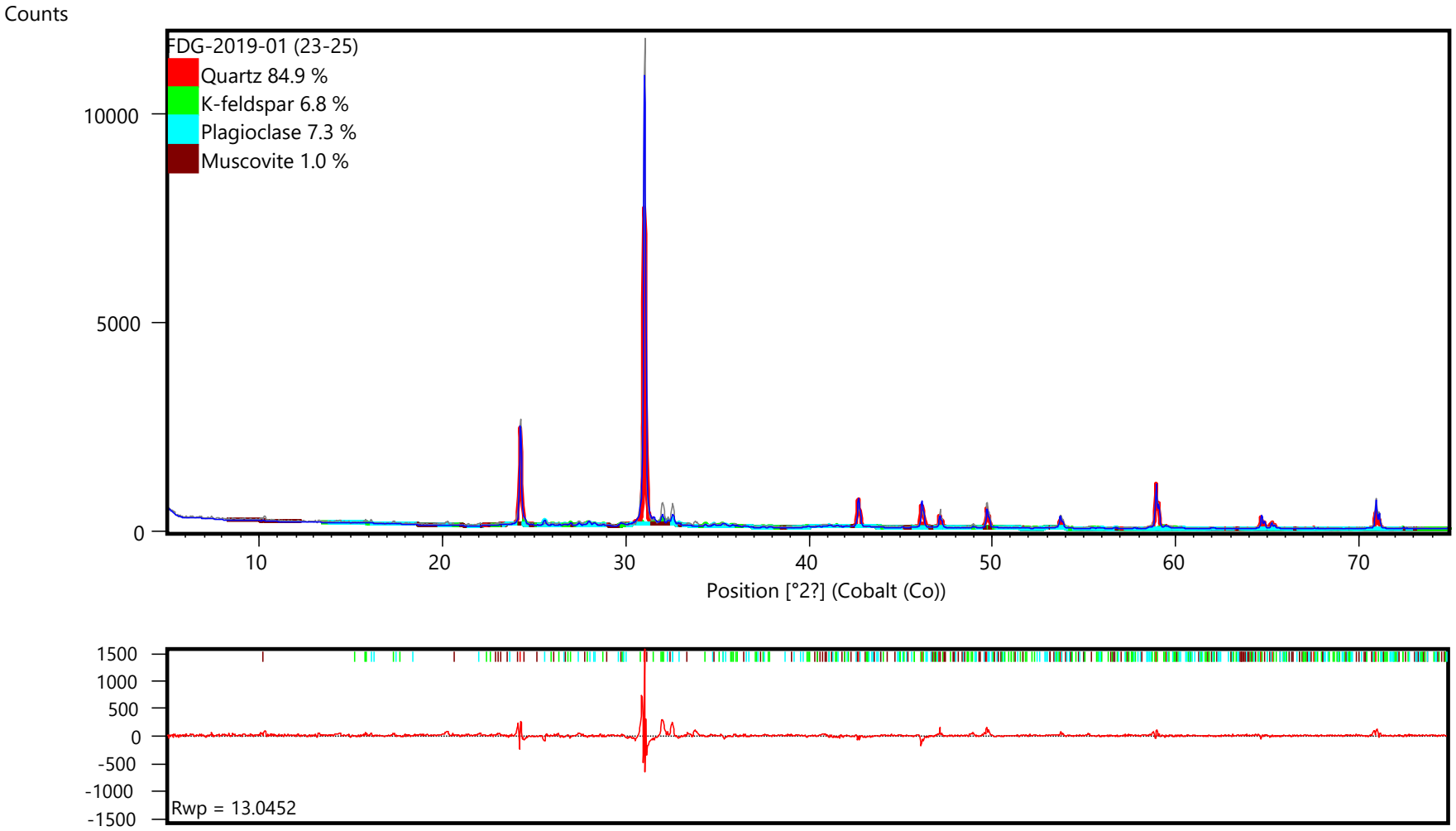
| Mineral/Compound | Formula |
|---|---|
| Quartz | $SiO_2$ |
| K-feldspar | $KAlSi_3O_8$ |
| Plagioclase | $(Na,Ca)[Al(Si,Al)Si_2O_8]$ |
| Muscovite | $KAl_2(AlSi_3O_{10})(OH)_2$ |
| Magnesite | $MgCO_3$ |




X-ray diffractogram. The upper pattern is the measured diffractogram, the blue curve is the calculated pattern from the Rietveld Refinement and the lower red curve is the difference plot.




X-ray diffractogram. The upper pattern is the measured diffractogram, the blue curve is the calculated pattern from the Rietveld Refinement and the lower red curve is the difference plot.




X-ray diffractogram. The upper pattern is the measured diffractogram, the blue curve is the calculated pattern from the Rietveld Refinement and the lower red curve is the difference plot.

eurofins | Environment Testing TestAmerica

# ANALYTICAL REPORT

Eurofins TestAmerica, Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
Tel: (865)291-3000

Laboratory Job ID: 140-15376-1
Client Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

For:
Golder Associates Inc.
2201 Double Creek Dr
Suite 4004
Round Rock, Texas 78664

Attn: Will Vienne

Terry Walker Wasmund

*Authorized for release by:*
*7/30/2019 3:12:58 PM*

Terry Walker Wasmund, Project Manager II
(865)291-3000
terry.wasmund@testamericainc.com

LINKS

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*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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# Definitions/Glossary

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Qualifiers

### Metals

| Qualifier | Qualifier Description |
|---|---|
| * | LCS or LCSD is outside acceptance limits. |
| * | RPD of the LCS and LCSD exceeds the control limits |
| B | Compound was found in the blank and sample. |
| F3 | Duplicate RPD exceeds the control limit |
| F5 | Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL. The data are considered valid because the absolute difference is less than the RL. |
| J | Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value. |

## Glossary

| Abbreviation | These commonly used abbreviations may or may not be present in this report. |
|---|---|
| ¤ | Listed under the "D" column to designate that the result is reported on a dry weight basis |
| %R | Percent Recovery |
| CFL | Contains Free Liquid |
| CNF | Contains No Free Liquid |
| DER | Duplicate Error Ratio (normalized absolute difference) |
| Dil Fac | Dilution Factor |
| DL | Detection Limit (DoD/DOE) |
| DL, RA, RE, IN | Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample |
| DLC | Decision Level Concentration (Radiochemistry) |
| EDL | Estimated Detection Limit (Dioxin) |
| LOD | Limit of Detection (DoD/DOE) |
| LOQ | Limit of Quantitation (DoD/DOE) |
| MDA | Minimum Detectable Activity (Radiochemistry) |
| MDC | Minimum Detectable Concentration (Radiochemistry) |
| MDL | Method Detection Limit |
| ML | Minimum Level (Dioxin) |
| NC | Not Calculated |
| ND | Not Detected at the reporting limit (or MDL or EDL if shown) |
| PQL | Practical Quantitation Limit |
| QC | Quality Control |
| RER | Relative Error Ratio (Radiochemistry) |
| RL | Reporting Limit or Requested Limit (Radiochemistry) |
| RPD | Relative Percent Difference, a measure of the relative difference between two points |
| TEF | Toxicity Equivalent Factor (Dioxin) |
| TEQ | Toxicity Equivalent Quotient (Dioxin) |

## Job ID: 140-15376-1

### Laboratory: Eurofins TestAmerica, Knoxville

**Narrative**

**Job Narrative**
**140-15376-1**

**Receipt**
The samples were received on 5/24/2019 at 9:40 AM. The samples arrived in good condition, properly preserved, and on ice. The temperature of the cooler at receipt was 0.8º C.

**Metals - 7 Step Sequential Extraction Procedure**
These soil samples were prepared and analyzed using Eurofins TestAmerica Knoxville standard operating procedure KNOX-MT-0008, "7 Step Sequential Extraction Procedure". SW-846 Method 6010B as incorporated in Eurofins TestAmerica Knoxville standard operating procedure KNOX-MT-0007 was used to perform the final instrument analyses.

An aliquot of each sample was sequentially extracted using the steps listed below:

- ***Step 1 - Exchangeable Fraction***: A 5 gram aliquot of sample was extracted with 25 mL of 1M magnesium sulfate (MgSO4), centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 2 - Carbonate Fraction:*** The sample residue from step 1 was extracted with 25 mL of 1M sodium acetate/acetic acid (NaOAc/HOAc) at pH 5, centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 3 - Non-crystalline Materials Fraction:*** The sample residue from step 2 was extracted with 25 mL of 0.2M ammonium oxalate (pH 3), centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 4 - Metal Hydroxide Fraction:*** The sample residue from step 3 was extracted with 25 mL of 1M hydroxylamine hydrochloride solution in 25% v/v acetic acid, centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 5 - Organic-bound Fraction:*** The sample residue from step 4 was extracted three times with 25 mL of 5% sodium hypochlorite (NaClO) at pH 9.5, centrifuged and filtered. The resulting leachates were combined and 5 mL were digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 6 - Acid/Sulfide Fraction***: The sample residue from step 5 was extracted with 25 mL of a 3:1:2 v/v solution of HCl-HNO3-H2O, centrifuged and filtered. 5 mL of the resulting leachate was diluted to 50 mL with reagent water and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 7 - Residual Fraction:*** A 1.0 g aliquot of the sample residue from step 6 was digested using HF, HNO3, HCl and H3BO3. The digestate was analyzed by ICP using method 6010B. Results are reported in mg/kg on a dry weight basis.

In addition, a 1.0 g aliquot of the original sample was digested using HF, HNO3, HCl and H3BO3. The digestate was analyzed by ICP using method 6010B. Total metal results are reported in mg/kg on a dry weight basis.

Results were calculated using the following equation:

Result, µg/g or mg/Kg, dry weight = (C × V × V1 × D) / (W × S × V2)

Where:
C = Concentration from instrument readout, µg/mL
V = Final volume of digestate, mL
D = Instrument dilution factor
V1 = Total volume of leachate, mL
V2 = Volume of leachate digested, mL
W = Wet weight of sample, g
S = Percent solids/100

A method blank, laboratory control sample and laboratory control sample duplicate were prepared and analyzed with each SEP step in order to provide information about both the presence of elements of interest in the extraction solutions, and the recovery of elements of interest from the extraction solutions. Results outside of laboratory QC limits do not reflect out of control performance, but rather the effect of the extraction solution upon the analyte.

## Job ID: 140-15376-1 (Continued)

### Laboratory: Eurofins TestAmerica, Knoxville (Continued)

A laboratory sample duplicate was prepared and analyzed with each batch of samples in order to provide information regarding the reproducibility of the procedure.

**SEP Report Notes:**
The final report lists the results for each step, the result for the total digestion of the sample, and a sum of the results of steps 1 through 7 by element.

Magnesium was not reported for step 1 because the extraction solution for this step (magnesium sulfate) contains high levels of magnesium. Sodium was not reported for steps 2 and 5 since the extraction solutions for these steps contain high levels of sodium. The sum of steps 1 through 7 is much higher than the total result for sodium and magnesium due to the magnesium and sodium introduced by the extraction solutions.

The step 1 digestates were reanalyzed for vanadium at a 1/10 dilution due to positive interelement interferences resulting from the high magnesium results. The reporting limits were adjusted accordingly.

The digestates for steps 1, 2 and 5 were analyzed at a dilution due to instrument problems caused by the high solids content of the digestates. The reporting limits were adjusted accordingly.

The serial dilution performed for the following samples associated with batch 140-31255 was outside control limits: (140-15376-A-1-A SD ^5), (140-15376-A-1-A SD ^50) and (140-15376-A-1-AA SD ^50)

Samples FGO-15 (25-27) (140-15376-1), FGO-14 (30-32) (140-15376-2), FGO-2019-1 (23-25) (140-15376-3), (140-15376-A-1-AB DU) and (140-15376-A-1-B DU) were diluted due to the presence of silicon or titanium which interferes with Arsenic, Cobalt, Selenium and Thallium. Elevated reporting limits (RLs) are provided.

Sample FGO-2019-1 (23-25) (140-15376-3) was diluted due to the presence of titanium which interferes with Cobalt. Elevated reporting limits (RLs) are provided.

There was a difference between the Total Metals results for cobalt and the Total SEP result for cobalt. At the client's request, the cobalt results for SEP 3 and SEP 4 were confirmed by reanalysis, and the total analysis for metals was reanalyzed with a separate aliquot. The original results for SEP 3 and SEP 4 were confirmed, but the reanalysis of the totals was much higher than the original test result. This suggests that the sample is heterogeneous, as different total cobalt results are obtained by the three tests. The affected sample is FGO-2019-1 (23-25) (140-15376-3).

The sample duplicate (DUP) precision for preparation batch 140-30453, 140-30480, 140-30481, 140-31696 and 140-31697 and analytical batch 140-31197 was outside control limits. Sample non-homogeneity is suspected.

The sample duplicate (DUP) precision for preparation batch 140-30852 and analytical batch 140-31255 was outside control limits. Sample non-homogeneity is suspected.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

**General Chemistry - % Moisture**
The samples were analyzed for percent moisture using SOP number KNOX-WC-0012 (based on Modified MCAWW 160.3 and SM2540B and on the percent moisture determinations described in methods 3540C and 3550B).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

**Comments**
No additional comments.

# Detection Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-15 (25-27)
## Lab Sample ID: 140-15376-1

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| Manganese | 0.47 | J | 3.9 | 0.16 | mg/Kg | 4 | ☼ | 6010B SEP | Step 1 |
| Manganese | 1.4 | J | 2.9 | 1.1 | mg/Kg | 3 | ☼ | 6010B SEP | Step 2 |
| Aluminum | 23 | | 13 | 2.7 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Barium | 1.4 | J B | 3.3 | 0.16 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Beryllium | 0.020 | J | 0.33 | 0.020 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Cobalt | 0.63 | J | 3.3 | 0.059 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Iron | 58 | | 6.5 | 3.8 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Manganese | 14 | B | 0.98 | 0.035 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Aluminum | 600 | | 13 | 2.1 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Arsenic | 0.64 | J B | 0.65 | 0.29 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Barium | 9.6 | | 3.3 | 0.16 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Beryllium | 0.12 | J | 0.33 | 0.021 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Cobalt | 0.41 | J | 3.3 | 0.069 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Iron | 1400 | | 6.5 | 3.8 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Li | 0.93 | J | 3.3 | 0.20 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Manganese | 6.9 | | 0.98 | 0.17 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Selenium | 0.65 | * B | 0.65 | 0.61 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Aluminum | 67 | J * | 200 | 31 | mg/Kg | 5 | ☼ | 6010B SEP | Step 5 |
| Aluminum | 1200 | | 13 | 2.1 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Arsenic | 0.62 | J | 0.65 | 0.20 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Barium | 6.0 | | 3.3 | 0.16 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Beryllium | 0.053 | J | 0.33 | 0.016 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Cobalt | 0.27 | J | 3.3 | 0.060 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Iron | 1100 | | 6.5 | 3.8 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Li | 0.93 | J | 3.3 | 0.20 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Manganese | 10 | | 0.98 | 0.33 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Aluminum | 28000 | | 130 | 21 | mg/Kg | 10 | ☼ | 6010B SEP | Step 7 |
| Arsenic | 0.90 | J | 1.3 | 0.34 | mg/Kg | 2 | ☼ | 6010B SEP | Step 7 |
| Barium | 510 | | 33 | 1.6 | mg/Kg | 10 | ☼ | 6010B SEP | Step 7 |
| Beryllium | 0.48 | | 0.33 | 0.0098 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Cobalt | 0.48 | J | 6.5 | 0.39 | mg/Kg | 2 | ☼ | 6010B SEP | Step 7 |
| Iron | 2900 | | 6.5 | 5.4 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Li | 7.0 | | 3.3 | 0.20 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Manganese | 54 | B | 0.98 | 0.068 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Mo | 0.11 | J | 2.6 | 0.11 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Thallium | 0.59 | J | 4.6 | 0.47 | mg/Kg | 2 | ☼ | 6010B SEP | Step 7 |
| Aluminum | 30000 | | 10 | 1.6 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Arsenic | 2.2 | | 0.50 | 0.13 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Barium | 530 | | 2.5 | 0.12 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Beryllium | 0.67 | | 0.25 | 0.0075 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Cobalt | 1.8 | J | 2.5 | 0.023 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Iron | 5400 | | 5.0 | 4.1 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Li | 8.9 | | 2.5 | 0.15 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Manganese | 88 | | 0.75 | 0.052 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |

This Detection Summary does not include radiochemical test results.

# Detection Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-15 (25-27) (Continued)
## Lab Sample ID: 140-15376-1

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| Mo | 0.11 | J | 2.0 | 0.082 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Selenium | 0.65 | | 0.50 | 0.17 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Thallium | 0.59 | J | 1.8 | 0.18 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Chromium | 4.2 | | 1.8 | 0.27 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Lead | 3.2 | | 1.8 | 0.34 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Phosphorus | 69 | | 36 | 2.9 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Aluminum | 46000 | | 130 | 21 | mg/Kg | 10 | ☼ | 6010B | Total/NA |
| Arsenic | 1.6 | | 0.65 | 0.17 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Barium | 670 | | 33 | 1.6 | mg/Kg | 10 | ☼ | 6010B | Total/NA |
| Beryllium | 0.71 | | 0.33 | 0.0098 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Cobalt | 1.8 | J | 6.5 | 0.39 | mg/Kg | 2 | ☼ | 6010B | Total/NA |
| Iron | 5700 | | 6.5 | 5.4 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Lithium | 10 | | 3.3 | 0.20 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Manganese | 93 | | 0.98 | 0.068 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Molybdenum | 0.21 | J | 2.6 | 0.11 | mg/Kg | 1 | ☼ | 6010B | Total/NA |

## Client Sample ID: FGO-14 (30-32)
## Lab Sample ID: 140-15376-2

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| Barium | 0.67 | J | 13 | 0.61 | mg/Kg | 4 | ☼ | 6010B SEP | Step 1 |
| Manganese | 0.20 | J | 3.8 | 0.16 | mg/Kg | 4 | ☼ | 6010B SEP | Step 1 |
| Barium | 0.55 | J * | 9.5 | 0.45 | mg/Kg | 3 | ☼ | 6010B SEP | Step 2 |
| Aluminum | 40 | | 13 | 2.7 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Arsenic | 0.28 | J | 0.63 | 0.16 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Barium | 6.4 | B | 3.2 | 0.15 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Beryllium | 0.036 | J | 0.32 | 0.019 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Cobalt | 0.63 | J | 3.2 | 0.057 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Iron | 31 | | 6.3 | 3.7 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Manganese | 4.4 | B | 0.95 | 0.034 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Aluminum | 990 | | 13 | 2.0 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Arsenic | 1.1 | B | 0.63 | 0.28 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Barium | 12 | | 3.2 | 0.15 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Beryllium | 0.18 | J | 0.32 | 0.020 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Cobalt | 0.63 | J | 3.2 | 0.067 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Iron | 2100 | | 6.3 | 3.7 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Li | 0.27 | J | 3.2 | 0.19 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Manganese | 4.8 | | 0.95 | 0.16 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Aluminum | 90 | J * | 190 | 30 | mg/Kg | 5 | ☼ | 6010B SEP | Step 5 |
| Aluminum | 1600 | | 13 | 2.0 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Arsenic | 0.69 | | 0.63 | 0.19 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Barium | 4.2 | | 3.2 | 0.15 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Beryllium | 0.056 | J | 0.32 | 0.015 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Cobalt | 0.32 | J | 3.2 | 0.058 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Iron | 1300 | | 6.3 | 3.7 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Li | 0.57 | J | 3.2 | 0.19 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Manganese | 6.4 | | 0.95 | 0.32 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Aluminum | 39000 | | 130 | 20 | mg/Kg | 10 | ☼ | 6010B SEP | Step 7 |
| Arsenic | 0.47 | J | 1.3 | 0.33 | mg/Kg | 2 | ☼ | 6010B SEP | Step 7 |
| Barium | 520 | | 32 | 1.5 | mg/Kg | 10 | ☼ | 6010B SEP | Step 7 |

This Detection Summary does not include radiochemical test results.

## Client Sample ID: FGO-14 (30-32) (Continued)
## Lab Sample ID: 140-15376-2

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.59 | | 0.32 | 0.0095 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Cobalt | 0.62 | J | 6.3 | 0.38 | mg/Kg | 2 | ☼ | 6010B SEP | Step 7 |
| Iron | 3100 | | 6.3 | 5.2 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Li | 7.9 | | 3.2 | 0.19 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Manganese | 18 | B | 0.95 | 0.066 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Thallium | 0.95 | J | 4.4 | 0.45 | mg/Kg | 2 | ☼ | 6010B SEP | Step 7 |
| Aluminum | 42000 | | 10 | 1.6 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Arsenic | 2.5 | | 0.50 | 0.13 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Barium | 540 | | 2.5 | 0.12 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Beryllium | 0.86 | | 0.25 | 0.0075 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Cobalt | 2.2 | J | 2.5 | 0.023 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Iron | 6600 | | 5.0 | 4.1 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Li | 8.7 | | 2.5 | 0.15 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Manganese | 34 | | 0.75 | 0.052 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Thallium | 0.95 | J | 1.8 | 0.18 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Chromium | 3.3 | | 1.8 | 0.26 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Lead | 3.4 | | 1.8 | 0.33 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Phosphorus | 43 | | 35 | 2.8 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Aluminum | 44000 | | 130 | 20 | mg/Kg | 10 | ☼ | 6010B | Total/NA |
| Arsenic | 2.5 | | 1.3 | 0.33 | mg/Kg | 2 | ☼ | 6010B | Total/NA |
| Barium | 760 | | 32 | 1.5 | mg/Kg | 10 | ☼ | 6010B | Total/NA |
| Beryllium | 0.85 | | 0.32 | 0.0095 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Cobalt | 1.7 | J | 6.3 | 0.38 | mg/Kg | 2 | ☼ | 6010B | Total/NA |
| Iron | 5900 | | 6.3 | 5.2 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Lithium | 7.6 | | 3.2 | 0.19 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Manganese | 34 | | 0.95 | 0.066 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Molybdenum | 0.16 | J | 2.5 | 0.10 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Thallium | 0.68 | J | 4.4 | 0.45 | mg/Kg | 2 | ☼ | 6010B | Total/NA |

## Client Sample ID: FGO-2019-1 (23-25)
## Lab Sample ID: 140-15376-3

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| Barium | 0.86 | J | 13 | 0.62 | mg/Kg | 4 | ☼ | 6010B SEP | Step 1 |
| Manganese | 0.99 | J | 3.9 | 0.16 | mg/Kg | 4 | ☼ | 6010B SEP | Step 1 |
| Barium | 1.9 | J * | 9.7 | 0.47 | mg/Kg | 3 | ☼ | 6010B SEP | Step 2 |
| Selenium | 0.88 | J B | 1.9 | 0.66 | mg/Kg | 3 | ☼ | 6010B SEP | Step 2 |
| Aluminum | 62 | | 13 | 2.7 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Arsenic | 0.30 | J | 0.65 | 0.17 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Barium | 4.0 | B | 3.2 | 0.16 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Beryllium | 0.10 | J | 0.32 | 0.019 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Cobalt | 29 | | 3.2 | 0.058 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Cobalt | 29 | | 3.2 | 0.058 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Iron | 61 | | 6.5 | 3.8 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Li | 0.80 | J | 3.2 | 0.19 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |
| Manganese | 110 | B | 0.97 | 0.035 | mg/Kg | 1 | ☼ | 6010B SEP | Step 3 |

This Detection Summary does not include radiochemical test results.

# Detection Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-2019-1 (23-25) (Continued)
## Lab Sample ID: 140-15376-3

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 1800 | | 13 | 2.1 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Arsenic | 1.9 | B | 0.65 | 0.29 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Barium | 14 | | 3.2 | 0.16 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Beryllium | 0.25 | J | 0.32 | 0.021 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Cobalt | 36 | | 3.2 | 0.069 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Cobalt | 35 | | 3.2 | 0.069 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Iron | 3400 | | 6.5 | 3.8 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Li | 3.9 | | 3.2 | 0.19 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Manganese | 98 | | 0.97 | 0.17 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Mo | 0.18 | J | 2.6 | 0.11 | mg/Kg | 1 | ☼ | 6010B SEP | Step 4 |
| Aluminum | 65 | J * | 190 | 30 | mg/Kg | 5 | ☼ | 6010B SEP | Step 5 |
| Barium | 27 | J * | 49 | 2.3 | mg/Kg | 5 | ☼ | 6010B SEP | Step 5 |
| Cobalt | 2.6 | J * | 49 | 0.78 | mg/Kg | 5 | ☼ | 6010B SEP | Step 5 |
| Aluminum | 2600 | | 13 | 2.1 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Arsenic | 1.6 | | 0.65 | 0.19 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Barium | 35 | | 3.2 | 0.16 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Beryllium | 0.074 | J | 0.32 | 0.016 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Cobalt | 1.6 | J | 3.2 | 0.060 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Iron | 1100 | | 6.5 | 3.8 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Li | 1.2 | J | 3.2 | 0.19 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Manganese | 10 | | 0.97 | 0.32 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Mo | 0.21 | J | 2.6 | 0.13 | mg/Kg | 1 | ☼ | 6010B SEP | Step 6 |
| Aluminum | 33000 | | 130 | 21 | mg/Kg | 10 | ☼ | 6010B SEP | Step 7 |
| Arsenic | 1.2 | | 0.65 | 0.17 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Barium | 410 | | 32 | 1.6 | mg/Kg | 10 | ☼ | 6010B SEP | Step 7 |
| Beryllium | 0.39 | | 0.32 | 0.0097 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Cobalt | 0.70 | J | 6.5 | 0.39 | mg/Kg | 2 | ☼ | 6010B SEP | Step 7 |
| Iron | 4400 | | 6.5 | 5.3 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Li | 14 | | 3.2 | 0.19 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Manganese | 19 | B | 0.97 | 0.067 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Mo | 0.80 | J | 2.6 | 0.11 | mg/Kg | 1 | ☼ | 6010B SEP | Step 7 |
| Aluminum | 38000 | | 10 | 1.6 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Arsenic | 5.0 | | 0.50 | 0.13 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Barium | 490 | | 2.5 | 0.12 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Beryllium | 0.81 | | 0.25 | 0.0075 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Cobalt | 69 | | 2.5 | 0.023 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Iron | 9100 | | 5.0 | 4.1 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Li | 20 | | 2.5 | 0.15 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Manganese | 230 | | 0.75 | 0.052 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Mo | 1.2 | J | 2.0 | 0.082 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Selenium | 0.88 | | 0.50 | 0.17 | mg/Kg | 1 | | 6010B SEP | Sum of Steps 1-7 |
| Chromium | 4.8 | | 1.8 | 0.27 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Lead | 6.0 | | 1.8 | 0.34 | mg/Kg | 1 | ☼ | 6010B | Total/NA |

This Detection Summary does not include radiochemical test results.

# Detection Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-2019-1 (23-25) (Continued)
## Lab Sample ID: 140-15376-3

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| Phosphorus | 65 | | 36 | 2.9 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Aluminum | 43000 | | 130 | 21 | mg/Kg | 10 | ☼ | 6010B | Total/NA |
| Arsenic | 7.6 | | 0.65 | 0.17 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Barium | 730 | | 32 | 1.6 | mg/Kg | 10 | ☼ | 6010B | Total/NA |
| Beryllium | 0.76 | | 0.32 | 0.0097 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Cobalt | 6.9 | | 3.2 | 0.19 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Cobalt | 17 | | 6.5 | 0.39 | mg/Kg | 2 | ☼ | 6010B | Total/NA |
| Iron | 8400 | | 6.5 | 5.3 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Lithium | 14 | | 3.2 | 0.19 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Manganese | 61 | | 0.97 | 0.067 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Molybdenum | 1.1 | J | 2.6 | 0.11 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Thallium | 0.85 | J | 2.3 | 0.23 | mg/Kg | 1 | ☼ | 6010B | Total/NA |
| Hg | 0.15 | | 0.13 | 0.052 | mg/Kg | 1 | ☼ | 7470A | Total/NA |

This Detection Summary does not include radiochemical test results.

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

**Client Sample ID: FGO-15 (25-27)**
**Date Collected: 05/22/19 19:15**
**Date Received: 05/24/19 09:40**

**Lab Sample ID: 140-15376-1**
**Matrix: Solid**
**Percent Solids: 76.6**

### Method: 6010B SEP - SEP Metals (ICP) - Step 1

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 52 | 8.4 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Antimony | ND | | 16 | 1.5 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Arsenic | ND | | 2.6 | 0.68 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Barium | ND | | 13 | 0.63 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Beryllium | ND | | 1.3 | 0.40 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Cobalt | ND | | 13 | 0.24 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Iron | ND | | 26 | 15 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Li | ND | | 13 | 0.78 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| **Manganese** | **0.47** | **J** | 3.9 | 0.16 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Mo | ND | | 10 | 0.43 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Selenium | ND | | 2.6 | 0.89 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Thallium | ND | | 9.1 | 1.1 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 2

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | * | 39 | 6.3 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Antimony | ND | | 12 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Arsenic | ND | | 2.0 | 0.51 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Barium | ND | * | 9.8 | 0.47 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Beryllium | ND | * | 0.98 | 0.063 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Cobalt | ND | | 9.8 | 0.25 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Iron | ND | * | 20 | 11 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Li | ND | | 9.8 | 0.59 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| **Manganese** | **1.4** | **J** | 2.9 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Mo | ND | | 7.8 | 0.32 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Selenium | ND | | 2.0 | 0.67 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Thallium | ND | | 6.9 | 0.82 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 3

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **23** | | 13 | 2.7 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Antimony | ND | | 3.9 | 0.37 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Arsenic | ND | | 0.65 | 0.17 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| **Barium** | **1.4** | **J B** | 3.3 | 0.16 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| **Beryllium** | **0.020** | **J** | 0.33 | 0.020 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| **Cobalt** | **0.63** | **J** | 3.3 | 0.059 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| **Iron** | **58** | | 6.5 | 3.8 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Li | ND | | 3.3 | 0.20 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| **Manganese** | **14** | **B** | 0.98 | 0.035 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Mo | ND | | 2.6 | 0.11 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Thallium | ND | | 2.3 | 0.27 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 4

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **600** | | 13 | 2.1 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Antimony | ND | | 3.9 | 0.59 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| **Arsenic** | **0.64** | **J B** | 0.65 | 0.29 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| **Barium** | **9.6** | | 3.3 | 0.16 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| **Beryllium** | **0.12** | **J** | 0.33 | 0.021 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |

**Client Sample ID: FGO-15 (25-27)**
**Lab Sample ID: 140-15376-1**
**Date Collected: 05/22/19 19:15**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 76.6**

### Method: 6010B SEP - SEP Metals (ICP) - Step 4 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.41 | J | 3.3 | 0.069 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Iron | 1400 | | 6.5 | 3.8 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Li | 0.93 | J | 3.3 | 0.20 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Manganese | 6.9 | | 0.98 | 0.17 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Mo | ND | | 2.6 | 0.11 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Selenium | 0.65 | * B | 0.65 | 0.61 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Thallium | ND | | 2.3 | 0.38 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 5

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 67 | J * | 200 | 31 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Antimony | ND | | 59 | 5.5 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Arsenic | ND | | 9.8 | 2.5 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Barium | ND | * | 49 | 2.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Beryllium | ND | * | 4.9 | 0.41 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Cobalt | ND | * | 49 | 0.78 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Iron | ND | * | 98 | 57 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Li | ND | | 49 | 2.9 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Manganese | ND | * | 15 | 2.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Mo | ND | | 39 | 1.6 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Selenium | ND | | 9.8 | 3.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Thallium | ND | * | 34 | 4.6 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 6

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 1200 | | 13 | 2.1 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Antimony | ND | | 3.9 | 0.37 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Arsenic | 0.62 | J | 0.65 | 0.20 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Barium | 6.0 | | 3.3 | 0.16 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Beryllium | 0.053 | J | 0.33 | 0.016 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Cobalt | 0.27 | J | 3.3 | 0.060 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Iron | 1100 | | 6.5 | 3.8 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Li | 0.93 | J | 3.3 | 0.20 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Manganese | 10 | | 0.98 | 0.33 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Mo | ND | | 2.6 | 0.13 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Thallium | ND | | 2.3 | 0.27 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 28000 | | 130 | 21 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:17 | 10 |
| Antimony | ND | | 3.9 | 0.18 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |
| Arsenic | 0.90 | J | 1.3 | 0.34 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:43 | 2 |
| Barium | 510 | | 33 | 1.6 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:17 | 10 |
| Beryllium | 0.48 | | 0.33 | 0.0098 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |
| Cobalt | 0.48 | J | 6.5 | 0.39 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:43 | 2 |
| Iron | 2900 | | 6.5 | 5.4 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |
| Li | 7.0 | | 3.3 | 0.20 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |
| Manganese | 54 | B | 0.98 | 0.068 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |
| Mo | 0.11 | J | 2.6 | 0.11 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |

**Client Sample ID: FGO-15 (25-27)** **Lab Sample ID: 140-15376-1**
**Date Collected: 05/22/19 19:15** **Matrix: Solid**
**Date Received: 05/24/19 09:40** **Percent Solids: 76.6**

## Method: 6010B SEP - SEP Metals (ICP) - Step 7 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Selenium | ND | | 1.3 | 0.44 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:43 | 2 |
| **Thallium** | **0.59** | **J** | 4.6 | 0.47 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:43 | 2 |

## Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **30000** | | 10 | 1.6 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Antimony | ND | | 3.0 | 0.14 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Arsenic** | **2.2** | | 0.50 | 0.13 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Barium** | **530** | | 2.5 | 0.12 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Beryllium** | **0.67** | | 0.25 | 0.0075 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Cobalt** | **1.8** | **J** | 2.5 | 0.023 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Iron** | **5400** | | 5.0 | 4.1 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Li** | **8.9** | | 2.5 | 0.15 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Manganese** | **88** | | 0.75 | 0.052 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Mo** | **0.11** | **J** | 2.0 | 0.082 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Selenium** | **0.65** | | 0.50 | 0.17 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Thallium** | **0.59** | **J** | 1.8 | 0.18 | mg/Kg | | | 07/11/19 10:59 | 1 |

## Method: 6010B - Metals (ICP)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 24 | 12 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:27 | 1 |
| **Chromium** | **4.2** | | 1.8 | 0.27 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:27 | 1 |
| **Lead** | **3.2** | | 1.8 | 0.34 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:27 | 1 |
| **Phosphorus** | **69** | | 36 | 2.9 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:27 | 1 |

## Method: 6010B - SEP Metals (ICP) - Total

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **46000** | | 130 | 21 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:37 | 10 |
| Antimony | ND | | 3.9 | 0.18 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Arsenic** | **1.6** | | 0.65 | 0.17 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Barium** | **670** | | 33 | 1.6 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:37 | 10 |
| **Beryllium** | **0.71** | | 0.33 | 0.0098 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Cobalt** | **1.8** | **J** | 6.5 | 0.39 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:40 | 2 |
| **Iron** | **5700** | | 6.5 | 5.4 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Lithium** | **10** | | 3.3 | 0.20 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Manganese** | **93** | | 0.98 | 0.068 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Molybdenum** | **0.21** | **J** | 2.6 | 0.11 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| Thallium | ND | | 4.6 | 0.47 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:40 | 2 |

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-14 (30-32)
**Date Collected: 05/23/19 10:40**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-2
**Matrix: Solid**
**Percent Solids: 79.2**

### Method: 6010B SEP - SEP Metals (ICP) - Step 1

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 51 | 8.1 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Antimony | ND | | 15 | 1.4 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Arsenic | ND | | 2.5 | 0.66 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| **Barium** | **0.67** | **J** | 13 | 0.61 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Beryllium | ND | | 1.3 | 0.39 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Cobalt | ND | | 13 | 0.23 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Iron | ND | | 25 | 15 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Li | ND | | 13 | 0.76 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| **Manganese** | **0.20** | **J** | 3.8 | 0.16 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Mo | ND | | 10 | 0.41 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Selenium | ND | | 2.5 | 0.86 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Thallium | ND | | 8.8 | 1.1 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 2

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | * | 38 | 6.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Antimony | ND | | 11 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Arsenic | ND | | 1.9 | 0.49 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| **Barium** | **0.55** | **J *** | 9.5 | 0.45 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Beryllium | ND | * | 0.95 | 0.061 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Cobalt | ND | | 9.5 | 0.24 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Iron | ND | * | 19 | 11 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Li | ND | | 9.5 | 0.57 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Manganese | ND | | 2.8 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Mo | ND | | 7.6 | 0.31 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Selenium | ND | | 1.9 | 0.64 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Thallium | ND | | 6.6 | 0.80 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 3

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **40** | | 13 | 2.7 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| Antimony | ND | | 3.8 | 0.35 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Arsenic** | **0.28** | **J** | 0.63 | 0.16 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Barium** | **6.4** | **B** | 3.2 | 0.15 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Beryllium** | **0.036** | **J** | 0.32 | 0.019 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Cobalt** | **0.63** | **J** | 3.2 | 0.057 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Iron** | **31** | | 6.3 | 3.7 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| Li | ND | | 3.2 | 0.19 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Manganese** | **4.4** | **B** | 0.95 | 0.034 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| Mo | ND | | 2.5 | 0.10 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| Selenium | ND | | 0.63 | 0.21 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| Thallium | ND | | 2.2 | 0.27 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 4

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **990** | | 13 | 2.0 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| Antimony | ND | | 3.8 | 0.57 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Arsenic** | **1.1** | **B** | 0.63 | 0.28 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Barium** | **12** | | 3.2 | 0.15 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Beryllium** | **0.18** | **J** | 0.32 | 0.020 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |

## Client Sample ID: FGO-14 (30-32)
**Date Collected: 05/23/19 10:40**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-2
**Matrix: Solid**
**Percent Solids: 79.2**

### Method: 6010B SEP - SEP Metals (ICP) - Step 4 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Cobalt** | **0.63** | **J** | 3.2 | 0.067 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Iron** | **2100** | | 6.3 | 3.7 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Li** | **0.27** | **J** | 3.2 | 0.19 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Manganese** | **4.8** | | 0.95 | 0.16 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| Mo | ND | | 2.5 | 0.10 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| Selenium | ND | * | 0.63 | 0.59 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| Thallium | ND | | 2.2 | 0.37 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 5

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **90** | **J *** | 190 | 30 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Antimony | ND | | 57 | 5.3 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Arsenic | ND | | 9.5 | 2.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Barium | ND | * | 47 | 2.3 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Beryllium | ND | * | 4.7 | 0.40 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Cobalt | ND | * | 47 | 0.76 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Iron | ND | * | 95 | 56 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Li | ND | | 47 | 2.8 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Manganese | ND | * | 14 | 2.3 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Mo | ND | | 38 | 1.6 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Selenium | ND | | 9.5 | 3.3 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Thallium | ND | * | 33 | 4.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 6

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **1600** | | 13 | 2.0 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| Antimony | ND | | 3.8 | 0.35 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Arsenic** | **0.69** | | 0.63 | 0.19 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Barium** | **4.2** | | 3.2 | 0.15 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Beryllium** | **0.056** | **J** | 0.32 | 0.015 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Cobalt** | **0.32** | **J** | 3.2 | 0.058 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Iron** | **1300** | | 6.3 | 3.7 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Li** | **0.57** | **J** | 3.2 | 0.19 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Manganese** | **6.4** | | 0.95 | 0.32 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| Mo | ND | | 2.5 | 0.13 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| Selenium | ND | | 0.63 | 0.21 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| Thallium | ND | | 2.2 | 0.27 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **39000** | | 130 | 20 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:27 | 10 |
| Antimony | ND | | 3.8 | 0.18 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |
| **Arsenic** | **0.47** | **J** | 1.3 | 0.33 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:53 | 2 |
| **Barium** | **520** | | 32 | 1.5 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:27 | 10 |
| **Beryllium** | **0.59** | | 0.32 | 0.0095 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |
| **Cobalt** | **0.62** | **J** | 6.3 | 0.38 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:53 | 2 |
| **Iron** | **3100** | | 6.3 | 5.2 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |
| **Li** | **7.9** | | 3.2 | 0.19 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |
| **Manganese** | **18** | **B** | 0.95 | 0.066 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |
| Mo | ND | | 2.5 | 0.10 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |

## Client Sample ID: FGO-14 (30-32)
**Date Collected: 05/23/19 10:40**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-2
**Matrix: Solid**
**Percent Solids: 79.2**

### Method: 6010B SEP - SEP Metals (ICP) - Step 7 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Selenium | ND | | 1.3 | 0.43 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:53 | 2 |
| **Thallium** | **0.95** | **J** | 4.4 | 0.45 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:53 | 2 |

### Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **42000** | | 10 | 1.6 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Antimony | ND | | 3.0 | 0.14 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Arsenic** | **2.5** | | 0.50 | 0.13 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Barium** | **540** | | 2.5 | 0.12 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Beryllium** | **0.86** | | 0.25 | 0.0075 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Cobalt** | **2.2** | **J** | 2.5 | 0.023 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Iron** | **6600** | | 5.0 | 4.1 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Li** | **8.7** | | 2.5 | 0.15 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Manganese** | **34** | | 0.75 | 0.052 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Mo | ND | | 2.0 | 0.082 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Selenium | ND | | 0.50 | 0.17 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Thallium** | **0.95** | **J** | 1.8 | 0.18 | mg/Kg | | | 07/11/19 10:59 | 1 |

### Method: 6010B - Metals (ICP)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 24 | 12 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:41 | 1 |
| **Chromium** | **3.3** | | 1.8 | 0.26 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:41 | 1 |
| **Lead** | **3.4** | | 1.8 | 0.33 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:41 | 1 |
| **Phosphorus** | **43** | | 35 | 2.8 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:41 | 1 |

### Method: 6010B - SEP Metals (ICP) - Total

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **44000** | | 130 | 20 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:47 | 10 |
| Antimony | ND | | 3.8 | 0.18 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| **Arsenic** | **2.5** | | 1.3 | 0.33 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:50 | 2 |
| **Barium** | **760** | | 32 | 1.5 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:47 | 10 |
| **Beryllium** | **0.85** | | 0.32 | 0.0095 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| **Cobalt** | **1.7** | **J** | 6.3 | 0.38 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:50 | 2 |
| **Iron** | **5900** | | 6.3 | 5.2 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| **Lithium** | **7.6** | | 3.2 | 0.19 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| **Manganese** | **34** | | 0.95 | 0.066 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| **Molybdenum** | **0.16** | **J** | 2.5 | 0.10 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| Selenium | ND | | 1.3 | 0.43 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:50 | 2 |
| **Thallium** | **0.68** | **J** | 4.4 | 0.45 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:50 | 2 |

### Method: 7470A - SEP Mercury (CVAA) - Total

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Hg | ND | | 0.13 | 0.051 | mg/Kg | ☼ | 05/30/19 08:00 | 06/03/19 14:52 | 1 |

## Client Sample ID: FGO-2019-1 (23-25)
**Date Collected: 05/23/19 15:20**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-3
**Matrix: Solid**
**Percent Solids: 77.2**

### Method: 6010B SEP - SEP Metals (ICP) - Step 1

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 52 | 8.3 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Antimony | ND | | 16 | 1.5 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Arsenic | ND | | 2.6 | 0.67 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| **Barium** | **0.86** | **J** | 13 | 0.62 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Beryllium | ND | | 1.3 | 0.40 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Cobalt | ND | | 13 | 0.23 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Iron | ND | | 26 | 15 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Li | ND | | 13 | 0.78 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| **Manganese** | **0.99** | **J** | 3.9 | 0.16 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Mo | ND | | 10 | 0.43 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Selenium | ND | | 2.6 | 0.88 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Thallium | ND | | 9.1 | 1.1 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 2

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | * | 39 | 6.2 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Antimony | ND | | 12 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Arsenic | ND | | 1.9 | 0.51 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| **Barium** | **1.9** | **J *** | 9.7 | 0.47 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Beryllium | ND | * | 0.97 | 0.062 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Cobalt | ND | | 9.7 | 0.24 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Iron | ND | * | 19 | 11 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Li | ND | | 9.7 | 0.58 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Manganese | ND | | 2.9 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Mo | ND | | 7.8 | 0.32 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| **Selenium** | **0.88** | **J B** | 1.9 | 0.66 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Thallium | ND | | 6.8 | 0.82 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 3

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **62** | | 13 | 2.7 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| Antimony | ND | | 3.9 | 0.36 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Arsenic** | **0.30** | **J** | 0.65 | 0.17 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Barium** | **4.0** | **B** | 3.2 | 0.16 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Beryllium** | **0.10** | **J** | 0.32 | 0.019 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Cobalt** | **29** | | 3.2 | 0.058 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Cobalt** | **29** | | 3.2 | 0.058 | mg/Kg | ☼ | 07/16/19 08:00 | 07/17/19 11:32 | 1 |
| **Iron** | **61** | | 6.5 | 3.8 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Li** | **0.80** | **J** | 3.2 | 0.19 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Manganese** | **110** | **B** | 0.97 | 0.035 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| Mo | ND | | 2.6 | 0.11 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| Thallium | ND | | 2.3 | 0.27 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 4

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **1800** | | 13 | 2.1 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| Antimony | ND | | 3.9 | 0.58 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Arsenic** | **1.9** | **B** | 0.65 | 0.29 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Barium** | **14** | | 3.2 | 0.16 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |

## Client Sample ID: FGO-2019-1 (23-25)
**Date Collected: 05/23/19 15:20**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-3
**Matrix: Solid**
**Percent Solids: 77.2**

### Method: 6010B SEP - SEP Metals (ICP) - Step 4 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Beryllium** | **0.25** | **J** | 0.32 | 0.021 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Cobalt** | **36** | | 3.2 | 0.069 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Cobalt** | **35** | | 3.2 | 0.069 | mg/Kg | ☼ | 07/16/19 08:00 | 07/17/19 11:53 | 1 |
| **Iron** | **3400** | | 6.5 | 3.8 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Li** | **3.9** | | 3.2 | 0.19 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Manganese** | **98** | | 0.97 | 0.17 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Mo** | **0.18** | **J** | 2.6 | 0.11 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| Selenium | ND | * | 0.65 | 0.61 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| Thallium | ND | | 2.3 | 0.38 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 5

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **65** | **J *** | 190 | 30 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Antimony | ND | | 58 | 5.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Arsenic | ND | | 9.7 | 2.5 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| **Barium** | **27** | **J *** | 49 | 2.3 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Beryllium | ND | * | 4.9 | 0.41 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| **Cobalt** | **2.6** | **J *** | 49 | 0.78 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Iron | ND | * | 97 | 57 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Li | ND | | 49 | 2.9 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Manganese | ND | * | 15 | 2.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Mo | ND | | 39 | 1.6 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Selenium | ND | | 9.7 | 3.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Thallium | ND | * | 34 | 4.5 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 6

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **2600** | | 13 | 2.1 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| Antimony | ND | | 3.9 | 0.36 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Arsenic** | **1.6** | | 0.65 | 0.19 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Barium** | **35** | | 3.2 | 0.16 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Beryllium** | **0.074** | **J** | 0.32 | 0.016 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Cobalt** | **1.6** | **J** | 3.2 | 0.060 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Iron** | **1100** | | 6.5 | 3.8 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Li** | **1.2** | **J** | 3.2 | 0.19 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Manganese** | **10** | | 0.97 | 0.32 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Mo** | **0.21** | **J** | 2.6 | 0.13 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| Thallium | ND | | 2.3 | 0.27 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **33000** | | 130 | 21 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:32 | 10 |
| Antimony | ND | | 3.9 | 0.18 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| **Arsenic** | **1.2** | | 0.65 | 0.17 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| **Barium** | **410** | | 32 | 1.6 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:32 | 10 |
| **Beryllium** | **0.39** | | 0.32 | 0.0097 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| **Cobalt** | **0.70** | **J** | 6.5 | 0.39 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:58 | 2 |
| **Iron** | **4400** | | 6.5 | 5.3 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| **Li** | **14** | | 3.2 | 0.19 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |

# Client Sample Results

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

**Client Sample ID: FGO-2019-1 (23-25)**
**Lab Sample ID: 140-15376-3**
**Date Collected: 05/23/19 15:20**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 77.2**

## Method: 6010B SEP - SEP Metals (ICP) - Step 7 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Manganese | 19 | B | 0.97 | 0.067 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| Mo | 0.80 | J | 2.6 | 0.11 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| Thallium | ND | | 4.5 | 0.47 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:58 | 2 |

## Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 38000 | | 10 | 1.6 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Antimony | ND | | 3.0 | 0.14 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Arsenic | 5.0 | | 0.50 | 0.13 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Barium | 490 | | 2.5 | 0.12 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Beryllium | 0.81 | | 0.25 | 0.0075 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Cobalt | 69 | | 2.5 | 0.023 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Iron | 9100 | | 5.0 | 4.1 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Li | 20 | | 2.5 | 0.15 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Manganese | 230 | | 0.75 | 0.052 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Mo | 1.2 | J | 2.0 | 0.082 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Selenium | 0.88 | | 0.50 | 0.17 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Thallium | ND | | 1.8 | 0.18 | mg/Kg | | | 07/11/19 10:59 | 1 |

## Method: 6010B - Metals (ICP)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 24 | 12 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:47 | 1 |
| Chromium | 4.8 | | 1.8 | 0.27 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:47 | 1 |
| Lead | 6.0 | | 1.8 | 0.34 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:47 | 1 |
| Phosphorus | 65 | | 36 | 2.9 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:47 | 1 |

## Method: 6010B - SEP Metals (ICP) - Total

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 43000 | | 130 | 21 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:52 | 10 |
| Antimony | ND | | 3.9 | 0.18 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Arsenic | 7.6 | | 0.65 | 0.17 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Barium | 730 | | 32 | 1.6 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:52 | 10 |
| Beryllium | 0.76 | | 0.32 | 0.0097 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Cobalt | 6.9 | | 3.2 | 0.19 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Cobalt | 17 | | 6.5 | 0.39 | mg/Kg | ☼ | 07/16/19 08:00 | 07/17/19 12:03 | 2 |
| Iron | 8400 | | 6.5 | 5.3 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Lithium | 14 | | 3.2 | 0.19 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Manganese | 61 | | 0.97 | 0.067 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Molybdenum | 1.1 | J | 2.6 | 0.11 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Thallium | 0.85 | J | 2.3 | 0.23 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |

## Method: 7470A - SEP Mercury (CVAA) - Total

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Hg | 0.15 | | 0.13 | 0.052 | mg/Kg | ☼ | 05/30/19 08:00 | 06/03/19 14:54 | 1 |

# Default Detection Limits

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Method: 6010B SEP - SEP Metals (ICP) - Step 1

### Prep: 3010A

### SEP: Exchangeable

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.28 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.077 | mg/Kg |
| Cobalt | 2.5 | 0.045 | mg/Kg |
| Iron | 5.0 | 2.9 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.031 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.21 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 2

### Prep: 3010A

### SEP: Carbonate

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.28 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.016 | mg/Kg |
| Cobalt | 2.5 | 0.063 | mg/Kg |
| Iron | 5.0 | 2.9 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.28 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.21 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 3

### Prep: 3010A

### SEP: Non-Crystalline

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 2.1 | mg/Kg |
| Antimony | 3.0 | 0.28 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.015 | mg/Kg |
| Cobalt | 2.5 | 0.045 | mg/Kg |
| Iron | 5.0 | 2.9 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.027 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.21 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 4

### Prep: 3010A

### SEP: Metal Hydroxide

# Default Detection Limits

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Method: 6010B SEP - SEP Metals (ICP) - Step 4

### Prep: 3010A

### SEP: Metal Hydroxide

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.45 | mg/Kg |
| Arsenic | 0.50 | 0.22 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.016 | mg/Kg |
| Cobalt | 2.5 | 0.053 | mg/Kg |
| Iron | 5.0 | 2.9 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.13 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.47 | mg/Kg |
| Thallium | 1.8 | 0.29 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 5

### Prep: 3010A

### SEP: Organic-Bound

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 30 | 4.7 | mg/Kg |
| Antimony | 9.0 | 0.84 | mg/Kg |
| Arsenic | 1.5 | 0.38 | mg/Kg |
| Barium | 7.5 | 0.36 | mg/Kg |
| Beryllium | 0.75 | 0.063 | mg/Kg |
| Cobalt | 7.5 | 0.12 | mg/Kg |
| Iron | 15 | 8.8 | mg/Kg |
| Li | 7.5 | 0.44 | mg/Kg |
| Manganese | 2.3 | 0.37 | mg/Kg |
| Mo | 6.0 | 0.25 | mg/Kg |
| Selenium | 1.5 | 0.52 | mg/Kg |
| Thallium | 5.3 | 0.70 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 6

### SEP: Acid/Sulfide

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.28 | mg/Kg |
| Arsenic | 0.50 | 0.15 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.012 | mg/Kg |
| Cobalt | 2.5 | 0.046 | mg/Kg |
| Iron | 5.0 | 2.9 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.25 | mg/Kg |
| Mo | 2.0 | 0.099 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.21 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 7

### Prep: Residual

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |

# Default Detection Limits

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Method: 6010B SEP - SEP Metals (ICP) - Step 7 (Continued)
### Prep: Residual

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Antimony | 3.0 | 0.14 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.0075 | mg/Kg |
| Cobalt | 2.5 | 0.15 | mg/Kg |
| Iron | 5.0 | 4.1 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.052 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.18 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.14 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.0075 | mg/Kg |
| Cobalt | 2.5 | 0.023 | mg/Kg |
| Iron | 5.0 | 4.1 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.052 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.18 | mg/Kg |

## Method: 6010B - Metals (ICP)
### Prep: 3050B

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Boron | 20 | 10 | mg/Kg |
| Chromium | 1.5 | 0.22 | mg/Kg |
| Lead | 1.5 | 0.28 | mg/Kg |
| Phosphorus | 30 | 2.4 | mg/Kg |

## Method: 6010B - SEP Metals (ICP) - Total
### Prep: Total

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.14 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.0075 | mg/Kg |
| Cobalt | 2.5 | 0.15 | mg/Kg |
| Iron | 5.0 | 4.1 | mg/Kg |
| Lithium | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.052 | mg/Kg |
| Molybdenum | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.18 | mg/Kg |

# Default Detection Limits

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Method: 7470A - SEP Mercury (CVAA) - Total

### Prep: Total

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Hg | 0.10 | 0.040 | mg/Kg |

## Method: 6010B - Metals (ICP)

**Lab Sample ID: MB 140-30853/8-A**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 30853**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 20 | 10 | mg/Kg | | 06/16/19 08:00 | 06/17/19 11:06 | 1 |
| Chromium | ND | | 1.5 | 0.22 | mg/Kg | | 06/16/19 08:00 | 06/17/19 11:06 | 1 |
| Lead | ND | | 1.5 | 0.28 | mg/Kg | | 06/16/19 08:00 | 06/17/19 11:06 | 1 |
| Phosphorus | ND | | 30 | 2.4 | mg/Kg | | 06/16/19 08:00 | 06/17/19 11:06 | 1 |

**Lab Sample ID: LCS 140-30853/9-A**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 30853**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Boron | 100 | 99.1 | | mg/Kg | | 99 | 80 - 120 |
| Chromium | 20.0 | 20.5 | | mg/Kg | | 102 | 90 - 110 |
| Lead | 10.0 | 10.2 | | mg/Kg | | 102 | 90 - 110 |
| Phosphorus | 500 | 507 | | mg/Kg | | 101 | 80 - 120 |

**Lab Sample ID: 140-15376-1 MS**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30853**

| Analyte | Sample Result | Sample Qualifier | Spike Added | MS Result | MS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 128 | 121 | | mg/Kg | ☼ | 95 | 75 - 125 |
| Chromium | 4.2 | | 25.5 | 33.9 | | mg/Kg | ☼ | 117 | 75 - 125 |
| Lead | 3.2 | | 12.8 | 15.4 | | mg/Kg | ☼ | 96 | 75 - 125 |
| Phosphorus | 69 | | 638 | 680 | | mg/Kg | ☼ | 96 | 75 - 125 |

**Lab Sample ID: 140-15376-1 MSD**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30853**

| Analyte | Sample Result | Sample Qualifier | Spike Added | MSD Result | MSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 127 | 122 | | mg/Kg | ☼ | 96 | 75 - 125 | 1 | 20 |
| Chromium | 4.2 | | 25.4 | 33.5 | | mg/Kg | ☼ | 116 | 75 - 125 | 1 | 20 |
| Lead | 3.2 | | 12.7 | 15.4 | | mg/Kg | ☼ | 96 | 75 - 125 | 1 | 20 |
| Phosphorus | 69 | | 635 | 672 | | mg/Kg | ☼ | 95 | 75 - 125 | 1 | 20 |

## Method: 6010B - SEP Metals (ICP) - Total

**Lab Sample ID: MB 140-30373/11-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 10 | 1.6 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Antimony | ND | | 3.0 | 0.14 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Arsenic | ND | | 0.50 | 0.13 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Barium | ND | | 2.5 | 0.12 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Beryllium | ND | | 0.25 | 0.0075 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Cobalt | ND | | 2.5 | 0.15 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Iron | ND | | 5.0 | 4.1 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Lithium | ND | | 2.5 | 0.15 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |

## Method: 6010B - SEP Metals (ICP) - Total (Continued)

**Lab Sample ID: MB 140-30373/11-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Manganese | ND | | 0.75 | 0.052 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Molybdenum | ND | | 2.0 | 0.082 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Selenium | ND | | 0.50 | 0.17 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Thallium | ND | | 1.8 | 0.18 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |

**Lab Sample ID: LCS 140-30373/12-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 96.4 | | mg/Kg | | 96 | 75 - 125 |
| Antimony | 25.0 | 25.3 | | mg/Kg | | 101 | 75 - 125 |
| Arsenic | 5.00 | 5.23 | | mg/Kg | | 105 | 75 - 125 |
| Barium | 5.00 | 5.07 | | mg/Kg | | 101 | 75 - 125 |
| Beryllium | 2.50 | 2.47 | | mg/Kg | | 99 | 75 - 125 |
| Cobalt | 5.00 | 5.25 | | mg/Kg | | 105 | 75 - 125 |
| Iron | 50.0 | 50.6 | | mg/Kg | | 101 | 75 - 125 |
| Lithium | 5.00 | 5.37 | | mg/Kg | | 107 | 75 - 125 |
| Manganese | 5.00 | 5.27 | | mg/Kg | | 105 | 75 - 125 |
| Molybdenum | 25.0 | 26.5 | | mg/Kg | | 106 | 75 - 125 |
| Selenium | 7.50 | 7.36 | | mg/Kg | | 98 | 75 - 125 |
| Thallium | 20.0 | 21.6 | | mg/Kg | | 108 | 75 - 125 |

**Lab Sample ID: LCSD 140-30373/13-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 95.8 | | mg/Kg | | 96 | 75 - 125 | 1 | 30 |
| Antimony | 25.0 | 25.3 | | mg/Kg | | 101 | 75 - 125 | 0 | 30 |
| Arsenic | 5.00 | 5.23 | | mg/Kg | | 105 | 75 - 125 | 0 | 30 |
| Barium | 5.00 | 5.06 | | mg/Kg | | 101 | 75 - 125 | 0 | 30 |
| Beryllium | 2.50 | 2.47 | | mg/Kg | | 99 | 75 - 125 | 0 | 30 |
| Cobalt | 5.00 | 5.22 | | mg/Kg | | 104 | 75 - 125 | 0 | 30 |
| Iron | 50.0 | 50.6 | | mg/Kg | | 101 | 75 - 125 | 0 | 30 |
| Lithium | 5.00 | 5.35 | | mg/Kg | | 107 | 75 - 125 | 0 | 30 |
| Manganese | 5.00 | 5.25 | | mg/Kg | | 105 | 75 - 125 | 0 | 30 |
| Molybdenum | 25.0 | 26.4 | | mg/Kg | | 106 | 75 - 125 | 0 | 30 |
| Selenium | 7.50 | 7.37 | | mg/Kg | | 98 | 75 - 125 | 0 | 30 |
| Thallium | 20.0 | 21.4 | | mg/Kg | | 107 | 75 - 125 | 1 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Antimony | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Arsenic | 1.6 | | 1.73 | | mg/Kg | ☼ | 10 | 30 |
| Beryllium | 0.71 | | 0.709 | | mg/Kg | ☼ | 0.6 | 30 |

## Method: 6010B - SEP Metals (ICP) - Total (Continued)

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Iron | 5700 | | 5780 | | mg/Kg | ☼ | 2 | 30 |
| Lithium | 10 | | 10.4 | | mg/Kg | ☼ | 0.9 | 30 |
| Manganese | 93 | | 86.6 | | mg/Kg | ☼ | 7 | 30 |
| Molybdenum | 0.21 | J | 0.176 | J | mg/Kg | ☼ | 17 | 30 |
| Selenium | ND | | ND | | mg/Kg | ☼ | NC | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Aluminum | 46000 | | 46400 | | mg/Kg | ☼ | 1 | 30 |
| Barium | 670 | | 697 | | mg/Kg | ☼ | 3 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Cobalt | 1.8 | J | 1.74 | J | mg/Kg | ☼ | 5 | 30 |
| Thallium | ND | | ND | | mg/Kg | ☼ | NC | 30 |

**Lab Sample ID: MB 140-31695/2-A**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 31695**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | ND | | 2.5 | 0.15 | mg/Kg | | 07/16/19 08:00 | 07/17/19 11:17 | 1 |

**Lab Sample ID: LCS 140-31695/3-A**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 31695**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Cobalt | 5.00 | 5.28 | | mg/Kg | | 106 | 75 - 125 |

**Lab Sample ID: LCSD 140-31695/4-A**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Total/NA**
**Prep Batch: 31695**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 5.00 | 5.29 | | mg/Kg | | 106 | 75 - 125 | 0 | 30 |

## Method: 6010B SEP - SEP Metals (ICP)

**Lab Sample ID: MB 140-30374/11-B ^4**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Method Blank**
**Prep Type: Step 1**
**Prep Batch: 30422**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 40 | 6.4 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Antimony | ND | | 12 | 1.1 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Arsenic | ND | | 2.0 | 0.52 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Barium | ND | | 10 | 0.48 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Beryllium | ND | | 1.0 | 0.31 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Cobalt | ND | | 10 | 0.18 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Iron | ND | | 20 | 12 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Li | ND | | 10 | 0.60 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Manganese | ND | | 3.0 | 0.12 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Mo | ND | | 8.0 | 0.33 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Selenium | ND | | 2.0 | 0.68 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Thallium | ND | | 7.0 | 0.84 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |

**Lab Sample ID: LCS 140-30374/12-B ^5**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 1**
**Prep Batch: 30422**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 94.0 | | mg/Kg | | 94 | 75 - 125 |
| Antimony | 25.0 | 24.7 | | mg/Kg | | 99 | 75 - 125 |
| Arsenic | 5.00 | 4.79 | | mg/Kg | | 96 | 75 - 125 |
| Barium | 5.00 | 5.16 | J | mg/Kg | | 103 | 75 - 125 |
| Beryllium | 2.50 | 2.57 | | mg/Kg | | 103 | 75 - 125 |
| Cobalt | 5.00 | 5.06 | J | mg/Kg | | 101 | 75 - 125 |
| Iron | 50.0 | 51.3 | | mg/Kg | | 103 | 75 - 125 |
| Li | 5.00 | 5.37 | J | mg/Kg | | 107 | 75 - 125 |
| Manganese | 5.00 | 4.96 | | mg/Kg | | 99 | 75 - 125 |
| Mo | 25.0 | 25.8 | | mg/Kg | | 103 | 75 - 125 |
| Selenium | 7.50 | 7.86 | | mg/Kg | | 105 | 75 - 125 |
| Thallium | 20.0 | 19.6 | | mg/Kg | | 98 | 75 - 125 |

**Lab Sample ID: LCSD 140-30374/13-B ^5**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 1**
**Prep Batch: 30422**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 96.4 | | mg/Kg | | 96 | 75 - 125 | 3 | 30 |
| Antimony | 25.0 | 23.9 | | mg/Kg | | 95 | 75 - 125 | 4 | 30 |
| Arsenic | 5.00 | 4.66 | | mg/Kg | | 93 | 75 - 125 | 3 | 30 |
| Barium | 5.00 | 5.00 | J | mg/Kg | | 100 | 75 - 125 | 3 | 30 |
| Beryllium | 2.50 | 2.55 | | mg/Kg | | 102 | 75 - 125 | 1 | 30 |
| Cobalt | 5.00 | 4.97 | J | mg/Kg | | 99 | 75 - 125 | 2 | 30 |
| Iron | 50.0 | 50.4 | | mg/Kg | | 101 | 75 - 125 | 2 | 30 |
| Li | 5.00 | 5.04 | J | mg/Kg | | 101 | 75 - 125 | 6 | 30 |
| Manganese | 5.00 | 4.92 | | mg/Kg | | 98 | 75 - 125 | 1 | 30 |
| Mo | 25.0 | 25.3 | | mg/Kg | | 101 | 75 - 125 | 2 | 30 |
| Selenium | 7.50 | 7.98 | | mg/Kg | | 106 | 75 - 125 | 2 | 30 |
| Thallium | 20.0 | 19.4 | | mg/Kg | | 97 | 75 - 125 | 1 | 30 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Step 1**
**Prep Batch: 30422**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Antimony | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Arsenic | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Barium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Beryllium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Cobalt | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Iron | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Li | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Manganese | 0.47 | J | | 1.04 | J F5 | mg/Kg | ☼ | | | 76 | 30 |
| Mo | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Selenium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Thallium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |

**Lab Sample ID: MB 140-30423/11-B ^3**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Method Blank**
**Prep Type: Step 2**
**Prep Batch: 30452**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 30 | 4.8 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Antimony | ND | | 9.0 | 0.84 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Arsenic | ND | | 1.5 | 0.39 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Barium | ND | | 7.5 | 0.36 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Beryllium | ND | | 0.75 | 0.048 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Cobalt | ND | | 7.5 | 0.19 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Iron | ND | | 15 | 8.7 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Li | ND | | 7.5 | 0.45 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Manganese | ND | | 2.3 | 0.84 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Mo | ND | | 6.0 | 0.25 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Selenium | 0.644 | J | 1.5 | 0.51 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Thallium | ND | | 5.3 | 0.63 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |

**Lab Sample ID: LCS 140-30423/12-B ^5**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 2**
**Prep Batch: 30452**

| Analyte | | | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 100 | ND | * | mg/Kg | | -4 | 75 - 125 | | |
| Antimony | | | 25.0 | 21.2 | | mg/Kg | | 85 | 75 - 125 | | |
| Arsenic | | | 5.00 | 3.93 | | mg/Kg | | 79 | 75 - 125 | | |
| Barium | | | 5.00 | 2.38 | J * | mg/Kg | | 48 | 75 - 125 | | |
| Beryllium | | | 2.50 | 1.28 | J * | mg/Kg | | 51 | 75 - 125 | | |
| Cobalt | | | 5.00 | 4.75 | J | mg/Kg | | 95 | 75 - 125 | | |
| Iron | | | 50.0 | ND | * | mg/Kg | | 2 | 75 - 125 | | |
| Li | | | 5.00 | 4.71 | J | mg/Kg | | 94 | 75 - 125 | | |
| Manganese | | | 5.00 | 4.63 | | mg/Kg | | 93 | 75 - 125 | | |
| Mo | | | 25.0 | 21.1 | | mg/Kg | | 84 | 75 - 125 | | |
| Selenium | | | 7.50 | 6.91 | | mg/Kg | | 92 | 75 - 125 | | |
| Thallium | | | 20.0 | 18.1 | | mg/Kg | | 90 | 75 - 125 | | |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCSD 140-30423/13-B ^5**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 2**
**Prep Batch: 30452**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 100 | ND | * | mg/Kg | | -0.3 | 75 - 125 | 167 | 30 |
| Antimony | | | 25.0 | 21.3 | | mg/Kg | | 85 | 75 - 125 | 0 | 30 |
| Arsenic | | | 5.00 | 4.07 | | mg/Kg | | 81 | 75 - 125 | 4 | 30 |
| Barium | | | 5.00 | 2.40 | J * | mg/Kg | | 48 | 75 - 125 | 1 | 30 |
| Beryllium | | | 2.50 | 1.27 | J * | mg/Kg | | 51 | 75 - 125 | 0 | 30 |
| Cobalt | | | 5.00 | 4.76 | J | mg/Kg | | 95 | 75 - 125 | 0 | 30 |
| Iron | | | 50.0 | ND | * | mg/Kg | | 4 | 75 - 125 | 57 | 30 |
| Li | | | 5.00 | 5.06 | J | mg/Kg | | 101 | 75 - 125 | 7 | 30 |
| Manganese | | | 5.00 | 4.64 | | mg/Kg | | 93 | 75 - 125 | 0 | 30 |
| Mo | | | 25.0 | 21.2 | | mg/Kg | | 85 | 75 - 125 | 0 | 30 |
| Selenium | | | 7.50 | 6.76 | | mg/Kg | | 90 | 75 - 125 | 2 | 30 |
| Thallium | | | 20.0 | 18.8 | | mg/Kg | | 94 | 75 - 125 | 4 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Step 2**
**Prep Batch: 30452**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Antimony | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Arsenic | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Barium | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Beryllium | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Cobalt | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Iron | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Li | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Manganese | 1.4 | J | | 1.49 | J | mg/Kg | ☼ | | | 8 | 30 |
| Mo | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Selenium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Thallium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |

**Lab Sample ID: MB 140-30453/11-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Method Blank**
**Prep Type: Step 3**
**Prep Batch: 30480**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 10 | 2.1 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Antimony | ND | | 3.0 | 0.28 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Arsenic | ND | | 0.50 | 0.13 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Barium | 0.487 | J | 2.5 | 0.12 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Beryllium | ND | | 0.25 | 0.015 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Cobalt | ND | | 2.5 | 0.045 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Iron | ND | | 5.0 | 2.9 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Li | ND | | 2.5 | 0.15 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Manganese | 0.0625 | J | 0.75 | 0.027 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Mo | ND | | 2.0 | 0.082 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Selenium | ND | | 0.50 | 0.17 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Thallium | ND | | 1.8 | 0.21 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCS 140-30453/12-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 3**
**Prep Batch: 30480**

| Analyte | | | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 100 | 95.1 | | mg/Kg | | 95 | 75 - 125 | | |
| Antimony | | | 25.0 | 24.2 | | mg/Kg | | 97 | 75 - 125 | | |
| Arsenic | | | 5.00 | 5.01 | | mg/Kg | | 100 | 75 - 125 | | |
| Barium | | | 5.00 | 4.36 | | mg/Kg | | 87 | 75 - 125 | | |
| Beryllium | | | 2.50 | 2.53 | | mg/Kg | | 101 | 75 - 125 | | |
| Cobalt | | | 5.00 | 4.87 | | mg/Kg | | 97 | 75 - 125 | | |
| Iron | | | 50.0 | 49.3 | | mg/Kg | | 99 | 75 - 125 | | |
| Li | | | 5.00 | 4.84 | | mg/Kg | | 97 | 75 - 125 | | |
| Manganese | | | 5.00 | 4.86 | | mg/Kg | | 97 | 75 - 125 | | |
| Mo | | | 25.0 | 24.5 | | mg/Kg | | 98 | 75 - 125 | | |
| Selenium | | | 7.50 | 7.45 | | mg/Kg | | 99 | 75 - 125 | | |
| Thallium | | | 20.0 | 20.0 | | mg/Kg | | 100 | 75 - 125 | | |

**Lab Sample ID: LCSD 140-30453/13-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 3**
**Prep Batch: 30480**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 100 | 98.4 | | mg/Kg | | 98 | 75 - 125 | 3 | 30 |
| Antimony | | | 25.0 | 25.0 | | mg/Kg | | 100 | 75 - 125 | 3 | 30 |
| Arsenic | | | 5.00 | 5.11 | | mg/Kg | | 102 | 75 - 125 | 2 | 30 |
| Barium | | | 5.00 | 4.42 | | mg/Kg | | 88 | 75 - 125 | 2 | 30 |
| Beryllium | | | 2.50 | 2.64 | | mg/Kg | | 106 | 75 - 125 | 4 | 30 |
| Cobalt | | | 5.00 | 4.99 | | mg/Kg | | 100 | 75 - 125 | 2 | 30 |
| Iron | | | 50.0 | 50.9 | | mg/Kg | | 102 | 75 - 125 | 3 | 30 |
| Li | | | 5.00 | 4.97 | | mg/Kg | | 99 | 75 - 125 | 3 | 30 |
| Manganese | | | 5.00 | 5.00 | | mg/Kg | | 100 | 75 - 125 | 3 | 30 |
| Mo | | | 25.0 | 25.2 | | mg/Kg | | 101 | 75 - 125 | 3 | 30 |
| Selenium | | | 7.50 | 7.80 | | mg/Kg | | 104 | 75 - 125 | 5 | 30 |
| Thallium | | | 20.0 | 20.7 | | mg/Kg | | 104 | 75 - 125 | 3 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Step 3**
**Prep Batch: 30480**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 23 | | | 21.4 | | mg/Kg | ☼ | | | 7 | 30 |
| Antimony | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Arsenic | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Barium | 1.4 | J B | | 1.37 | J | mg/Kg | ☼ | | | 5 | 30 |
| Beryllium | 0.020 | J | | 0.0202 | J | mg/Kg | ☼ | | | 3 | 30 |
| Cobalt | 0.63 | J | | 0.599 | J | mg/Kg | ☼ | | | 4 | 30 |
| Iron | 58 | | | 54.6 | | mg/Kg | ☼ | | | 6 | 30 |
| Li | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Manganese | 14 | B | | 7.32 | F3 | mg/Kg | ☼ | | | 63 | 30 |
| Mo | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Selenium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Thallium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: MB 140-30453/11-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Method Blank**
**Prep Type: Step 3**
**Prep Batch: 31696**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | ND | | 2.5 | 0.045 | mg/Kg | | 07/16/19 08:00 | 07/17/19 10:47 | 1 |

**Lab Sample ID: LCS 140-30453/12-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 3**
**Prep Batch: 31696**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Cobalt | 5.00 | 4.88 | | mg/Kg | | 98 | 75 - 125 |

**Lab Sample ID: LCSD 140-30453/13-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 3**
**Prep Batch: 31696**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 5.00 | 5.04 | | mg/Kg | | 101 | 75 - 125 | 3 | 30 |

**Lab Sample ID: MB 140-30481/11-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Method Blank**
**Prep Type: Step 4**
**Prep Batch: 30528**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 10 | 1.6 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Antimony | ND | | 3.0 | 0.45 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Arsenic | 0.220 | J | 0.50 | 0.22 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Barium | ND | | 2.5 | 0.12 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Beryllium | ND | | 0.25 | 0.016 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Cobalt | ND | | 2.5 | 0.053 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Iron | ND | | 5.0 | 2.9 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Li | ND | | 2.5 | 0.15 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Manganese | ND | | 0.75 | 0.13 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Mo | ND | | 2.0 | 0.082 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Selenium | 0.473 | J | 0.50 | 0.47 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Thallium | ND | | 1.8 | 0.29 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |

**Lab Sample ID: LCS 140-30481/12-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 4**
**Prep Batch: 30528**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 96.7 | | mg/Kg | | 97 | 75 - 125 |
| Antimony | 25.0 | 24.7 | | mg/Kg | | 99 | 75 - 125 |
| Arsenic | 5.00 | 5.37 | | mg/Kg | | 107 | 75 - 125 |
| Barium | 5.00 | 4.86 | | mg/Kg | | 97 | 75 - 125 |
| Beryllium | 2.50 | 2.61 | | mg/Kg | | 104 | 75 - 125 |
| Cobalt | 5.00 | 4.98 | | mg/Kg | | 100 | 75 - 125 |
| Iron | 50.0 | 50.1 | | mg/Kg | | 100 | 75 - 125 |
| Li | 5.00 | 5.01 | | mg/Kg | | 100 | 75 - 125 |
| Manganese | 5.00 | 4.99 | | mg/Kg | | 100 | 75 - 125 |
| Mo | 25.0 | 25.1 | | mg/Kg | | 100 | 75 - 125 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCS 140-30481/12-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 4**
**Prep Batch: 30528**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Selenium | 7.50 | 0.489 | J * | mg/Kg | | 7 | 75 - 125 |
| Thallium | 20.0 | 18.2 | | mg/Kg | | 91 | 75 - 125 |

**Lab Sample ID: LCSD 140-30481/13-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 4**
**Prep Batch: 30528**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 100 | | mg/Kg | | 100 | 75 - 125 | 4 | 30 |
| Antimony | 25.0 | 26.1 | | mg/Kg | | 104 | 75 - 125 | 5 | 30 |
| Arsenic | 5.00 | 5.60 | | mg/Kg | | 112 | 75 - 125 | 4 | 30 |
| Barium | 5.00 | 5.02 | | mg/Kg | | 100 | 75 - 125 | 3 | 30 |
| Beryllium | 2.50 | 2.71 | | mg/Kg | | 108 | 75 - 125 | 4 | 30 |
| Cobalt | 5.00 | 5.15 | | mg/Kg | | 103 | 75 - 125 | 3 | 30 |
| Iron | 50.0 | 51.4 | | mg/Kg | | 103 | 75 - 125 | 3 | 30 |
| Li | 5.00 | 5.15 | | mg/Kg | | 103 | 75 - 125 | 3 | 30 |
| Manganese | 5.00 | 5.14 | | mg/Kg | | 103 | 75 - 125 | 3 | 30 |
| Mo | 25.0 | 26.7 | | mg/Kg | | 107 | 75 - 125 | 6 | 30 |
| Selenium | 7.50 | 0.529 | * | mg/Kg | | 7 | 75 - 125 | 8 | 30 |
| Thallium | 20.0 | 18.7 | | mg/Kg | | 94 | 75 - 125 | 3 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Step 4**
**Prep Batch: 30528**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Aluminum | 600 | | 659 | | mg/Kg | ☼ | 9 | 30 |
| Antimony | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Arsenic | 0.64 | J B | 0.637 | J | mg/Kg | ☼ | 0.5 | 30 |
| Barium | 9.6 | | 10.1 | | mg/Kg | ☼ | 5 | 30 |
| Beryllium | 0.12 | J | 0.120 | J | mg/Kg | ☼ | 4 | 30 |
| Cobalt | 0.41 | J | 0.445 | J | mg/Kg | ☼ | 8 | 30 |
| Iron | 1400 | | 1370 | | mg/Kg | ☼ | 2 | 30 |
| Li | 0.93 | J | 1.11 | J | mg/Kg | ☼ | 18 | 30 |
| Manganese | 6.9 | | 5.98 | | mg/Kg | ☼ | 14 | 30 |
| Mo | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Selenium | 0.65 | * B | 0.697 | * | mg/Kg | ☼ | 8 | 30 |
| Thallium | ND | | ND | | mg/Kg | ☼ | NC | 30 |

**Lab Sample ID: MB 140-30481/11-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Method Blank**
**Prep Type: Step 4**
**Prep Batch: 31697**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | ND | | 2.5 | 0.053 | mg/Kg | | 07/16/19 08:00 | 07/17/19 11:02 | 1 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCS 140-30481/12-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 4**
**Prep Batch: 31697**

| Analyte | | | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | | | 5.00 | 5.05 | | mg/Kg | | 101 | 75 - 125 | | |

**Lab Sample ID: LCSD 140-30481/13-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 4**
**Prep Batch: 31697**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | | | 5.00 | 5.21 | | mg/Kg | | 104 | 75 - 125 | 3 | 30 |

**Lab Sample ID: MB 140-30529/11-B ^5**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Method Blank**
**Prep Type: Step 5**
**Prep Batch: 30726**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 150 | 24 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Antimony | ND | | 45 | 4.2 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Arsenic | ND | | 7.5 | 1.9 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Barium | ND | | 38 | 1.8 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Beryllium | ND | | 3.8 | 0.32 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Cobalt | ND | | 38 | 0.60 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Iron | ND | | 75 | 44 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Li | ND | | 38 | 2.2 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Manganese | ND | | 11 | 1.9 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Mo | ND | | 30 | 1.3 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Selenium | ND | | 7.5 | 2.6 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Thallium | ND | | 26 | 3.5 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |

**Lab Sample ID: LCS 140-30529/12-B ^5**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 5**
**Prep Batch: 30726**

| Analyte | | | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 300 | 30.0 | J * | mg/Kg | | 10 | 75 - 125 | | |
| Antimony | | | 75.0 | 85.8 | | mg/Kg | | 114 | 75 - 125 | | |
| Arsenic | | | 15.0 | 12.7 | | mg/Kg | | 85 | 75 - 125 | | |
| Barium | | | 15.0 | 8.33 | J * | mg/Kg | | 56 | 75 - 125 | | |
| Beryllium | | | 7.50 | 4.27 | * | mg/Kg | | 57 | 75 - 125 | | |
| Cobalt | | | 15.0 | 5.06 | J * | mg/Kg | | 34 | 75 - 125 | | |
| Iron | | | 150 | ND | * | mg/Kg | | 0.4 | 75 - 125 | | |
| Li | | | 15.0 | 16.5 | J | mg/Kg | | 110 | 75 - 125 | | |
| Manganese | | | 15.0 | 3.17 | J * | mg/Kg | | 21 | 75 - 125 | | |
| Mo | | | 75.0 | 63.7 | | mg/Kg | | 85 | 75 - 125 | | |
| Selenium | | | 22.5 | 26.1 | | mg/Kg | | 116 | 75 - 125 | | |
| Thallium | | | 60.0 | 25.2 | J * | mg/Kg | | 42 | 75 - 125 | | |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCSD 140-30529/13-B ^5**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 5**
**Prep Batch: 30726**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 300 | ND | * | mg/Kg | | 6 | 75 - 125 | 43 | 30 |
| Antimony | | | 75.0 | 85.4 | | mg/Kg | | 114 | 75 - 125 | 0 | 30 |
| Arsenic | | | 15.0 | 12.5 | | mg/Kg | | 84 | 75 - 125 | 2 | 30 |
| Barium | | | 15.0 | 8.04 | J * | mg/Kg | | 54 | 75 - 125 | 3 | 30 |
| Beryllium | | | 7.50 | 4.25 | * | mg/Kg | | 57 | 75 - 125 | 0 | 30 |
| Cobalt | | | 15.0 | 4.94 | J * | mg/Kg | | 33 | 75 - 125 | 2 | 30 |
| Iron | | | 150 | ND | * | mg/Kg | | 1 | 75 - 125 | 103 | 30 |
| Li | | | 15.0 | 17.4 | J | mg/Kg | | 116 | 75 - 125 | 5 | 30 |
| Manganese | | | 15.0 | 4.43 | J * | mg/Kg | | 30 | 75 - 125 | 33 | 30 |
| Mo | | | 75.0 | 64.0 | | mg/Kg | | 85 | 75 - 125 | 0 | 30 |
| Selenium | | | 22.5 | 27.5 | | mg/Kg | | 122 | 75 - 125 | 5 | 30 |
| Thallium | | | 60.0 | 26.1 | * | mg/Kg | | 44 | 75 - 125 | 3 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Step 5**
**Prep Batch: 30726**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 67 | J * | | 61.2 | J * | mg/Kg | ☼ | | | 10 | 30 |
| Antimony | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Arsenic | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Barium | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Beryllium | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Cobalt | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Iron | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Li | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Manganese | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Mo | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Selenium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Thallium | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |

**Lab Sample ID: MB 140-30781/11-A**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Method Blank**
**Prep Type: Step 6**
**Prep Batch: 30781**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 10 | 1.6 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Antimony | ND | | 3.0 | 0.28 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Arsenic | ND | | 0.50 | 0.15 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Barium | ND | | 2.5 | 0.12 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Beryllium | ND | | 0.25 | 0.012 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Cobalt | ND | | 2.5 | 0.046 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Iron | ND | | 5.0 | 2.9 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Li | ND | | 2.5 | 0.15 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Manganese | ND | | 0.75 | 0.25 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Mo | ND | | 2.0 | 0.099 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Selenium | ND | | 0.50 | 0.17 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Thallium | ND | | 1.8 | 0.21 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCS 140-30781/12-A**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 6**
**Prep Batch: 30781**

| Analyte | | | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 100 | 97.3 | | mg/Kg | | 97 | 75 - 125 | | |
| Antimony | | | 25.0 | 25.0 | | mg/Kg | | 100 | 75 - 125 | | |
| Arsenic | | | 5.00 | 5.14 | | mg/Kg | | 103 | 75 - 125 | | |
| Barium | | | 5.00 | 4.63 | | mg/Kg | | 93 | 75 - 125 | | |
| Beryllium | | | 2.50 | 2.59 | | mg/Kg | | 104 | 75 - 125 | | |
| Cobalt | | | 5.00 | 4.78 | | mg/Kg | | 96 | 75 - 125 | | |
| Iron | | | 50.0 | 49.6 | | mg/Kg | | 99 | 75 - 125 | | |
| Li | | | 5.00 | 4.67 | | mg/Kg | | 93 | 75 - 125 | | |
| Manganese | | | 5.00 | 4.87 | | mg/Kg | | 97 | 75 - 125 | | |
| Mo | | | 25.0 | 24.3 | | mg/Kg | | 97 | 75 - 125 | | |
| Selenium | | | 7.50 | 7.24 | | mg/Kg | | 97 | 75 - 125 | | |
| Thallium | | | 20.0 | 19.7 | | mg/Kg | | 99 | 75 - 125 | | |

**Lab Sample ID: LCSD 140-30781/13-A**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 6**
**Prep Batch: 30781**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 100 | 103 | | mg/Kg | | 103 | 75 - 125 | 5 | 30 |
| Antimony | | | 25.0 | 26.5 | | mg/Kg | | 106 | 75 - 125 | 6 | 30 |
| Arsenic | | | 5.00 | 5.49 | | mg/Kg | | 110 | 75 - 125 | 7 | 30 |
| Barium | | | 5.00 | 4.90 | | mg/Kg | | 98 | 75 - 125 | 6 | 30 |
| Beryllium | | | 2.50 | 2.76 | | mg/Kg | | 110 | 75 - 125 | 6 | 30 |
| Cobalt | | | 5.00 | 5.04 | | mg/Kg | | 101 | 75 - 125 | 5 | 30 |
| Iron | | | 50.0 | 52.4 | | mg/Kg | | 105 | 75 - 125 | 5 | 30 |
| Li | | | 5.00 | 4.93 | | mg/Kg | | 99 | 75 - 125 | 5 | 30 |
| Manganese | | | 5.00 | 5.14 | | mg/Kg | | 103 | 75 - 125 | 5 | 30 |
| Mo | | | 25.0 | 25.7 | | mg/Kg | | 103 | 75 - 125 | 6 | 30 |
| Selenium | | | 7.50 | 7.77 | | mg/Kg | | 104 | 75 - 125 | 7 | 30 |
| Thallium | | | 20.0 | 20.7 | | mg/Kg | | 104 | 75 - 125 | 5 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Step 6**
**Prep Batch: 30781**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 1200 | | | 1360 | | mg/Kg | ☼ | | | 9 | 30 |
| Antimony | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Arsenic | 0.62 | J | | 0.568 | J | mg/Kg | ☼ | | | 9 | 30 |
| Barium | 6.0 | | | 6.53 | | mg/Kg | ☼ | | | 8 | 30 |
| Beryllium | 0.053 | J | | 0.0522 | J | mg/Kg | ☼ | | | 1 | 30 |
| Cobalt | 0.27 | J | | 0.286 | J | mg/Kg | ☼ | | | 8 | 30 |
| Iron | 1100 | | | 1090 | | mg/Kg | ☼ | | | 2 | 30 |
| Li | 0.93 | J | | 0.902 | J | mg/Kg | ☼ | | | 3 | 30 |
| Manganese | 10 | | | 10.8 | | mg/Kg | ☼ | | | 5 | 30 |
| Mo | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Selenium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Thallium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: MB 140-30852/11-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Method Blank**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 10 | 1.6 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Antimony | ND | | 3.0 | 0.14 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Arsenic | ND | | 0.50 | 0.13 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Barium | ND | | 2.5 | 0.12 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Beryllium | ND | | 0.25 | 0.0075 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Cobalt | ND | | 2.5 | 0.15 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Iron | ND | | 5.0 | 4.1 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Li | ND | | 2.5 | 0.15 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Manganese | 0.0585 | J | 0.75 | 0.052 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Mo | ND | | 2.0 | 0.082 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Selenium | ND | | 0.50 | 0.17 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Thallium | ND | | 1.8 | 0.18 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |

**Lab Sample ID: LCS 140-30852/12-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 96.0 | | mg/Kg | | 96 | 75 - 125 |
| Antimony | 25.0 | 25.5 | | mg/Kg | | 102 | 75 - 125 |
| Arsenic | 5.00 | 5.23 | | mg/Kg | | 105 | 75 - 125 |
| Barium | 5.00 | 5.07 | | mg/Kg | | 101 | 75 - 125 |
| Beryllium | 2.50 | 2.50 | | mg/Kg | | 100 | 75 - 125 |
| Cobalt | 5.00 | 5.26 | | mg/Kg | | 105 | 75 - 125 |
| Iron | 50.0 | 51.1 | | mg/Kg | | 102 | 75 - 125 |
| Li | 5.00 | 5.34 | | mg/Kg | | 107 | 75 - 125 |
| Manganese | 5.00 | 5.28 | | mg/Kg | | 106 | 75 - 125 |
| Mo | 25.0 | 26.6 | | mg/Kg | | 106 | 75 - 125 |
| Selenium | 7.50 | 7.39 | | mg/Kg | | 98 | 75 - 125 |
| Thallium | 20.0 | 21.5 | | mg/Kg | | 108 | 75 - 125 |

**Lab Sample ID: LCSD 140-30852/13-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 95.8 | | mg/Kg | | 96 | 75 - 125 | 0 | 30 |
| Antimony | 25.0 | 25.6 | | mg/Kg | | 102 | 75 - 125 | 0 | 30 |
| Arsenic | 5.00 | 5.24 | | mg/Kg | | 105 | 75 - 125 | 0 | 30 |
| Barium | 5.00 | 5.13 | | mg/Kg | | 103 | 75 - 125 | 1 | 30 |
| Beryllium | 2.50 | 2.51 | | mg/Kg | | 100 | 75 - 125 | 0 | 30 |
| Cobalt | 5.00 | 5.29 | | mg/Kg | | 106 | 75 - 125 | 1 | 30 |
| Iron | 50.0 | 51.1 | | mg/Kg | | 102 | 75 - 125 | 0 | 30 |
| Li | 5.00 | 5.47 | | mg/Kg | | 109 | 75 - 125 | 2 | 30 |
| Manganese | 5.00 | 5.42 | | mg/Kg | | 108 | 75 - 125 | 3 | 30 |
| Mo | 25.0 | 26.8 | | mg/Kg | | 107 | 75 - 125 | 1 | 30 |
| Selenium | 7.50 | 7.49 | | mg/Kg | | 100 | 75 - 125 | 1 | 30 |
| Thallium | 20.0 | 21.6 | | mg/Kg | | 108 | 75 - 125 | 0 | 30 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Antimony | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Beryllium | 0.48 | | 0.502 | | mg/Kg | ☼ | 5 | 30 |
| Iron | 2900 | | 3090 | | mg/Kg | ☼ | 5 | 30 |
| Li | 7.0 | | 8.01 | | mg/Kg | ☼ | 13 | 30 |
| Manganese | 54 | B | 51.4 | | mg/Kg | ☼ | 6 | 30 |
| Mo | 0.11 | J | ND | | mg/Kg | ☼ | NC | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Aluminum | 28000 | | 35200 | | mg/Kg | ☼ | 23 | 30 |
| Barium | 510 | | 545 | | mg/Kg | ☼ | 6 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGO-15 (25-27)**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.90 | J | 0.478 | J F5 | mg/Kg | ☼ | 61 | 30 |
| Cobalt | 0.48 | J | 0.509 | J | mg/Kg | ☼ | 7 | 30 |
| Selenium | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Thallium | 0.59 | J | 0.828 | J F5 | mg/Kg | ☼ | 34 | 30 |

## Method: 7470A - SEP Mercury (CVAA) - Total

**Lab Sample ID: MB 140-30373/11-B**
**Matrix: Solid**
**Analysis Batch: 30491**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Hg | ND | | 0.10 | 0.040 | mg/Kg | | 05/30/19 08:00 | 06/03/19 14:34 | 1 |

**Lab Sample ID: LCS 140-30373/12-B**
**Matrix: Solid**
**Analysis Batch: 30491**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Hg | 2.50 | 2.54 | | mg/Kg | | 101 | 75 - 125 |

**Lab Sample ID: LCSD 140-30373/13-B**
**Matrix: Solid**
**Analysis Batch: 30491**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Hg | 2.50 | 2.53 | | mg/Kg | | 101 | 75 - 125 | 0 | 30 |

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Method: 7470A - SEP Mercury (CVAA) - Total (Continued)

**Lab Sample ID: 140-15376-A-1-J DU**
**Client Sample ID: 140-15376-A-1-J DU**
**Matrix: Solid**
**Prep Type: Total/NA**
**Analysis Batch: 30491**
**Prep Batch: 30373**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hg | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |

# QC Association Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Metals

### Prep Batch: 30373

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Total/NA | Solid | Total | |
| 140-15376-2 | FGO-14 (30-32) | Total/NA | Solid | Total | |
| 140-15376-3 | FGO-2019-1 (23-25) | Total/NA | Solid | Total | |
| MB 140-30373/11-A | Method Blank | Total/NA | Solid | Total | |
| MB 140-30373/11-B | Method Blank | Total/NA | Solid | Total | |
| LCS 140-30373/12-A | Lab Control Sample | Total/NA | Solid | Total | |
| LCS 140-30373/12-B | Lab Control Sample | Total/NA | Solid | Total | |
| LCSD 140-30373/13-A | Lab Control Sample Dup | Total/NA | Solid | Total | |
| LCSD 140-30373/13-B | Lab Control Sample Dup | Total/NA | Solid | Total | |
| 140-15376-1 DU | FGO-15 (25-27) | Total/NA | Solid | Total | |
| 140-15376-A-1-J DU | 140-15376-A-1-J DU | Total/NA | Solid | Total | |

### SEP Batch: 30374

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 1 | Solid | Exchangeable | |
| 140-15376-2 | FGO-14 (30-32) | Step 1 | Solid | Exchangeable | |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 1 | Solid | Exchangeable | |
| MB 140-30374/11-B ^4 | Method Blank | Step 1 | Solid | Exchangeable | |
| LCS 140-30374/12-B ^5 | Lab Control Sample | Step 1 | Solid | Exchangeable | |
| LCSD 140-30374/13-B ^5 | Lab Control Sample Dup | Step 1 | Solid | Exchangeable | |
| 140-15376-1 DU | FGO-15 (25-27) | Step 1 | Solid | Exchangeable | |

### Prep Batch: 30422

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 1 | Solid | 3010A | 30374 |
| 140-15376-2 | FGO-14 (30-32) | Step 1 | Solid | 3010A | 30374 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 1 | Solid | 3010A | 30374 |
| MB 140-30374/11-B ^4 | Method Blank | Step 1 | Solid | 3010A | 30374 |
| LCS 140-30374/12-B ^5 | Lab Control Sample | Step 1 | Solid | 3010A | 30374 |
| LCSD 140-30374/13-B ^5 | Lab Control Sample Dup | Step 1 | Solid | 3010A | 30374 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 1 | Solid | 3010A | 30374 |

### SEP Batch: 30423

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 2 | Solid | Carbonate | |
| 140-15376-2 | FGO-14 (30-32) | Step 2 | Solid | Carbonate | |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 2 | Solid | Carbonate | |
| MB 140-30423/11-B ^3 | Method Blank | Step 2 | Solid | Carbonate | |
| LCS 140-30423/12-B ^5 | Lab Control Sample | Step 2 | Solid | Carbonate | |
| LCSD 140-30423/13-B ^5 | Lab Control Sample Dup | Step 2 | Solid | Carbonate | |
| 140-15376-1 DU | FGO-15 (25-27) | Step 2 | Solid | Carbonate | |

### Prep Batch: 30447

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-2 | FGO-14 (30-32) | Total/NA | Solid | 7470A | 30373 |
| 140-15376-3 | FGO-2019-1 (23-25) | Total/NA | Solid | 7470A | 30373 |
| MB 140-30373/11-B | Method Blank | Total/NA | Solid | 7470A | 30373 |
| LCS 140-30373/12-B | Lab Control Sample | Total/NA | Solid | 7470A | 30373 |
| LCSD 140-30373/13-B | Lab Control Sample Dup | Total/NA | Solid | 7470A | 30373 |
| 140-15376-A-1-J DU | 140-15376-A-1-J DU | Total/NA | Solid | 7470A | 30373 |

# QC Association Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Metals

### Prep Batch: 30452

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 2 | Solid | 3010A | 30423 |
| 140-15376-2 | FGO-14 (30-32) | Step 2 | Solid | 3010A | 30423 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 2 | Solid | 3010A | 30423 |
| MB 140-30423/11-B ^3 | Method Blank | Step 2 | Solid | 3010A | 30423 |
| LCS 140-30423/12-B ^5 | Lab Control Sample | Step 2 | Solid | 3010A | 30423 |
| LCSD 140-30423/13-B ^5 | Lab Control Sample Dup | Step 2 | Solid | 3010A | 30423 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 2 | Solid | 3010A | 30423 |

### SEP Batch: 30453

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 3 | Solid | Non-Crystalline | |
| 140-15376-2 | FGO-14 (30-32) | Step 3 | Solid | Non-Crystalline | |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 3 | Solid | Non-Crystalline | |
| MB 140-30453/11-B | Method Blank | Step 3 | Solid | Non-Crystalline | |
| MB 140-30453/11-C | Method Blank | Step 3 | Solid | Non-Crystalline | |
| LCS 140-30453/12-B | Lab Control Sample | Step 3 | Solid | Non-Crystalline | |
| LCS 140-30453/12-C | Lab Control Sample | Step 3 | Solid | Non-Crystalline | |
| LCSD 140-30453/13-B | Lab Control Sample Dup | Step 3 | Solid | Non-Crystalline | |
| LCSD 140-30453/13-C | Lab Control Sample Dup | Step 3 | Solid | Non-Crystalline | |
| 140-15376-1 DU | FGO-15 (25-27) | Step 3 | Solid | Non-Crystalline | |

### Prep Batch: 30480

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 3 | Solid | 3010A | 30453 |
| 140-15376-2 | FGO-14 (30-32) | Step 3 | Solid | 3010A | 30453 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 3 | Solid | 3010A | 30453 |
| MB 140-30453/11-B | Method Blank | Step 3 | Solid | 3010A | 30453 |
| LCS 140-30453/12-B | Lab Control Sample | Step 3 | Solid | 3010A | 30453 |
| LCSD 140-30453/13-B | Lab Control Sample Dup | Step 3 | Solid | 3010A | 30453 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 3 | Solid | 3010A | 30453 |

### SEP Batch: 30481

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 4 | Solid | Metal Hydroxide | |
| 140-15376-2 | FGO-14 (30-32) | Step 4 | Solid | Metal Hydroxide | |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 4 | Solid | Metal Hydroxide | |
| MB 140-30481/11-B | Method Blank | Step 4 | Solid | Metal Hydroxide | |
| MB 140-30481/11-C | Method Blank | Step 4 | Solid | Metal Hydroxide | |
| LCS 140-30481/12-B | Lab Control Sample | Step 4 | Solid | Metal Hydroxide | |
| LCS 140-30481/12-C | Lab Control Sample | Step 4 | Solid | Metal Hydroxide | |
| LCSD 140-30481/13-B | Lab Control Sample Dup | Step 4 | Solid | Metal Hydroxide | |
| LCSD 140-30481/13-C | Lab Control Sample Dup | Step 4 | Solid | Metal Hydroxide | |
| 140-15376-1 DU | FGO-15 (25-27) | Step 4 | Solid | Metal Hydroxide | |

### Analysis Batch: 30491

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-2 | FGO-14 (30-32) | Total/NA | Solid | 7470A | 30447 |
| 140-15376-3 | FGO-2019-1 (23-25) | Total/NA | Solid | 7470A | 30447 |
| MB 140-30373/11-B | Method Blank | Total/NA | Solid | 7470A | 30447 |
| LCS 140-30373/12-B | Lab Control Sample | Total/NA | Solid | 7470A | 30447 |
| LCSD 140-30373/13-B | Lab Control Sample Dup | Total/NA | Solid | 7470A | 30447 |

## Metals (Continued)

### Analysis Batch: 30491 (Continued)

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-A-1-J DU | 140-15376-A-1-J DU | Total/NA | Solid | 7470A | 30447 |

### Prep Batch: 30528

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 4 | Solid | 3010A | 30481 |
| 140-15376-2 | FGO-14 (30-32) | Step 4 | Solid | 3010A | 30481 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 4 | Solid | 3010A | 30481 |
| MB 140-30481/11-B | Method Blank | Step 4 | Solid | 3010A | 30481 |
| LCS 140-30481/12-B | Lab Control Sample | Step 4 | Solid | 3010A | 30481 |
| LCSD 140-30481/13-B | Lab Control Sample Dup | Step 4 | Solid | 3010A | 30481 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 4 | Solid | 3010A | 30481 |

### SEP Batch: 30529

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 5 | Solid | Organic-Bound | |
| 140-15376-2 | FGO-14 (30-32) | Step 5 | Solid | Organic-Bound | |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 5 | Solid | Organic-Bound | |
| MB 140-30529/11-B ^5 | Method Blank | Step 5 | Solid | Organic-Bound | |
| LCS 140-30529/12-B ^5 | Lab Control Sample | Step 5 | Solid | Organic-Bound | |
| LCSD 140-30529/13-B ^5 | Lab Control Sample Dup | Step 5 | Solid | Organic-Bound | |
| 140-15376-1 DU | FGO-15 (25-27) | Step 5 | Solid | Organic-Bound | |

### Prep Batch: 30726

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 5 | Solid | 3010A | 30529 |
| 140-15376-2 | FGO-14 (30-32) | Step 5 | Solid | 3010A | 30529 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 5 | Solid | 3010A | 30529 |
| MB 140-30529/11-B ^5 | Method Blank | Step 5 | Solid | 3010A | 30529 |
| LCS 140-30529/12-B ^5 | Lab Control Sample | Step 5 | Solid | 3010A | 30529 |
| LCSD 140-30529/13-B ^5 | Lab Control Sample Dup | Step 5 | Solid | 3010A | 30529 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 5 | Solid | 3010A | 30529 |

### SEP Batch: 30781

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 6 | Solid | Acid/Sulfide | |
| 140-15376-2 | FGO-14 (30-32) | Step 6 | Solid | Acid/Sulfide | |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 6 | Solid | Acid/Sulfide | |
| MB 140-30781/11-A | Method Blank | Step 6 | Solid | Acid/Sulfide | |
| LCS 140-30781/12-A | Lab Control Sample | Step 6 | Solid | Acid/Sulfide | |
| LCSD 140-30781/13-A | Lab Control Sample Dup | Step 6 | Solid | Acid/Sulfide | |
| 140-15376-1 DU | FGO-15 (25-27) | Step 6 | Solid | Acid/Sulfide | |

### Prep Batch: 30852

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 7 | Solid | Residual | |
| 140-15376-2 | FGO-14 (30-32) | Step 7 | Solid | Residual | |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 7 | Solid | Residual | |
| MB 140-30852/11-A | Method Blank | Step 7 | Solid | Residual | |
| LCS 140-30852/12-A | Lab Control Sample | Step 7 | Solid | Residual | |
| LCSD 140-30852/13-A | Lab Control Sample Dup | Step 7 | Solid | Residual | |
| 140-15376-1 DU | FGO-15 (25-27) | Step 7 | Solid | Residual | |

# QC Association Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Metals

### Prep Batch: 30853

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Total/NA | Solid | 3050B | |
| 140-15376-2 | FGO-14 (30-32) | Total/NA | Solid | 3050B | |
| 140-15376-3 | FGO-2019-1 (23-25) | Total/NA | Solid | 3050B | |
| MB 140-30853/8-A | Method Blank | Total/NA | Solid | 3050B | |
| LCS 140-30853/9-A | Lab Control Sample | Total/NA | Solid | 3050B | |
| 140-15376-1 MS | FGO-15 (25-27) | Total/NA | Solid | 3050B | |
| 140-15376-1 MSD | FGO-15 (25-27) | Total/NA | Solid | 3050B | |

### Analysis Batch: 30900

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 1 | Solid | 6010B SEP | 30422 |
| 140-15376-1 | FGO-15 (25-27) | Step 2 | Solid | 6010B SEP | 30452 |
| 140-15376-1 | FGO-15 (25-27) | Total/NA | Solid | 6010B | 30853 |
| 140-15376-2 | FGO-14 (30-32) | Step 1 | Solid | 6010B SEP | 30422 |
| 140-15376-2 | FGO-14 (30-32) | Step 2 | Solid | 6010B SEP | 30452 |
| 140-15376-2 | FGO-14 (30-32) | Total/NA | Solid | 6010B | 30853 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 1 | Solid | 6010B SEP | 30422 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 2 | Solid | 6010B SEP | 30452 |
| 140-15376-3 | FGO-2019-1 (23-25) | Total/NA | Solid | 6010B | 30853 |
| MB 140-30374/11-B ^4 | Method Blank | Step 1 | Solid | 6010B SEP | 30422 |
| MB 140-30423/11-B ^3 | Method Blank | Step 2 | Solid | 6010B SEP | 30452 |
| MB 140-30853/8-A | Method Blank | Total/NA | Solid | 6010B | 30853 |
| LCS 140-30374/12-B ^5 | Lab Control Sample | Step 1 | Solid | 6010B SEP | 30422 |
| LCS 140-30423/12-B ^5 | Lab Control Sample | Step 2 | Solid | 6010B SEP | 30452 |
| LCS 140-30853/9-A | Lab Control Sample | Total/NA | Solid | 6010B | 30853 |
| LCSD 140-30374/13-B ^5 | Lab Control Sample Dup | Step 1 | Solid | 6010B SEP | 30422 |
| LCSD 140-30423/13-B ^5 | Lab Control Sample Dup | Step 2 | Solid | 6010B SEP | 30452 |
| 140-15376-1 MS | FGO-15 (25-27) | Total/NA | Solid | 6010B | 30853 |
| 140-15376-1 MSD | FGO-15 (25-27) | Total/NA | Solid | 6010B | 30853 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 1 | Solid | 6010B SEP | 30422 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 2 | Solid | 6010B SEP | 30452 |

### Analysis Batch: 31197

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 3 | Solid | 6010B SEP | 30480 |
| 140-15376-1 | FGO-15 (25-27) | Step 4 | Solid | 6010B SEP | 30528 |
| 140-15376-1 | FGO-15 (25-27) | Step 5 | Solid | 6010B SEP | 30726 |
| 140-15376-1 | FGO-15 (25-27) | Step 6 | Solid | 6010B SEP | 30781 |
| 140-15376-2 | FGO-14 (30-32) | Step 3 | Solid | 6010B SEP | 30480 |
| 140-15376-2 | FGO-14 (30-32) | Step 4 | Solid | 6010B SEP | 30528 |
| 140-15376-2 | FGO-14 (30-32) | Step 5 | Solid | 6010B SEP | 30726 |
| 140-15376-2 | FGO-14 (30-32) | Step 6 | Solid | 6010B SEP | 30781 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 3 | Solid | 6010B SEP | 30480 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 4 | Solid | 6010B SEP | 30528 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 5 | Solid | 6010B SEP | 30726 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 6 | Solid | 6010B SEP | 30781 |
| MB 140-30453/11-B | Method Blank | Step 3 | Solid | 6010B SEP | 30480 |
| MB 140-30481/11-B | Method Blank | Step 4 | Solid | 6010B SEP | 30528 |
| MB 140-30529/11-B ^5 | Method Blank | Step 5 | Solid | 6010B SEP | 30726 |
| MB 140-30781/11-A | Method Blank | Step 6 | Solid | 6010B SEP | 30781 |
| LCS 140-30453/12-B | Lab Control Sample | Step 3 | Solid | 6010B SEP | 30480 |

## Metals (Continued)

### Analysis Batch: 31197 (Continued)

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| LCS 140-30481/12-B | Lab Control Sample | Step 4 | Solid | 6010B SEP | 30528 |
| LCS 140-30529/12-B ^5 | Lab Control Sample | Step 5 | Solid | 6010B SEP | 30726 |
| LCS 140-30781/12-A | Lab Control Sample | Step 6 | Solid | 6010B SEP | 30781 |
| LCSD 140-30453/13-B | Lab Control Sample Dup | Step 3 | Solid | 6010B SEP | 30480 |
| LCSD 140-30481/13-B | Lab Control Sample Dup | Step 4 | Solid | 6010B SEP | 30528 |
| LCSD 140-30529/13-B ^5 | Lab Control Sample Dup | Step 5 | Solid | 6010B SEP | 30726 |
| LCSD 140-30781/13-A | Lab Control Sample Dup | Step 6 | Solid | 6010B SEP | 30781 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 3 | Solid | 6010B SEP | 30480 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 4 | Solid | 6010B SEP | 30528 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 5 | Solid | 6010B SEP | 30726 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 6 | Solid | 6010B SEP | 30781 |

### Analysis Batch: 31255

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 | FGO-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 | FGO-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 | FGO-15 (25-27) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-1 | FGO-15 (25-27) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-1 | FGO-15 (25-27) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-2 | FGO-14 (30-32) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-2 | FGO-14 (30-32) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-2 | FGO-14 (30-32) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-2 | FGO-14 (30-32) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-2 | FGO-14 (30-32) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-2 | FGO-14 (30-32) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-3 | FGO-2019-1 (23-25) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-3 | FGO-2019-1 (23-25) | Total/NA | Solid | 6010B | 30373 |
| MB 140-30373/11-A | Method Blank | Total/NA | Solid | 6010B | 30373 |
| MB 140-30852/11-A | Method Blank | Step 7 | Solid | 6010B SEP | 30852 |
| LCS 140-30373/12-A | Lab Control Sample | Total/NA | Solid | 6010B | 30373 |
| LCS 140-30852/12-A | Lab Control Sample | Step 7 | Solid | 6010B SEP | 30852 |
| LCSD 140-30373/13-A | Lab Control Sample Dup | Total/NA | Solid | 6010B | 30373 |
| LCSD 140-30852/13-A | Lab Control Sample Dup | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 DU | FGO-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 DU | FGO-15 (25-27) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-1 DU | FGO-15 (25-27) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-1 DU | FGO-15 (25-27) | Total/NA | Solid | 6010B | 30373 |

### Analysis Batch: 31570

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Sum of Steps 1-7 | Solid | 6010B SEP | |
| 140-15376-2 | FGO-14 (30-32) | Sum of Steps 1-7 | Solid | 6010B SEP | |
| 140-15376-3 | FGO-2019-1 (23-25) | Sum of Steps 1-7 | Solid | 6010B SEP | |

# QC Association Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Metals

### Prep Batch: 31695

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-3 | FGO-2019-1 (23-25) | Total/NA | Solid | Total | |
| MB 140-31695/2-A | Method Blank | Total/NA | Solid | Total | |
| LCS 140-31695/3-A | Lab Control Sample | Total/NA | Solid | Total | |
| LCSD 140-31695/4-A | Lab Control Sample Dup | Total/NA | Solid | Total | |

### Prep Batch: 31696

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-3 | FGO-2019-1 (23-25) | Step 3 | Solid | 3010A | 30453 |
| MB 140-30453/11-C | Method Blank | Step 3 | Solid | 3010A | 30453 |
| LCS 140-30453/12-C | Lab Control Sample | Step 3 | Solid | 3010A | 30453 |
| LCSD 140-30453/13-C | Lab Control Sample Dup | Step 3 | Solid | 3010A | 30453 |

### Prep Batch: 31697

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-3 | FGO-2019-1 (23-25) | Step 4 | Solid | 3010A | 30481 |
| MB 140-30481/11-C | Method Blank | Step 4 | Solid | 3010A | 30481 |
| LCS 140-30481/12-C | Lab Control Sample | Step 4 | Solid | 3010A | 30481 |
| LCSD 140-30481/13-C | Lab Control Sample Dup | Step 4 | Solid | 3010A | 30481 |

### Analysis Batch: 31812

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-3 | FGO-2019-1 (23-25) | Step 3 | Solid | 6010B SEP | 31696 |
| 140-15376-3 | FGO-2019-1 (23-25) | Step 4 | Solid | 6010B SEP | 31697 |
| 140-15376-3 | FGO-2019-1 (23-25) | Total/NA | Solid | 6010B | 31695 |
| MB 140-30453/11-C | Method Blank | Step 3 | Solid | 6010B SEP | 31696 |
| MB 140-30481/11-C | Method Blank | Step 4 | Solid | 6010B SEP | 31697 |
| MB 140-31695/2-A | Method Blank | Total/NA | Solid | 6010B | 31695 |
| LCS 140-30453/12-C | Lab Control Sample | Step 3 | Solid | 6010B SEP | 31696 |
| LCS 140-30481/12-C | Lab Control Sample | Step 4 | Solid | 6010B SEP | 31697 |
| LCS 140-31695/3-A | Lab Control Sample | Total/NA | Solid | 6010B | 31695 |
| LCSD 140-30453/13-C | Lab Control Sample Dup | Step 3 | Solid | 6010B SEP | 31696 |
| LCSD 140-30481/13-C | Lab Control Sample Dup | Step 4 | Solid | 6010B SEP | 31697 |
| LCSD 140-31695/4-A | Lab Control Sample Dup | Total/NA | Solid | 6010B | 31695 |

## General Chemistry

### Analysis Batch: 30352

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Total/NA | Solid | Moisture | |
| 140-15376-2 | FGO-14 (30-32) | Total/NA | Solid | Moisture | |
| 140-15376-3 | FGO-2019-1 (23-25) | Total/NA | Solid | Moisture | |
| 140-15376-1 DU | FGO-15 (25-27) | Total/NA | Solid | Moisture | |

# Lab Chronicle

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-15 (25-27)
**Lab Sample ID: 140-15376-1**
**Date Collected: 05/22/19 19:15**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Sum of Steps 1-7 | Analysis | 6010B SEP | | 1 | | | 31570 | 07/11/19 10:59 | CLJ | TAL KNX |
| | Instrument ID: NOEQUIP | | | | | | | | | |
| Total/NA | Analysis | Moisture | | 1 | | | 30352 | 05/28/19 16:16 | BKD | TAL KNX |
| | Instrument ID: W3 | | | | | | | | | |

## Client Sample ID: FGO-15 (25-27)
**Lab Sample ID: 140-15376-1**
**Date Collected: 05/22/19 19:15**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.542 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:27 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 15:23 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 10 | | | 31255 | 06/28/19 16:37 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 2 | | | 31255 | 06/28/19 18:40 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 4 | | | 30900 | 06/17/19 14:14 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 3 | | | 30900 | 06/17/19 15:37 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:30 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 18:52 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 20:25 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 21:48 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-15 (25-27)
**Lab Sample ID: 140-15376-1**
**Date Collected: 05/22/19 19:15**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 12:53 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 10 | | | 31255 | 06/28/19 14:17 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 2 | | | 31255 | 06/28/19 17:43 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: FGO-14 (30-32)
**Lab Sample ID: 140-15376-2**
**Date Collected: 05/23/19 10:40**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Sum of Steps 1-7 | Analysis | 6010B SEP | | 1 | | | 31570 | 07/11/19 10:59 | CLJ | TAL KNX |
| | Instrument ID: NOEQUIP | | | | | | | | | |
| Total/NA | Analysis | Moisture | | 1 | | | 30352 | 05/28/19 16:16 | BKD | TAL KNX |
| | Instrument ID: W3 | | | | | | | | | |

## Client Sample ID: FGO-14 (30-32)
**Lab Sample ID: 140-15376-2**
**Date Collected: 05/23/19 10:40**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 79.2**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.535 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:41 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 15:34 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 10 | | | 31255 | 06/28/19 16:47 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 2 | | | 31255 | 06/28/19 18:50 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 4 | | | 30900 | 06/17/19 14:24 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 3 | | | 30900 | 06/17/19 15:58 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-14 (30-32) Lab Sample ID: 140-15376-2

**Date Collected: 05/23/19 10:40** **Matrix: Solid**
**Date Received: 05/24/19 09:40** **Percent Solids: 79.2**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:40 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 19:13 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 20:35 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 22:14 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 13:19 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 10 | | | 31255 | 06/28/19 14:27 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 2 | | | 31255 | 06/28/19 17:53 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:52 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

## Client Sample ID: FGO-2019-1 (23-25) Lab Sample ID: 140-15376-3

**Date Collected: 05/23/19 15:20** **Matrix: Solid**
**Date Received: 05/24/19 09:40**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Sum of Steps 1-7 | Analysis | 6010B SEP | | 1 | | | 31570 | 07/11/19 10:59 | CLJ | TAL KNX |
| | Instrument ID: NOEQUIP | | | | | | | | | |
| Total/NA | Analysis | Moisture | | 1 | | | 30352 | 05/28/19 16:16 | BKD | TAL KNX |
| | Instrument ID: W3 | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

**Client Sample ID: FGO-2019-1 (23-25)**
**Lab Sample ID: 140-15376-3**
**Date Collected: 05/23/19 15:20**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 77.2**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.534 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:47 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 15:40 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 10 | | | 31255 | 06/28/19 16:52 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 31695 | 07/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 2 | | | 31812 | 07/17/19 12:03 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 4 | | | 30900 | 06/17/19 14:29 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 3 | | | 30900 | 06/17/19 16:03 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:45 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 31696 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 11:32 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 19:18 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 31697 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 11:53 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 20:41 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 22:20 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 13:24 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-2019-1 (23-25)
**Lab Sample ID: 140-15376-3**
**Date Collected: 05/23/19 15:20** **Matrix: Solid**
**Date Received: 05/24/19 09:40** **Percent Solids: 77.2**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 10 | | | 31255 | 06/28/19 14:32 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 2 | | | 31255 | 06/28/19 17:58 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:54 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

## Client Sample ID: Method Blank
**Lab Sample ID: MB 140-30373/11-A**
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 12:27 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank
**Lab Sample ID: MB 140-30373/11-B**
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:34 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

## Client Sample ID: Method Blank
**Lab Sample ID: MB 140-30374/11-B ^4**
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 4 | | | 30900 | 06/17/19 13:48 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30423/11-B ^3

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 3 | | | 30900 | 06/17/19 15:11 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30453/11-B

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:04 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30453/11-C

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 31696 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 10:47 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30481/11-B

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 18:27 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30481/11-C

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 31697 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 11:02 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30529/11-B ^5

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 19:48 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30781/11-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 21:23 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30852/11-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 12:11 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30853/8-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.500 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:06 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-31695/2-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 31695 | 07/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31812 | 07/17/19 11:17 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30373/12-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 12:32 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30373/12-B

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:37 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30374/12-B ^5

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 5 | | | 30900 | 06/17/19 13:53 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30423/12-B ^5

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 5 | | | 30900 | 06/17/19 15:16 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30453/12-B

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:09 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30453/12-C
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 31696 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 10:52 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30481/12-B
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 18:32 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30481/12-C
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 31697 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 11:07 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30529/12-B ^5
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 19:54 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30781/12-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 21:28 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30852/12-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 12:17 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30853/9-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.500 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:11 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-31695/3-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 31695 | 07/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31812 | 07/17/19 11:22 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30373/13-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 12:37 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30373/13-B
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:40 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30374/13-B ^5
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 5 | | | 30900 | 06/17/19 13:58 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30423/13-B ^5
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 5 | | | 30900 | 06/17/19 15:21 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30453/13-B
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:14 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30453/13-C
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 31696 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 10:57 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30481/13-B
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 18:37 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30481/13-C
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 31697 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 11:12 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30529/13-B ^5
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 20:09 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30781/13-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 21:33 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30852/13-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 12:22 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-31695/4-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 31695 | 07/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31812 | 07/17/19 11:27 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-15 (25-27) — Lab Sample ID: 140-15376-1 MS

**Date Collected: 05/22/19 19:15** — **Matrix: Solid**
**Date Received: 05/24/19 09:40** — **Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.512 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:32 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: FGO-15 (25-27) — Lab Sample ID: 140-15376-1 MSD

**Date Collected: 05/22/19 19:15** — **Matrix: Solid**
**Date Received: 05/24/19 09:40** — **Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.514 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:37 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: FGO-15 (25-27) — Lab Sample ID: 140-15376-1 DU

**Date Collected: 05/22/19 19:15** — **Matrix: Solid**
**Date Received: 05/24/19 09:40**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Analysis | Moisture | | 1 | | | 30352 | 05/28/19 16:16 | BKD | TAL KNX |
| | Instrument ID: W3 | | | | | | | | | |

## Client Sample ID: FGO-15 (25-27) — Lab Sample ID: 140-15376-1 DU

**Date Collected: 05/22/19 19:15** — **Matrix: Solid**
**Date Received: 05/24/19 09:40** — **Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 15:29 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 10 | | | 31255 | 06/28/19 16:42 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 2 | | | 31255 | 06/28/19 18:45 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 4 | | | 30900 | 06/17/19 14:19 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 3 | | | 30900 | 06/17/19 15:53 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGO-15 (25-27)
**Date Collected: 05/22/19 19:15**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-1 DU
**Matrix: Solid**
**Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:35 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 19:08 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 20:30 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 21:54 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 13:13 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 10 | | | 31255 | 06/28/19 14:22 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 2 | | | 31255 | 06/28/19 17:48 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: 140-15376-A-1-J DU
**Date Collected: 05/22/19 19:15**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-A-1-J DU
**Matrix: Solid**
**Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:49 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

**Laboratory References:**

TAL KNX = Eurofins TestAmerica, Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

# Method Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

| Method | Method Description | Protocol | Laboratory |
|---|---|---|---|
| 6010B | Metals (ICP) | SW846 | TAL KNX |
| 6010B | SEP Metals (ICP) - Total | SW846 | TAL KNX |
| 6010B SEP | SEP Metals (ICP) | SW846 | TAL KNX |
| 7470A | SEP Mercury (CVAA) - Total | SW846 | TAL KNX |
| Moisture | Percent Moisture | EPA | TAL KNX |
| 3010A | Preparation, Total Metals | SW846 | TAL KNX |
| 3050B | Preparation, Metals | SW846 | TAL KNX |
| 7470A | Preparation, Mercury | SW846 | TAL KNX |
| Acid/Sulfide | Sequential Extraction Procedure, Acid/Sulfide Fraction | TAL-KNOX | TAL KNX |
| Carbonate | Sequential Extraction Procedure, Carbonate Fraction | TAL-KNOX | TAL KNX |
| Exchangeable | Sequential Extraction Procedure, Exchangeable Fraction | TAL-KNOX | TAL KNX |
| Metal Hydroxide | Sequential Extraction Procedure, Metal Hydroxide Fraction | TAL-KNOX | TAL KNX |
| Non-Crystalline | Sequential Extraction Procedure, Non-crystalline Materials | TAL-KNOX | TAL KNX |
| Organic-Bound | Sequential Extraction Procedure, Organic Bound Fraction | TAL-KNOX | TAL KNX |
| Residual | Sequential Extraction Procedure, Residual Fraction | TAL-KNOX | TAL KNX |
| Total | Preparation, Total Material | TAL-KNOX | TAL KNX |

**Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL-KNOX = TestAmerica Laboratories, Knoxville, Facility Standard Operating Procedure.

**Laboratory References:**

TAL KNX = Eurofins TestAmerica, Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

# Sample Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

| Lab Sample ID | Client Sample ID | Matrix | Collected | Received | Asset ID |
|---|---|---|---|---|---|
| 140-15376-1 | FGO-15 (25-27) | Solid | 05/22/19 19:15 | 05/24/19 09:40 | |
| 140-15376-2 | FGO-14 (30-32) | Solid | 05/23/19 10:40 | 05/24/19 09:40 | |
| 140-15376-3 | FGO-2019-1 (23-25) | Solid | 05/23/19 15:20 | 05/24/19 09:40 | |

**Eurofins TestAmerica, Knoxville**
5815 Middlebrook Pike
Knoxville, TN 37921
Phone (865) 291-3000 Fax (865) 584-4315

# Chain of Custody Record

eurofins | Environment Testing TestAmerica

| **Client Information** | Sampler: Jacob Jarvis | Lab PM: Walker Wasmund, Terry | Carrier Tracking No(s): | COC No: 140-6678-2224.1 |
|---|---|---|---|---|
| Client Contact: Will Vienne | Phone: 361 877 5553 | E-Mail: terry.wasmund@testamericainc.com | | Page: Page 1 of 1 |
| Company: Golder Associates Inc. | | **Analysis Requested** | | Job #: |
| Address: 2201 Double Creek Dr Suite 4004 | Due Date Requested: | | | Preservation Codes: A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify) |
| City: Round Rock | TAT Requested (days): | | | |
| State, Zip: TX, 78664 | | | | |
| Phone: 512-671-3434(Tel) | PO #: 19122434-F | | | Other: |
| Email: William_Vienne@golder.com | WO #: 1922434-F | | | |
| Project Name: Oak Grove FGD Ponds - SEP and Totals | Project #: 14005266 | | | |
| Site: | SSOW#: | | | |

140-15376 Chain of Custody

| Sample Identification | Sample Date | Sample Time | Sample Type (C=comp, G=grab) | Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air) | Field Filtered Sample (Yes or No) | Perform MS/MSD (Yes or No) | 6010B_SEP - 7-Step SEP (12 metals) | 6010B Total B, Cr, Pb, P | Total Number of containers | Special Instructions/Note: |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Preservation Code: | | | | N | | | |
| FGD-15 (25-27) | 5/22/19 | 1415 | C | S | N | | X | X | | |
| FGD-121 (30-32) | 5/23/19 | 1040 | C | ES | | | | | | |
| FGD-2019-1 (23-25) | 5/23/19 | 1520 | C | S | | | | | | |
| RT: 0.8°C CT: 0.8°C | | | | | | | | | | |
| 1 Cooler, Fedex Po | | | | | | | | | | |
| Custody seal intact | | | | | | | | | | |
| tr#7874 5047 1949 | | | | | | | | | | |
| KLS/24/19 | | | | | | | | | | |

**Possible Hazard Identification**
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

**Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)**
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

| Empty Kit Relinquished by: | Date: | Time: | Method of Shipment: | | |
|---|---|---|---|---|---|
| Relinquished by: | Date/Time: 5/23/19 5:50p | Company | Received by: | Date/Time: 5/24/19 940 | Company TA-Knx |
| Relinquished by: | Date/Time: | Company | Received by: | Date/Time: | Company |
| Relinquished by: | Date/Time: | Company | Received by: | Date/Time: | Company |

| Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks: |
|---|---|---|

Ver: 01/16/2019

## TESTAMERICA KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST

**Log In Number:** Loc: 140 **15376**

| Review Items | Yes | No | NA | If No, what was the problem? |
|---|---|---|---|---|
| 1. Are the shipping containers intact? | ✓ | | | ☐ **Containers, Broken** |
| 2. Were ambient air containers received intact? | | | ✓ | ☐ Checked in lab |
| 3. The coolers/containers custody seal if present, is it intact? | ✓ | | | ☐ Yes<br>☐ NA |
| 4. Is the cooler temperature within limits? (> freezing temp. of water to 6 °C, VOST: 10°C)<br>Thermometer ID : VC68<br>Correction factor: Ta.2 | ✓ | | | ☐ **Cooler Out of Temp, Client Contacted, Proceed/Cancel**<br>☐ **Cooler Out of Temp, Same Day Receipt** |
| 5. Were all of the sample containers received intact? | ✓ | | | ☐ **Containers, Broken** |
| 6. Were samples received in appropriate containers? | ✓ | | | ☐ **Containers, Improper; Client Contacted; Proceed/Cancel** |
| 7. Do sample container labels match COC? (IDs, Dates, Times) | ✓ | | | ☐ **COC & Samples Do Not Match**<br>☐ **COC Incorrect/Incomplete**<br>☐ **COC Not Received** |
| 8. Were all of the samples listed on the COC received? | ✓ | | | ☐ **Sample Received, Not on COC**<br>☐ **Sample on COC, Not Received** |
| 9. Is the date/time of sample collection noted? | ✓ | | | ☐ **COC; No Date/Time; Client Contacted** |
| 10. Was the sampler identified on the COC? | ✓ | | | ☐ **Sampler Not Listed on COC** |
| 11. Is the client and project name/# identified? | ✓ | | | ☐ **COC Incorrect/Incomplete** |
| 12. Are tests/parameters listed for each sample? | ✓ | | | ☐ **COC No tests on COC** |
| 13. Is the matrix of the samples noted? | ✓ | | | ☐ **COC Incorrect/Incomplete** |
| 14. Was COC relinquished? (Signed/Dated/Timed) | ✓ | | | ☐ **COC Incorrect/Incomplete** |
| 15. Were samples received within holding time? | ✓ | | | ☐ **Holding Time - Receipt** |
| 16. Were samples received with correct chemical preservative (excluding Encore)? | | | ✓ | ☐ **pH Adjusted, pH Included (See box 16A)**<br>☐ **Incorrect Preservative** |
| 17. Were VOA samples received without headspace? | | | ✓ | ☐ **Headspace (VOA only)** |
| 18. Did you check for residual chlorine, if necessary? (e.g. 1613B, 1668)<br>Chlorine test strip lot number: | | | ✓ | ☐ **Residual Chlorine** |
| 19. For 1613B water samples is pH<9? | | | ✓ | ☐ If no, notify lab to adjust |
| 20. For rad samples was sample activity info. Provided? | | | ✓ | ☐ Project missing info |

**Comments/Actions Taken**

**Labeling Verified by:** **Date:**

**pH test strip lot number:**

| | Box 16A: pH Preservation | Box 18A: Residual Chlorine |
|---|---|---|
| Preservative: | | |
| Lot Number: | | |
| Exp Date: | | |
| Analyst: | | |
| Date: | | |
| Time: | | |

Project #: 140S266 PM Instructions: _____

Sample Receiving Associate: _____ Date: 5/24/19

QA026R31.doc, 112618

**APPENDIX D**

# GROUNDWATER SAMPLING RECORDS

# RECORD OF WATER LEVEL READINGS

GOLDER

Project Name: LUMINANT-OGSES-PONDS Location: NEAR FRANKLIN, TX Project No.: 19122262-F

| Borehole No. | Date | Time | Measuring Device / Serial No. | Measurement Point (M.P) | Water Level Below M.P. | Correction To Survey Mark | Survey Mark Elevation | Water Level Elevation | By | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-16 | 5-16-19 | 08 | SOLINST | TOC | 16.37 | | | | JTB | |
| FGD-4 | 5-16-19 | | | TOC | 19.52 | | | | | |
| FGD-3 | 5-16-19 | | | TOC | 22.13 | | | | | |
| FGD-2 | 5-16-19 | | | TOC | 27.97 | | | | | |
| FGD-5 | 5-16-19 | | | TOC | 20.41 | | | | | |
| FGD-1 | 5-16-19 | | | TOC | 12.34 | | | | | |
| FGD-8 | 5-16-19 | | | TOC | 29.11 | | | | | |
| FGD-11 | 5-16-19 | | | TOC | 38.72 | | | | | |
| FGD-12 | 5-16-19 | | | TOC | 30.18 | | | | | |

Sheet 1 of 1

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191|22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-1
Sampling Location (well ID, etc.): FGD-1
Sampled by: JTB
Measuring Point (MP) of Well: TOC|PVC
Screened Interval (ft. BGL): –
Filter Pack Interval (ft. BGL): –

Starting Water Level (ft. BMP): 12.34
Casing Stickup (ft.): –
Starting Water Level (ft. BGL): 12.34
Total Depth (ft. BGL): –
Casing Diameter (In ID): 2.0
Casing Volume (gal.): –

## QUALITY ASSURANCE

METHODS (describe):
Cleaning Equipment: alconox & DI rinse
Purging: peristaltic / bladder Sampling: same
Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA
pH Meter: HORIBA Field Calibration: 7-4
Conductivity Meter: HORIBA Field Calibration: 1413
Filter / Filter Size: – Other:

## SAMPLING MEASUREMENTS

| 1412 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1422 | – | .2 | 22.6 | 6.71 | 1430 | 0.71 | -26 | 4.2 | 12.52 |
| 1426 | | | 22.7 | 6.64 | 1460 | 0.59 | -31 | 4.6 | 12.53 |
| 1433 | | ↓ | 22.7 | 6.63 | 1470 | 0.58 | -32 | 4.7 | 12.52 |
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Water Level (ft. BMP) at End of Purge: 12.52 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration (Y / N) | Preservation | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | | | |
| 1450 | 250mL | P | 1 | N | – | GEN CHEM |
| 1450 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191|22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-2

Sampling Location (well ID, etc.): FGD-2

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 27.97

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 27.97

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.):

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: bailer

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1126 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1136 | - | .2 | 23.1 | 6.86 | 1320 | 0.47 | -92 | 6.2 | 28.17 |
| 1141 | | 1 | 22.9 | 6.87 | 1360 | 0.39 | -91 | 7.1 | 28.16 |
| 1147 | | ↓ | 22.9 | 6.86 | 1370 | 0.40 | -91 | 6.8 | 28.16 |
| | | | | | | | | | |
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Water Level (ft. BMP) at End of Purge: 28.16 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1200 | 250mL | P | 1 | N | - | GEN CHEM |
| 1200 | 500mL | P | 1 | N | HNO3 | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-3

Sampling Location (well ID, etc.): FGD-3

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 22.13

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 22.13

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.):

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1032 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1041 | - | .2 | 23.1 | 6.71 | 1620 | 0.71 | -57 | 6.7 | 22.31 |
| 1047 | | 1 | 22.7 | 6.74 | 1630 | 0.61 | -56 | 7.1 | 22.32 |
| 1053 | | ↓ | 22.7 | 6.73 | 1630 | 0.62 | -56 | 7.2 | 22.31 |
| | | | | | | | | | |
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Water Level (ft. BMP) at End of Purge: 22.31 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1110 | 250mL | P | 1 | N | - | GEN CHEM |
| 1110 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191|22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-4

Sampling Location (well ID, etc.): FGD-4

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 19.52

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 19.52

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.):

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 0939 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 0949 | - | .2 | 22.4 | 6.59 | 1730 | 0.63 | -42 | 3.6 | 19.71 |
| 0954 | | 1 | 22.6 | 6.56 | 1760 | 0.51 | -41 | 4.1 | 19.72 |
| 0958 | | ↓ | 22.7 | 6.57 | 1770 | 0.52 | -41 | 4.0 | 19.71 |
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Water Level (ft. BMP) at End of Purge: 19.71 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1015 | 250mL | P | 1 | N | - | GEN CHEM |
| 1015 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-S
Sampling Location (well ID, etc.): FGD-S
Sampled by: JTB
Measuring Point (MP) of Well: TOC/PVC
Screened Interval (ft. BGL): -
Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 20.41
Casing Stickup (ft.): -
Starting Water Level (ft. BGL): 20.41
Total Depth (ft. BGL): -
Casing Diameter (In ID): 2.0
Casing Volume (gal.):

## QUALITY ASSURANCE

METHODS (describe):
Cleaning Equipment: alconox & DI rinse
Purging: peristaltic / bladder Sampling: same
Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA
pH Meter: HORIBA Field Calibration: 7-4
Conductivity Meter: HORIBA Field Calibration: 1413
Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1315 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O. | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1323 | - | .2 | 22.6 | 6.41 | 1620 | 0.71 | -26 | 7.4 | 20.69 |
| 1329 | | | 22.8 | 6.46 | 1610 | 0.46 | -31 | 6.7 | 20.71 |
| 1334 | | | 22.8 | 6.46 | 1620 | 0.51 | -31 | 6.8 | 20.70 |
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Water Level (ft. BMP) at End of Purge: 20.70
Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1350 | 250mL | P | 1 | N | - | GEN CHEM |
| 1350 | 500mL | P | 1 | N | HNO3 | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-6

Sampling Location (well ID, etc.): FGD-6

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): —

Filter Pack Interval (ft. BGL): —

Starting Water Level (ft. BMP): 16.37

Casing Stickup (ft.): —

Starting Water Level (ft. BGL): 16.37

Total Depth (ft. BGL): —

Casing Diameter (in ID): 2.0

Casing Volume (gal.): —

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: — Other:

## SAMPLING MEASUREMENTS

| 0843 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 0852 | — | .2 | 22.7 | 6.91 | 1410 | 1.06 | -31 | 11 | 16.61 |
| 0857 | | 1 | 22.8 | 6.86 | 1440 | 0.81 | -29 | 6.6 | 16.62 |
| 0904 | | ↓ | 22.9 | 6.85 | 1450 | 0.84 | -28 | 6.2 | 16.61 |

Water Level (ft. BMP) at End of Purge: 16.61 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 0920 | 250mL | P | 1 | N | — | GEN CHEM |
| 0920 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191|22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-8

Sampling Location (well ID, etc.): FGD-8

Sampled by: JTB

Measuring Point (MP) of Well: TOC|PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 29.11

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 29.11

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.): -

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1513 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1522 | - | .2 | 23.1 | 6.71 | 1320 | 0.76 | -36 | 7.4 | 29.34 |
| 1527 | | ↓ | 22.6 | 6.68 | 1340 | 0.71 | -41 | 7.6 | 29.34 |
| 1534 | | ↓ | 22.7 | 6.67 | 1340 | 0.70 | -42 | 7.7 | 29.35 |
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Water Level (ft. BMP) at End of Purge: 29.35 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration (Y / N) | Preservation | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | | | |
| 1545 | 250mL | P | 1 | N | - | GEN CHEM |
| 1545 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-11

Sampling Location (well ID, etc.): FGD-11

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 38.72

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 38.72

Total Depth (ft. BGL):

Casing Diameter (In ID): 2.0

Casing Volume (gal.):

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1606 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1616 | - | .2 | 23.4 | 6.81 | 1360 | 0.91 | -47 | 9.1 | 38.93 |
| 1622 | | 1 | 23.5 | 6.82 | 1340 | 0.77 | -48 | 6.8 | 38.94 |
| 1627 | | 1 | 23.5 | 6.83 | 1340 | 0.78 | -48 | 6.9 | 38.94 |
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Water Level (ft. BMP) at End of Purge: 38.94 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration (Y / N) | Preservation | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | | | |
| 1640 | 250mL | P | 1 | N | - | GEN CHEM |
| 1640 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191|22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-12

Sampling Location (well ID, etc.): FGD-12

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): —

Filter Pack Interval (ft. BGL): —

Starting Water Level (ft. BMP): 30.18

Casing Stickup (ft.): —

Starting Water Level (ft. BGL): 30.18

Total Depth (ft. BGL): —

Casing Diameter (In ID): 2.0

Casing Volume (gal.): —

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: — Other:

## SAMPLING MEASUREMENTS

| 1703 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L /m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1713 | — | .2 | 23.2 | 6.96 | 1530 | 0.71 | -17 | 7.1 | 30.31 |
| 1717 | | .1 | 23.0 | 6.51 | 1510 | 0.44 | -19 | 7.7 | 30.32 |
| 1724 | | .1 | 23.0 | 6.52 | 1510 | 0.46 | -19 | 7.8 | 30.32 |
| | | | | | | | | | |
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Water Level (ft. BMP) at End of Purge: 30.32 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration (Y / N) | Preservation | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | | | |
| 1735 | 250mL | P | 1 | N | — | GEN CHEM |
| 1735 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 5-17-19

Sample Number: FGD-14

Sampling Location (well ID, etc.): FGD-14

Sampled by: HTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 15.52

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 15.52

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.): -

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 0724 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O. | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 0733 | - | .2 | 22.7 | 6.63 | 1410 | 1.24 | -6 | 4.7 | 15.81 |
| 0738 | | ↓ | 22.9 | 6.65 | 1440 | 1.07 | -7 | 5.2 | 15.82 |
| 0744 | | ↓ | 22.9 | 6.65 | 1430 | 1.06 | -7 | 5.7 | 15.82 |
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Water Level (ft. BMP) at End of Purge: 15.82 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 0750 | 250mL | P | 1 | N | - | GEN CHEM |
| 0750 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 6-6-19

Sample Number: FGD-15

Sampling Location (well ID, etc.): FGD-15

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 25.22

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 25.22

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.): -

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1412 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O. | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1421 | - | .2 | 20.9 | 6.67 | 1570 | 1.29 | -17 | 7.7 | 25.41 |
| 1426 | | ↓ | 20.7 | 6.62 | 1560 | 1.06 | -16 | 5.2 | 25.42 |
| 1432 | | ↓ | 20.6 | 6.62 | 1560 | 1.07 | -16 | 5.9 | 25.41 |
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Water Level (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1445 | 250mL | P | 1 | N | - | GEN CHEM |
| 1445 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| 1445 | 1L | P | 2 | N | $HNO_3$ | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 6-6-19

| | | | |
|---|---|---|---|
| Sample Number: | FGD-16 | Starting Water Level (ft. BMP): | 31.06 |
| Sampling Location (well ID, etc.): | FGD-16 | Casing Stickup (ft.): | - |
| Sampled by: | JTB | Starting Water Level (ft. BGL): | 31.06 |
| Measuring Point (MP) of Well: | TOC/PVC | Total Depth (ft. BGL): | - |
| Screened Interval (ft. BGL): | - | Casing Diameter (In ID): | 2.0 |
| Filter Pack Interval (ft. BGL): | - | Casing Volume (gal.): | - |

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: bailer

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

| | | | |
|---|---|---|---|
| Water Level: | KECK | Thermometer: | HORIBA |
| pH Meter | HORIBA | Field Calibration: | 7-4 |
| Conductivity Meter: | HORIBA | Field Calibration: | 1413 |
| Filter / Filter Size: | - | Other: | |

## SAMPLING MEASUREMENTS

| 1232 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1241 | - | .2 | 21.7 | 6.74 | 1760 | 0.71 | -39 | 5.7 | 31.27 |
| 1246 | | ↓ | 21.6 | 6.73 | 1740 | 0.56 | -31 | 6.7 | 31.26 |
| 1253 | | ↓ | 21.6 | 6.73 | 1740 | 0.57 | -32 | 6.9 | 31.26 |
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Water Level (ft. BMP) at End of Purge: 31.26 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1300 | 250mL | P | 1 | N | - | GEN CHEM |
| 1300 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| 1300 | 1L | P | 2 | N | $HNO_3$ | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

GOLDER

# RECORD OF WATER LEVEL READINGS

Project Name: LUMINANT-OGSES Location: FGD PONDS Project No.: 19122262-F

| Borehole No. | Date | Time | Measuring Device / Serial No. | Measurement Point (M.P) | Water Level Below M.P. | Correction To Survey Mark | Survey Mark Elevation | Water Level Elevation | By | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 8-19-19 | | KECK | TOC/PVC | 16.61 | | | | JTB | |
| FGD-3 | ↓ | | ↓ | ↓ | 22.19 | | | | ↓ | |
| FGD-02 | | | | | 26.71 | | | | | |
| FGD-05 | | | | | 20.23 | | | | | |
| FGD-08 | | | | | 28.72 | | | | | |
| FGD-01 | | | | | 16.72 | | | | | |
| FGD-14 | | | | | 16.22 | | | | | |
| FGD-4 | | | | | 19.44 | | | | | |
| FGD-11 | | | | | 39.08 | | | | | |
| FGD-12 | | | | | 30.11 | | | | | |
| FGD-15 | ↓ | | ↓ | ↓ | 25.71 | | | | ↓ | |

Sheet 1 of 1

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F Project Name: LUMINANT - OGSES Date: 8-19-19

Sampling Location (well ID, etc.): FGD-15

Sample Number: FGD-15

Sampled by: JTB

Measuring Point (MP) of Well: (TOC) - Steel or (PVC)

Screened Interval (ft. BGL):

Filter Pack Interval (ft. BGL):

Starting Water Level (ft. BMP): 25.71

Casing Stickup (ft.):

WL (ft. BMP): 25.71 (ft. BGL):

TD (ft. BMP): (ft. BGL):

Ft. water: Casing Dia. (In ID):

1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16 4": 0.65 5.25": 1.12 6": 1.47 6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge:

| Time | DTW (ft BTOC) | Cum. Vol. (gal. or (L)) | Purge Rate (gal. or (L/m)) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 1707 | 25.92 | — | .2 | 23.4 | 1.09 | 1710 | 6.81 | -31 | 4.6 | medal |
| 1712 | 25.93 | | ↓ | 23.5 | 1.01 | 1730 | 6.84 | -32 | 3.8 | ↓ |
| 1717 | 25.92 | | ↓ | 23.5 | 1.02 | 1740 | 6.85 | -32 | 3.8 | ↓ |

WL (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Time | | Bottles Collected Volume | Composition (G, P) | No. | Filtration (Y / N) | Preservation (type) | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|---|
| 1730 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |

Comments:

GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
Phone: (512) 671-3434 Fax: (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F Project Name: LUMINANT - OGSES Date: 8-19-19

Sampling Location (well ID, etc.): FGD-12 Starting Water Level (ft. BMP): 30.11

Sample Number: FGD-12 Casing Stickup (ft.):

Sampled by: JTB WL (ft. BMP): 30.11 (ft. BGL):

Measuring Point (MP) of Well: (TOC) - Steel or (PVC) TD (ft. BMP): (ft. BGL):

Screened Interval (ft. BGL): Ft. water: Casing Dia. (In ID):

Filter Pack Interval (ft. BGL): 1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16 4": 0.65 5.25": 1.12 6": 1.47 6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge:

| Time (1553) | DTW (ft BTOC) | Cum. Vol. (gal. or (L)) | Purge Rate (gal. or (L) /m) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 1604 | 30.27 | — | .2 | 24.1 | 0.64 | 1390 | 6.74 | -21 | 6.9 | modest |
| 1609 | 30.28 | | ↓ | 23.7 | 0.47 | 1360 | 6.71 | -22 | 6.1 | ↓ |
| 1614 | 30.28 | | ↓ | 23.7 | 0.46 | 1360 | 6.71 | -22 | 6.1 | ↓ |
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WL (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected Time | | Volume | Composition (G, P) | No. | Filtration (Y / N) | Preservation (type) | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|---|
| 1625 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |
| | | | | | | | |

Comments:

GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
Phone: (512) 671-3434 Fax: (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F Project Name: LUMINANT - OGSES Date: 8-19-19

Sampling Location (well ID, etc.): FGD-11

Sample Number: FGD-11

Sampled by: JTB

Measuring Point (MP) of Well: (TOC) - Steel or (PVC)

Screened Interval (ft. BGL):

Filter Pack Interval (ft. BGL):

Starting Water Level (ft. BMP): 39.08

Casing Stickup (ft.):

WL (ft. BMP): 39.08 (ft. BGL):

TD (ft. BMP): (ft. BGL):

Ft. water: Casing Dia. (In ID):

1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16 4": 0.65 5.25": 1.12 6": 1.47 6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge:

| Time (1447) | DTW (ft BTOC) | Cum. Vol. (gal. or (L)) | Purge Rate (gal. or L /m) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 1458 | 39.27 | — | 2 | 23.6 | 0.88 | 1480 | 6.72 | -39 | 6.8 | sediment |
| 1503 | 39.29 | | ↓ | 23.7 | 0.61 | 1470 | 6.71 | -43 | 7.8 | ↓ |
| 1509 | 39.29 | | ↓ | 23.7 | 0.61 | 1470 | 6.71 | -44 | 7.4 | ↓ |
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WL (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected: Time | | Volume | Composition (G, P) | No. | Filtration (Y / N) | Preservation (type) | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|---|
| 1520 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |
| | | | | | | | |

Comments:

GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
Phone: (512) 671-3434 Fax: (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F Project Name: LUMINANT - OGSES Date: 8-19-19

Sampling Location (well ID, etc.): FGD-4

Sample Number: FGD-4

Sampled by: JTB

Measuring Point (MP) of Well: (TOC) - Steel or (PVC)

Screened Interval (ft. BGL):

Filter Pack Interval (ft. BGL):

Starting Water Level (ft. BMP): 19.44

Casing Stickup (ft.):

WL (ft. BMP): 19.44 (ft. BGL):

TD (ft. BMP): (ft. BGL):

Ft. water: Casing Dia. (In ID):

1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16 4": 0.65 5.25": 1.12 6": 1.47 6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge:

| 1342 Time | DTW (ft BTOC) | Cum. Vol. (gal. or L) | Purge Rate (gal. or L / m) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 1351 | 19.62 | — | .2 | 23.4 | 1.34 | 1570 | 6.67 | -42 | 8.6 | muddy |
| 1356 | 19.63 | | ↓ | 23.6 | 1.03 | 1540 | 6.69 | -47 | 9.2 | ↓ |
| 1402 | 19.62 | | ↓ | 23.7 | 1.04 | 1550 | 6.69 | -46 | 9.1 | ↓ |
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WL (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | | Filtration (Y / N) | Preservation (type) | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|---|
| Time | | Volume | Composition (G, P) | No. | | | |
| 1415 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |
| | | | | | | | |

Comments:

GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
Phone: (512) 671-3434 Fax: (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F Project Name: LUMINANT - OGSES Date: 8-19-19

Sampling Location (well ID, etc.): FGD-14 Starting Water Level (ft. BMP): 16.22

Sample Number: FGD-14 Casing Stickup (ft.):

Sampled by: JTB WL (ft. BMP): 16.22 (ft. BGL):

Measuring Point (MP) of Well: (TOC) - Steel or (PVC) TD (ft. BMP): (ft. BGL):

Screened Interval (ft. BGL): Ft. water: Casing Dia. (In ID):

Filter Pack Interval (ft. BGL): 1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16 4": 0.65 5.25": 1.12 6": 1.47 6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge:

| 1239 Time | DTW (ft BTOC) | Cum. Vol. (gal. or (L)) | Purge Rate (gal. or (L/m)) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 1249 | 16.41 | — | .2 | 23.4 | 0.72 | 1410 | 6.63 | -29 | 4.6 | neutral |
| 1254 | 16.41 | | ↓ | 23.3 | 0.61 | 1460 | 6.67 | -27 | 5.1 | ↓ |
| 1259 | 16.41 | | ↓ | 23.3 | 0.62 | 1470 | 6.68 | -27 | 5.0 | ↓ |
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WL (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | | Filtration | Preservation | Remarks |
|---|---|---|---|---|---|---|---|
| Time | | Volume | Composition (G, P) | No. | (Y / N) | (type) | (quality control sample, other) |
| 1315 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |
| | | | | | | | |

Comments:

GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
Phone: (512) 671-3434 Fax: (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F Project Name: LUMINANT - OGSES Date: 8-19-19

Sampling Location (well ID, etc.): FGD-01

Sample Number: FGD-01

Sampled by: VTB

Measuring Point (MP) of Well: (TOC) - Steel or (PVC)

Screened Interval (ft. BGL):

Filter Pack Interval (ft. BGL):

Starting Water Level (ft. BMP): 16.72

Casing Stickup (ft.):

WL (ft. BMP): 16.72 (ft. BGL):

TD (ft. BMP): (ft. BGL):

Ft. water: Casing Dia. (In ID):

1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16 4": 0.65 5.25": 1.12 6": 1.47 6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge:

| 1433 Time | DTW (ft BTOC) | Cum. Vol. (gal. or (L)) | Purge Rate (gal. or (L/m)) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 1144 | 16.96 | — | .2 | 22.9 | 0.84 | 1610 | 6.47 | -32 | 7.2 | merbel |
| 1149 | 16.96 | | ↓ | 23.2 | 0.79 | 1610 | 6.49 | -36 | 7.7 | |
| 1154 | 16.95 | | ↓ | 23.2 | 0.77 | 1610 | 6.49 | -36 | 7.7 | |

WL (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | | Filtration (Y / N) | Preservation (type) | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|---|
| Time | | Volume | Composition (G, P) | No. | | | |
| 1205 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |

Comments:

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Phone: (512) 671-3434 Fax: (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F Project Name: LUMINANT - OGSES Date: 8-19-19

Sampling Location (well ID, etc.): FGD-08 Starting Water Level (ft. BMP): 28.72

Sample Number: FGD-08 Casing Stickup (ft.):

Sampled by: JTB WL (ft. BMP): 28.72 (ft. BGL):

Measuring Point (MP) of Well: (TOC) - Steel or (PVC) TD (ft. BMP): (ft. BGL):

Screened Interval (ft. BGL): Ft. water: Casing Dia. (In ID):

Filter Pack Interval (ft. BGL): 1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16 4": 0.65 5.25": 1.12 6": 1.47 6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge:

| 1028 Time | DTW (ft BTOC) | Cum. Vol. (gal. or (L)) | Purge Rate (gal. or (L) /m) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 1037 | 29.04 | — | .2 | 23.4 | 1.09 | 1860 | 6.86 | -43 | 4.8 | medium |
| 1043 | 29.11 | | ↓ | 23.3 | 1.01 | 1880 | 6.89 | -46 | 6.1 | ↓ |
| 1049 | 29.10 | | ↓ | 23.3 | 1.02 | 1890 | 6.89 | -47 | 6.2 | ↓ |
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WL (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | | Filtration | Preservation | Remarks |
|---|---|---|---|---|---|---|---|
| Time | | Volume | Composition (G, P) | No. | (Y / N) | (type) | (quality control sample, other) |
| 1100 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |
| | | | | | | | |

Comments:

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Phone: (512) 671-3434 Fax: (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F Project Name: LUMINANT - OGSES Date: 8-19-19

Sampling Location (well ID, etc.): FGD-05

Sample Number: FGD-05

Sampled by: JTB

Measuring Point (MP) of Well: (TOC) - Steel or (PVC)

Screened Interval (ft. BGL):

Filter Pack Interval (ft. BGL):

Starting Water Level (ft. BMP): 20.23

Casing Stickup (ft.):

WL (ft. BMP): 20.23 (ft. BGL):

TD (ft. BMP): (ft. BGL):

Ft. water: Casing Dia. (In ID):

1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16 4": 0.65 5.25": 1.12 6": 1.47 6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge:

| 0928 Time | DTW (ft BTOC) | Cum. Vol. (gal. or (L)) | Purge Rate (gal. or L /(m)) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 0938 | 20.42 | — | .2 | 23.4 | 1.39 | 2310 | 6.74 | -17 | 4.8 | neutral |
| 0943 | 20.41 | | ↓ | 23.5 | 1.31 | 2360 | 6.77 | -16 | 3.6 | ↓ |
| 0949 | 20.41 | | ↓ | 23.5 | 1.32 | 2360 | 6.76 | -16 | 3.8 | ↓ |

WL (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | | Filtration | Preservation | Remarks |
|---|---|---|---|---|---|---|---|
| Time | | Volume | Composition (G, P) | No. | (Y / N) | (type) | (quality control sample, other) |
| 1000 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |

Comments:

DUP-1

1000- dammple time

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Round Rock, Texas 78664
Phone: (512) 671-3434 Fax: (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F Project Name: LUMINANT - OGSES Date: 8-19-19

Sampling Location (well ID, etc.): FGD-02 Starting Water Level (ft. BMP): 26.71

Sample Number: FGD-02 Casing Stickup (ft.):

Sampled by: NB WL (ft. BMP): 26.71 (ft. BGL):

Measuring Point (MP) of Well: (TOC) - Steel or (PVC) TD (ft. BMP): (ft. BGL):

Screened Interval (ft. BGL): Ft. water: Casing Dia. (In ID):

Filter Pack Interval (ft. BGL): 1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16 4": 0.65 5.25": 1.12 6": 1.47 6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge: 0835

| Time | DTW (ft BTOC) | Cum. Vol. (gal. or (L)) | Purge Rate (gal. or (L)/m) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 0849 | 26.88 | — | .2 | 23.1 | 0.99 | 1720 | 6.91 | -101 | 13 | mentuol |
| 0854 | 26.87 | | ↓ | 23.0 | 0.94 | 1730 | 6.89 | -102 | 10 | ↓ |
| 0859 | 26.87 | | ↓ | 23.1 | 0.95 | 1720 | 6.88 | -101 | 8.9 | ↓ |
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WL (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Time | Bottles Collected | Volume | Composition (G, P) | No. | Filtration (Y / N) | Preservation (type) | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|---|
| 0915 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |
| | | | | | | | |

Comments:

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Phone: (512) 671-3434 Fax: (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F Project Name: LUMINANT - OGSES Date: 8-19-19

Sampling Location (well ID, etc.): FGD-03 Starting Water Level (ft. BMP): 22.19

Sample Number: FGD-03 Casing Stickup (ft.):

Sampled by: JTB WL (ft. BMP): 22.19 (ft. BGL):

Measuring Point (MP) of Well: (TOC) - Steel or (PVC) TD (ft. BMP): (ft. BGL):

Screened Interval (ft. BGL): Ft. water: Casing Dia. (In ID):

Filter Pack Interval (ft. BGL): 1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16 4": 0.65 5.25": 1.12 6": 1.47 6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge:

| 0752 Time | DTW (ft BTOC) | Cum. Vol. (gal. or (L)) | Purge Rate (gal. or (L) /min) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 0803 | 22.36 | — | .2 | 23.4 | 0.77 | 1630 | 6.71 | -41 | 6.2 | neutral |
| 0807 | 22.38 | | ↓ | 23.6 | 0.61 | 1640 | 6.72 | -43 | 7.4 | ↓ |
| 0814 | 22.38 | | ↓ | 23.6 | 0.62 | 1640 | 6.72 | -43 | 7.4 | ↓ |

WL (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Time | | Bottles Collected Volume | Composition (G, P) | No. | Filtration (Y / N) | Preservation (type) | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|---|
| 0825 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |

Comments:

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Round Rock, Texas 78664
Phone: (512) 671-3434 Fax: (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 19122262-F  Project Name: LUMINANT - OGSES  Date: 8-19-19

Sampling Location (well ID, etc.): FGD-6  Starting Water Level (ft. BMP): 16.61

Sample Number: FGD-6  Casing Stickup (ft.):

Sampled by: JTB  WL (ft. BMP): 16.61 (ft. BGL):

Measuring Point (MP) of Well: (TOC) - Steel or (PVC)  TD (ft. BMP): (ft. BGL):

Screened Interval (ft. BGL):  Ft. water: Casing Dia. (In ID):

Filter Pack Interval (ft. BGL):  1X Casing Vol (gal.): 3X (gal):

## QUALITY ASSURANCE

Gallons/Foot: 2": 0.16  4": 0.65  5.25": 1.12  6": 1.47  6.25": 1.59

METHODS (describe): Low Flow - Dedicated Tubing/Equipment

Cleaning Equipment: DI/Alconox Rinse

Purge: Peristaltic Pump / SS Pump / Bailer / bladder  Sampling: Peristaltic Pump / SS Pump / Bailer / bladder

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK  Other: —

Multi Meter: HORIBA

Field Calibration: 7-4

Filter / Filter Size: —

## SAMPLING MEASUREMENTS

Begin Purge:

| 0701 Time | DTW (ft BTOC) | Cum. Vol. (gal. or (L)) | Purge Rate (gal. or (L/m)) | Temp. (oC) | DO (mg/L) | Spec. Cond. (µs/cm) | pH | ORP (mV) | Turbidity (NTU) | Color & Sediment |
|---|---|---|---|---|---|---|---|---|---|---|
| 0711 | 16.86 | — | .2 | 21.7 | 0.91 | 2110 | 6.74 | -17 | 6.8 | neutral |
| 0716 | 16.89 | | ↓ | 22.3 | 0.73 | 2120 | 6.71 | -13 | 7.2 | ↓ |
| 0725 | 16.88 | | ↓ | 22.4 | 0.74 | 2120 | 6.72 | -12 | 7.2 | ↓ |
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WL (ft. BMP) at End of Purge:  Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Time | | Bottles Collected Volume | Composition (G, P) | No. | Filtration (Y / N) | Preservation (type) | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|---|
| 0735 | | 250mL | P | 1 | N | — | APPENDIX III |
| ↓ | | 500mL | P | 1 | N | $HNO_3$ | APPENDIX III |
| ↓ | | 1L | P | 2 | N | $HNO_3$ | APPENDIX IV |
| | | | | | | | |

Comments:

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Round Rock, Texas 78664
Phone: (512) 671-3434  Fax: (512) 671-3446

# RECORD OF WATER LEVEL READINGS

GOLDER

Project Name: LUMINANT- OGSES Location: OGSES - FGD Project No.: 19122262

| Borehole No. | Date | Time | Measuring Device / Serial No. | Measurement Point (M.P) | Water Level Below M.P. | Correction To Survey Mark | Survey Mark Elevation | Water Level Elevation | By | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 5-6-20 | | SOLINST | TOC/PVC | 16.84 | | | | JB | |
| FGD-3 | | | | | 22.64 | | | | | |
| FGD-14 | | | | | 16.82 | | | | | |
| FGD-15 | | | | | 25.63 | | | | | |
| FGD-16 | | | | | 31.26 | | | | | |
| FGD-4 | | | | | [illegible] | 19.78 | | | | |
| FGD-2 | | | | | 26.98 | | | | | |
| FGD-5 | | | | | 20.09 | | | | | |
| FGD-1 | | | | | 11.59 | | | | | |
| FGD-8 | | | | | 28.99 | | | | | |
| FGD-11 | | | | | 38.91 | | | | | |
| FGD-12 | ↓ | | ↓ | ↓ | 29.97 | | | | ↓ | |

Sheet 1 of 1

## Groundwater Sample Collection



GOLDER

| | | | | | | |
|---|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 16.82 | ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | — | ft. |
| Date | 5-6-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 16.82 | ft. BGL |
| MW ID | FGD-14 | Location | Other | Total MW Depth | | ft. BGL |
| Sample ID | FGD-14 | Water Quality | | MW Diameter | 2.0 | inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-50 | Pump Intake Depth | | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate (L/min) | Cumulative Purge Volume (L) | Depth to Water (ft) | Temp (°C) ☐ NM | pH ☐ NM | Conductivity (µS/m or mS/cm) ☐ not measured | Dissolved Oxygen (mg/L) ☐ not measured | Redox Potential (mV) ☐ not measured | Turbidity (NTU) ☐ NM |
|---|---|---|---|---|---|---|---|---|---|
| 1436 | | | | | | | | | |
| 1447 | .2 | / | 17.14 | 21.7 | 6.81 | 1320 | 2.34 | 26 | 7.6 |
| 1451 | ↓ | / | 17.17 | 21.9 | 6.86 | 1360 | 1.94 | 27 | 6.3 |
| 1456 | ↓ | / | 17.18 | 21.9 | 6.87 | 1350 | 1.93 | 27 | 6.7 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration (10µm / 45µm) | Preserved (type) | Notes and Observations (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | | | |
| 1505 | 1L | P | 2 | ☐ filtered ☒ unfiltered | HNO3 | MNA |
| | | | | ☐ filtered ☐ unfiltered | | |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAYTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | | |
|---|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 25.63 | ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | – | ft. |
| Date | 5-6-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 25.63 | ft. BGL |
| MW ID | FGD-15 | Location | Other | Total MW Depth | – | ft. BGL |
| Sample ID | FGD-15 | Water Quality | | MW Diameter | 2.0 | inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | / | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-50 | Pump Intake Depth | | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 1521 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 1531 | .2 | / | 25.91 | 22.3 | 6.87 | 1920 | 1.31 | -31 | 7.2 |
| 1536 | ↓ | / | ~~25~~.96 | 22.2 | 6.83 | 1930 | 1.06 | -36 | 3.6 |
| 1541 | ↓ | / | 25.99 | 22.2 | 6.82 | 1920 | 1.07 | -37 | 4.7 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 1545 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$ | MNA |
| | | | | ☐ filtered ☐ unfiltered | | |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAYTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | | |
|---|---|---|---|---|---|---|
| Project/Phase | 19116549/19122263 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 31.26 | ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | – | ft. |
| Date | 5-6-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 31.26 | ft. BGL |
| MW ID | FGD-16 | Location | Other | Total MW Depth | – | ft. BGL |
| Sample ID | FGD-16 | Water Quality | | MW Diameter | 2.0 | inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | 1 | gallons |
| | ☐ Peristaltic ☒ Bladder | Unit Number | U-50 | Pump Intake Depth | – | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 1602 | | | | | | | | | |
| 1612 | .2 | 1 | 31.57 | 21.4 | 6.81 | 1720 | 1.79 | -21 | 8.4 |
| 1617 | ↓ | 1 | 31.59 | 21.9 | 6.77 | 1710 | 1.29 | -26 | 9.2 |
| 1622 | ↓ | 1 | 31.59 | 21.9 | 6.76 | 1710 | 1.31 | -26 | 9.7 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration (10µm / 45µm) | Preserved (type) | Notes and Observations (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | | | |
| 1630 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$ | MNA |
| | | | | ☐ filtered ☐ unfiltered | | |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

**Field Team Leader** JOHN BRAYTON (name) (signature)

## Groundwater Sample Collection



GOLDER

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 16.84 | ft. BMP | |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | – | ft. | |
| Date | 5-6-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 16.84 | ft. BGL | |
| MW ID | FGD-6 | Location | Other | Total MW Depth | | ft, BGL | |
| Sample ID | FGD-6 | Water Quality | | MW Diameter | 2.0 | inches | |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | – | gallons | |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-50 | Pump Intake Depth | – | ft. BGL | |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 1249 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 1258 | .2 | / | 17.13 | 21.3 | 6.71 | 1620 | 0.99 | -14 | 4.2 |
| 1304 | ↓ | / | 17.16 | 21.4 | 6.74 | 1640 | 0.76 | -17 | 6.7 |
| 1309 | ↓ | / | 17.17 | 21.6 | 6.75 | 1640 | 0.77 | -17 | 6.9 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 1320 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | MNA |
| 1320 | 1L | P | 4 | ☐ filtered ☒ unfiltered | $HNO_3$ | APPENDIX III & IV |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAYTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 22.64 ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | – ft. |
| Date | 5-6-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 22.64 ft. BGL |
| MW ID | FGD-3 | Location | Other | Total MW Depth | – ft. BGL |
| Sample ID | FGD-3 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | ~~2.0~~ gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-50 | Pump Intake Depth | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 1341 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 1349 | .2 | / | 22.87 | 20.9 | 6.64 | 1520 | 1.39 | 13 | 9.2 |
| 1356 | ↓ | / | 22.89 | 21.2 | 6.62 | 1570 | 1.17 | 16 | 8.6 |
| 1402 | ↓ | / | 22.89 | 21.2 | 6.62 | 1580 | 1.18 | 16 | 8.9 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 1420 | 250mL | P | 3 | ☐ filtered ☐ unfiltered | NONE, $HNO_3$ | MNA |
| 1420 | 1L | P | 4 | ☐ filtered ☒ unfiltered | $HNO_3$ | APPENDIX III & IV |

Notes: record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAYTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 29.97 ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | ft. |
| Date | 5-11-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 29.97 ft. BGL |
| MW ID | FGD-12 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-12 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | 1 gallons |
| | ☐ Peristaltic ☒ Bladder | Unit Number | U-50 | Pump Intake Depth | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 1309 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 1319 | .2 | / | 30.26 | 22.4 | 6.56 | 1560 | 1.26 | -29 | 12 |
| 1324 | ↓ | / | 30.29 | 22.5 | 6.59 | 1590 | 0.91 | -34 | 10 |
| 1329 | ↓ | / | 30.29 | 22.5 | 6.59 | 1590 | 0.92 | -33 | 10 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 1345 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | CCR |
| 1345 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | MNA |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAYTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 38.91 ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | – ft. |
| Date | 5-11-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 38.91 ft. BGL |
| MW ID | FGD-11 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-11 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | 1 gallons |
| | ☐ Peristaltic ☒ Bladder | Unit Number | U-50 | Pump Intake Depth | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate (L/min) | Cumulative Purge Volume (L) | Depth to Water (ft) | Temp (°C) ☐ NM | pH ☐ NM | Conductivity (µS/m or mS/cm) ☐ not measured | Dissolved Oxygen (mg/L) ☐ not measured | Redox Potential (mV) ☐ not measured | Turbidity (NTU) ☐ NM |
|---|---|---|---|---|---|---|---|---|---|
| 1213 | | | | | | | | | |
| 1223 | .2 | 1 | 39.19 | 22.6 | 6.79 | 1210 | 1.67 | -41 | 3.2 |
| 1228 | ↓ | 1 | 39.22 | 22.7 | 6.76 | 1260 | 1.52 | -46 | 3.7 |
| 1233 | ↓ | 1 | 39.23 | 22.6 | 6.74 | 1270 | 1.53 | -45 | 3.6 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 1245 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | CCR |
| 1245 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | MNA |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAYTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 28.99 | ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | – | ft. |
| Date | 5-11-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 28.99 | ft. BGL |
| MW ID | FGD-8 | Location | Other | Total MW Depth | | ft. BGL |
| Sample ID | FGD-8 | Water Quality | | MW Diameter | 2.0 | inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | / | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-50 | Pump Intake Depth | | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 1038 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 1048 | .2 | / | 29.16 | 6.76 | 21.7 | 2160 | 1.67 | -12 | 3.6 |
| 1053 | ↓ | / | 29.17 | 6.71 | 21.9 | 2120 | 1.34 | -14 | 4.7 |
| 1058 | ↓ | / | 29.17 | 6.69 | 21.9 | 2130 | 1.33 | -14 | 4.7 |
| | | | | ↖ | ↗ | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 1110 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, HNO3 | CCS |
| 1110 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, HNO3 | MNA |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAYTON (name) _____ (signature)

## Groundwater Sample Collection



GOLDER

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 11.59 | ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | – | ft. |
| Date | 5-11-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 11.59 | ft. BGL |
| MW ID | FGD-1 | Location | Other | Total MW Depth | | ft. BGL |
| Sample ID | FGD-1 | Water Quality | | MW Diameter | 2.0 | inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | 1 | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-50 | Pump Intake Depth | | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 0941 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 0951 | .2 | 1 | 11.79 | 22.4 | 6.91 | 1360 | 2.39 | -49 | 13 |
| 0956 | ↓ | ↓ | 11.91 | 22.6 | 6.94 | 1390 | 2.06 | -56 | 10 |
| 1001 | ↓ | ↓ | 11.80 | 22.6 | 6.95 | 1380 | 2.09 | -55 | 10 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 1015 | 250ML | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | CCR |
| 1015 | 250ML | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | MNA |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAYTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 26.98 | ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | — | ft. |
| Date | 5-11-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 26.98 | ft. BGL |
| MW ID | FGD-2 | Location | Other | Total MW Depth | | ft. BGL |
| Sample ID | FGD-2 | Water Quality | | MW Diameter | 2.0 | inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | 1 | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-50 | Pump Intake Depth | | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 0804 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 0814 | .2 | 1 | 27.22 | 22.4 | 6.54 | 1110 | 0.91 | -29 | 4.7 |
| 0819 | ↓ | 1 | 27.26 | 22.6 | 6.61 | 1140 | 0.76 | -26 | 4.9 |
| 0824 | ↓ | 1 | 27.25 | 22.6 | 6.61 | 1130 | 0.77 | -27 | 4.9 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 0835 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | CCR |
| 0835 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | MNA |

Notes: record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAYTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 20.09 ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | – ft. |
| Date | 5-11-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 20.09 ft. BGL |
| MW ID | FGD-5 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-5 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | 1. gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-50 | Pump Intake Depth | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 0852 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 0903 | .2 | 1 | 20.26 | 21.4 | 6.84 | 1640 | 1.43 | -7 | 6.7 |
| 0907 | ↓ | 1 | 20.29 | 21.5 | 6.81 | 1670 | 1.27 | -14 | 7.9 |
| 0913 | ↓ | 1 | 20.29 | 21.5 | 6.82 | 1670 | 1.26 | -15 | 7.1 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 0925 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | CCR |
| 0925 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | MNA |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

**Field Team Leader** JOHN BRAYTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project/Phase | 19116549/19122262 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 19.78 | ft. BMP |
| Site Location | OGSES | | ☐ Decon between locations | Casing Stickup | – | ft. |
| Date | 5-11-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 19.78 | ft. BGL |
| MW ID | FGD-4 | Location | Other | Total MW Depth | | ft. BGL |
| Sample ID | FGD-4 | Water Quality | | MW Diameter | 2.0 | inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | YSI - HORIBA | MW Volume | 1 | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-50 | Pump Intake Depth | | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 0709 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 0719 | .2 | 1 | 20.06 | 22.4 | 6.67 | 1260 | 1.72 | -42 | 9.2 |
| 0724 | ↓ | 1 | 20.11 | 22.6 | 6.63 | 1290 | 1.77 | -46 | 7.6 |
| 0729 | ↓ | 1 | 20.12 | 22.7 | 6.62 | 1290 | 1.78 | -46 | 7.8 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 0745 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | CCR |
| 0745 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | NONE, $HNO_3$ | MNA |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAYTON (name) (signature)

# SURFACE WATER SAMPLING RECORD

SAMPLE ID: FGD-A-POND

Project No: 19122262 Project Name: LUMINANT-OGSES Page 1 of: 1

Sampled by JTB Date: 5-11-20

Weather (@ sampling): cloudy 75° Weather (past 48 hrs.) NO RAIN

Sampling Location (i.d., description): POND

Water Body (describe type, flow): —

## QUALITY ASSURANCE

METHODS (describe):
Cleaning Equipment: new equipment
Sampling: —

INSTRUMENTS (indicate make, model, i.d.):
Flow Measurement: —
pH Meter: HORIBA
Conductivity Meter: HORIBA
Filtration: —
Thermometer: HORIBA
Field Calibration: 7-4
Field Calibration: 1413
Other: —

## SAMPLING MEASUREMENTS

| Time | Sampling Depth (ft) | Water Quality Data: Temp. (°C) | pH | Specific Conductance (µmhos/cm) @ Field | Specific Conductance (µmhos/cm) @ 25° C. | DO (mg/L) | Appearance: Color | Appearance: Turbidity & Sediment | Remarks (debris, sheen, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| 1405 | surface | 23.1 | 6.59 | 1610 | | 3.67 | tan | slt. cloudy | |
| | | | | | | | | | |

## STAFF GAUGE AND DISCHARGE MEASUREMENTS

| Staff Gauge Reading (ft) | Stream Width (ft) | Center Depth (ft) | Velocity (ft/sec): | Remarks |
|---|---|---|---|---|
| | | | | |

## SAMPLE INVENTORY

| Bottles Collected: Time | Volume | Composition (glass, plastic) | Quantity | Filtration (Y/N) | Preservation (type) | Remarks (quality control sample, etc.) |
|---|---|---|---|---|---|---|
| 1405 | 1L | P | 4 | N | - $HNO_3$ | CCR |
| 1405 | 250mL | P | 3 | N | $HNO_3$ | MNA |
| | | | | | | |
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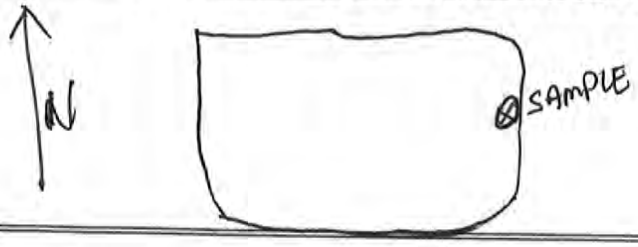
## SAMPLING LOCATION MAP AND OTHER INFORMATION




GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
(512) 671-3434

# SURFACE WATER SAMPLING RECORD

SAMPLE ID: FGD-B-POND

Project No: 19122262 Project Name: LUMINANT-OGSES Page 1 of: 1

Sampled by JTB Date: 5-11-20

Weather (@ sampling): cloudy 75° Weather (past 48 hrs.) NO RAIN

Sampling Location (i.d., description): POND

Water Body (describe type, flow): —

## QUALITY ASSURANCE

METHODS (describe):
Cleaning Equipment: new equipment
Sampling: —

INSTRUMENTS (indicate make, model, i.d.):
Flow Measurement: —
pH Meter: HORIBA
Conductivity Meter: HORIBA
Filtration: —
Thermometer: HORIBA
Field Calibration: 7-4
Field Calibration: 1413
Other: —

## SAMPLING MEASUREMENTS

| Time | Sampling Depth (ft) | Water Quality Data: Temp. (°C) | pH | Specific Conductance (µmhos/cm) @ Field | Specific Conductance (µmhos/cm) @ 25° C. | DO (mg/L) | Appearance: Color | Appearance: Turbidity & Sediment | Remarks (debris, sheen, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| 1425 | surface | 23.1 | 6.64 | | 1790 | 4.06 | Hitan | sld. cloudy | |
| | | | | | | | | | |

## STAFF GAUGE AND DISCHARGE MEASUREMENTS

| Staff Gauge Reading (ft) | Stream Width (ft) | Center Depth (ft) | Velocity (ft/sec): | Remarks |
|---|---|---|---|---|
| | | | | |

## SAMPLE INVENTORY

| Bottles Collected: Time | Volume | Composition (glass, plastic) | Quantity | Filtration (Y/N) | Preservation (type) | Remarks (quality control sample, etc.) | |
|---|---|---|---|---|---|---|---|
| 1425 | 1L | P | 4 | N | - $HNO_3$ | CCR | |
| 1425 | 250mL | P | 3 | N | $HNO_3$ | MNA | |
| | | | | | | | |
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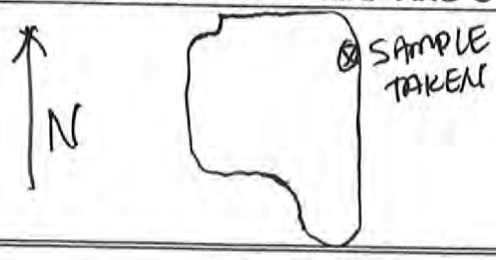
## SAMPLING LOCATION MAP AND OTHER INFORMATION

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(512) 671-3434

# RECORD OF WATER LEVEL READINGS

GOLDER

Project Name: LUMINANT - OGSES  Location: OGSES - FGD PONDS - CCR  Project No.: 19122262 - F2020

| Borehole No. | Date | Time | Measuring Device / Serial No. | Measurement Point (M.P) | Water Level Below M.P. | Correction To Survey Mark | Survey Mark Elevation | Water Level Elevation | By | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-5 | 9-9-20 | | SOLINST | TOC/PVC | 20.48 | | | | JB | |
| FGD-2 | " | | " | " | 27.49 | | | | " | |
| FGD-11 | " | | " | " | 39.97 | | | | " | |
| FGD-12 | " | | " | " | 30.31 | | | | " | |
| FGD-6 | " | | " | " | 16.91 | | | | " | |
| FGD-4 | " | | " | " | 20.04 | | | | " | |
| FGD-3 | " | | " | " | 22.83 | | | | " | |
| FGD-8 | " | | " | " | 29.06 | | | | " | |
| FGD-1 | " | | " | " | 12.12 | | | | " | |

Sheet 1 of 1

# Groundwater Sample Collection



GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19122262-F2020 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 12.12 ft. BMP |
| Site Location | LIMINANT-OGSES | | ☐ Decon between locations | Casing Stickup | — ft. |
| Date | 9-9-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 12.12 ft. BGL |
| MW ID | FGD-1 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-1 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | HORIBA | MW Volume | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-SOOO | Pump Intake Depth | ft. BGL |

Standard volume capacity of monitoring wells: Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate (L/min) | Cumulative Purge Volume (L) | Depth to Water (ft) | Temp (°C) ☐ NM | pH ☐ NM | Conductivity (µS/m or mS/cm) ☐ not measured | Dissolved Oxygen (mg/L) ☐ not measured | Redox Potential (mV) ☐ not measured | Turbidity (NTU) ☐ NM |
|---|---|---|---|---|---|---|---|---|---|
| 1156 | | | | | | | | | |
| 1206 | .2 | 1 | 12.49 | 23.1 | 6.77 | 1560 | 0.93 | -21 | 4.7 |
| 1212 | ↓ | 1 | 12.46 | 22.9 | 6.74 | 1570 | 0.71 | -26 | 8.6 |
| 1219 | ↓ | 1 | 12.45 | 22.9 | 6.73 | 1570 | 0.72 | -24 | 9.1 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration (10µm / 45µm) | Preserved (type) | Notes and Observations (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | | | |
| 1235 | 250 mL | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, NEAT | |
| 1235 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, $HNO_3$ | |

Notes: record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

DUP-01
1235 - Sample time

Field Team Leader JOHN BEAKTON (name) (signature)

# Groundwater Sample Collection

Page 1 of 1

GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19122262-F2020 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 29.06 ft. BMP |
| Site Location | LUMINANT-OGSES | | ☐ Decon between locations | Casing Stickup | — ft. |
| Date | 9-9-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 29.06 ft. BGL |
| MW ID | FGD-8 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-8 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | HORIBA | MW Volume | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-5000 | Pump Intake Depth | ft. BGL |

Standard volume capacity of monitoring wells: Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 1013 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 1024 | .2 | 1 | 29.31 | 23.6 | 6.82 | 1630 | 1.46 | -15 | 7.6 |
| 1029 | ↓ | ↓ | 29.36 | 23.4 | 6.86 | 1650 | 1.21 | -17 | 7.7 |
| 1035 | ↓ | ↓ | 29.39 | 23.3 | 6.87 | 1650 | 1.20 | -17 | 7.1 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 1045 | 250 mL | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, NEAT | |
| 1045 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, $HNO_3$ | |

Notes: record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAXTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19122262-F2020 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 22.83 ft. BMP |
| Site Location | LUMINANT-OGSES | | ☐ Decon between locations | Casing Stickup | — ft. |
| Date | 9-9-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 22.83 ft. BGL |
| MW ID | FGD-3 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-3 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | HORIBA | MW Volume | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-5000 | Pump Intake Depth | ft. BGL |

Standard volume capacity of monitoring wells: Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 0917 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 0927 | .2 | 1 | 23.16 | 22.9 | 6.86 | 1480 | 0.79 | -21 | 8.6 |
| 0932 | " | 1 | 23.14 | 22.4 | 6.81 | 1460 | 0.36 | -26 | 9.6 |
| 0937 | " | 1 | 23.14 | 22.5 | 6.82 | 1460 | 0.39 | -27 | 9.1 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45 µm) | (type) | (quality control sample, other) |
| 0945 | 250 mL | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, NEAT | |
| 0945 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, $HNO_3$ | |

Notes: record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAXTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19122262-F2020 | Equipment Decon | ☒ Dedicated equipment<br>☐ Decon between locations | Depth to Water | 20.04 ft. BMP |
| Site Location | VOLUNANT-OGSES | | | Casing Stickup | — ft. |
| Date | 9-15-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 20.04 ft. BGL |
| MW ID | FGD-4 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-4 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible<br>☒ Peristaltic ☐ Bladder | Meter Model | HORIBA | MW Volume | gallons |
| | | Unit Number | U-5000 | Pump Intake Depth | ft. BGL |

Standard volume capacity of monitoring wells: Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 0822 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 0831 | .2 | 1 | 20.31 | 6.79 | 20.9 | 1710 | 1.69 | -71 | 4.7 |
| 0837 | ↓ | 1 | 20.36 | 6.86 | 22.6 | 1760 | 1.33 | -76 | 6.2 |
| 0843 | ↓ | 1 | 20.38 | 6.87 | 22.7 | 1750 | 1.34 | -77 | 6.7 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 0855 | 250 mL | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, NEAT | |
| 0855 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, $HNO_3$ | |

Notes: record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAXTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19122262-F2020 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 16.91 ft. BMP |
| Site Location | LUMINANT-OGSES | | ☐ Decon between locations | Casing Stickup | — ft. |
| Date | 9-15-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 16.91 ft. BGL |
| MW ID | FGD-6 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-6 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | HORIBA | MW Volume | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-5000 | Pump Intake Depth | ft. BGL |

Standard volume capacity of monitoring wells: Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 0736 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 0746 | .2 | 1 | 17.26 | 23.2 | 6.72 | 1730 | 0.79 | -29 | 11 |
| 0751 | ↓ | ↓ | 17.25 | 23.4 | 6.76 | 1740 | 0.56 | -34 | 7.2 |
| 0756 | ↓ | ↓ | 17.26 | 23.4 | 6.77 | 1740 | 0.57 | -34 | 7.9 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 0805 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, NEAT | |
| 0805 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, $HNO_3$ | |

Notes: record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAXTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19122262-F2020 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 30.31 ft. BMP |
| Site Location | LUMINANT-OGSES | | ☐ Decon between locations | Casing Stickup | — ft. |
| Date | 9-9-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 30.31 ft. BGL |
| MW ID | FGD-12 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-12 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | HORIBA | MW Volume | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-5000 | Pump Intake Depth | ft. BGL |

Standard volume capacity of monitoring wells: Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 1008 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 1017 | .2 | 1 | 30.62 | 22.6 | 6.79 | 1620 | 0.86 | -26 | 6.7 |
| 1022 | ↓ | ↓ | 30.61 | 22.7 | 6.81 | 1630 | 0.61 | -24 | 7.2 |
| 1029 | ↓ | ↓ | 30.61 | 22.7 | 6.82 | 1630 | 0.61 | -24 | 7.1 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 1040 | 250 mL | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, NEAT | |
| 1040 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, $HNO_3$ | |

Notes: record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAXTON (name) (signature)

# Groundwater Sample Collection



GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19122262 - F2020 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 39.97 ft. BMP |
| Site Location | LUMINANT - OGSES | | ☐ Decon between locations | Casing Stickup | — ft. |
| Date | 9-9-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 39.97 ft. BGL |
| MW ID | FGD-11 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-11 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | HORIBA | MW Volume | gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-5000 | Pump Intake Depth | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 0913 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 0922 | .2 | 1 | 40.26 | 22.9 | 6.77 | 1540 | 1.31 | -19 | 8.3 |
| 0928 | 1 | 1 | 40.28 | 23.0 | 6.78 | 1560 | 1.12 | -21 | 7.6 |
| 0933 | ↓ | 1 | 40.28 | 23.0 | 6.79 | 1570 | 1.13 | -21 | 7.7 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 0940 | 250 mL | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, NEAT | |
| 0940 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, $HNO_3$ | |

Notes: record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAXTON (name) (signature)

## Groundwater Sample Collection

Page 1 of 1

GOLDER

| | | | | | |
|---|---|---|---|---|---|
| Project/Phase | 19122262 - F2020 | Equipment Decon | ☒ Dedicated equipment | Depth to Water | 27.49 ft. BMP |
| Site Location | LUMINANT - OGSES | | ☐ Decon between locations | Casing Stickup | — ft. |
| Date | 9-9-20 | Reference Point | ☒ Top of casing | ☐ Depth to Water | 27.49 ft. BGL |
| MW ID | FGD-2 | Location | Other | Total MW Depth | ft. BGL |
| Sample ID | FGD-2 | Water Quality | | MW Diameter | 2.0 inches |
| Pump | ☐ Waterra ☐ Submersible | Meter Model | HORIBA | MW Volume | / gallons |
| | ☒ Peristaltic ☐ Bladder | Unit Number | U-5000 | Pump Intake Depth | ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 0818 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 0828 | .2 | 1 | 27.81 | 23.1 | 6.59 | 1290 | 1.29 | -31 | 7.4 |
| 0833 | ↓ | ↓ | 27.81 | 22.7 | 6.57 | 1310 | 1.06 | -29 | 6.2 |
| 0838 | ↓ | ↓ | 27.82 | 22.6 | 6.57 | 1310 | 1.08 | -29 | 6.1 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 0845 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, NEAT | |
| 0845 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, $HNO_3$ | |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

Field Team Leader JOHN BRAXTON (name) (signature)

# Groundwater Sample Collection

Page 1 of 1

GOLDER

| | | | | | |
|---|---|---|---|---|---|
| **Project/Phase** | 19122262-F2020 | **Equipment Decon** | ☒ Dedicated equipment | **Depth to Water** | 20.48 ft. BMP |
| **Site Location** | LUMINANT-OGSES | | ☐ Decon between locations | **Casing Stickup** | — ft. |
| **Date** | 9/10-20 | **Reference Point** | ☒ Top of casing | ☐ **Depth to Water** | 20.48 ft. BGL |
| **MW ID** | FGD-5 | **Location** | Other ____ | **Total MW Depth** | ____ ft. BGL |
| **Sample ID** | FGD-5 | **Water Quality** | | **MW Diameter** | 2.0 inches |
| **Pump** | ☐ Waterra ☐ Submersible | **Meter Model** | HORIBA | **MW Volume** | ____ gallons |
| | ☒ Peristaltic ☐ Bladder | **Unit Number** | U-5000 | **Pump Intake Depth** | ____ ft. BGL |

**Standard volume capacity of monitoring wells:** Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

| Time | Purge Rate | Cumulative Purge Volume | Depth to Water | Temp (°C) | pH | Conductivity (µS/m or mS/cm) | Dissolved Oxygen (mg/L) | Redox Potential (mV) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| 0726 | (L/min) | (L) | (ft) | ☐ NM | ☐ NM | ☐ not measured | ☐ not measured | ☐ not measured | ☐ NM |
| 0737 | .2 | 1 | 20.74 | 22.4 | 6.81 | 1670 | 0.94 | -29 | 13 |
| 0741 | ↓ | 1 | 20.76 | 22.5 | 6.84 | 1630 | 0.76 | -26 | 9.7 |
| 0746 | ↓ | 1 | 20.76 | 22.5 | 6.84 | 1640 | 0.77 | -26 | 9.6 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Purging was completed based on: ☒ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)

| Bottles Collected | | | | Filtration | Preserved | Notes and Observations |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G / P) | No. | (10µm / 45µm) | (type) | (quality control sample, other) |
| 0750 | 250mL | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, NEAT | |
| 0750 | 1L | P | 2 | ☐ filtered ☒ unfiltered | $HNO_3$, $HNO_3$ | |

**Notes:** record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☒ 10 Low Flow Groundwater Sample Collection.

**Field Team Leader** JOHN BRAXTON (name) ____ (signature)

golder.com

# Open House

## Regarding Oak Grove Power Plant Groundwater Quality

Under a 2015 U.S. EPA rule, Oak Grove Management Company LLC has been monitoring groundwater quality near the Oak Grove Power Plant ash storage site.

The company is hosting an open house for the public to learn more about the groundwater testing, the results, and mitigation options.

The informational open house is a come-and-go event, and provides attendees with an opportunity to ask questions. There will not be a formal presentation.

**OPEN HOUSE**

Date: Tuesday, Oct. 29, 2019
Time: 6 to 7:30 p.m.
Location: The Pridgeon Center
351 Cooks Ln., Franklin, TX 77856

Oak Grove Power Plant
Oak Grove Management Company LLC

**Hearne Eagles (4-3) (2-1) vs. Thorndale Bulldogs (6-2) (3-1) on Friday, October 25 at 7:30 p.m. in Thorndale**

# Time to whelp the Bulldogs

**MICHAEL COTTON**
Sports Editor
Robertson County News

Noland Harper | Robertson County News
Charles Cooks takes down the Milano Eagle with help from Jalen Sauls-Lewis and Damian Dunn.

It's put up or shut up time for the Hearne Eagles as they enter this Friday's showdown against the Thorndale Bulldogs. Both teams have only one loss on their resume and that was to district leading Holland.

Thorndale lost to Holland 40-13 while the Eagles lost to them 34-19. Their only other common opponent was the Milano Eagles. Both defeated the Eagles handily so that game is really no gauge.

The best comparison is the Holland contest. Hearne had many opportunities to defeat Holland and was in the game until the very end. A late Holland score sealed the win whereas, the Bulldogs were never in the game against Holland.

Thorndale will rely on a strong junior varsity from last season and 13 returning starters. All purpose player Jagger Rubio leads the team but he has help in a big offensive line and fellow running back Michael Herzog.

Their offense has been explosive at times scoring 60+ three times and 36 points in their other two victories. Only Holland has managed to score more than 20 points against the Bulldog defense. Hearne will have their work cut out on both sides of the ball.

The Eagles are coming off their best defensive performance of the year before the bye week. They limited Milano to a single field goal and just 28 total yards. They will need that kind of effort against the Bulldogs offense if they are to win. On offense it will just take consistency.

Quarterback Micah Smith has demonstrated he is one of the top quarterback prospects in the state. He has a big arm and is an accurate passer. In addition he has shown himself to be a better than average runner making him a dual threat at the position. He has a load of talented receivers in wideouts Jalen Gonzales, Damian Dunn, and Jabari Dunn and tight end Tyquez Tindle.

The Eagles have not run the ball as well as Coach Sargent would have liked but Quinston Owens, Alijah Miles, and Dunn give the Eagles threats at the position. It will all come down to how consistent on offense can the Eagles be when they have the ball.

Coach Sargent knows a lot is on the line this game and rest assured he will have the Eagles ready to play.

It is our time Eagles let's take advantage of the opportunity.

**Calvert Trojans (4-3) vs. Oglesby Tigers (1-5-1) on Friday October 25 at 7:30 p.m. in Oglesby**

# Trojans determined to cage the Tigers

Suzi Elliott | Robertson County News
Calvert Trojans keeping their teammate guarded from the three BVCHEA players attempting to take possession of the ball.

**MICHAEL COTTON**
Sports Editor
Robertson County News

It was good to play at home for the Calvert Trojans after being on the road for five of their first six games. It was a strong schedule against some state ranked opponents and it was what Coach Ashley wanted for his team. Learning to play good teams on the road is important come playoff time because their are no home playoff games and no patsies to play.

Another reason it was important for Coach Ashley and the Trojans is because there is such limited competition within the district. None of the three teams in district are expected to give the Trojans much of a fight beginning with this weeks opponent the Oglesby Tigers.

The Tigers are 1-5-1 on the season and have been mercy ruled three times. They have shown an ability to score points having never been shut out this season.

Spread back Ian Markum, a junior, is the leader of the offense. He accounted for over 1500 yards last season and is the key that sparks the Tigers offense. Running back Isaac Uribe and all around athlete Travis Bass will provide help on the offensive side of the ball.

Whether they can move the ball against Calvert will be a big question. The Trojans have not allowed more than 36 points in any game this season despite the loaded schedule.

However, it will be on defense that the Tigers will get their true test having given up 98 points in a game doesn't look real promising against a potent Calvert offense.

It was their final tune-up before district season starts and the Calvert Trojans looked prime for a playoff run, especially on defense, as they disposed of Brazos Valley Homeschool 45-0.

The Trojans defense owned the night as they scored a touchdown, recovered 3 fumbles, intercepted 3 passes, and held BVCHEA to a total offense of 30 yards. You could see it would be the defense's night, when after the offense turned the ball over on downs on it's first drive, linebacker David Williams intercepted a pass and rambled 14 yards for the first score of the night on the very next play.

The defense would give the offense the ball

See TROJANS » Page 11

## BRAZOS VALLEY & ROBERTSON COUNTY OIL & GAS REPORT

**Drilling Permits:**

BRAZOS COUNTY 17.14 MILES NE. OF BRYAN, TEXAS MADISONVILLE, W. (WOODBINE -A-) FIELD
Hawkwood Energy Operating LLC has a new drill permit for its Hayes Unit Lease, Well No. 1H (API No. 42-041-32601), a proposed horizontal well --- 2,210' FNWL & 5,005' FSWL of the T.W. Blakey Survey, Abstract 6, 9,800' total depth, 610.72 acre lease

BRAZOS COUNTY 17.14 MILES NE. OF BRYAN, TEXAS MADISONVILLE, W. (WOODBINE -A-) FIELD
Hawkwood Energy Operating LLC has a new drill permit for its Hayes Unit Lease, Well No. 2H (API No. 42-041-32602), a proposed horizontal well --- 2,210' FNWL & 4,980' FSWL of the T.W. Blakey Survey, Abstract 6, 9,800' total depth, 610.72 acre lease

**Oil Well Completions:**

BRAZOS COUNTY 4.6 MILES SE. OF MUMFORD, TEXAS GIDDINGS (EAGLEFORD) FIELD
Chesapeake Operating LLC has completed its S. Buckman Falsone HCX2 Lease, Well No. 2H (API No. 42-041-32565), a new horizontally drilled well completed 8-27-2019 --- 2,850' FWL & 4,750' FSEL of the F. Ruiz Survey, Abstract 48, 17,745' total depth, 6,118'-17,693' producing interval, 1,095.01 acre lease
***** 24 HR. POTENTIAL TEST *****
DATE OF TEST 9-15-2019
624 barrels of oil per day, 167,000 cubic feet of gas per day, 1,048 barrels of water per day, 20/64" choke, flowing, 910 psi flowing tubing pressure, 37 degree API oil, the producing interval was fracture stimulated, 7,223 barrels of oil were produced prior to testing

**Gas Well Completions**

NONE FOR THIS WEEK

TWO DRIVERS DEDICATED TO THE ROBERTSON COUNTY AREA
Leon Gas Co.
"Your Local Propane Provider Since 1948"
Call Roy Reed to ask about saving money on propane heating, water heating and drying clothes.
(936)-396-3921 or (800) 533-2605

CALVERT VOLUNTEER FIREDEPARTMENT'S
CORNHOLE
REGISTER YOUR TEAM
November 9
11:00 am - 5:00 pm
911 Railroad St.
in Calvert
Twisted 6 BBQ
DJ Catalina
Silent Auction
Bake Sale & More
Call Renda Bermudez
979-324-7605
This year we will be raising nmoney to equip our trucks with AED devices to help better serve our community!

Open House
Regarding Oak Grove Power Plant Groundwater Quality

Under a 2015 U.S. EPA rule, Oak Grove Management Company LLC has been monitoring groundwater quality near the Oak Grove Power Plant ash storage site.

The company is hosting an open house for the public to learn more about the groundwater testing, the results, and mitigation options.

The informational open house is a come-and-go event, and provides attendees with an opportunity to ask questions. There will not be a formal presentation.

OPEN HOUSE

Date: Tuesday, Oct. 29, 2019
Time: 6 to 7:30 p.m.
Location: The Pridgeon Center
351 Cooks Ln., Franklin, TX 77856

Oak Grove Power Plant
Oak Grove Management Company LLC

## Please Sign-In

***Thank You!***

**Oak Grove Power Plant - Open House**

**Oct. 29, 2019**

| | NAME | ADDRESS | PHONE | EMAIL |
|---|---|---|---|---|
| 1 | Stephen Maynes | | 713-357-8419 | |
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APPENDIX F-Revision 1 November 21, 2022

Sign Up Sheet Templates © 2017 by Vertex42.com. Free to Print.

# Remedy Selection Report

*Oak Grove Steam Electric Station - FGD Ponds*

*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

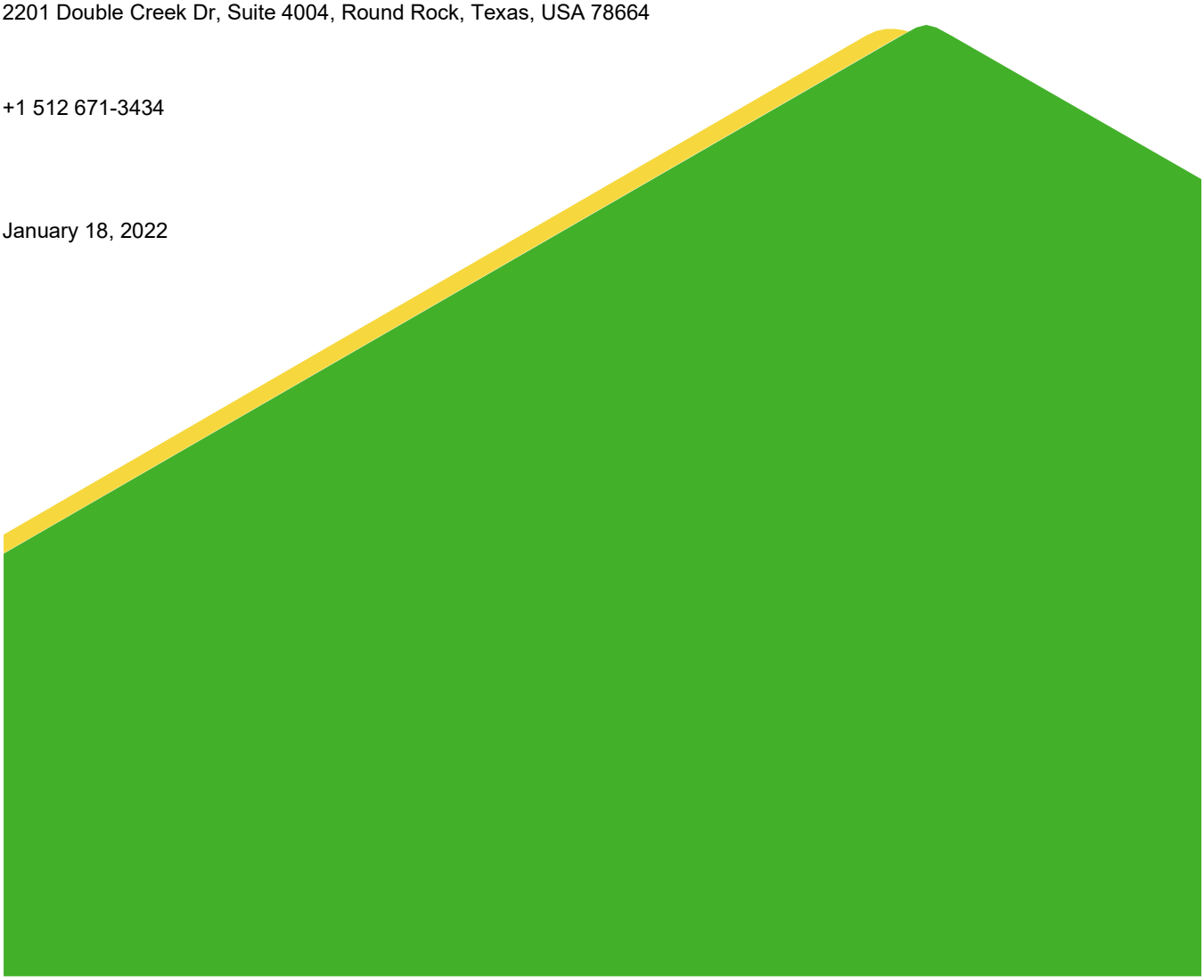
Submitted by:

**Golder Associates Inc.**

2201 Double Creek Dr, Suite 4004, Round Rock, Texas, USA 78664

+1 512 671-3434

January 18, 2022



## PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that this Remedy Selection Report meets the requirements of 40 C.F.R. § 257.97 and 30 TAC §352.971.

_____

Patrick J. Behling, P.E.
Principal Engineer
Golder Associates Inc.

## DISTRIBUTION LIST

Renee Collins, Luminant

David Mitchell, Luminant

Eric Chavers, Luminant

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## FIGURES

Figure 1 Detailed Site Plan

## APPENDICES

Appendix A Tier I Monitored Natural Attenuation Evaluation

Appendix B Tier II and Tier III Monitored Natural Attenuation Evaluation

Appendix C Tier IV Monitored Natural Attenuation Performance Monitoring Plan

# 1.0 INTRODUCTION

On behalf of Oak Grove Management Company (Luminant), Golder Associates Inc. (Golder), Member of WSP, has prepared this Remedy Selection Report for FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the "FGD Ponds") at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas (hereafter, the "Site") (**Figure 1**). Luminant manages coal combustion residuals (CCR) generated from the OGSES in the FGD Ponds per the applicable requirements of 40 C.F.R. Part 257, Subpart D as amended (CCR Final Rule) and 30 TAC Chapter 352 (Texas CCR Rule). The United States Environmental Protection Agency (USEPA) published its final approval of the Texas CCR rule on June 28, 2021. *See* 86 Fed. Reg. 33,892 (June 28, 2021). The Texas CCR Rule became effective on July 28, 2021, and it adopts and incorporates by reference the requirements for remedy selection located at § 257.97.

Statistically significant levels (SSLs) of cobalt and lithium above groundwater protection standards (GWPSs) were detected in the uppermost aquifer hydraulically downgradient of the FGD Ponds during 2018 assessment monitoring. In response to the 2018 cobalt and lithium SSLs, an Assessment of Corrective Measures (ACM) report was completed for the FGD Ponds in September 2019 as required by § 257.96 (Golder 2019a). The ACM demonstrated that groundwater concentrations of cobalt and lithium were stable or decreasing at all wells and the extent of cobalt and lithium SSLs was delineated on-site (i.e., no offsite migration was indicated). The ACM evaluated various source control and groundwater response technologies to address the cobalt and lithium SSLs. An Alternate Source Demonstration (ASD) was completed in accordance with § 257.95(g)(3)(ii) in October 2020 (Golder 2020), which indicated that a source other than the FGD Ponds caused the lithium SSL. Lithium has therefore been eliminated as a constituent of concern at the FGD Ponds. The ACM was updated in May 2021 (Golder 2021a) to remove lithium from the list of constituents evaluated in the ACM. In addition, updated statistical analyses for cobalt that incorporated assessment monitoring data collected from 2019 to 2021 indicate that cobalt is also no longer present at SSLs above the GWPS; however, for the purposes of the ACM and remedy selection, Luminant continued to evaluate potential groundwater remedies for cobalt based on the 2018 SSL to address potential cobalt SSLs that may occur in the future.

The purpose of this selection of remedy report is to describe the selected remedy, describe how the selected remedy meets the requirements of §257.97, and provide a schedule for implementing and completing remedial activities.

# 2.0 SITE SETTING

The OGSES is located approximately 10 miles north of the city of Franklin in Robertson County, Texas. Construction of the OGSES began in the mid-1980s; however, plant construction was suspended in the mid-1980s prior to completion. OGSES construction resumed in 2007 and the plant was commissioned in 2010. The OGSES is expected to remain in operation for the foreseeable future, depending on future power demands. The FGD Ponds are located approximately 2,500 feet northwest of the OGSES power generation units (**Figure 1**).

FGD-A construction began in the mid-1980s, but pond construction stopped when construction of the OGSES was suspended (Golder 2016a). FGD-A construction resumed in 2007 and was completed in 2008. FGD-A covers an area of approximately 9 acres and stores CCR and other wastes generated from the OGSES prior to recycling or disposal in OGSES Ash Landfill 1. FGD-A is lined with a 3-foot thick compacted clay liner. FGD-A was removed from service prior to April 2021 and Luminant anticipates retrofit completion in 2022 with a composite liner system meeting the requirements of § 257.71(a)(1)(ii) of the CCR Rule. The retrofitted liner system will consist of a minimum 2-foot thick compacted clay liner or geosynthetic clay liner (GCL), overlain by a

60-mil HDPE geomembrane liner. The floor of the pond will be covered by a 1.5-foot thick layer of protective soil and the upper portion of the pond side slopes will be covered with concrete revetment mat.

Construction began on the FGD-B Pond in the mid-1980s during the initial OGSES construction phase for use as a storm water retention pond. Pond construction was halted in the 1980s when construction of the OGSES was suspended. The former retention pond was reconstructed in 2012 as FGD-B Pond for use in management of CCR and other wastes (Golder 2016b). FGD-B covers an area of approximately 11.2 acres and receives CCR and other wastes generated from the OGSES. FGD-B is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain by a 60-mil HDPE geomembrane liner, overlain by a 1-foot thick layer of protective soil (Golder 2016a). The composite liner system in FGD-B complies with the requirements of §257.71(a)(1)(ii) of the CCR Rule.

FGD-C Pond construction commenced in 2015 and was completed in 2016 (Golder 2016b). FGD-C Pond is approximately 15.2 acres in size and receives CCR and other wastes generated from the OGSES. FGD-C is constructed with a composite liner consisting of a minimum 2-foot thick compacted clay liner, overlain by a 60-mil HDPE geomembrane liner, overlain by a 2-foot thick soil/ash protective layer (Golder 2016b). The composite liner system in FGD-C complies with the requirements of §257.71(a)(1)(ii) of the CCR Rule.

## 2.1 Site Hydrogeology and CCR Monitoring Well Network

The Site is located in the outcrop area of the Eocene-aged Wilcox Group (Barnes 1970), which is divided into three formations in the region: the Calvert Bluff, Simsboro, and Hooper Formations (in order from youngest to oldest). The FGD Ponds are completed in the Calvert Bluff Formation, which consists of unconsolidated to moderately consolidated clay and silt, with various amounts of interbedded sand and lignite.

Based on soil borings completed at the Site, the geology near the FGD Ponds generally consists of an upper zone of relatively thick, interbedded sand and clay strata underlain by a lower zone of interbedded silty to clayey sand and well sorted sand (PBW 2017). The uppermost groundwater-bearing unit (GWBU) occurs under unconfined conditions within the shallow interbedded sand units of the Calvert Bluff Formation. Groundwater elevations have generally been highest southeast of the FGD Ponds and relatively flat in the vicinity of the FGD Ponds. Since CCR monitoring began in 2015, the inferred groundwater flow direction at the Site has been to the east-northeast toward Twin Oak Reservoir, which borders the FGD Pond area to the north and east. The CCR groundwater monitoring well network at the FGD Ponds was established in 2015 using Site monitoring wells screened in the uppermost GWBU (FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, FGD-8, FGD-11, and FGD-12). A map of the CCR groundwater monitoring network is provided on **Figure 1**.

Golder performed a survey of water supply wells located in the vicinity of the FGD Ponds in May 2019 as part of a Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program (TRRP) assessment of the Site. A Drinking Water Survey Report (Golder, 2019b) documenting the water well survey activities and findings was approved by the TCEQ in a letter dated August 12, 2019. No imminent threats to water wells or potentially affected drinking water wells were identified.

# 3.0 SOURCE CONTROL MEASURES

FGD-B and FGD-C are constructed with composite liner systems that comply with the requirements of §257.71(a)(1)(ii) of the CCR Rule and these ponds are considered lined surface impoundments under the Rule. Since the liner systems in these ponds comply with the CCR Rule, FGD-B and FGD-C provide an appropriate level of source control as currently constructed and no modifications are necessary to these ponds.

FGD-A is constructed with a clay liner and the pond is considered an unlined surface impoundment under the CCR Rule. As a result, Luminant anticipates completing the retrofit of FGD-A in 2022 with a composite liner system meeting the requirements of § 257.71(a)(1)(ii) of the CCR Rule. The retrofitted liner system will consist of a minimum 2-foot thick compacted clay liner or geosynthetic clay liner (GCL), overlain by a 60-mil HDPE geomembrane liner. The floor of the pond will be covered by a 1.5-foot thick layer of protective soil and the upper portion of the pond side slopes will be covered with concrete revetment mat. Retrofitting FGD-A with a new composite liner system will serve as the source control component of the potential corrective measures for the FGD Ponds.

## 4.0 POTENTIAL GROUNDWATER CORRECTIVE MEASURES

The ACM Report (Golder, 2019a), which assessed potential corrective measures, was prepared to comply with the requirements of CCR Rule § 257.96. A public meeting was held on October 29, 2019 at the Pridgeon Center in Franklin, Texas to discuss the results of the ACM in accordance with § 257.96(e). In accordance with the applicable screening criteria described in §257.96(c), potential corrective measures were evaluated based on their overall performance, reliability, ease of implementation, potential impacts of the remedy, time to begin and complete the remedy, and institutional requirements. The source control measures discussed in Section 3 are considered a component of each of the corrective measures that were evaluated. Possible corrective measures for groundwater included the following options to address groundwater impacts:

- Monitored Natural Attenuation (MNA);
- Groundwater Extraction and Treatment;
- Vertical Hydraulic Barrier;
- Permeable Reactive Barrier;
- In-situ chemical treatment; and
- Phytoremediation

MNA was identified as the most applicable groundwater remedy for further evaluation.

## 5.0 CCR RULE REMEDY OBJECTIVES

In accordance with §257.97(a), based on the results of the ACM, as soon as feasible a remedy should be selected for the CCR Units. Per the regulations, the remedy must prevent further releases, remediate any releases, and restore the affected area to original conditions. Specifically, under § 257.97(b) the remedy must (1) protect human health and the environment; (2) attain the groundwater protection standard as specified pursuant to § 257.95(h); (3) control the sources of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in appendix IV into the environment; (4) remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems; and (5) comply with any relevant standards for management of wastes as specified in § 257.98(d). The CCR Rule also specifies decision criteria to be considered by the owner or operator in selecting the most appropriate remedy. Under § 257.97(c), these criteria include: (1) Long- and short-term effectiveness and protectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful; (2) effectiveness of remedy in controlling the source to reduce further releases; (3) ease or difficulty of implementation; and (4) community concerns.

# 6.0 REMEDY SELECTION

MNA with source control measures has been selected as the remedy to address cobalt concentrations observed at SSLs. This remedy was selected over the other potential corrective measure alternatives based on its overall high performance, high reliability, ease of implementation, low potential for negative impacts, and minimal institutional requirements.

MNA refers to the reliance on natural attenuation processes (within the context of a carefully controlled and monitored approach) to achieve site-specific groundwater remediation objectives. MNA relies on a range of natural processes, including sorption, (co)precipitation, radioactive decay, dispersion, dilution, and abiotic degradation/transformation to achieve remediation objectives. MNA has been demonstrated effective in reducing cobalt concentrations in groundwater by way of cobalt being removed through adsorption to iron hydroxides and/or amorphous metals and the level of effectiveness is dependent on iron hydroxide availability as well as pH, alkalinity, and calcium levels (USEPA 2007a; ITRC 2010).

A Site-specific feasibility study to evaluate MNA as a potential groundwater remedy for the 2018 cobalt SSL at the FGD Ponds was performed in accordance with guidance and best practices promulgated by the USEPA (USEPA 2007a and 2007b) and ITRC (ITRC 2010). The overall feasibility of MNA as a groundwater response technology was evaluated based on the following multi-tiered approach:

1) Demonstrate active constituent removal from groundwater and dissolved plume stability (Tier I);

2) Determine the mechanisms and rates of the operative attenuation processes (Tier II);

3) Determine the long-term capacity for attenuation and the stability of immobilized constituents (Tier III); and

4) Prepare a long-term MNA performance monitoring plan (Tier IV).

A Tier I MNA evaluation report was completed in December 2019 (Golder 2019c) and a Tier II/III MNA evaluation report was completed in June 2021 (Golder 2021b). Based on the results of these MNA evaluations, the following was concluded regarding cobalt:

- Physical and chemical attenuation of cobalt is occurring at the Site. Cobalt levels are stable and the aquifer has adequate capacity to attenuate cobalt in a reasonable timeframe. Modeling indicates that cobalt attenuation will be efficient and stable in the long term. Cobalt in the CCR unit porewater is well below the level that is observed in groundwater, including when a periodic exceedance occurs in downgradient groundwater. Therefore, MNA would be effective in remediating cobalt in groundwater beneath and downgradient of the FGD Ponds.

Copies of the Tier I and Tier II/III MNA evaluation reports are provided in **Appendix A and B**, respectively.

The selected remedy will attain the objectives stated in §257.97 as outlined below:

**(1) <u>Long and short term effectiveness, and degree of certainty of success:</u>**

The Tier I through Tier III MNA studies completed for the Site demonstrate that physical and chemical attenuation of cobalt is occurring, that cobalt concentrations are stable, and that the aquifer has adequate capacity to attenuate cobalt in a reasonable timeframe.

*(i)* *Magnitude of reduction of existing risks*:

Source control measures are likely effective at preventing future releases, and MNA feasibility data indicate that conditions are suitable for the ongoing reduction in cobalt concentrations in groundwater to concentrations below GWPSs.

*(ii)* *Magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy*:

Source control measures reduce the risk of future impacts by preventing the transport of CCR constituents to groundwater at concentrations above GWPSs.

*(iii)* *The type and degree of long-term management required, including monitoring, operation, and maintenance*:

Long-term assessment of the condition of monitoring network will be required. Maintenance of the monitoring network is anticipated to be low.

*(iv)* *Short-term risks that might be posed to the community or the environment during implementation of such a remedy, including potential threats to human health and the environment associated with excavation, transportation, and redisposal of contaminant*:

The remedy presents minimal risk of exposure. Results from the ACM nature and extent investigation indicate that Appendix IV constituents at SSLs were contained within the plant property boundary. The Drinking Water Survey Report (Golder, 2019b) indicated the CCR units pose no imminent threats to water supply wells.

*(v)* *Time until full protection is achieved*:

MNA generally requires relatively long periods of time to attenuate cobalt present at SSLs. However, cobalt is not currently present above SSLs.

*(vi)* *Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, or containment*:

The selected remedy presents a low risk of exposure. Access to the CCR units and surrounding land are controlled by Luminant. Potential exposure to CCR will be prevented through source control measures and Site access restrictions.

*(vii)* *Long-term reliability of the engineering and institutional controls*:

Restriction of access and exposure are currently implemented and will continue. Site wells to be used in the monitoring network are secured with locks.

*(viii)* *Potential need for replacement of the remedy*:

Although unlikely, monitoring wells may need to be replaced over the monitoring period. Monitoring well replacement will be documented in the Annual Groundwater Monitoring and Corrective Action Report following well replacement activities.

**(2) Effectiveness of remedy in controlling the source to reduce further releases:**

Source control measures are being implemented as discussed in Section 3.0. Source control will reduce infiltration of surface water from the CCR ponds to the GWBU, preventing potential releases to the GWBU.

*(i)* *The extent to which containment practices will reduce further releases*:

Source control measures are likely effective at preventing future releases, and MNA feasibility data indicate that conditions are suitable for the ongoing reduction of cobalt concentrations in groundwater.

(ii) *The extent to which treatment technologies may be used*:

MNA feasibility data indicate that conditions are suitable for the ongoing reduction of cobalt concentrations in groundwater. Additional treatment technologies are not proposed.

**(3) Ease or difficulty of implementation:**

MNA is relatively easily implemented. The existing monitoring well network can be used for the monitoring component of the remedy. Source control measures described in Section 3.0 involve significant cost; however, these measures are being implemented to bring the FGD Ponds into compliance with §257.71(a)(1)(ii). The source control measures will also provide long-term stability to groundwater conditions and ensure long-term effectiveness of MNA as a remedy.

(i) *Degree of difficulty associated with constructing the technology*:

The current monitoring well network will be used to evaluate the effectiveness of the remedy. If required, additional monitoring wells can be installed relatively easily.

(ii) *Expected operational reliability of the technologies*:

There are no anticipated problems with the monitoring network or source control measures.

(iii) *Need to coordinate with and obtain necessary approvals and permits from other agencies*:

The monitoring well network is already in place at the Site. There is no anticipated need to coordinate with and obtain approvals and permits from other agencies.

(iv) *Availability of necessary equipment and specialists*:

Consulting and engineering firms are established that can implement the remedy. Drilling companies and drilling equipment are available in the event that additional wells need to be installed.

(v) *Available capacity and location of needed treatment, storage, and disposal services*:

Adequate treatment, storage, and disposal services are available at the plant or at offsite waste management facilities.

**(4) Community concerns:**

A public meeting was held on October 29, 2019 at the Pridgeon Center in Franklin, Texas to discuss the results of the ACM in accordance with § 257.96(e). No comments were received from the public. As indicated in Section 2.1, there are no nearby water supply wells completed within the GWBU below or downgradient of the FGD Ponds. The ACM (Golder 2019a) demonstrated that groundwater concentrations of cobalt were stable or decreasing at all wells and the extent of the cobalt SSLs was delineated on-site (i.e., no offsite migration was indicated).

# 7.0 SCHEDULE

Routine groundwater monitoring as part of an MNA program is required to verify that MNA is occurring. A Tier IV MNA Performance Monitoring Plan (Golder 2021c) has been prepared to describe the monitoring network, sampling and analysis methods, procedures for assessing MNA effectiveness, and reporting for an MNA program, if one is to be established at the Site. A copy of the Tier IV MNA Performance Monitoring Plan is provided in **Appendix C**. The MNA program could be implemented upon completion of the source control measures described in Section 3.0. However, as discussed previously, cobalt is not currently present at SSLs at the FGD Ponds; therefore, implementation of an MNA program or other remedy option is not currently necessary. Cobalt concentrations in groundwater will continue to be monitored in accordance with the CCR rule to confirm that cobalt concentrations remain below the GWPS. An MNA program will be implemented to address cobalt SSLs of SSLs for other constituents if they are identified in future.

# 8.0 REFERENCES


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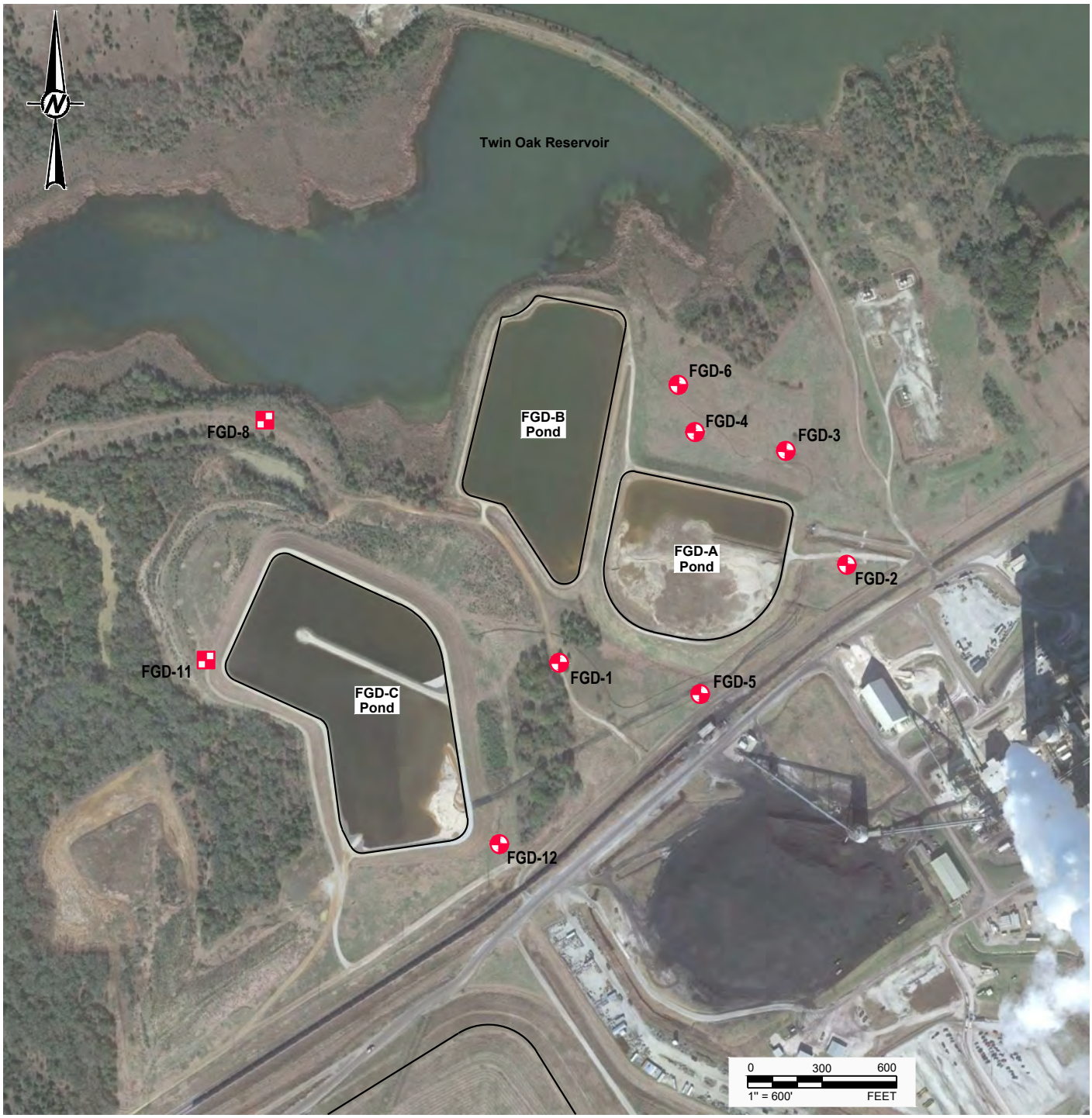
# FIGURES




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**DETAILED SITE PLAN - FGD POND AREA**

CONSULTANT
GOLDER

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| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

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# APPENDIX A

## Tier I Monitored Natural Attenuation Evaluation

**DATE** 12/13/2019 **Project No.** 19122434

**TO** Kim Mireles, Sr. Director - Environmental Services
Luminant Generation Company LLC

**CC** David Mitchell - Luminant Generation Company LLC

**FROM** Patrick Behling - Golder Associates, Inc. **EMAIL Patrick_Behling@Golder.com**

# OAK GROVE MONITORED NATURAL ATTENUATION EVALUATION

## 1.0 OVERVIEW

Groundwater and solid materials were evaluated to determine the feasibility of Monitored Natural Attenuation (MNA) as part of the Assessment of Corrective Measures (ACM) on behalf of Oak Grove Management Company LLC (Luminant) for FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the "FGD Ponds") located at the Oak Grove Steam Electric Station (OGSES) in the FGD Pond area, in Robertson County, Texas. The structure of this feasibility evaluation closely follows the United States Environmental Protection Agency (USEPA) guidance on using MNA as a remedial strategy (USEPA 2007a and 2007b) and considers best practices from the Interstate Technology Regulatory Council (ITRC) document: "A Decision Framework for Applying Monitored Natural Attenuation Processes to Metals and Radionuclides in Groundwater" (ITRC 2010).

Based on the evaluation presented in this document, cobalt and lithium are candidates for MNA at the OGSES FGD Pond area per 40 Code of Federal Regulations (CFR) Part 257 as amended (CCR Final Rule). Both constituents are subject to attenuation controls on their concentrations in downgradient groundwater and meet the initial screening criteria as part of this attenuation assessment. Further geochemical evaluation (i.e. Tier II) of MNA with institutional controls is, therefore, recommended if a future Statistically Significant Level (SSL) of either constituent is identified in groundwater.

## 2.0 APPROACH

To assess the feasibility of MNA at the OGSES FGD Pond area at the Tier 1 MNA screening level, samples of overburden, porewater and groundwater were collected in May 2019 and analyzed to provide a geochemical dataset that was used for a supplemental assessment in addition to previously-reported groundwater data (Golder 2019). Golder performed the supplemental assessment activities in accordance with the OGSES FGD Pond Groundwater Monitoring Program. The supplemental assessment activities included:

- Groundwater characterization to identify temporal and geographical trends, where present.
- Geochemical modeling to identify the major chemical species and evaluate saturation indices of minerals relevant to attenuation of cobalt and lithium.
- Mineralogical analysis of overburden to identify and quantify the major mineral components.

- Chemical analysis of overburden to quantify the total metal content and identify the environmentally-available fraction of metals.

Based on the results generated by this supplemental assessment, a screening-level attenuation evaluation was completed to determine the overall feasibility of MNA at the OGSES FGD Ponds.

## 2.1 Groundwater and Porewater Sampling and Analysis

### 2.1.1 Sample Collection

Golder personnel collected groundwater and porewater samples from the background wells, downgradient or "monitoring" wells, porewater, and nature and extent monitoring wells presented in Table 1. The nature and extent of the plume was fully delineated in accordance with 40 CFR §257.95(g) (Golder 2019).

### 2.1.2 Geochemical Analysis

Geochemical analysis of porewater and groundwater samples included the determination of field parameters and the concentrations of total metals and major cations and anions. The rationale and methods used were as follows:

**Field Parameters:** Parameters measured in the field included pH, dissolved oxygen, oxidation reduction potential (ORP), conductivity, and temperature. These parameters were used to determine general geochemical conditions in the groundwater and support geochemical modeling.

**Metals:** Analysis of Appendix III and IV metals concentrations was conducted to understand the geochemical composition of groundwater and porewater. Metals analysis allows for the delineation of a potential plume, evaluation of mineral saturation indices, development of partitioning coefficients (in conjunction with solid material analyses), and evaluation of background contributions from natural sources or anthropogenic sources.

**Major Cations and Anions**: Geochemical modeling of mineral solubility, metals attenuation and background contributions requires analysis of major cations and anions because they affect and participate in sorption and mineral dissolution or precipitation reactions.

The groundwater and porewater samples were analyzed using the following methods:

- pH following SW846 9040C "pH Electrometric Measurement" (USEPA 2004)
- Total dissolved solids standard method (SM) 2540C "Total Dissolved Solids Dried at 180°C" (USEPA 1993a)
- Total hardness following SM 2340B (USEPA 1997)
- Chloride and fluoride following USEPA SW846 9056A "Determination of Inorganic Anions by Ion Chromatography", Revision 1 (USEPA 2007c)
- Nitrate and nitrite following EPA 353.2 "Determination of Nitrate-Nitrite Nitrogen by Automated Colorimetry, Revision 2.0" (USEPA 1993b)
- Alkalinity following SM 2320B "Alkalinity by Titration" (USEPA 2005a)
- Phosphorous following SM 4500-P E "Phosphorous by Ascorbic Acid Method" (USEPA 2005b)

- Total Target Analyte List (TAL) metals following USEPA SW846 6010C “Inductively Coupled Plasma-Atomic Emission Spectrometry”, Revision 3, SW846 6020B “Inductively Coupled Plasma-Mass Spectrometry”, Revision 2, and SW846 6020A “Inductively Coupled Plasma-Mass Spectrometry”, Revision 1 (USEPA 1998)

### 2.1.3 Geochemical Modeling Approach

Geochemical modeling was conducted to evaluate general groundwater and porewater quality, determine the potential for precipitation of sorbent media, evaluate the potential for mineral precipitation or adsorption in the aquifer, and determine the speciation of metals of interest. The geochemical computer code developed by the United States Geological Survey (USGS), PHREEQC, was used for these simulations (Parkhurst and Appelo 2013). PHREEQC version 3.4 is a general-purpose geochemical modeling code used to simulate reactions in water and between water and solid mineral phases (e.g., rocks and sediments). Reactions include aqueous equilibria, mineral dissolution and precipitation, ion exchange, surface complexation, solid solutions, gas-water equilibrium, and kinetic biogeochemical reactions. The widely-accepted thermodynamic database Minteq.v4, 2017 edition, was used as a basis for the thermodynamic constants required for modeling.

The Geochemist’s Workbench version 12 (Bethke 2015) was used to generate graphical representations of geochemical modeling outputs in the form of predominance, or Pourbaix diagrams (also known as Eh-pH diagrams) for the species of interest (i.e. barium, cobalt, lithium, selenium, and elemental radium) and trilinear plots (also known as Piper plots) displaying the relative abundance of major ions. The Minteq.v4 database was used as the basis for the Pourbaix diagrams.

The potential for mineral precipitation was assessed in PHREEQC using a saturation index (SI) calculated according to Equation 1.

$$SI = \log (IAP/Ksp) \qquad \text{(Equation 1)}$$

The saturation index is the ratio of the ion activity product (IAP) of a mineral to the solubility product (Ksp). An SI value greater than zero indicates that the water is supersaturated with respect to a particular mineral phase and, therefore, precipitation of the mineral may occur. An evaluation of precipitation kinetics is then required to determine whether the supersaturated mineral will indeed form. An SI value less than zero indicates the water is undersaturated with respect to a particular mineral phase. An SI value close to zero indicates equilibrium conditions exist between the mineral and the solution. SI values between -0.5 and 0.5 are referred to as ‘at equilibrium’ in this report.

### 2.1.4 Data Handling and Geochemical Modeling Assumptions

Assumptions related to data handling and geochemical modeling assumptions were as follows:

- **Groundwater continuity:** Groundwater quality data from a single sampling event conducted from May 16, 2019 to June 6, 2019 were evaluated. This sampling event was selected because all wells related to the FGD Ponds were sampled and analyzed for the full suite of parameters described in Section 2.1.2 and the resulting data are assumed to provide a comprehensive overview of groundwater conditions. Temporal trend analysis for cobalt and lithium made use of all available sampling events from a well (up to 11 samples from some wells), dating back to November 2015.
- **Porewater chemistry:** The porewater samples collected from FGD Pond A and FGD Pond B are assumed to be representative of porewater found in the FGD Ponds at the OGSES FGD Pond area.

- **Redox values:** ORP values measured in the field were converted to reduction potential (Eh) by adding 200 millivolts (mV) to the field-measured values as per YSI (2015).
- **Non-detect values:** Constituents with concentrations less than their respective method detection limits were assumed to have a concentration equal to the reporting limit in model simulations.
- **Total recoverable concentrations:** Total recoverable fraction results were used for geochemical modeling.
- **Charge balance:** Groundwater compositions with charge balance errors less than 10% were considered valid. Compositions with charge balance errors greater than 10% were included in the assessment but would be considered less reliable and are denoted as such.

## 2.2 Overburden Sampling and Analysis

### 2.2.1 Sample Collection

A drilling contractor collected continuous cores from two nature and extent well borings (FGD-15 and FGD-16) and one soil boring and (FGD-2019-1) located downgradient of the CCR units. Golder staff collected overburden samples from drill cores obtained at various intervals at the three locations ranging from 23' below ground surface to up to 32' below ground surface. These samples are representative of the saturated uppermost aquifer downgradient of the CCR Units, which is underlain by a confining sandy clay unit.

These samples were submitted to the laboratory for analysis under chain-of-custody procedures. The unique descriptions used to identify the samples included the overburden boring name and depth of the sample below ground surface (bgs). Sample locations and depths are described in Table 2. Boring logs are provided in Appendix A.

### 2.2.2 Overburden Analysis

Multiple geochemical analytical methods were used to assess the mineralogical and chemical composition of the overburden material samples. The selected geochemical test methods included:

- **Mineralogical composition**: The purpose of the mineralogical analysis was to identify and quantify the crystalline mineral phases in each sample. This information is required for geochemical modeling as the release or attenuation of constituents of interest is influenced by the mineral phase(s) present in the aquifer (Hem 1985). The mineralogical testing laboratory (SGS Minerals Services) performed the mineralogical analysis using quantitative (Rietveld) X-ray diffraction (XRD) (ME-LR-MIN-MET-MN-DO5) and a Bruker AXS D8 Advance Diffractometer.
- **Total metals:** This test was used to quantify the chemical composition of overburden materials. The total mass of metals, in combination with the results of sequential extraction testing, can be used to determine the provenance of metals and verify sequential extraction results. The laboratory analyzed a target analyte list of metals following the methods USEPA SW846 6010C "Inductively Coupled Plasma-Atomic Emission Spectrometry", Revision 3 (November 2000).
- **Sequential extraction (SEP):** This test consists of a seven-step metals extraction from solids as per Tessier et al. (1979) to identify the provenance of constituents of interest (i.e. the operationally-defined

fraction that contains the metal)[1] and determine their potential environmental mobility. For instance, metals bound in the carbonate fraction, or that are exchangeable, are much more likely to become mobile due to changes in groundwater conditions than metals bound within a sulfide or silicate fraction. The total concentration of a metal measured from all seven steps can be compared to the concentration determined from the total metal analysis for compositional accountability. The laboratory analyzed the metals content of the extracted samples using the method USEPA SW846 6020B "Inductively Coupled Plasma-Mass Spectrometry", Revision 2 (July 2014).

## 3.0 GROUNDWATER AND POREWATER CHARACTERIZATION

Groundwater quality data from background wells FGD-8 and FGD-11; monitoring wells FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, and FGD-12; nature and extent monitoring wells FGD-14, FGD-15, and FGD-16; and porewater samples FGD-A-2019-1 and FGD-B-2019-1 were used for this evaluation. The water quality monitoring data are presented in Appendices A and can be summarized as follows:

**General Chemistry Parameters**

- pH: The pH of groundwater samples collected from monitoring and nature and extent wells ranged from 6.5 to 6.9 across the site in May and June 2019. Historically, pH was lowest in June of 2018, at 5.6 in FGD-1 and the highest pH measured in groundwater was 7.1 in FGD-6 in February 2016. No geographical trend in pH was discernable in groundwater samples. The pH of porewater was approximately 6.5 in June 2019.
- ORP (Redox): Field-measured redox values in May and June 2019, corrected to Eh (+200mV), ranged from +144 to +181 mV in the groundwater samples in the CCR monitoring well network. The Eh of groundwater in the nature and extent monitoring wells ranged from +168 mV to +193 mV, indicating that redox conditions were similar to those in the CCR monitoring network wells. Redox measurements were not obtained for porewater.
- Total Dissolved Solids (TDS): Groundwater TDS concentrations were variable in May 2019 in the CCR monitoring and nature and extent well network. The lowest TDS concentrations (140 mg/L) occurred in groundwater at CCR monitoring well FGD-12. The highest measured TDS in groundwater (3970 mg/L) was observed in CCR monitoring well FGD-8. The TDS in groundwater of the nature and extent network ranged from 325 mg/L to 2,880 mg/L in wells FGD-16 and FGD-15, respectively. Geographically, the highest TDS observed in groundwater (in wells FGD-8 and FGD-15) is found on opposite sides of the FGD Pond area. The TDS of porewater is much higher than that of groundwater, ranging from 7,240 to 7,410 mg/L.

[1] Sequential extraction of metals from overburden samples consisted of seven discrete steps for this investigation:

Step 1 - Exchangeable Fraction: This extraction includes trace elements that are reversibly adsorbed to overburden minerals, amorphous solids, and/or organic material by electrostatic forces.

Step 2 - Carbonate Fraction: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals.

Step 3 – Non-Crystalline Materials Fraction: This extraction targets trace elements that are complexed by amorphous minerals (e.g., iron).

Step 4 - Metal Hydroxide Fraction: Trace elements bound to hydroxides of iron, manganese, and/or aluminum.

Step 5 - Organic Fraction: This extraction targets trace elements strongly bound via chemisorption to organic material.

Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.

Step 7 - Residual Fraction: Trace elements remaining in the overburden after the previous extractions will be distributed between silicates, phosphates, and refractory oxides.

- Major ion chemistry: A Piper plot was generated for groundwater samples to facilitate the identification of water types and source contributions (Figure 1a). Generally speaking, background, downgradient, and nature and extent wells plotted in a region of the trilinear plot separate from the FGD Pond water samples. Upon further investigation of three specific ions (sulfate, magnesium, and sodium) (Figure 1b), the difference between groundwater from CCR monitoring wells and nature and extent wells and FGD Pond water becomes more apparent. Based on the molar ratios of these ions, the composition of groundwater in all wells (downgradient, background and nature and extent) is very different from that of porewater.

- Iron: Oxidized iron (ferric iron - $Fe^{+3}$) concentrations were variable, ranging from non-detect (<0.05 mg/L) to 61 mg/L in May and June of 2019 (Appendix B). Reduced iron (ferrous iron - $Fe^{+2}$) was non-detect (<0.05 mg/L) in all groundwater samples except for FGD-6, where it was measured at 202 mg/L. In this well, the highest trivalent iron concentration of 61 mg/L was also observed. Ferrihydrite, an oxidized iron hydroxide mineral, would likely be present based on these data, and ferrihydrite attenuation of cobalt has been well studied (Smith 1999). Ferric and ferrous iron concentrations were both below detection limits in porewater samples.

- Nutrients: Nitrate (nitrate as N) was present in groundwater at monitoring and nature and extent wells at variable levels, ranging from non-detect (< 0.1 mg/L as N) to 1.54 mg/L as N at FGD-2 in May 2019 (Appendix B). Nitrate was the highest in porewater, ranging from 1.87 to 3.24 mg/L in ponds A and B, respectively. Phosphate concentrations in groundwater ranged from 0.049 to 0.714 mg/L in CCR monitoring and nature and extent wells. Phosphate was not detected (<0.03 mg/L) in porewater samples. No spatial trend was apparent in the nitrate or phosphate distribution in groundwater. However, the presence of nitrate in porewater confirms a likely oxic state of porewater (not measured).

**Constituents with SSL Notification:**

- Cobalt: Cobalt concentrations in groundwater samples from nature and extent wells or CCR monitoring network wells did not exceed the GWPS (0.016 mg/L) for cobalt in May and June 2019 (Figure 2a). The cobalt concentration in groundwater collected from the downgradient nature and extent monitoring well FGD-14 was non-detect (<0.003 mg/L) in May 2019. Cobalt in groundwater across the entire monitoring network was lowest in downgradient wells; the highest concentration was measured at 0.0132 mg/L in FGD-6 in May 2019. The highest cobalt in groundwater measured in May to June 2019 was in FGD-8, an upgradient background well, at 0.0146 mg/L, but still below the GWPS. The cobalt concentration in FGD-3, where previous exceedances of the GWPS occurred, was below the GWPS in the latest samples (Figure 2a). Cobalt was not detected in the porewater of FGD Pond A or B (Appendix A). Based on historical trends, cobalt concentrations at the FGD Pond area are stable or decreasing in all wells as of May 2019 (Figure 2a). Cobalt is likely present in groundwater as the divalent cation $Co^{+2}$ based on the pH and Eh of groundwater (Figure 3a).

- Lithium: Lithium concentrations in groundwater samples collected from the nature and extent and CCR monitoring well networks were all below the GWPS (0.149 mg/L) in May and June 2019 (Figure 2b). Lithium levels in nature and extent wells ranged from 0.0056 mg/L to 0.0768 mg/L in FGD-14 and FGD-15, respectively. The lithium concentration in groundwater from well FGD-14, which is the nature and extent well downgradient closest to the FGD Ponds, was just above detection limit of 0.005 mg/L at 0.0056 mg/L, and over an order of magnitude below the GWPS. The concentration in FGD-5, where historical GWPS occurrences occurred, was below the GWPS during the May 2019 sampling (Figure 2b). Lithium in

porewater ranged from 0.167 to 0.172 mg/L, only slightly above its GWPS (Appendix A). Based on historical trends, lithium in groundwater at the FGD Pond area appears to be stable or decreasing at all wells as of May 2019 (Figure 2b). Lithium is likely present in groundwater as the monovalent cation $Li^+$ based on the pH and Eh of groundwater (Figure 3b).

In summary, the groundwater data at the FGD Pond area show that concentrations of metals of interest in groundwater are decreasing or stable. The absence of cobalt in porewater of the FGD Ponds demonstrates that the ponds are not a likely source of cobalt to groundwater. As indicated by major ion compositions (Figures 1a and b), porewater from the FGD Ponds is substantially different than downgradient groundwater, suggesting an absence of direct interaction between porewater and groundwater.

## 3.1 Geochemical Modeling Results

The results of speciation modeling of groundwater at background, downgradient, nature and extent wells, and porewater are provided in Table 3. Mineral saturation plays an important role in attenuation of metals, either directly by their removal through mineral precipitation, or indirectly by providing a sorptive surface. The results can be summarized as follows:

- Iron-bearing minerals: Ferrihydrite [$Fe(OH)_3$] was simulated to be at equilibrium or oversaturated in all groundwater samples, indicating a strong potential for ongoing precipitation of solid phase iron oxides. Thus, throughout the FGD Ponds area, the prevalence of iron oxides is assumed.
- Other minerals: In all groundwater samples where barium was measured, groundwater was in equilibrium with barite [$BaSO_4$]. Calcite [$CaCO_3$] was in equilibrium was groundwater at wells FGD-3, FGD-8, and FGD-11. The formation of barite and calcite can help control dissolved metal concentrations by providing both a sorptive surface for metal attenuation and through co-precipitation of COIs (Smith 1999; Zhang et al. 2014).

In summary, barite, calcite, and ferrihydrite contribute to controlling groundwater composition at some or all of the monitoring wells. Particularly in the case of ferrihydrite, the dissolved concentrations of certain COIs can be reduced through the ability of these minerals to act as a substrate for adsorption in addition to precipitation/co-precipitation.

# 4.0 COMPOSITIONAL ANALYSIS OF OVERBURDEN

## 4.1 Mineralogical Composition

Quantitative X-ray diffraction (XRD) with Rietveld refinement was used to identify and quantify minerals in three overburden samples collected during the drilling activities - one sample from each of the soil borings completed in June 2019 (FGD-15, FGD-16, and FGD-2019-1). These samples were obtained to better understand the mineralogical composition of the aquifer system and identify any minerals that would potentially influence attenuation of constituents of interest. In contrast, the presence of certain minerals could also indicate a potential for naturally-occurring release of metals into groundwater, for instance due to oxidation of sulfide minerals.

The mineralogical analysis identified the materials in boreholes samples at the FGD Ponds predominately consist of quartz with varying amounts of the silicate minerals K-feldspar, plagioclase, and muscovite. A trace amount of magnesite [$MgCO_3$] was encountered in one sample. Analytical reports for the XRD samples are provided in Appendix B.

### 4.1.1 Chemical Composition and Sequential Extraction

Chemical analysis and sequential extractions were used to determine the chemical composition of the overburden and the distribution of constituents of interest over various operationally-defined fractions comprising the overburden. This testing was completed per Table 1 on overburden from three borehole locations, (reported in Table 4).

A description of the individual fractions determined by sequential extraction is presented in Footnote 1, Section 2.2.2. Metals extracted in steps 1 through 5 are considered environmentally available, whereas metals extracted in steps 6 and 7 are present in refractory fractions and are not expected to be released under conditions typically encountered in aquifers (Tessier et al. 1979). Total metal quantities from the sequential extraction are expressed as "SEP Total" in Table 4. The sum of the sequential extraction steps is also presented for comparison but does not represent an analytically-determined value.

The results from the chemical analysis and sequential extraction can be summarized as follows:

**General Soil Parameters**

- Aluminum: Aluminum is not a constituent of interest (COI) at the site but it has been well studied as a sorbing medium in soils (e.g., Karamalidis and Dzombak 2011). Total aluminum in soils ranged from 29,890 mg/kg to 41,270 mg/kg, and the environmentally-available fraction ranged from just 690 mg/kg (FGD-15) to 1,927 mg/kg (FGD-2019-1; Figure 4). Aluminum in the soil at the site is, therefore, largely (~88% to 94%) present in the residual, or silicate-bound fraction. This fraction is likely at least partially represented by hydrous aluminum phyllosilicates minerals or clays intermixed in the silica sand matrix. Clays can represent an important sorptive reservoir for numerous trace metals and metalloids (Uddin 2017).
- Iron: While not a COI, iron and its minerals commonly represent one of most abundant reservoirs for metal/metalloid attenuation in soils (Dzombak and Morel 1990; Smith 1999). Iron was present in all three core samples analyzed, varying from 5,458 mg/kg (FGD-15) to 8,961 mg/kg (FGD-2019-1). In all samples, the sulfide and residual fractions accounted for the largest proportion of total iron (61% to 73%) and, as such, most of the iron is not environmentally available (Figure 5). However, the remainder of the iron in the samples is largely present in the metal hydroxide phase. This fraction, part of the labile component in steps 1 through 5, can generally be considered representative of the amount of iron in soil that may be available as a sorbing medium and can, therefore, along with aluminum be used as a proxy to determine the potential for attenuation of cobalt and lithium.

**Constituents Identified with an SSL Notification**

- Cobalt: Total cobalt in soil ranged from 1.8 mg/kg to 69.9 mg/kg while the environmentally-available fraction ranged from 1.0 mg/kg in FGD-15 to 67.6 mg/kg in FGD-2019-1, representing from 58% to 97% of total cobalt (Figure 6). Cobalt in FGD-2019-1 was well above the level that would be considered naturally occurring in typical soils and rock (Hem 1985), with almost all cobalt associated with the metal hydroxide and amorphous metal fractions. Although cobalt was present in the soil of FGD-2019-1 at higher level compared to other soils samples, cobalt concentrations in groundwater from FGD-3 and FGD-14, the closest wells next to and downgradient of FGD-2019-1, respectively, were non-detect, or just above the detection limit of 0.005 mg/L. Also, cobalt was not detected in the porewater of FGD Pond A or B.

- Lithium: Total lithium in soil ranged from 8.74 mg/kg to 19.9 mg/kg, of which between 76% and 97% of the lithium occurred in the non-environmentally-available fraction (Figure 7). All lithium that was environmentally available (0.27 mg/kg to 4.7 mg/kg) was present in the amorphous metal and metal hydroxide fractions. This indicates the high likelihood of the presence of naturally-occurring lithium contained within the non-environmentally available fractions and potential attenuation of lithium by amorphous and metal hydroxide minerals at the site.

Based on the above results, attenuation of both COIs is likely occurring in various soil fractions. The most pronounced attenuation is associated with amorphous metals and metal hydroxides. Clays also present a viable attenuation fraction in the soil matrix.

## 5.0 ATTENUATION EVALUATION

The potential for natural attenuation of cobalt and lithium was evaluated at a screening level, in accordance with recommended practices and guidance promulgated by the US EPA and the ITRC (EPA 2007a; EPA 2007b; ITRC 2010). According to EPA (2007a), the purpose of the evaluation conducted during this screening phase is to "Demonstrate that the groundwater plume is not expanding and that sorption of the contaminant onto aquifer solids is occurring where immobilization is the predominant attenuation process." Based on this definition, the following observations support MNA as a viable corrective measure for the OGSES FGD Pond area:

- **Plume Stability:** Based on the water quality monitoring data presented in this assessment, groundwater concentrations of cobalt and lithium in groundwater at the FGD Pond area appear to be stable or decreasing at all wells. Cobalt is unlikely to originate from the FGD Ponds due to its absence in FGD porewater. It is also possible that lithium in groundwater does not originate just from the FGD Ponds given the high relative of lithium in soils/overburden in a non-environmentally available, likely naturally-occurring phase. These observations indicate that the distribution of cobalt and lithium, in the aquifer is stable and in the case of cobalt cannot be linked to the FGD Ponds.

- **Magnitude of Exceedances**: Occasional exceedances and the trend at some wells of cobalt and lithium in groundwater do not amount to levels that would be considered an SSL per the CCR Rule (Golder 2019). Levels of both cobalt and lithium in groundwater were both below their respective GWPS as of May 2019. Cobalt and lithium have only ever exceeded the GWPS in two monitoring wells, FGD-3 and FGD-5. Since February 2016, cobalt in groundwater has only exceeded the GWPS in monitoring well FGD-3, and lithium in groundwater has only exceeded the GWPS in FGD-5. I the case of cobalt, as of the most recent sampling (May 2019), the highest concentration was measured in FGD-8, a background well.

- **FGD Pond Porewater:** Historical records are not available for ash additions or porewater concentrations over the lifespan of the CCR units. However, based on recent porewater data, cobalt has not been measured in the FGD Ponds above detection limits. This indicates that the FGD Ponds are not likely to be a current source of cobalt.

- **Groundwater Chemistry:** The groundwater monitoring results, and the findings of the geochemical modeling support the potential for natural attenuation of cobalt and lithium. The major relative ion abundance of porewater compared to that of groundwater at monitoring wells indicated distinctly different composition and thus potentially no direct connection between groundwater and porewater I the FGD Ponds exists. Equilibrium of groundwater with the mineral phase ferrihydrite was indicated in all groundwater

samples. Modeling results are consistent with the results from the sequential extraction analysis, which indicated amorphous and metal hydroxide fractions sequester cobalt and lithium.

- **Confirmation of Attenuation/Immobilization:** Based on both mineralogical and chemical analysis, it is evident that attenuation that cobalt and lithium is occurring. Iron, capable of forming (hydr)oxide or amorphous phases that facilitate metals attenuation (Dzombak and Morel 1990), was identified in all overburden samples. The presence of metal hydroxides in soils also supports a strong potential for cobalt and lithium attenuation (Smith 1999), which was confirmed by the sequential extraction results. In addition, lithium in groundwater is limited in extent, and is potentially being attenuated by amorphous metals, metal hydroxides or in clays (Smith 1999), as confirmed by sequential extraction testing of soil samples. The ubiquitous presence of aluminum, both identified mineralogically in the form of clay minerals and through SEP in the silicate fraction, likely also as a hydrous aluminum phyllosilicate (clay), provides an additional well-studied attenuation reservoir (Karamalidis and Dzombak 2011; Prodromou 2016; Uddin 2017). Thus, soil samples from the FGD Pond area demonstrated a significant proportion of COIs attenuated in various phases, confirming their sequestration is occurring at the OGSES.

Based on these findings, cobalt and lithium appear to be candidates for an MNA remedy application and meet the criteria for Tier I MNA in accordance with USEPA guidance (USEPA 2007a and 2007b). Based on the results of this analysis, the feasibility of MNA at the FGD Pond area can be further evaluated with a Tier II MNA evaluation if SSLs of cobalt or lithium in groundwater are identified in the future.

## 6.0 CONCLUSION

The above serves as the Tier I evaluation of MNA feasibility at the OGSES Site for cobalt and lithium with respect to the FGD Pond Area. This document and evaluation have been completed in accordance with guidance and best practices promulgated by the USEPA (USEPA 2007a and 2007b) and the ITRC (ITRC 2010). Based on the findings of this evaluation, the FGD Pond area at the OGSES is a viable candidate for MNA as a corrective measure.

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# Signature Page

**Golder Associates Inc.**

PJ Nolan, Ph.D.
*Project Geochemist*

Patrick Behling, P.E.
*Principal Engineer*

# Tables

**Table 1: Overview of the wells used in the MNA assessment.** 19122434

| Background Wells | Monitoring Wells | Nature and Extent Wells | Porewater Samples |
|---|---|---|---|
| FGD-8, FGD-11 | FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, FGD-12 | FGD-14, FGD-15, FGD-16 | FGD-A-2019-1, FGD-B-2019-1 |

**Table 2: Summary of overburden samples collected** 19122434

| Sample Location | Core Description |
|---|---|
| Assessment boring FGD-15 (25'-27') | Silty sand (SM), fine to very fine, grayish purple with some iron staining, wet, trace clay, unconsolidated |
| Assessment boring FGD-16 (30'-32') | Sand (SP), red to purple gray, well sorted, wet, unconsolidated |
| Assessment boring FGD-2019-1 (23'-25') | Sand (SW), light tan, wet, unconsolidated |

**Table 3: Groundwater Geochemical Modeling Results**



| Parameter | Units | FGD-1 | FGD-2 | FGD-3 | FGD-4 | FGD-5 | FGD-6 | FGD-8 | FGD-11 | FGD-12 | FGD-15 | FGD-16 | FGD-A-2019-1 | FGD-B-2019-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MINERAL PHASES - Saturation Indices** | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -3.54 | -3.01 | -2.61 | -3.15 | -3.27 | -2.74 | -3.37 | -3.01 | -3.67 | | | -4.41 | -3.44 |
| Ferrihydrite | $Fe(OH)_3$ | 2.41 | 2.26 | 2.31 | 2.08 | 1.66 | 4.03 | 4.90 | 3.44 | 2.69 | 1.69 | 1.89 | 1.77 | 0.64 |
| Siderite | $FeCO_3$ | -2.77 | -2.15 | -1.86 | -2.32 | -2.41 | -1.93 | 1.33 | -2.05 | -2.92 | -2.71 | -2.18 | -3.54 | -3.52 |
| Melanterite | $FeSO_4$ $7H_2O$ | -7.28 | -7.49 | -7.22 | -7.69 | -7.60 | -7.59 | -4.21 | -7.80 | -7.83 | -6.84 | -7.98 | -6.86 | -6.87 |
| Anglesite | $PbSO_4$ | -4.80 | -5.29 | -5.30 | -5.48 | -5.38 | -5.55 | -4.83 | -5.41 | -5.29 | | | -3.23 | -3.24 |
| Gypsum | $CaSO_4$:$2H_2O$ | -2.15 | -2.05 | -1.59 | -2.23 | -1.86 | -2.43 | -1.32 | -1.99 | -3.17 | -0.55 | -2.95 | -0.13 | -0.17 |
| Jarosite-H | $(H_3O)Fe_3(SO_4)_2(OH)_6$ | -4.17 | -5.82 | -4.41 | -5.63 | -6.19 | -0.66 | 2.95 | -2.59 | -4.18 | -4.75 | -7.62 | -3.66 | -6.90 |
| Jarosite-K | $KFe_3(SO_4)_2(OH)_6$ | 0.99 | -0.37 | 0.89 | -0.66 | -1.01 | 4.22 | 9.04 | 2.99 | 0.73 | 0.85 | -2.13 | 2.85 | -0.40 |
| Jarosite-Na | $NaFe_3(SO_4)_2(OH)_6$ | -1.04 | -1.87 | -0.46 | -2.06 | -2.86 | 3.33 | 7.26 | 1.50 | -1.55 | -0.61 | -4.12 | -0.01 | -3.26 |
| Calcite | $CaCO_3$ | -1.76 | -0.84 | -0.35 | -0.97 | -0.79 | -0.90 | 0.10 | -0.38 | -2.39 | -0.51 | -1.25 | -0.97 | -0.97 |
| Magnesite | $MgCO_3$ | -2.76 | -1.96 | -1.34 | -2.08 | -1.74 | -2.14 | -0.84 | -1.59 | -3.51 | -1.63 | -2.68 | -1.51 | -1.48 |
| Barite | $BaSO_4$ | 0.15 | 0.25 | 0.27 | 0.11 | 0.11 | 0.18 | 1.02 | 0.50 | -0.45 | | | 1.11 | 1.12 |
| Witherite | $BaCO_3$ | -4.76 | -3.83 | -3.78 | -3.93 | -4.12 | -3.57 | -2.86 | -3.18 | -4.96 | | | -5.01 | -4.96 |
| Fluorite | $CaF_2$ | -2.53 | -2.29 | -1.62 | -2.38 | -1.73 | -2.05 | -3.09 | -2.06 | -3.97 | -1.43 | -3.24 | 1.05 | 1.06 |
| CoCO3 | $CoCO_3$ | -4.28 | -3.70 | -3.23 | -3.88 | -3.98 | -2.86 | -3.17 | -3.62 | -4.43 | | | -5.05 | -5.02 |
| Cerrusite | $PbCO_3$ | -2.91 | -2.59 | -2.56 | -2.73 | -2.81 | -2.52 | -1.92 | -2.30 | -3.01 | | | -2.59 | -2.56 |
| Carbon Dioxide | pCO2(g) [(b)] | -1.84 | -1.62 | -0.97 | -1.22 | -1.05 | -1.38 | -1.00 | -1.39 | -1.87 | -1.38 | -1.47 | -1.87 | -1.75 |

**Notes:**

[(a)] Saturation indices between -0.5 and 0.5 identified

[(b)] pCO2(g) values presented at $10^{\wedge value}$ atm

**Table 4. Sequential Extraction and Total Metals From Overburden** 19122434

| Sample Location<br>Sample Depth (feet bgs)<br>Sample Date | | FGD-16<br>30'-32'<br>5/23/2019 | FGD-15<br>25'-27'<br>5/22/2019 | FGD-2019-1<br>23'-25'<br>5/23/2019 |
|---|---|---|---|---|
| **Analyte** | **SEP Step** | **mg/kg** | **mg/kg** | **mg/kg** |
| Aluminum | SEP Step 1 | <51 U | <52 U | <52 U |
| Aluminum | SEP Step 2 | <38 * U | <39 * U | <39 * U |
| Aluminum | SEP Step 3 | 40 | 23 | 62 |
| Aluminum | SEP Step 4 | 990 | 600 | 1800 |
| Aluminum | SEP Step 5 | 90 J * | 67 J * | 65 J * |
| Aluminum | SEP Step 6 | 1600 | 1200 | 2600 |
| Aluminum | SEP Step 7 | 39000 | 28000 | 33000 |
| Aluminum | SEP Sum of Steps 1-7 | 42000 | 30000 | 38000 |
| Aluminum | Total/NA | 44000 | 46000 | 43000 |
| Antimony | SEP Step 1 | <15 U | <16 U | <16 U |
| Antimony | SEP Step 2 | <11 U | <12 U | <12 U |
| Antimony | SEP Step 3 | <3.8 U | <3.9 U | <3.9 U |
| Antimony | SEP Step 4 | <3.8 U | <3.9 U | <3.9 U |
| Antimony | SEP Step 5 | <57 U | <59 U | <58 U |
| Antimony | SEP Step 6 | <3.8 U | <3.9 U | <3.9 U |
| Antimony | SEP Step 7 | <3.8 U | <3.9 U | <3.9 U |
| Antimony | SEP Sum of Steps 1-7 | <3.0 U | <3.0 U | <3.0 U |
| Antimony | Total/NA | <3.8 U | <3.9 U | <3.9 U |
| Arsenic | SEP Step 1 | <2.5 U | <2.6 U | <2.6 U |
| Arsenic | SEP Step 2 | <1.9 U | <2.0 U | <1.9 U |
| Arsenic | SEP Step 3 | 0.28 J | <0.65 U | 0.3 J |
| Arsenic | SEP Step 4 | 1.1 B | 0.64 J B | 1.9 B |
| Arsenic | SEP Step 5 | <9.5 U | <9.8 U | <9.7 U |
| Arsenic | SEP Step 6 | 0.69 | 0.62 J | 1.6 |
| Arsenic | SEP Step 7 | 0.47 J | 0.9 J | 1.2 |
| Arsenic | SEP Sum of Steps 1-7 | 2.5 | 2.2 | 5 |
| Arsenic | Total/NA | 2.5 | 1.6 | 7.6 |
| Barium | SEP Step 1 | 0.67 J | <13 U | 0.86 J |
| Barium | SEP Step 2 | 0.55 J * | <9.8 * U | 1.9 J * |
| Barium | SEP Step 3 | 6.4 B | 1.4 J B | 4 B |
| Barium | SEP Step 4 | 12 | 9.6 | 14 |
| Barium | SEP Step 5 | <47 * U | <49 * U | 27 J * |
| Barium | SEP Step 6 | 4.2 | 6 | 35 |
| Barium | SEP Step 7 | 520 | 510 | 410 |
| Barium | SEP Sum of Steps 1-7 | 540 | 530 | 490 |
| Barium | Total/NA | 760 | 670 | 730 |
| Beryllium | SEP Step 1 | <1.3 U | <1.3 U | <1.3 U |
| Beryllium | SEP Step 2 | <0.95 * U | <0.98 * U | <0.97 * U |
| Beryllium | SEP Step 3 | 0.036 J | 0.02 J | 0.1 J |
| Beryllium | SEP Step 4 | 0.18 J | 0.12 J | 0.25 J |
| Beryllium | SEP Step 5 | <4.7 * U | <4.9 * U | <4.9 * U |
| Beryllium | SEP Step 6 | 0.056 J | 0.053 J | 0.074 J |
| Beryllium | SEP Step 7 | 0.59 | 0.48 | 0.39 |
| Beryllium | SEP Sum of Steps 1-7 | 0.86 | 0.67 | 0.81 |
| Beryllium | Total/NA | 0.85 | 0.71 | 0.76 |
| Boron | Total/NA | <24 U | <24 U | <24 U |
| Chromium | Total/NA | 3.3 | 4.2 | 4.8 |

**Table 4. Sequential Extraction and Total Metals From Overburden** 19122434

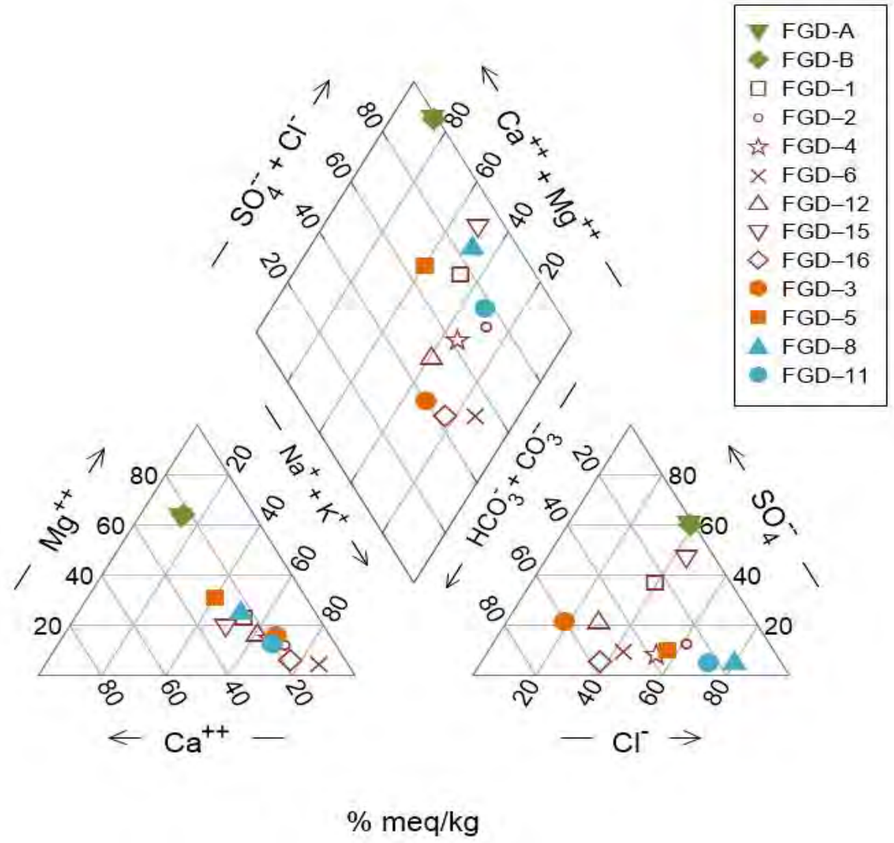
| Sample Location<br>Sample Depth (feet bgs)<br>Sample Date | | FGD-16<br>30'-32'<br>5/23/2019 | FGD-15<br>25'-27'<br>5/22/2019 | FGD-2019-1<br>23'-25'<br>5/23/2019 |
|---|---|---|---|---|
| **Analyte** | **SEP Step** | **mg/kg** | **mg/kg** | **mg/kg** |
| Cobalt | SEP Step 1 | <13 U | <13 U | <13 U |
| Cobalt | SEP Step 2 | <9.5 U | <9.8 U | <9.7 U |
| Cobalt | SEP Step 3 | 0.63 J | 0.63 J | 29 |
| Cobalt | SEP Step 4 | 0.63 J | 0.41 J | 36 |
| Cobalt | SEP Step 5 | <47 * U | <49 * U | 2.6 J * |
| Cobalt | SEP Step 6 | 0.32 J | 0.27 J | 1.6 J |
| Cobalt | SEP Step 7 | 0.62 J | 0.48 J | 0.7 J |
| Cobalt | SEP Sum of Steps 1-7 | 2.2 J | 1.8 J | 69 |
| Cobalt | Total/NA | 1.7 J | 1.8 J | 6.9 |
| Iron | SEP Step 1 | <25 U | <26 U | <26 U |
| Iron | SEP Step 2 | <19 * U | <20 * U | <19 * U |
| Iron | SEP Step 3 | 31 | 58 | 61 |
| Iron | SEP Step 4 | 2100 | 1400 | 3400 |
| Iron | SEP Step 5 | <95 * U | <98 * U | <97 * U |
| Iron | SEP Step 6 | 1300 | 1100 | 1100 |
| Iron | SEP Step 7 | 3100 | 2900 | 4400 |
| Iron | SEP Sum of Steps 1-7 | 6600 | 5400 | 9100 |
| Iron | Total/NA | 5900 | 5700 | 8400 |
| Lead | Total/NA | 3.4 | 3.2 | 6 |
| Lithium | SEP Step 1 | <13 U | <13 U | <13 U |
| Lithium | SEP Step 2 | <9.5 U | <9.8 U | <9.7 U |
| Lithium | SEP Step 3 | <3.2 U | <3.3 U | 0.8 J |
| Lithium | SEP Step 4 | 0.27 J | 0.93 J | 3.9 |
| Lithium | SEP Step 5 | <47 U | <49 U | <49 U |
| Lithium | SEP Step 6 | 0.57 J | 0.93 J | 1.2 J |
| Lithium | SEP Step 7 | 7.9 | 7 | 14 |
| Lithium | SEP Sum of Steps 1-7 | 8.7 | 8.9 | 20 |
| Lithium | Total/NA | 7.6 | 10 | 14 |
| Manganese | SEP Step 1 | 0.2 J | 0.47 J | 0.99 J |
| Manganese | SEP Step 2 | <2.8 U | 1.4 J | <2.9 U |
| Manganese | SEP Step 3 | 4.4 B | 14 B | 110 B |
| Manganese | SEP Step 4 | 4.8 | 6.9 | 98 |
| Manganese | SEP Step 5 | <14 * U | <15 * U | <15 * U |
| Manganese | SEP Step 6 | 6.4 | 10 | 10 |
| Manganese | SEP Step 7 | 18 B | 54 B | 19 B |
| Manganese | SEP Sum of Steps 1-7 | 34 | 88 | 230 |
| Manganese | Total/NA | 34 | 93 | 61 |
| Molybdenum | SEP Step 1 | <10 U | <10 U | <10 U |
| Molybdenum | SEP Step 2 | <7.6 U | <7.8 U | <7.8 U |
| Molybdenum | SEP Step 3 | <2.5 U | <2.6 U | <2.6 U |
| Molybdenum | SEP Step 4 | <2.5 U | <2.6 U | 0.18 J |
| Molybdenum | SEP Step 5 | <38 U | <39 U | <39 U |
| Molybdenum | SEP Step 6 | <2.5 U | <2.6 U | 0.21 J |
| Molybdenum | SEP Step 7 | <2.5 U | 0.11 J | 0.8 J |
| Molybdenum | SEP Sum of Steps 1-7 | <2.0 U | 0.11 J | 1.2 J |

**Table 4. Sequential Extraction and Total Metals From Overburden** 19122434

| Sample Location<br>Sample Depth (feet bgs)<br>Sample Date | | FGD-16<br>30'-32'<br>5/23/2019 | FGD-15<br>25'-27'<br>5/22/2019 | FGD-2019-1<br>23'-25'<br>5/23/2019 |
|---|---|---|---|---|
| **Analyte** | **SEP Step** | **mg/kg** | **mg/kg** | **mg/kg** |
| Molybdenum | Total/NA | 0.16 J | 0.21 J | 1.1 J |
| Selenium | SEP Step 1 | <2.5 U | <2.6 U | <2.6 U |
| Selenium | SEP Step 2 | <1.9 U | <2.0 U | 0.88 J B |
| Selenium | SEP Step 3 | <0.63 U | <0.65 U | <0.65 U |
| Selenium | SEP Step 4 | <0.63 * U | 0.65 * B | <0.65 * U |
| Selenium | SEP Step 5 | <9.5 U | <9.8 U | <9.7 U |
| Selenium | SEP Step 6 | <0.63 U | <0.65 U | <0.65 U |
| Selenium | SEP Step 7 | <1.3 U | <1.3 U | <0.65 U |
| Selenium | SEP Sum of Steps 1-7 | <0.50 U | 0.65 | 0.88 |
| Selenium | Total/NA | <1.3 U | <0.65 U | <0.65 U |
| Thallium | SEP Step 1 | <8.8 U | <9.1 U | <9.1 U |
| Thallium | SEP Step 2 | <6.6 U | <6.9 U | <6.8 U |
| Thallium | SEP Step 3 | <2.2 U | <2.3 U | <2.3 U |
| Thallium | SEP Step 4 | <2.2 U | <2.3 U | <2.3 U |
| Thallium | SEP Step 5 | <33 * U | <34 * U | <34 * U |
| Thallium | SEP Step 6 | <2.2 U | <2.3 U | <2.3 U |
| Thallium | SEP Step 7 | 0.95 J | 0.59 J | <4.5 U |
| Thallium | SEP Sum of Steps 1-7 | 0.95 J | 0.59 J | <1.8 U |
| Thallium | Total/NA | 0.68 J | <4.6 U | 0.85 J |

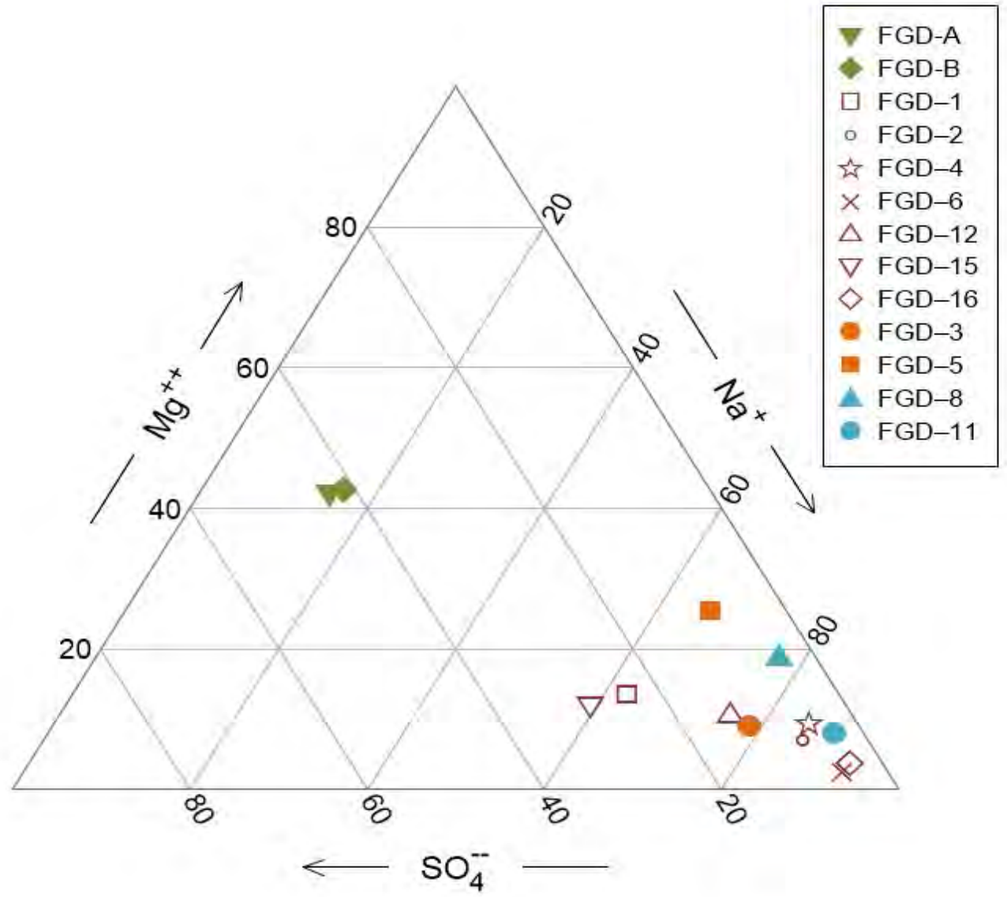
# Figures

(a)




% meq/kg

(b)




% mol/l

CLIENT
LUMINANT
OAK GROVE SES
FGD PONDS

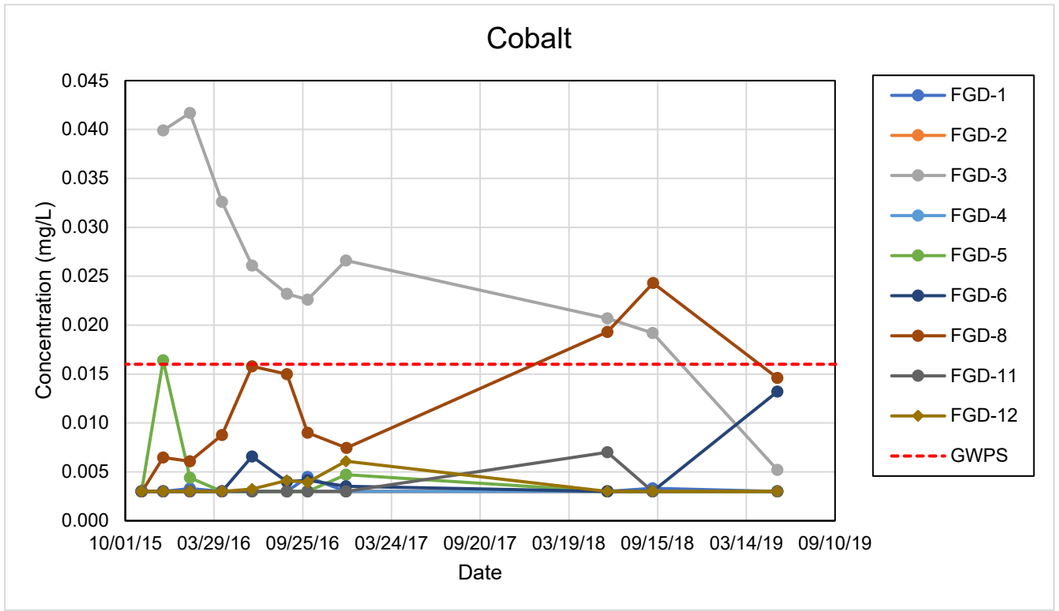
CONSULTANT
GOLDER

PROJECT
MONITORED NATURAL ATTENUATION EVALUATION
GEOCHEMICAL ASSESSMENT

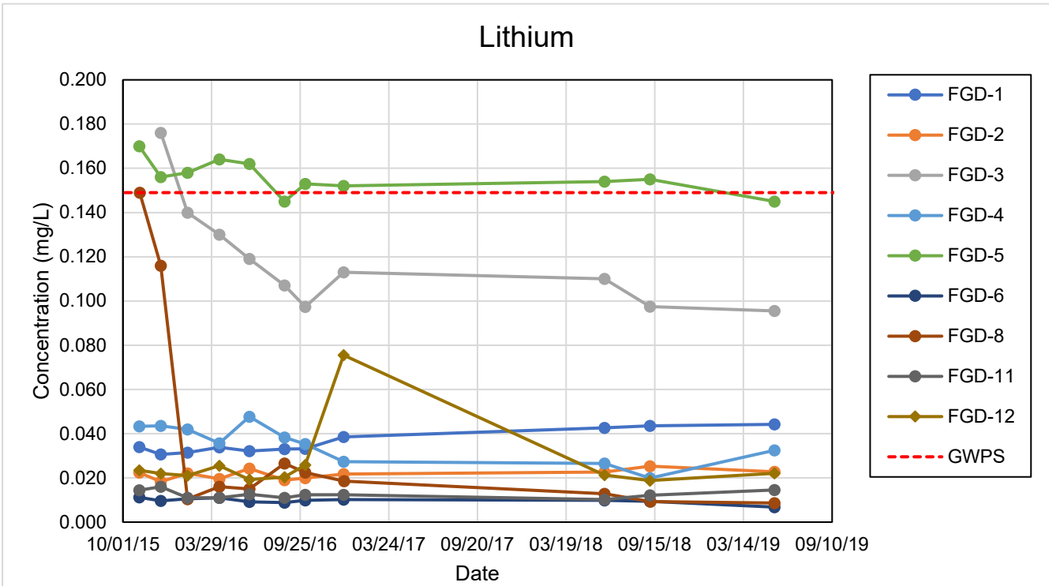
TITLE
GENEREAL GROUNDWATER RELATIVE ION ABUNDANCE (A)
AND SELECT ION RATIOS (B) IN GROUNDWATER

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19122434 | E | 1 | 1a-b |

**(a)**




**(b)**




CLIENT
LUMINANT
OAK GROVE SES
FGD PONDS

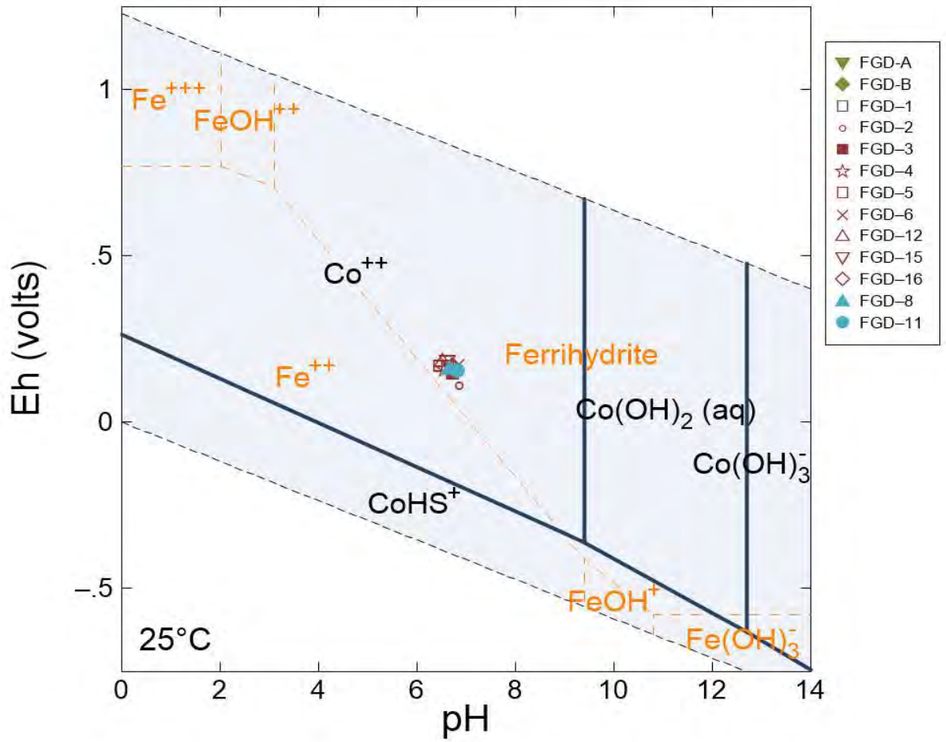
CONSULTANT
GOLDER

PROJECT
MONITORED NATURAL ATTENUATION EVALUATION
GEOCHEMICAL ASSESSMENT

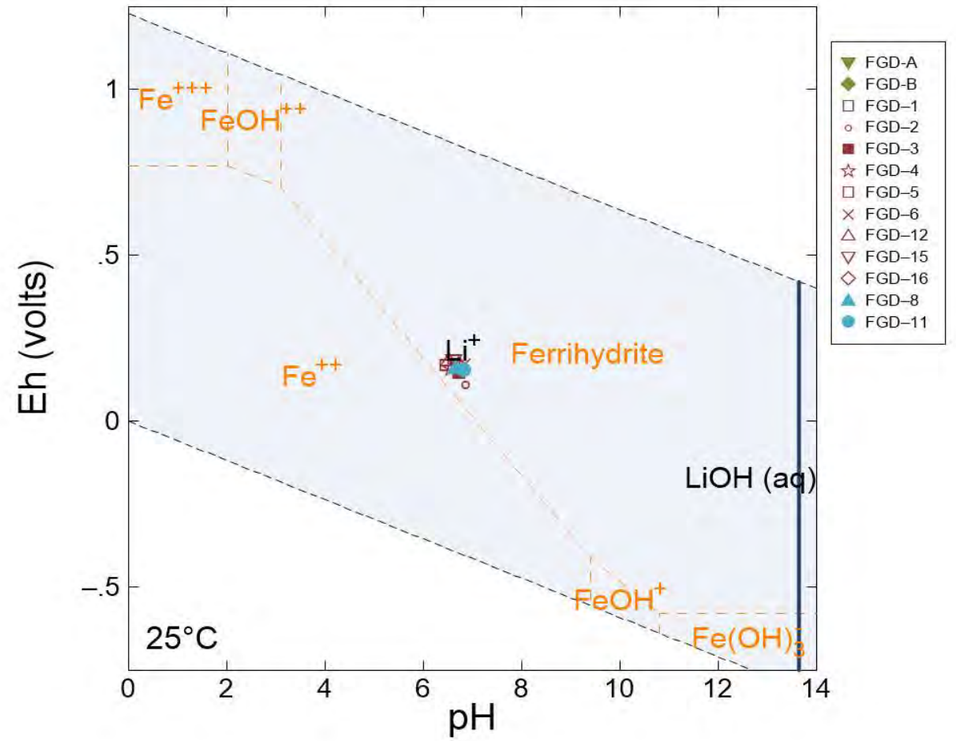
TITLE
HISTORICAL TRENDS OF COBALT (A)
AND LITHIUM (B) IN MONITORING WELLS

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19122434 | E | 1 | 2a-b |

(a




(b)



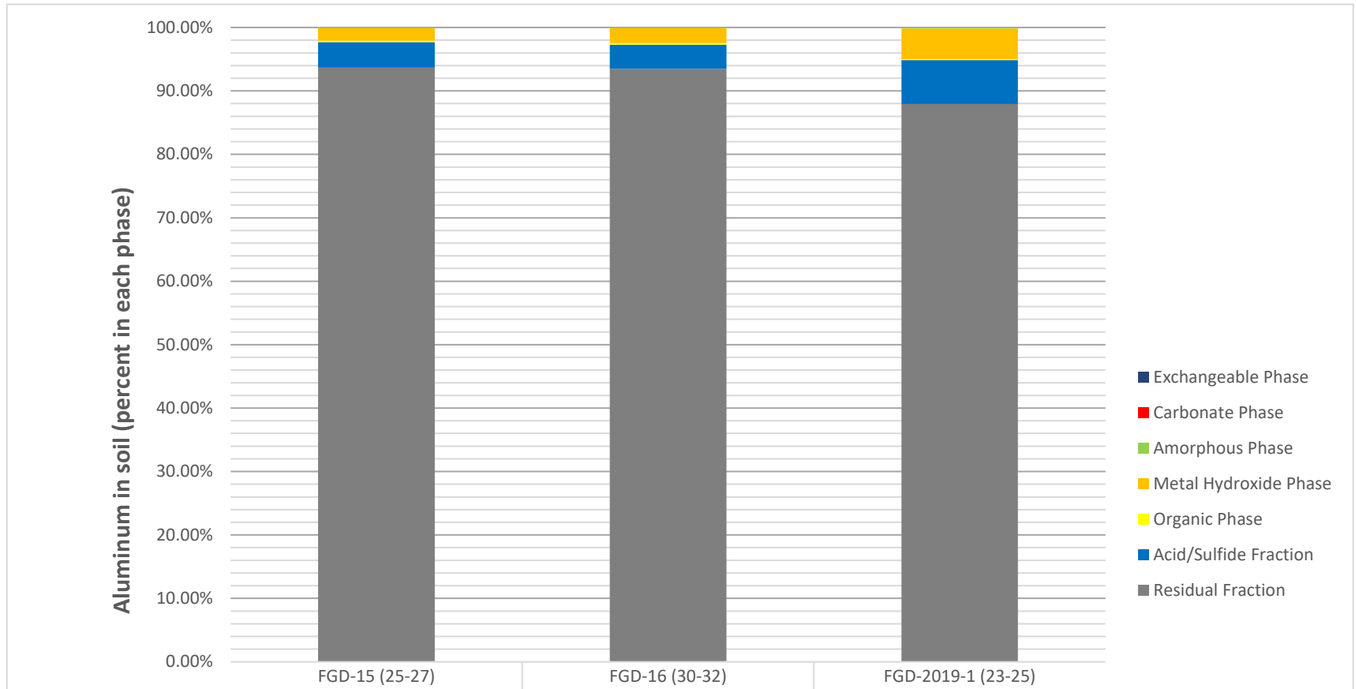

CLIENT
LUMINANT
OAK GROVE SES
FGD PONDS

CONSULTANT
GOLDER

PROJECT
MONITORED NATURAL ATTENUATION EVALUATION
GEOCHEMICAL ASSESSMENT

TITLE
HISTORICAL TRENDS OF COBALT (A)
AND LITHIUM (B) IN MONITORING WELLS

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19122434 | E | 1 | 3a-b |




| | FGD-15 (25-27) | FGD-16 (30-32) | FGD-2019-1 (23-25) |
|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 0.08% | 0.10% | 0.17% |
| Metal Hydroxide Phase | 2.01% | 2.37% | 4.80% |
| Organic Phase | 0.22% | 0.22% | 0.17% |
| Acid/Sulfide Fraction | 4.01% | 3.84% | 6.93% |
| Residual Fraction | 93.68% | 93.48% | 87.94% |

**Borehole and depth below ground surface (Aluminum in perecent of total)**

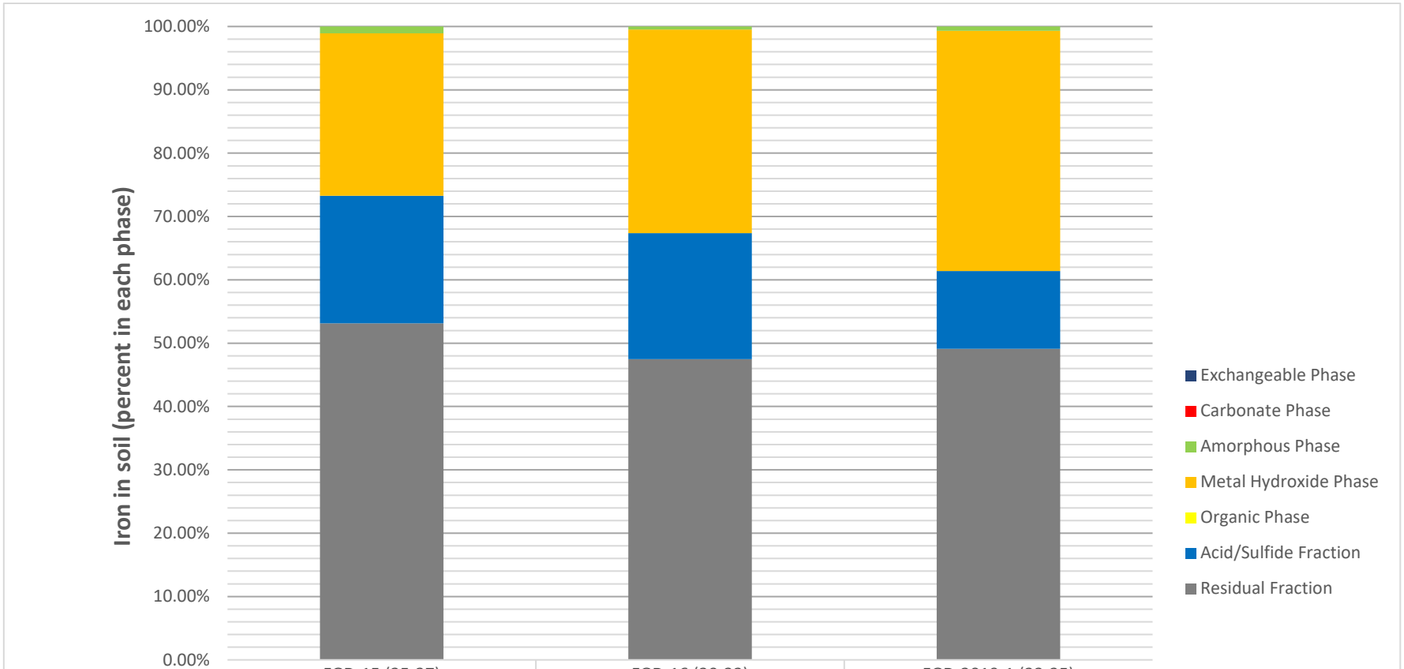
CLIENT
LUMINANT
OAK GROVE SES
FGD PONDS

CONSULTANT
GOLDER

PROJECT
MONITORED NATURAL ATTENUATION EVALUATION
GEOCHEMICAL ASSESSMENT

TITLE
**SEQUENTIAL EXTRACTION**

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19122434 | E | 1 | 4 |




| | FGD-15 (25-27) | FGD-16 (30-32) | FGD-2019-1 (23-25) |
|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 1.06% | 0.47% | 0.68% |
| Metal Hydroxide Phase | 25.65% | 32.15% | 37.94% |
| Organic Phase | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 20.15% | 19.91% | 12.28% |
| Residual Fraction | 53.13% | 47.47% | 49.10% |

**Borehole and depth below ground surface (Iron in perecent of total)**

CLIENT
LUMINANT
OAK GROVE SES
FGD PONDS

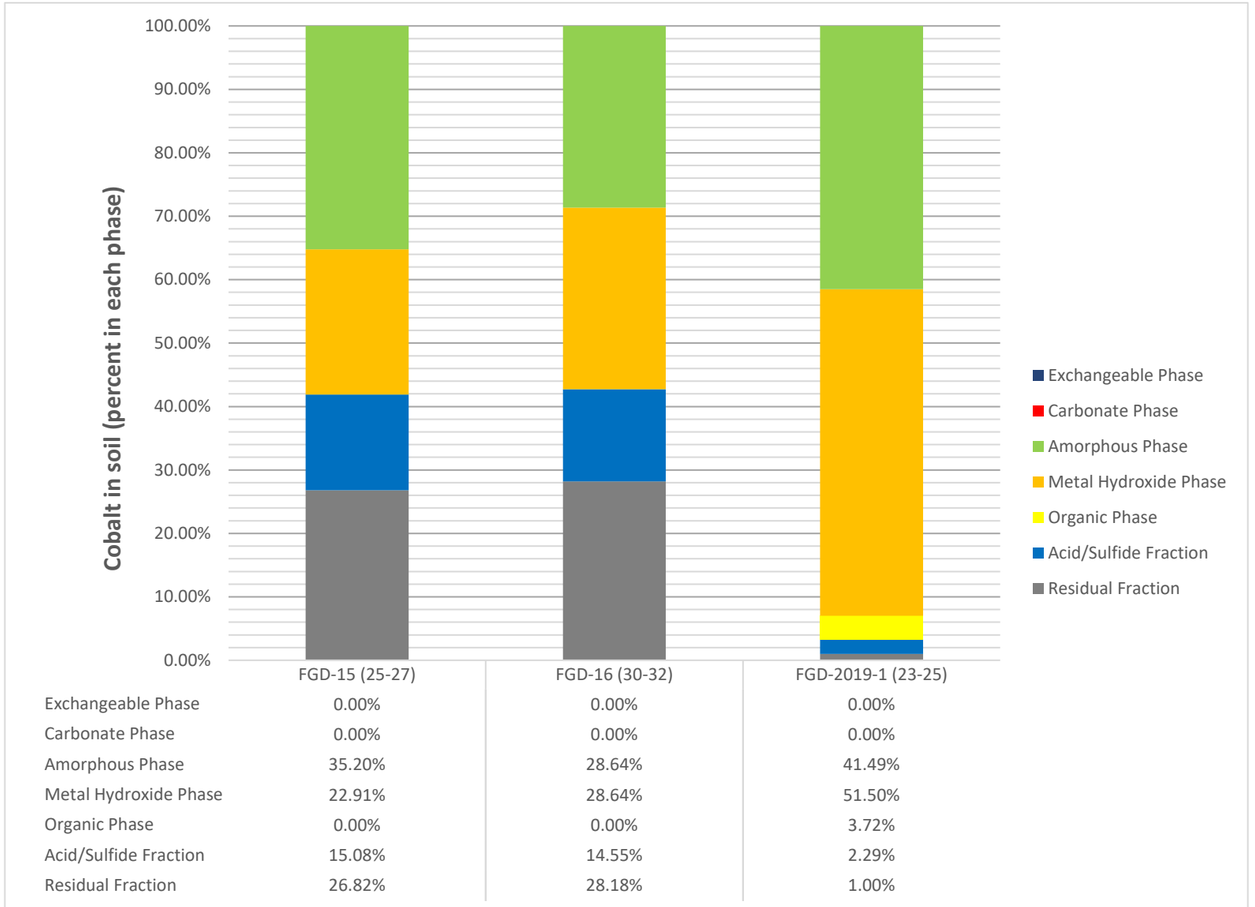
CONSULTANT
GOLDER

PROJECT
MONITORED NATURAL ATTENUATION EVALUATION
GEOCHEMICAL ASSESSMENT

TITLE
**SEQUENTIAL EXTRACTION**

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19122434 | E | 1 | 5 |

1 in
0




| | FGD-15 (25-27) | FGD-16 (30-32) | FGD-2019-1 (23-25) |
|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 35.20% | 28.64% | 41.49% |
| Metal Hydroxide Phase | 22.91% | 28.64% | 51.50% |
| Organic Phase | 0.00% | 0.00% | 3.72% |
| Acid/Sulfide Fraction | 15.08% | 14.55% | 2.29% |
| Residual Fraction | 26.82% | 28.18% | 1.00% |

**Borehole and depth below ground surface (Cobalt in perecent of total)**

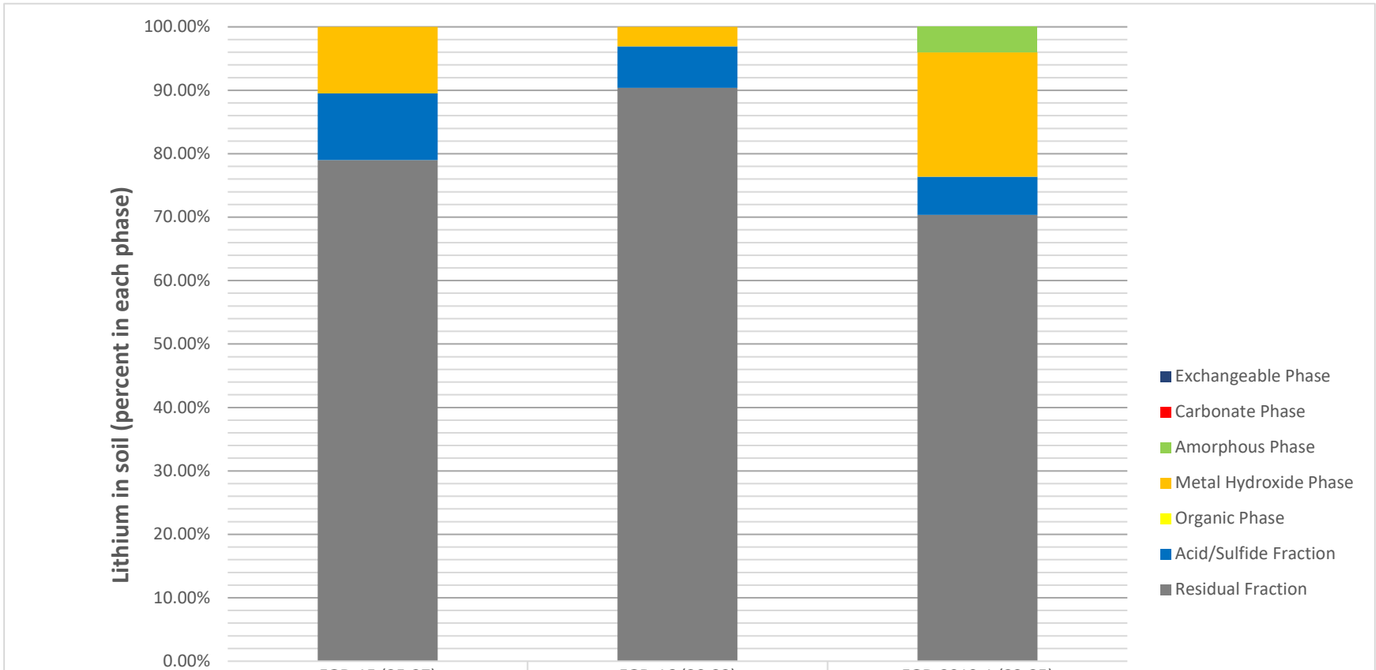
CLIENT
LUMINANT
OAK GROVE SES
FGD PONDS

CONSULTANT
GOLDER

PROJECT
MONITORED NATURAL ATTENUATION EVALUATION
GEOCHEMICAL ASSESSMENT

TITLE
**SEQUENTIAL EXTRACTION**

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19122434 | E | 1 | 6 |




| | FGD-15 (25-27) | FGD-16 (30-32) | FGD-2019-1 (23-25) |
|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 0.00% | 0.00% | 4.02% |
| Metal Hydroxide Phase | 10.50% | 3.09% | 19.60% |
| Organic Phase | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 10.50% | 6.52% | 6.03% |
| Residual Fraction | 79.01% | 90.39% | 70.35% |

**Borehole and depth below ground surface (Lithium in perecent of total)**

CLIENT
LUMINANT
OAK GROVE SES
FGD PONDS

CONSULTANT
GOLDER

PROJECT
MONITORED NATURAL ATTENUATION EVALUATION
GEOCHEMICAL ASSESSMENT

TITLE
**SEQUENTIAL EXTRACTION**

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19122434 | E | 1 | 7 |

**APPENDIX A**

# BORING LOGS

# RECORD OF BOREHOLE MW-FGD-01



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 27-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4549.42
EASTING (ft): 2454.41
ELEVATION (ft): 421.91

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy with vegetation | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 421.9 | | | | | | | | |
| | | Firm, brown to light brown, sandy CLAY, some vegetative presence, dry | | 0.0 | SB-1 | | 2<br>3<br>3<br>N6 | 40 | | | | |
| | | trace red at 1.5' | | | | | | | | | | |
| 2 | | Hard, grayish brown with red, CLAY, with sand, dry | | 2.0 | SB-2 | | 8<br>20<br>32<br>N52 | 67 | | | | |
| 4 | | Hard, gray, trace red, silty CLAY, dry | | 4.0 | SB-3 | | 10<br>14<br>18<br>N32 | 73 | | | | |
| 6 | | red, some iron oxide at 6' | | | | | | | | | | |
| | | Compact, grayish brown, SAND, with silt, damp | | 7.0 | SB-4 | | 7<br>13<br>14<br>N27 | 87 | | | | |
| 8 | | reddish brown, some clay at 8' | | | SB-5 | | 6<br>7<br>8<br>N15 | 87 | | | | |
| 10 | | trace red at 10' | | | SB-6 | | 7<br>8<br>8<br>N16 | 87 | | | | |
| 12 | | | | | SB-7 | | 3<br>10<br>13<br>N23 | 67 | | | | |
| 14 | | wet at 14' | | | SB-8 | | 7<br>9<br>9<br>N18 | 100 | | | | ▼ 14' 08/27/2008 |
| 16 | | | | | SB-9 | | 1<br>10<br>12<br>N22 | 87 | | | | |
| 18 | | | | | SB-10 | | 1<br>10<br>19<br>N29 | 93 | | | | |
| 20 | | some yellowish brown at 19.5' | | | | | | | | | | |
| | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

# RECORD OF BOREHOLE MW-FGD-01



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 27-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4549.42
EASTING (ft): 2454.41
ELEVATION (ft): 421.91

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | very dense at 20' | | 20.0 | SB-11 | | 15<br>26<br>35<br>N61 | 87 | | | | |
| 22 | | dense, grayish brown and mottled yellow at 22' | | | SB-12 | | 17<br>21<br>27<br>N48 | 100 | | | | |
| 24 | | very dense, moist at 24' | | | SB-13 | | 18<br>25<br>35<br>N60 | 87 | | | | |
| 26 | | | | | SB-14 | | 16<br>17<br>35<br>N52 | 93 | | | | |
| 28 | | | | | SB-15 | | 20<br>35<br>36<br>N71 | 100 | | | | |
| 30 | | | | | SB-16 | | 18<br>28<br>32<br>N60 | 87 | | | | |
| 32 | | | | | SB-17 | | 21<br>36<br>50/5" | 93 | | | | |
| 34 | | Very dense, dark brownish gray, clayey SAND, trace iron oxide, damp | | 33.0 | | | | | | | | |
| 36 | | BORING TERMINATED AT 34' | | 34.0 | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-02



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 436.2 | | | | | | | | |
| | | Stiff, brown with some dark brown, sandy CLAY, some gravel, damp | | 0.0 | SB-1 | | 4<br>4<br>5<br>N9 | 27 | | | | |
| 2 | | very stiff, dark brown at 2' | | | SB-2 | | 4<br>7<br>16<br>N23 | 47 | | | | |
| 4 | | very stiff, brown to yellowish brown, some iron oxide traces, possible lignite traces, dry at 4' | | | SB-3 | | 7<br>10<br>13<br>N23 | 53 | | | | |
| 6 | | Very stiff, mottled gray and brown, CLAY, some gravel, dry | | 6.0 | SB-4 | | 5<br>13<br>15<br>N28 | 67 | | | | |
| 8 | | Very stiff, brown, yellow, and gray, mottled, sandy CLAY | | 8.0 | SB-5 | | 5<br>13<br>16<br>N29 | 53 | | | | |
| 10 | | hard at 10' | | | SB-6 | | 7<br>13<br>20<br>N33 | 80 | | | | |
| | | gray at 11' | | | | | | | | | | |
| 12 | | Dense, light gray, fine, silty SAND, with a seam of clay, damp | | 12.0 | SB-7 | | 14<br>17<br>21<br>N38 | 87 | | | | |
| 14 | | | | | SB-8 | | 10<br>19<br>27<br>N46 | 93 | | | | |
| 16 | | | | | SB-9 | | 16<br>23<br>24<br>N47 | 87 | | | | |
| | | seam of hard CLAY | | 17.5 | | | | | | | | |
| 18 | | very dense at 18' | | | | | | | | | | |
| | | | | 18.5 | | | | | | | | |
| | | seam of very hard CLAY | | 18.8 | SB-10 | | 10<br>25<br>36<br>N61 | 87 | | | | |
| | | | | 19.8 | | | | | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

# RECORD OF BOREHOLE MW-FGD-02



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | dense at 20' | | 20.0 | SB-11 | | 14<br>19<br>27<br>N46 | 92 | | | | |
| | | seam of hard CLAY | | 21.0 | | | | | | | | |
| 22 | | very dense at 22' | | 22.0 | SB-12 | | 13<br>27<br>37<br>N64 | 100 | | | | |
| 24 | | | | | SB-13 | | 17<br>29<br>28<br>N57 | 87 | | | | |
| 26 | | | | | SB-14 | | 17<br>25<br>42<br>N67 | 67 | | | | |
| | | yellow at 27.5' | | | | | | | | | | |
| 28 | | | | | SB-15 | | 20<br>39<br>50/5" | 87 | | | | |
| 30 | | gray at 30.5' | | | SB-16 | | 25<br>45<br>24<br>N69 | 87 | | | | |
| 32 | | | | | | | | | | | | ▼ 32' 08/22/2008 |
| | | Very loose, brown, SAND, moist | | 33.0 | SB-17 | | 4<br>1<br>2<br>N3 | 80 | | | | |
| 34 | | | | | SB-18 | | 7<br>14<br>14<br>N28 | 73 | | | | |
| | | Very stiff, brown, sandy CLAY, moist | | 35.0 | | | | | | | | |
| 36 | | Hard, brown, CLAY, with silt, moist | | 36.0 | SB-19 | | 8<br>25<br>50/4" | 93 | | | | |
| | | Very dense, brown, SAND | | 37.5 | | | | | | | | |
| 38 | | gray and yellow, mottled at 39' | | | SB-20 | | 20<br>45<br>50/3" | 80 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-02



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | brownish gray at 40' | | 40.0 | SB-21 | | 24<br>42<br>50/4" | 87 | | | | |
| 42 | | gray at 41'<br>dense at 42' | | | SB-22 | | 32<br>25<br>22<br>N47 | 100 | | | | |
| 44 | | seam of hard, yellowish gray and brown, CLAY at 43.5' | | 43.5 | SB-23 | | 18<br>36<br>50/4" | 100 | | | | |
| | | very dense at 44' | | 44.5 | SB-24 | | 32<br>45<br>50/3" | 73 | | | | |
| 48 | | | | | SB-25 | | 24<br>24<br>50/5" | 80 | | | | |
| 50 | | | | | SB-26 | | 32<br>45<br>50/3" | 87 | | | | |
| 52 | | BORING TERMINATED AT 52' | | 52.0 | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | GROUND SURFACE | | 432.0 | | | | | | | | |
| | | Soft to firm, reddish brown, CLAY, with sand, some gravel | | 0.0 | SB-1 | | 2<br>2<br>2<br>N4 | 33 | | | | |
| 2 | | | | | ST-2 | | | 70 | ⊕ | | | |
| 4 | | very stiff, brown, mottled at 4' | | | SB-3 | | 5<br>7<br>12<br>N19 | 83 | | | | |
| 6 | | | | | SB-4 | | 5<br>12<br>15<br>N27 | 93 | | | | |
| | | Very stiff, gray, silty CLAY | | 7.5 | | | | | | | | |
| 8 | | | | | SB-5 | | 5<br>8<br>12<br>N20 | 87 | | | | |
| 10 | | trace brown at 10' | | | SB-6 | | 4<br>7<br>9<br>N16 | 93 | | | | |
| 12 | | stiff, light brown at 12' | | | SB-7 | | 3<br>5<br>7<br>N12 | 73 | | | | |
| 14 | | | | | SB-8 | | 3<br>5<br>6<br>N11 | 87 | | | | |
| 16 | | | | | ST-9 | | | 55 | ⊕ | | | |
| | | Stiff, brown, CLAY, damp | | 17.0 | | | | | | | | |
| 18 | | firm to stiff at 18' | | | SB-10 | | 2<br>3<br>5<br>N8 | 100 | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL ⊖W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | firm at 20' | | 20.0 | SB-11 | | 2<br>2<br>3<br>N5 | 100 | | | | |
| 22 | | firm to stiff at 22' | | | SB-12 | | 2<br>3<br>5<br>N8 | 100 | | | | |
| 24 | | dark brown, some silt at 24' | | | SB-13 | | 2<br>3<br>5<br>N8 | 87 | | | | |
| 26 | | Dense, light brown, SAND, moist | | 26.0 | SB-14 | | 12<br>15<br>30<br>N45 | 73 | | | | ▼ *26' 08/21/2008* |
| 28 | | very dense, gray at 28' | | | SB-15 | | 12<br>31<br>30<br>N61 | 73 | | | | |
| 30 | | dense, trace yellowish brown at 30' | | | SB-16 | | 5<br>14<br>17<br>N31 | 67 | | | | |
| 32 | | | | | SB-17 | | 3<br>13<br>21<br>N34 | 67 | | | | |
| | | Hard, brown, some mottled dark brown, CLAY, damp | | 33.0 | | | | | | | | |
| 34 | | Hard, gray and yellowish brown mottled, sandy CLAY, some iron staining | | 34.0 | SB-18 | | 6<br>21<br>23<br>N44 | 67 | | | | |
| 36 | | | | | SB-19 | | 5<br>13<br>20<br>N33 | 87 | | | | |
| 38 | | | | | SB-20 | | 7<br>16<br>25<br>N41 | 80 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-03



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | trace iron oxide at 40' | | 40.0 | SB-21 | | 7<br>16<br>25<br>N41 | 80 | | | | |
| 42 | | | | | SB-22 | | 10<br>19<br>29<br>N48 | 74 | | | | |
| 44 | | | | | ST-23 | | | 100 | | | | |
| 46 | | | | | SB-24 | | 13<br>23<br>36<br>N59 | 73 | | | | |
| 48 | | BORING TERMINATED AT 48' | | 48.0 | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-04



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear - ■; UU - ✪ TORV. - ▲ UCS - ✳) 400 800 1200 1600 | ROCK QUALITY DESIGNATION (RQD) % ★ 20 40 60 80; WATER CONTENT PERCENT PL W LL 20 40 60 80 | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Muddy | | | | | | | | | | |
| 0 | | GROUND SURFACE | | 429.2 | | | | | | | | |
| | | Brown, sandy CLAY, damp | | 0.0 | ST-1 | | | 75 | | | | |
| 2 | | Brown, CLAY, with silt, damp | | 2.0 | ST-2 | | | 65 | | | | |
| 4 | | very stiff, reddish and yellowish brown, mottled, with occasional calcareous nodules at 4' | | | SB-3 | | 4<br>6<br>10<br>N16 | 67 | | | | |
| 6 | | | | | ST-4 | | | 87 | | | | |
| 8 | | | | | SB-5 | | 9<br>11<br>14<br>N25 | 27 | | | | |
| | | Very stiff, brown, sandy CLAY, damp | | 9.0 | | | | | | | | |
| 10 | | with occasional coarse, angular gravel at 9.5'<br>reddish brown at 10' | | | SB-6 | | 7<br>9<br>9<br>N18 | 53 | | | | |
| 12 | | stiff at 12' | | | SB-7 | | 10<br>5<br>4<br>N9 | 40 | | | | |
| 14 | | Stiff, reddish brown, CLAY, with sand, damp | | 14.0 | SB-8 | | 4<br>6<br>5<br>N11 | 27 | | | | |
| | | Compact, brown, fine, silty SAND, damp | | 15.5 | | | | | | | | |
| 16 | | light brown at 16.25' | | | SB-9 | | 7<br>12<br>14<br>N26 | 93 | | | | |
| | | reddish brown at 17.25' | | | | | | | | | | |
| 18 | | Compact, reddish brown, clayey SAND, moist | | 18.0 | SB-10 | | 5<br>8<br>15<br>N23 | 87 | | | | |
| | | Compact, light brown, fine, SAND, moist | | 19.0 | | | | | | | | |
| 20 | | --- CONTINUED NEXT PAGE --- | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: BLT

# RECORD OF BOREHOLE MW-FGD-04



PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 20 | | dense, occasional seams of gray at 20' | | 20.0 | SB-11 | | 6<br>20<br>20<br>N40 | 100 | | | | |
| 22 | | occasional streaks of yellowish brown at 22' | | | SB-12 | | 12<br>15<br>19<br>N34 | 93 | | | | ▼ 22' 08/20/2008 |
| 24 | | very dense, gray with mottled reddish brown at 24' | | | SB-13 | | 14<br>28<br>30<br>N58 | 100 | | | | |
| 26 | | dense, mottled, reddish brown, yellowish brown, and gray at 26' | | | SB-14 | | 13<br>21<br>22<br>N43 | 100 | | | | |
| 28 | | very dense at 28' | | | SB-15 | | 11<br>15<br>50<br>N65 | 87 | | | | |
| 30 | | dense at 30' | | | SB-16 | | 8<br>15<br>21<br>N36 | 87 | | | | |
| 32 | | | | | SB-17 | | 14<br>18<br>27<br>N45 | 80 | | | | |
| 34 | | very dense at 34' | | | SB-18 | | 20<br>31<br>35<br>N66 | 100 | | | | |
| 36 | | | | | SB-19 | | 20<br>31<br>31<br>N62 | 100 | | | | |
| 38 | | | | | SB-20 | | 21<br>42<br>50/5" | 100 | | | | |
| 40 | | *--- CONTINUED NEXT PAGE ---* | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

# RECORD OF BOREHOLE MW-FGD-04



DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

| DEPTH SCALE FEET | BORING METHOD | SOIL PROFILE DESCRIPTION | STRATA PLOT | ELEV. / DEPTH (ft) | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/0.5 FT | RECOVERY% | UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600) | ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL W LL; 20 40 60 80) | ADDITIONAL LAB. TESTING | INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *--- CONTINUED FROM PREVIOUS PAGE ---* | | | | | | | | | | |
| 40 | | | | 40.0 | SB-21 | | 18<br>35<br>33<br>N68 | 100 | | | | |
| 42 | | Hard, gray, CLAY, with sand | | 42.0 | SB-22 | | 11<br>21<br>34<br>N55 | 100 | | | | |
| 44 | | BORING TERMINATED AT 43.5' | | 43.5 | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

OAK GROVE - MW 94281GINT.GPJ GLDR_HOU.GDT 10/31/08

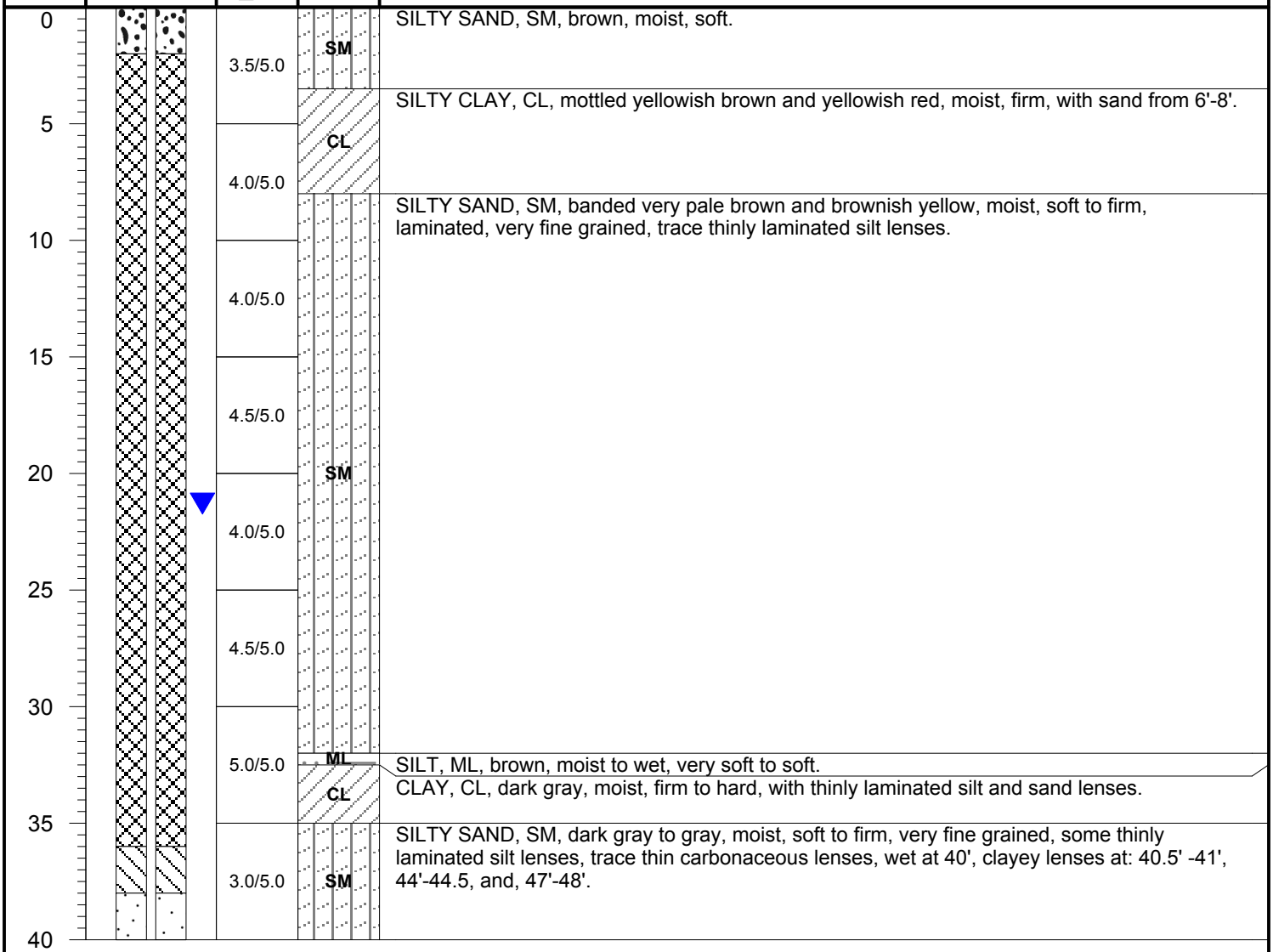
# Luminant Power

# Log of Boring: FGD-5

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/3/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 50 |
| Driller's License: | 3121 | Northing: | 571950.33 |
| Field Supervisor: | Chris Moore | Easting: | 3200628.33 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 430.54 |





**PBW**

**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446


Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 23.67 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 36.0) Cement/Bentonite Grout
(36.0 - 38.0) Bentonite Chips
(38.0 - 50.0) 12/20 Silica Sand

Well Materials
(+2.4 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

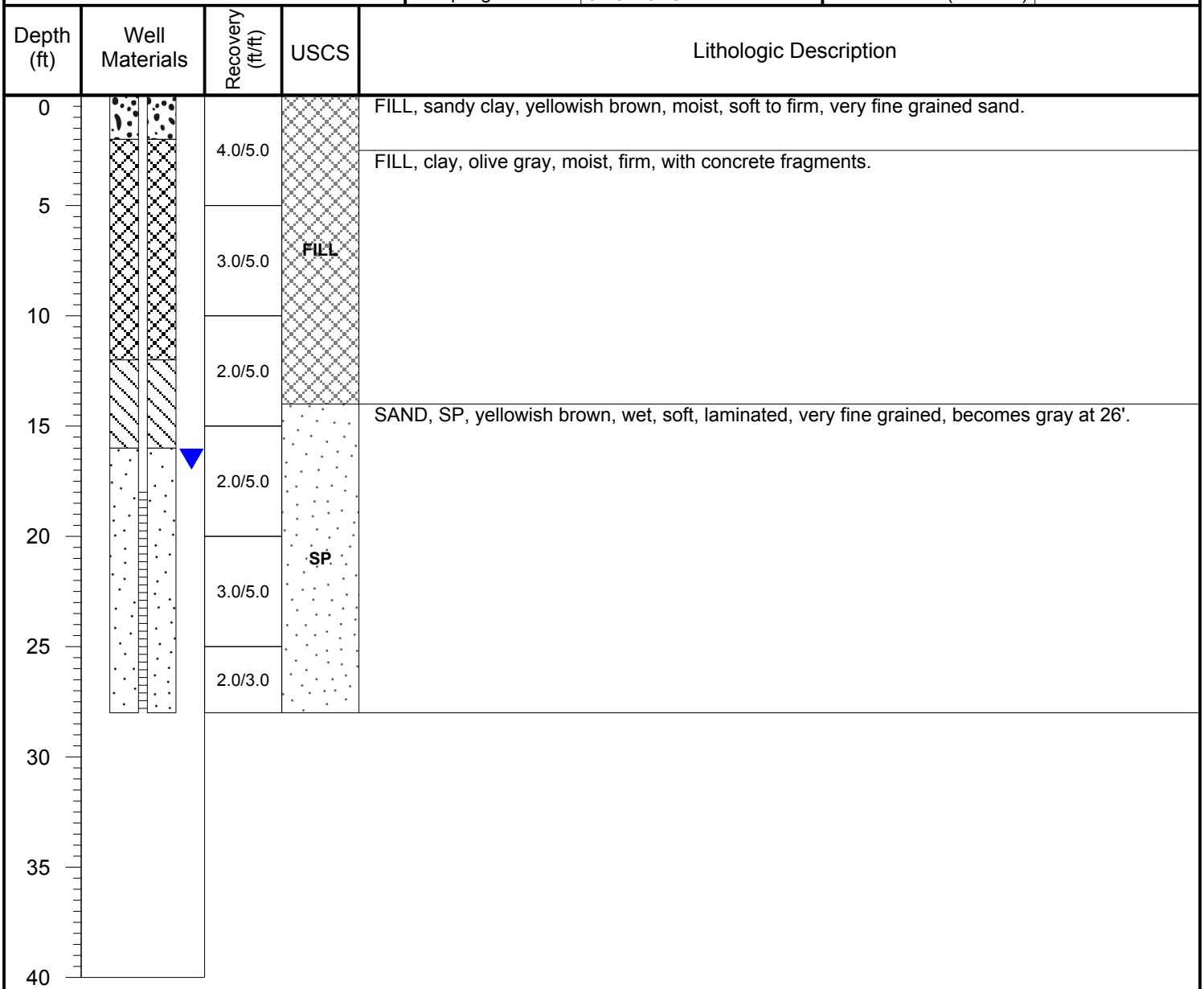
# Luminant Power

# Log of Boring: FGD-6

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/4/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 28 |
| Driller's License: | 3121 | Northing: | 573195.06 |
| Field Supervisor: | Chris Moore | Easting: | 3200525.61 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 425.63 |




Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 19.48 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 14.0) Cement/Bentonite Grout
(14.0 - 16.0) Bentonite Chips
(16.0 - 28.0) 12/20 Silica Sand

Well Materials
(+3.0 - 18.0) Casing, 2" Sch 40 FJT PVC
(18.0 - 28.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot


**PBW**
**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

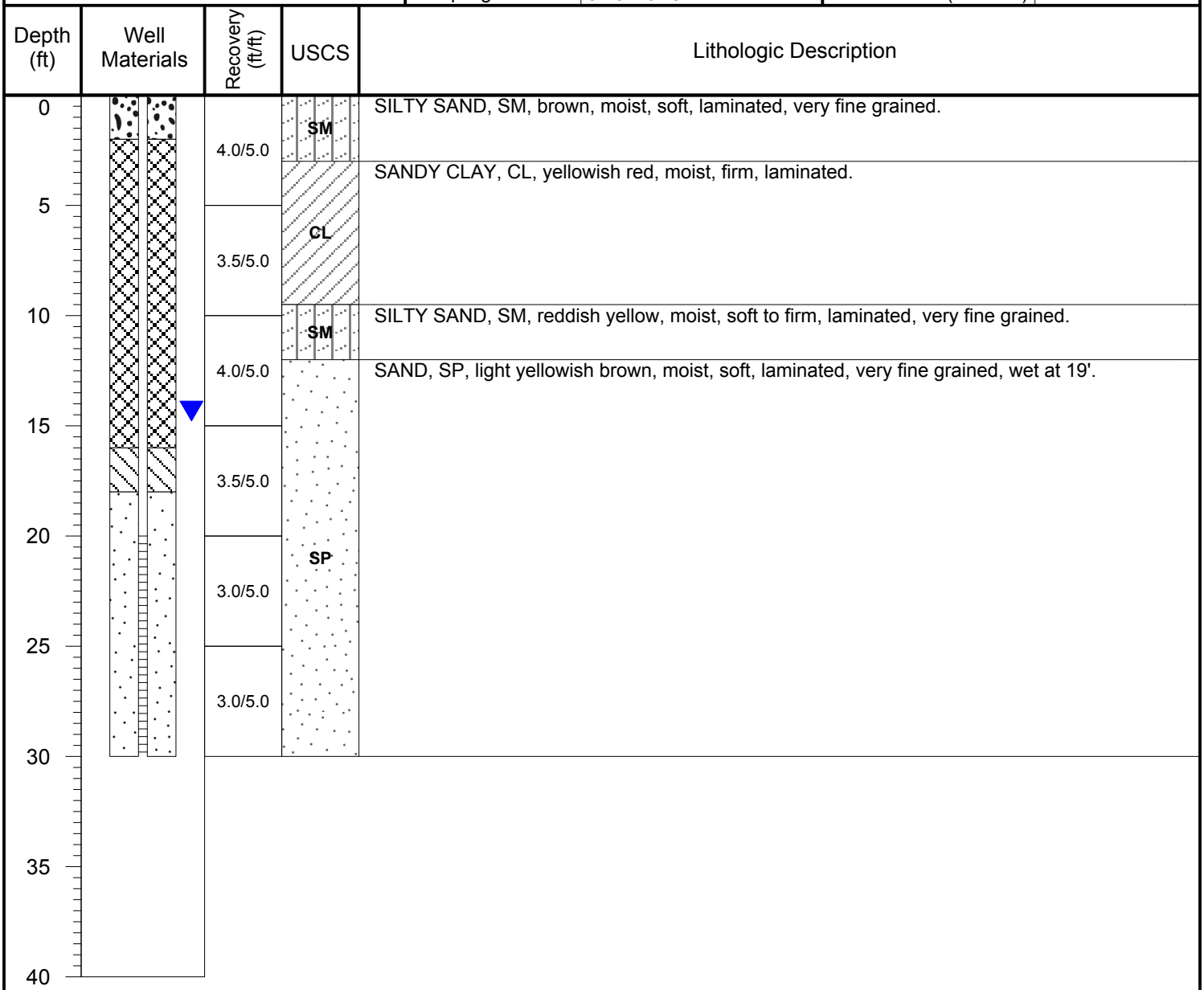
# Luminant Power

# Log of Boring: FGD-7

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/3/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 30 |
| Driller's License: | 3121 | Northing: | 572591.64 |
| Field Supervisor: | Chris Moore | Easting: | 3199761.32 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 423.6 |




Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 16.55 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 16.0) Cement/Bentonite Grout
(16.0 - 18.0) Bentonite Chips
(18.0 - 30.0) 12/20 Silica Sand

Well Materials
(+2.2 - 20.0) Casing, 2" Sch 40 FJT PVC
(20.0 - 30.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot


**PBW**
**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

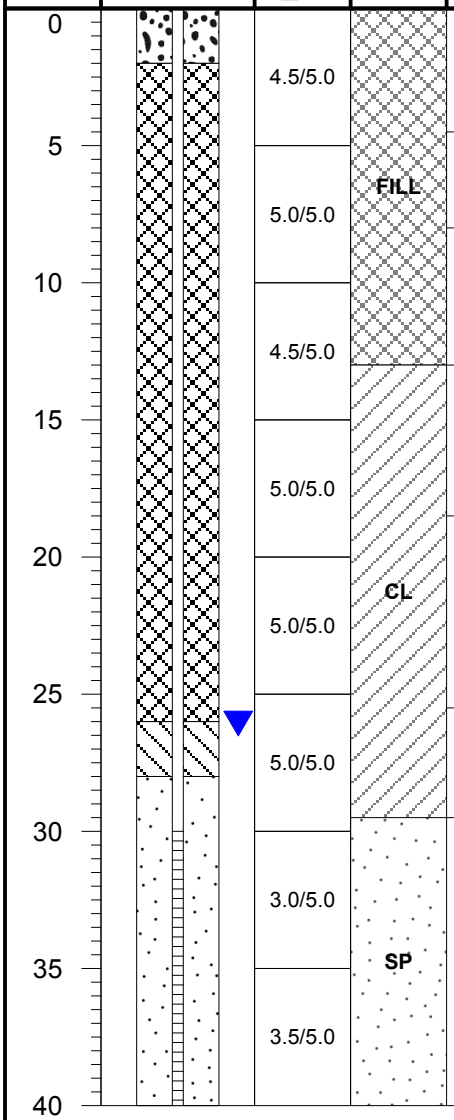
# Luminant Power

# Log of Boring: FGD-8

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

| | | | |
|---|---|---|---|
| Completion Date: | 3/4/10 | Drilling Method: | HSA |
| Drilling Company: | Strata Core, Inc. | Borehole Diameter (in.): | 6 |
| Driller: | Roddy Qualls | Total Depth (ft): | 40 |
| Driller's License: | 3121 | Northing: | 573033.29 |
| Field Supervisor: | Chris Moore | Easting: | 3198862.3 |
| Sampling Method: | 3"x5' Barrel | Ground Elev. (ft AMSL): | 437.06 |




Lithologic Description

FILL, silty clay, CL, brown, moist, soft to firm.

FILL, silty sand, SM, very pale brown, dry to moist, soft, very fine grained.

FILL, silty clay, CL, dark gray, moist, firm, crumbles easily, some sand layers.

SANDY, CLAY, CL, strong brown, moist, firm, laminated, very fine grained sand

SILTY CLAY, CL, dark gray, moist, firm, with sand laminae.

SILTY CLAY, CL, mottled gray and brown, moist, firm to hard, some sand laminae, some oxidized staining.

SAND, SP, dark gray, wet, very soft to soft, very fine grained, some silty laminae.

Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 29.11 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 26.0) Cement/Bentonite Grout
(26.0 - 28.0) Bentonite Chips
(28.0 - 40.0) 12/20 Silica Sand

Well Materials
(+3.0 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot


**PBW**
**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-11



**CLIENT** Luminant Power
**PROJECT NAME** Luminant
**PROJECT NUMBER** 1406296
**PROJECT LOCATION** Oak Grove SES
**DATE STARTED** 11/25/14 **COMPLETED** 11/26/14
**GROUND ELEVATION** 448.67 ft **HOLE SIZE** 6 inches
**DRILLING CONTRACTOR** Envirotech
**GROUND WATER LEVELS:**
**DRILLING METHOD** Auger
▽ **AT TIME OF DRILLING 40** 40' bgs
**LOGGED BY** DMW **CHECKED BY** CFR
**AT END OF DRILLING**
**NOTES**
**AFTER DRILLING**

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) | ▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL / □ FINES CONTENT (%) □ 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|
| 0 | | Firm, brown and green, CLAY, and topsoil, moist | ST | 75 | | 1.0 | | |
| | | Hard, brown and tan, SANDY CLAY, moist | ST | 50 | | 4.5 | | |
| 5 | | | ST | 54 | | 4.5 | | |
| | | | SS | 58 | 3-5-7-10 (12) | | | |
| | | | SS | 79 | 6-8-8-9 (16) | | | |
| 10 | | | SS | 67 | 5-9-10-12 (19) | | | |
| | | | SS | 71 | 6-8-9-12 (17) | | | |
| | | Very stiff, red and black, CLAY, with brown sand, moist | | | | | | |
| 15 | | Stiff, brown and tan, SANDY CLAY, moist | SS | 67 | 6-8-6-7 (14) | | | |
| | | maroon, gravel sized rocks at 15.0' | SS | 92 | 5-6-8-9 (14) | | | |
| | | | SS | 79 | 4-6-8-9 (14) | | | |
| 20 | | Compact, brown and tan, CLAYEY SAND, moist | SS | 71 | 6-8-7-8 (15) | | | |
| | | with gray and brown clay lenses at 21.0' | SS | 79 | 7-8-11-15 (19) | | | |
| | | loosely consolidated sand at 23.0' | SS | 83 | 9-13-17-19 (30) | | | |
| 25 | | orange mottlings at 25.0' | SS | 83 | 9-10-14-16 (24) | | | |
| | | | SS | 92 | 8-9-18-21 (27) | | | |
| 30 | | Very stiff, gray, SAND and CLAY, moist dense at 29.5' | | | | | | |

*(Continued Next Page)*

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 1/23/15 10:02 - L:\14- 2014 FILE FOLDER\1406296- LUMINANT_FGD-C\1406296 LUMINANT.GPJ

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-11

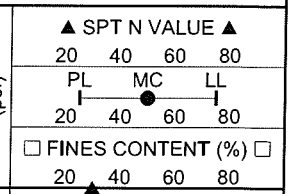


**CLIENT** Luminant Power **PROJECT NAME** Luminant

**PROJECT NUMBER** 1406296 **PROJECT LOCATION** Oak Grove SES

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 30 | | Very stiff, gray, SAND and CLAY, moist *(continued)* | SS | 83 | 9-13-17-19 (30) | | |
| | | without clay at 31.0' | SS | 88 | 10-16-22-22 (38) | | |
| | | Dense, gray and tan, SILTY SAND, moist | | | | | |
| | | poorly consoldiated at 33.0' | SS | 83 | 7-11-17-17 (28) | | |
| 35 | | | SS | 71 | 6-13-14-15 (27) | | |
| | | Very stiff, gray, SILTY CLAY, moist | SS | 75 | 4-6-13-17 (19) | | |
| | | Dense, gray and tan, SILTY SAND, moist<br>moist to wet at 38.0' | SS | 71 | 6-5-8-10 (13) | | |
| 40 | | Compact, gray and tan, SAND, moist to wet | SS | 67 | 3-4-4-7 (8) | | |
| | | Compact, gray and tan, SILTY SAND, wet<br>Very stiff, gray, SILTY CLAY, moist | SS | 88 | 7-9-10-13 (19) | | |
| 45 | | Dense, gray and tan, SILTY SAND, moist to wet | SS | 92 | 3-8-24-28 (32) | | |
| | | moist at 46.0' | SS | 83 | 4-8-26-40 (34) | | |
| | | slightly wet at 48.0' | SS | 75 | 14-28-29-34 (57) | | |
| 50 | | very dense at 50.0' | SS | 92 | 9-38-50 (88) | | |
| | | moist at 52.0' | SS | 83 | 15-28-46-50 (74) | | |
| | | moist to wet at 54.0' | SS | 71 | 14-36-50 (86) | | |
| 55 | | | SS | | 21-39-48-113 (87) | | |

Bottom of borehole at 58.0 feet.

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Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-12



**CLIENT** Luminant Power
**PROJECT NAME** Luminant
**PROJECT NUMBER** 1406296
**PROJECT LOCATION** Oak Grove SES
**DATE STARTED** 11/26/14 **COMPLETED** 11/26/14
**GROUND ELEVATION** 439.48 ft **HOLE SIZE** 6 inches
**DRILLING CONTRACTOR** Envirotech
**GROUND WATER LEVELS:**
**DRILLING METHOD** Auger
▽ **AT TIME OF DRILLING 32** 32' bgs
**LOGGED BY** DMW **CHECKED BY** CFR
**AT END OF DRILLING**
**NOTES**
**AFTER DRILLING**

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) | ▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|
| 0 | | Firm, brown, CLAY, topsoil, moist | ST | 46 | | 1.0 | | |
| | | Hard, brown, SANDY CLAY, moist | ST | 63 | | 4.5 | | |
| 5 | | | ST | 42 | | 4.5 | | |
| | | | SS | 75 | 6-8-10-7 (18) | | | ▲ |
| | | Firm, red, orange and gray, CLAY, moist, with red and orange mottling | SS | 75 | 5-8-10-11 (18) | | | ▲ |
| 10 | | | SS | 75 | 6-8-12-14 (20) | | | ▲ |
| | | Very stiff, gray and red, SILTY CLAY, moist, silt partings | SS | 71 | 4-8-14-15 (22) | | | ▲ |
| 15 | | increasing silt at 15.0' | SS | 63 | 8-10-19-16 (29) | | | ▲ |
| | | decreasing silt at 16.0' | SS | 75 | 5-9-12-16 (21) | | | ▲ |
| | | Dense, red and gray, SANDY SILT, moist<br>increasing silt at 17.5' | SS | 79 | 8-14-12-8 (26) | | | ▲ |
| | | Compact, orange and tan, SILTY SAND, moist | SS | 63 | 7-5-5-6 (10) | | | ▲ |
| 20 | | loosely consoldiated at 19.0' | SS | 83 | 9-12-13-15 (25) | | | ▲ |
| | | increased clay at 20.0' | SS | | 17-11-16-20 (27) | | | ▲ |
| | | more consolidated at 21.0' | SS | | 12-18-14-15 (32) | | | ▲ |
| 25 | | Stiff, gray, SILTY CLAY, moist, silt partings | SS | 83 | 9-19-19-17 (38) | | | ▲ |
| | | intervals of gray sand mixed with silty clay at 25.0' | | | | | | |
| | | Dense, gray, SAND, moist | | | | | | |
| | | Stiff, gray, SILTY CLAY, moist | | | | | | |
| 30 | | Dense, gray, SILTY SAND, with interbedded clay, moist, with red staining | | | | | | |

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Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas 77073
Telephone: (281) 821-6868
Fax: (281) 821-6870

# BOREHOLE FGD-12



**CLIENT** Luminant Power **PROJECT NAME** Luminant

**PROJECT NUMBER** 1406296 **PROJECT LOCATION** Oak Grove SES

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 30 | | Dense, gray, SILTY SAND, with interbedded clay, moist, with red staining *(continued)* | SS | 88 | 4-5-15-24 (20) | | |
| | | ▽ red to moist, turning red at 32.0' | SS | 67 | 10-16-30-28 (46) | | |
| 35 | | brown to gray at 34.0' | SS | 63 | 14-24-48-42 (72) | | |
| | | | SS | 92 | 8-18-32-42 (50) | | |
| | | increasing sand at 38.0' | SS | 92 | 8-26-48-50 (74) | | |
| 40 | | | SS | 92 | 3-4-10-26 (14) | | |
| | | gray and tan at 42.0' | SS | 92 | 13-24-42-43 (66) | | |
| 45 | | | SS | 92 | 16-30-45-50 (75) | | |
| | | | SS | 58 | 20-36-50 (86) | | |
| 50 | | | SS | 88 | 16-40-50 (90) | | |
| | | | SS | 71 | 18-26-50 (76) | | |
| | | | SS | 63 | 4-30-50 (80) | | |
| 55 | | | SS | 50 | 7-24-50 (74) | | |
| | | | SS | 58 | 22-48-50 (98) | | |
| | | | SS | 54 | 24-48-50 (98) | | |
| 60 | | dark gray at 60.0' | SS | 46 | 25-48-50 (98) | | |
| | | | SS | 50 | 30-50 | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 64.0 feet.

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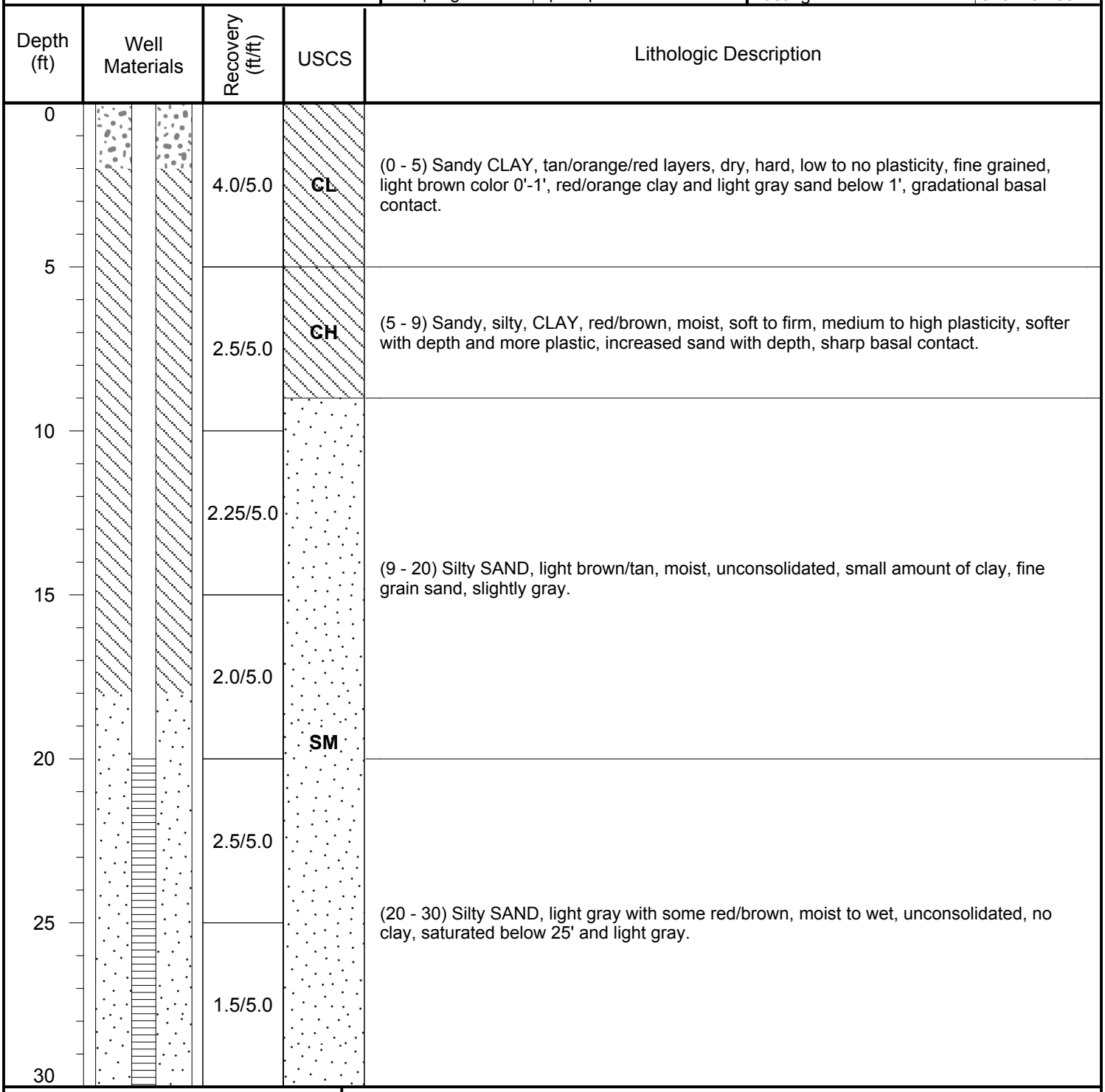
# Luminant

# Log of Boring: FGD-14

Oak Grove Steam Electric Station
Petteway, TX

PBW Project No. 5244

| | | | |
|---|---|---|---|
| Completion Date: | 7/25/2016 | Drilling Method: | HSA |
| Drilling Company: | Sunbelt | Borehole Diameter (in.): | 8.25 |
| Driller: | Raymond Alcala | Total Depth (ft): | 30 |
| Driller's License: | 59430 | TOC Elevation (ft. AMSL): | 428.91 |
| Logged By: | Sara Taube | Northing: | 572912.27 |
| Sampling Method: | Split Spoon | Easting: | 3201297.58 |





**PBW**

**Pastor, Behling & Wheeler, LLC**
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 - Fax (512) 671-3446


Notes:

Well Materials
(+2.70 - 20) Casing, 2" Sch 40 FJT PVC
(20 - 30) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-2') Cement
(2'-18') Bentonite chips
(18'-30') 16/30 sand

# Luminant

## Log of Boring: FGD-15

Big Brown Steam Electric Station
Franklin, Texas

Golder Project No. 19122434E

| | | | |
|---|---|---|---|
| Completion Date: | 5/22/2019 | Drilling Method: | HSA |
| Drilling Company: | Vortex | Borehole Diameter (in.): | 6 |
| Driller: | Robert Joiner | Total Depth (ft): | 35 |
| Driller's License: | 54776M | TOC Elevation (ft. AMSL): | 437.17 |
| Logged By: | Sergio Ruiz | Northing: | 3452427 |
| Sampling Method: | 2"X2.5' Split Spoon | Easting: | 739119.1 |

| Depth (ft) | Well Materials | Recovery (ft/ft) | USCS | Lithologic Description |
|---|---|---|---|---|
| 0 | | 0.0/5.0 | NR | (0 - 5) HydroVAC |
| 5 | | 1.2/2.5 | SM | (5 - 12.8) Silty SAND, fine grained, light tan with some yellow orange, trace roots, clay lense from 7.5'-7.6', slightly moist, orange at 12.2' then back to light brown, some more cohesive, some small firm pieces |
| | | 1.2/2.5 | | |
| 10 | | 1.3/2.5 | | |
| | | 1.6/2.5 | CL | (12.8 - 16.5) Sandy, silty, CLAY, brownish gray, thin fine sand lenses throughout, orange color 12.9'-13.1' |
| 15 | | 1.0/2.5 | | |
| | | 1.0/2.5 | SM | (16.5 - 20.1) Silty SAND, fine grained with silt, more clay with increased depth, some Fe staining. |
| 20 | | 1.9/2.5 | CL | (20.1 - 23) CLAY, brownish purple, moist to wet, firm, orange red staining at 20', fine sand lenses present |
| | | 1.5/2.5 | SM | (23 - 24.5) Silty SAND, moist, soft, fine silty sand, some orange Fe staining, some clay throughout |
| 25 | | | CL | (24.5 - 25) CLAY, brown purple, moist, low to moderate plasticity, saturated at 25', |
| | | 1.5/2.5 | SM | (25 - 35) Silty SAND, grayish purple, fine to very fine, wet, very soft, trace clay, some Fe staining |
| | | 1.0/2.5 | | |
| 30 | | 1.0/2.5 | | |
| | | 2.5/2.5 | | |
| 35 | | | | |

GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
O·512.671.3434 F·512.671.3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(+3 - 25) Casing, 2" Sch 40 FJT PVC
(25 - 35) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-2') Grout
(2'-23') Bentonite chips
(23'-35) 10/20 sand

# Luminant

## Log of Boring: FGD-16

Big Brown Steam Electric Station
Franklin, Texas

Golder Project No. 19122434E

| | | | |
|---|---|---|---|
| Completion Date: | 5/23/2019 | Drilling Method: | HSA |
| Drilling Company: | Vortex | Borehole Diameter (in.): | 6 |
| Driller: | Robert Joiner | Total Depth (ft): | 40 |
| Driller's License: | 54776M | TOC Elevation (ft. AMSL): | 444.3 |
| Logged By: | Jacob Jarvis | Northing: | 3452861 |
| Sampling Method: | 2"X2.5' Split Spoon | Easting: | 739235.7 |

| Depth (ft) | Well Materials | Recovery (ft/ft) | USCS | Lithologic Description |
|---|---|---|---|---|
| 0 | | 0.0/5.0 | NR | (0 - 5) HydroVAC |
| 5 | | 1.25/5.0 | SC | (5 - 7.5) Sandy CLAY, dry, soft, low plasticity, clay decreases with depth, yellow orange |
| | | 1.2/2.5 | SM | (7.5 - 10) Silty SAND, yellow orange, dry, very soft, subround, no plasticity, clay increases in bottom 3 inches |
| 10 | | 1.75/2.5 | | (10 - 12.5) Silty SAND, yellow orange, dry, soft, subround, no plasticity, few clay lenses, few clean sand lenses |
| | | 0.8/2.5 | SW | (12.5 - 15) SAND, fine, well sorted, brown, very soft, dry, no plasticity, color change from brown to dark brown |
| 15 | | 1.7/2.5 | CL | (15 - 17.5) Sandy CLAY, red, dry, hard, medium plasticity, hard clay with sand throughout |
| | | 1.25/2.5 | SC | (17.5 - 18.5) Clayey SAND, dark red, hard, low plasticity, dry |
| 20 | | 1.5/2.5 | | |
| | | 1.7/2.5 | | |
| 25 | | 1.4/2.5 | | |
| | | 1.75/2.5 | SW | (18.5 - 40) SAND, red to purple gray, well sorted, very soft, subround, no plasticity, gradual transition to clean sand, lighter red color, clay lenses 20.0'-22.5', saturated at 30' |
| 30 | | 1.75/2.5 | | |
| | | 1.75/2.5 | | |
| 35 | | 5.0/5.0 | | |
| 40 | | | | |

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2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
O·512.671.3434 F·512.671.3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(3 - 30) Casing, 2" Sch 40 FJT PVC
(30 - 40) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-2') Grout
(2'-28') Bentonite chips
(28'-40') 10/20 sand

# Luminant

# Log of Boring: FGD-2019-1

Big Brown Steam Electric Station
Franklin, TX

Golder Project No. 19122434E

| | | | |
|---|---|---|---|
| Completion Date: | 6/3/2019 | Drilling Method: | HSA |
| Drilling Company: | Vortex | Borehole Diameter (in.): | 6 |
| Driller: | Robert Joiner | Total Depth (ft): | 30 |
| Driller's License: | 54776 | TOC Elevation (ft. AMSL): | |
| Logged By: | Jacob Jarvis | Northing: | 3452823 |
| Sampling Method: | 2'X2.5' Split Spoon | Easting: | 739015.9 |

| Depth (ft) | Recovery (ft/ft) | USCS | Lithologic Description |
|---|---|---|---|
| 0 | 0.0/5.0 | NR | (0 - 5) HydroVAC |
| 5 | 1.6/2.5 | CL | (5 - 7.5) Silty Sandy CLAY, light tan, dry, firm, low to mod plasticity |
| | 1.55/2.5 | SC | (7.5 - 10) Silty SAND, yellow orange, dry, soft, few clay lenses throughout |
| 10 | 2.5/2.5 | CL | (10 - 12.5) Silty CLAY, light gray, dry to moist, soft, low to moderate plasticity, plasticity and silt increases with depth |
| | 2.5/2.5 | CH | (12.5 - 22) CLAY, wet, brown to dark brown, soft to firm, high plasticity |
| 15 | 2/2.5 | | |
| | 2.5/2.5 | | |
| 20 | 2.1/2.5 | | |
| | 2.2/2.5 | SW | (22 - 25) SAND, light tan, saturated, soft, no plasticity |
| 25 | 5.0/5.0 | | |
| 30 | | | |

GOLDER
2201 Double Creek Dr., Suite 4004
Round Rock, Texas 78664
O·512.671.3434 F·512.671.3446

Notes:
1. This log should not be used separately from the report to which it is attached.

**APPENDIX B**

# LABORATORY ANALYTICAL REPORTS

June 05, 2019

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1905205

RE: Luminant-OGSES FGD Ponds

Dear Will Vienne:

DHL Analytical, Inc. received 9 sample(s) on 5/17/2019 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-19-24

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 82719

# CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR, ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-17-19 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 1905205
PROJECT LOCATION OR NAME: LUMINANT - OGSES FGD PONDS
CLENT PROJECT #: 19122262-F COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl, $HNO_3$, $H_2SO_4$ ❑ NaOH ❑, ICE, UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ (METHOD 8021) | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO (METHOD 8015) ❑ DRO (METHOD 8105) ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS ❑ | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | ATTENUIT ALK, NO3, SO4, Na, Mg, K, FERROUS & FERRIC IRON

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | ATTENUIT | ALK, NO3, SO4, Na, Mg, K, FERROUS & FERRIC IRON | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 01 | 5-16-19 | 0920 | W | | 7 | | | | | | X | X X | |
| FGD-4 | 02 | | 1015 | W | | 7 | | | | | | X | X X | |
| FGD-3 | 03 | | 1110 | W | | 7 | | | | | | X | X X | |
| FGD-2 | 04 | | 1200 | W | | 7 | | | | | | X | X X | |
| FGD-5 | 05 | | 1350 | W | | 7 | | | | | | X | X X | |
| FGD-1 | 06 | | 1450 | W | | 7 | | | | | | X | X X | |
| [redacted] JB | — | | ~~1450~~ JB | W | | 7 | | | | | | X | X X | |
| FGD-8 | 07 | | 1545 | W | | 7 | | | | | | X | X X | |
| FGD-11 | 08 | | 1640 | W | | 7 | | | | | | X | X X | |
| FGD-12 | 09 | | 1735 | W | | 7 | | | | | | X | X X | |
| [redacted] JB | — | | | | | | | | | | | | | |

RELINQUISHED BY: (Signature) DATE/TIME 5-17-19 9:10 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME 5-17-19 11:20 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

❑ DHL DISPOSAL @ $5.00 each ❑ Return

TURN AROUND TIME
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑ _____

LABORATORY USE ONLY:
RECEIVING TEMP: 0.9/0.6 °C THERM #: 78
CUSTODY SEALS: ❑ BROKEN ❑ INTACT ☒ NOT USED
CARRIER: ❑ LONE STAR ❑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
☒ HAND DELIVERED

Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Golder | Date Received: 5/17/2019

Work Order Number 1905205 | Received by EL

Checklist completed by: [signature] Signature | 5/17/2019 Date | Reviewed by [initials] Initials | 5/17/2019 Date

Carrier name Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 0.9 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 11837 |
| | Adjusted? no | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *05-Jun-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD Ponds
**Lab Order:** 1905205

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2320 B - Alkalinity Analysis
Method M3500-Fe D - Ferrous Iron Analysis (this parameter is not NELAP certified)
Method M3500-Fe D - Ferric Iron (calculation) (this calculation is not NELAP certified).
Method M4500-P E - Orthophosphate Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904 and SM 7500 Ra B M. Analyzed at Pace Analytical.

## LOG IN

The samples were received and log-in performed on 5/17/19. A total of 9 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 5/20/19 the matrix spike and matrix spike duplicate recoveries were out of control limits for three analytes. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

For Metals analysis performed on 5/22/19 the RPD for the serial dilution was slightly above control limits for Boron. This is flagged accordingly. The PDS was within control limits for this analyte. No further corrective actions were taken.

For Metals analysis peformed on 5/22/19 LCVL6-190522 was above control limits for Sodium. This is flagged accordingly. The associated CCV6-190522 was within control limits for this analyte. No further corrective actions were taken.

## ALKALINITY ANALYSIS

For Alkalinity analysis performed on 5/21/19 the recovery of the Initial Calibration Verification (ICV-190521) was slightly above control limits. This is flagged accordingly in the QC summary report. The remaining bracketing CCVs were within control limits. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *05-Jun-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD Ponds
**Lab Order:** 1905205

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1905205-01 | FGD-6 | | 05/16/19 09:20 AM | 5/17/2019 |
| 1905205-02 | FGD-4 | | 05/16/19 10:15 AM | 5/17/2019 |
| 1905205-03 | FGD-3 | | 05/16/19 11:10 AM | 5/17/2019 |
| 1905205-04 | FGD-2 | | 05/16/19 12:00 PM | 5/17/2019 |
| 1905205-05 | FGD-5 | | 05/16/19 01:50 PM | 5/17/2019 |
| 1905205-06 | FGD-1 | | 05/16/19 02:50 PM | 5/17/2019 |
| 1905205-07 | FGD-8 | | 05/16/19 03:45 PM | 5/17/2019 |
| 1905205-08 | FGD-11 | | 05/16/19 04:40 PM | 5/17/2019 |
| 1905205-09 | FGD-12 | | 05/16/19 05:35 PM | 5/17/2019 |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1905205-01A | FGD-6 | 05/16/19 09:20 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-01B | FGD-6 | 05/16/19 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-01C | FGD-6 | 05/16/19 09:20 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-6 | 05/16/19 09:20 AM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-02A | FGD-4 | 05/16/19 10:15 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-02B | FGD-4 | 05/16/19 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-02C | FGD-4 | 05/16/19 10:15 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-4 | 05/16/19 10:15 AM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-03A | FGD-3 | 05/16/19 11:10 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-03B | FGD-3 | 05/16/19 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-03C | FGD-3 | 05/16/19 11:10 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-3 | 05/16/19 11:10 AM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-04A | FGD-2 | 05/16/19 12:00 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1905205-04B | FGD-2 | 05/16/19 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-04C | FGD-2 | 05/16/19 12:00 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-2 | 05/16/19 12:00 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-05A | FGD-5 | 05/16/19 01:50 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-05B | FGD-5 | 05/16/19 01:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-05C | FGD-5 | 05/16/19 01:50 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/30/19 03:00 PM | 91142 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-5 | 05/16/19 01:50 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-06A | FGD-1 | 05/16/19 02:50 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-06B | FGD-1 | 05/16/19 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-06C | FGD-1 | 05/16/19 02:50 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/30/19 03:00 PM | 91142 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-1 | 05/16/19 02:50 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1905205-07A | FGD-8 | 05/16/19 03:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-07B | FGD-8 | 05/16/19 03:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-07C | FGD-8 | 05/16/19 03:45 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | E300 | Anion Preparation | 05/20/19 09:14 AM | 90986 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-8 | 05/16/19 03:45 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-08A | FGD-11 | 05/16/19 04:40 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-08B | FGD-11 | 05/16/19 04:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-08C | FGD-11 | 05/16/19 04:40 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | E300 | Anion Preparation | 05/20/19 09:14 AM | 90986 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-11 | 05/16/19 04:40 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |
| 1905205-09A | FGD-12 | 05/16/19 05:35 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/21/19 04:52 PM | 91028 |
| 1905205-09B | FGD-12 | 05/16/19 05:35 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:30 AM | 90989 |
| | FGD-12 | 05/16/19 05:35 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/23/19 09:27 AM | 91060 |
| 1905205-09C | FGD-12 | 05/16/19 05:35 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/21/19 09:05 AM | 91010 |
| | FGD-12 | 05/16/19 05:35 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |
| | FGD-12 | 05/16/19 05:35 PM | Aqueous | E300 | Anion Preparation | 05/17/19 09:26 AM | 90965 |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1905205-09C | FGD-12 | 05/16/19 05:35 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/17/19 12:01 PM | 90972 |
| | FGD-12 | 05/16/19 05:35 PM | Aqueous | M2540C | TDS Preparation | 05/21/19 08:03 AM | 91019 |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1905205-01A | FGD-6 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-6 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:41 PM | UV/VIS_2_190521B |
| 1905205-01B | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 10:48 AM | CETAC2_HG_190524A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 03:52 PM | ICP-MS4_190522D |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 20 | 05/23/19 11:55 AM | ICP-MS4_190523A |
| 1905205-01C | FGD-6 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 10:03 AM | TITRATOR_190521A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 01:24 PM | IC4_190517A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 05:56 PM | IC4_190517A |
| | FGD-6 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:35 PM | UV/VIS_2_190517B |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-02A | FGD-4 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-4 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:42 PM | UV/VIS_2_190521B |
| 1905205-02B | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 10:50 AM | CETAC2_HG_190524A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 03:54 PM | ICP-MS4_190522D |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 10 | 05/23/19 11:57 AM | ICP-MS4_190523A |
| 1905205-02C | FGD-4 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 10:23 AM | TITRATOR_190521A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 02:12 PM | IC4_190517A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 06:12 PM | IC4_190517A |
| | FGD-4 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:35 PM | UV/VIS_2_190517B |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-03A | FGD-3 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-3 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:42 PM | UV/VIS_2_190521B |
| 1905205-03B | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:01 AM | CETAC2_HG_190524A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 20 | 05/23/19 11:59 AM | ICP-MS4_190523A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 03:56 PM | ICP-MS4_190522D |
| 1905205-03C | FGD-3 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 10:42 AM | TITRATOR_190521A |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1905205-03C | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 03:00 PM | IC4_190517A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 06:28 PM | IC4_190517A |
| | FGD-3 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:35 PM | UV/VIS_2_190517B |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-04A | FGD-2 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-2 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:43 PM | UV/VIS_2_190521B |
| 1905205-04B | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:03 AM | CETAC2_HG_190524A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 10 | 05/23/19 12:01 PM | ICP-MS4_190523A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 03:58 PM | ICP-MS4_190522D |
| 1905205-04C | FGD-2 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 10:50 AM | TITRATOR_190521A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 06:44 PM | IC4_190517A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 03:16 PM | IC4_190517A |
| | FGD-2 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:37 PM | UV/VIS_2_190517B |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-05A | FGD-5 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-5 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:43 PM | UV/VIS_2_190521B |
| 1905205-05B | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:06 AM | CETAC2_HG_190524A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 04:00 PM | ICP-MS4_190522D |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 10 | 05/23/19 12:03 PM | ICP-MS4_190523A |
| 1905205-05C | FGD-5 | Aqueous | M2320 B | Alkalinity | 91142 | 1 | 05/30/19 03:20 PM | TITRATOR_190530A |
| | FGD-5 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 10:54 AM | TITRATOR_190521A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 03:32 PM | IC4_190517A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 07:00 PM | IC4_190517A |
| | FGD-5 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:37 PM | UV/VIS_2_190517B |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-06A | FGD-1 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-1 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:44 PM | UV/VIS_2_190521B |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1905205-06B | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:08 AM | CETAC2_HG_190524A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 04:02 PM | ICP-MS4_190522D |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 10 | 05/23/19 12:05 PM | ICP-MS4_190523A |
| 1905205-06C | FGD-1 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 11:03 AM | TITRATOR_190521A |
| | FGD-1 | Aqueous | M2320 B | Alkalinity | 91142 | 1 | 05/30/19 03:23 PM | TITRATOR_190530A |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 03:48 PM | IC4_190517A |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 07:16 PM | IC4_190517A |
| | FGD-1 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:37 PM | UV/VIS_2_190517B |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-07A | FGD-8 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-8 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:44 PM | UV/VIS_2_190521B |
| | FGD-8 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 100 | 05/21/19 05:52 PM | UV/VIS_2_190521B |
| | FGD-8 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1000 | 05/21/19 05:59 PM | UV/VIS_2_190521B |
| 1905205-07B | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:10 AM | CETAC2_HG_190524A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 04:04 PM | ICP-MS4_190522D |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 50 | 05/23/19 12:07 PM | ICP-MS4_190523A |
| 1905205-07C | FGD-8 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 11:30 AM | TITRATOR_190521A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 04:04 PM | IC4_190517A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 90986 | 100 | 05/20/19 02:43 PM | IC4_190520A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 07:32 PM | IC4_190517A |
| | FGD-8 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:40 PM | UV/VIS_2_190517B |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-08A | FGD-11 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-11 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:44 PM | UV/VIS_2_190521B |
| 1905205-08B | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:12 AM | CETAC2_HG_190524A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 04:06 PM | ICP-MS4_190522D |

**Lab Order:** 1905205
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1905205-08B | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 20 | 05/23/19 12:09 PM | ICP-MS4_190523A |
| 1905205-08C | FGD-11 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 11:40 AM | TITRATOR_190521A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 07:48 PM | IC4_190517A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 90986 | 100 | 05/20/19 02:59 PM | IC4_190520A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 04:20 PM | IC4_190517A |
| | FGD-11 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:41 PM | UV/VIS_2_190517B |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |
| 1905205-09A | FGD-12 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91028 | 1 | 05/30/19 | UV/VIS_2_190530B |
| | FGD-12 | Aqueous | M3500-Fe D | Ferrous Iron | 91028 | 1 | 05/21/19 05:44 PM | UV/VIS_2_190521B |
| 1905205-09B | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 91060 | 1 | 05/24/19 11:15 AM | CETAC2_HG_190524A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90989 | 1 | 05/22/19 04:08 PM | ICP-MS4_190522D |
| 1905205-09C | FGD-12 | Aqueous | M2320 B | Alkalinity | 91010 | 1 | 05/21/19 11:44 AM | TITRATOR_190521A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 90965 | 10 | 05/17/19 04:36 PM | IC4_190517A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 90965 | 1 | 05/17/19 08:04 PM | IC4_190517A |
| | FGD-12 | Aqueous | M4500-P E | Orthophosphate | 90972 | 1 | 05/17/19 12:41 PM | UV/VIS_2_190517B |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 91019 | 1 | 05/21/19 10:00 AM | WC_190521C |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 09:20 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 03:52 PM |
| Arsenic | 0.0294 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:52 PM |
| Barium | 0.107 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 03:52 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:52 PM |
| Boron | 0.116 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 03:52 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:52 PM |
| Calcium | 20.3 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:52 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:52 PM |
| Cobalt | 0.0132 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 03:52 PM |
| Iron | 4.86 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 03:52 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:52 PM |
| Lithium | 0.00679 | 0.00500 | 0.0100 | J | mg/L | 1 | 05/22/19 03:52 PM |
| Magnesium | 6.61 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:52 PM |
| Molybdenum | 0.00770 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:52 PM |
| Potassium | 0.706 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:52 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:52 PM |
| Sodium | 225 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 11:55 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 03:52 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 10:48 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 170 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 01:24 PM |
| Fluoride | 0.669 | 0.100 | 0.400 | | mg/L | 1 | 05/17/19 05:56 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 05:56 PM |
| Sulfate | 51.3 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 05:56 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 262 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:03 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:03 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:03 AM |
| Alkalinity, Total (As CaCO3) | 262 | 20.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:03 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 4.86 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:41 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 09:20 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.714 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:35 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 710 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-02 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 10:15 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 03:54 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:54 PM |
| Barium | 0.117 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Boron | 0.0733 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 03:54 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Calcium | 41.7 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 11:57 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:54 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 03:54 PM |
| Iron | 0.103 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Lithium | 0.0325 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 03:54 PM |
| Magnesium | 18.6 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:54 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:54 PM |
| Potassium | 1.62 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:54 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:54 PM |
| Sodium | 160 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 11:57 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 03:54 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 10:50 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 205 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 02:12 PM |
| Fluoride | 0.327 | 0.100 | 0.400 | J | mg/L | 1 | 05/17/19 06:12 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 06:12 PM |
| Sulfate | 41.7 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 06:12 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 201 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 10:23 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 10:23 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 10:23 AM |
| Alkalinity, Total (As CaCO3) | 201 | 20.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 10:23 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.103 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:42 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-02 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 10:15 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.251 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:35 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 651 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-03 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 11:10 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 03:56 PM |
| Arsenic | 0.00230 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 03:56 PM |
| Barium | 0.0510 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Boron | 0.117 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 03:56 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Calcium | 60.1 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 11:59 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:56 PM |
| Cobalt | 0.00520 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 03:56 PM |
| Iron | 0.126 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Lithium | 0.0570 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 03:56 PM |
| Magnesium | 33.6 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 11:59 AM |
| Molybdenum | 0.00311 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 03:56 PM |
| Potassium | 2.50 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:56 PM |
| Selenium | 0.0423 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:56 PM |
| Sodium | 277 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 11:59 AM |
| Thallium | 0.000600 | 0.000500 | 0.00150 | J | mg/L | 1 | 05/22/19 03:56 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:01 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 117 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 03:00 PM |
| Fluoride | 0.776 | 0.100 | 0.400 | | mg/L | 1 | 05/17/19 06:28 PM |
| Nitrate-N | 1.41 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 06:28 PM |
| Sulfate | 182 | 10.0 | 30.0 | | mg/L | 10 | 05/17/19 03:00 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 533 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:42 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:42 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:42 AM |
| Alkalinity, Total (As CaCO3) | 533 | 20.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/21/19 10:42 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.126 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:42 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-03 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 11:10 AM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.0960 | 0.0300 | 0.100 | J | mg/L | 1 | 05/17/19 12:35 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1100 | 50.0 | 50.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-04 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 12:00 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 03:58 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:58 PM |
| Barium | 0.0993 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 03:58 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:58 PM |
| Boron | 0.105 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 03:58 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:58 PM |
| Calcium | 38.9 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:01 PM |
| Chromium | 0.00266 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 03:58 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 03:58 PM |
| Iron | 0.0799 | 0.0300 | 0.100 | J | mg/L | 1 | 05/22/19 03:58 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 03:58 PM |
| Lithium | 0.0228 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 03:58 PM |
| Magnesium | 16.7 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:58 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:58 PM |
| Potassium | 2.57 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 03:58 PM |
| Selenium | 0.0214 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 03:58 PM |
| Sodium | 198 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:01 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 03:58 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:03 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 260 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 03:16 PM |
| Fluoride | 0.383 | 0.100 | 0.400 | J | mg/L | 1 | 05/17/19 06:44 PM |
| Nitrate-N | 1.54 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 06:44 PM |
| Sulfate | 70.7 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 06:44 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 157 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/21/19 10:50 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/21/19 10:50 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/21/19 10:50 AM |
| Alkalinity, Total (As CaCO3) | 157 | 20.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/21/19 10:50 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.0799 | 0.0500 | 0.100 | JN | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:43 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-04 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 12:00 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.237 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:37 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 729 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-05 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 01:50 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 04:00 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:00 PM |
| Barium | 0.0926 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Boron | 0.108 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 04:00 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Calcium | 77.7 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:03 PM |
| Chromium | 0.0240 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:00 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 04:00 PM |
| Iron | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Lithium | 0.145 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 04:00 PM |
| Magnesium | 50.0 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:03 PM |
| Molybdenum | 0.00256 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 04:00 PM |
| Potassium | 3.46 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:00 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:00 PM |
| Sodium | 123 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:03 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 04:00 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:06 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 287 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 03:32 PM |
| Fluoride | 0.579 | 0.100 | 0.400 | | mg/L | 1 | 05/17/19 07:00 PM |
| Nitrate-N | 0.859 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 07:00 PM |
| Sulfate | 67.2 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 07:00 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 237 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/30/19 03:20 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/30/19 03:20 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/30/19 03:20 PM |
| Alkalinity, Total (As CaCO3) | 237 | 20.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/30/19 03:20 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:43 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-05 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 01:50 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.176 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:37 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 801 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-06 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 02:50 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 04:02 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:02 PM |
| Barium | 0.0485 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Boron | 0.0803 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 04:02 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Calcium | 19.5 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:02 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:02 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 04:02 PM |
| Iron | 0.186 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Lithium | 0.0442 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 04:02 PM |
| Magnesium | 11.2 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:02 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:02 PM |
| Potassium | 2.11 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:02 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:02 PM |
| Sodium | 49.4 | 1.00 | 3.00 | | mg/L | 10 | 05/23/19 12:05 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 04:02 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:08 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 62.4 | 3.00 | 10.0 | | mg/L | 10 | 05/17/19 03:48 PM |
| Fluoride | 0.362 | 0.100 | 0.400 | J | mg/L | 1 | 05/17/19 07:16 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 07:16 PM |
| Sulfate | 78.7 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 07:16 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 52.8 | 10.0 | 20.0 | | mg/L @ pH 4.5 | 1 | 05/30/19 03:23 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.5 | 1 | 05/30/19 03:23 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.5 | 1 | 05/30/19 03:23 PM |
| Alkalinity, Total (As CaCO3) | 52.8 | 20.0 | 20.0 | | mg/L @ pH 4.5 | 1 | 05/30/19 03:23 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.186 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:44 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-06 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 02:50 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.473 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:37 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 320 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-07 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 03:45 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 04:04 PM |
| Arsenic | 0.0126 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:04 PM |
| Barium | 0.864 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 04:04 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:04 PM |
| Boron | 0.0687 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 04:04 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:04 PM |
| Calcium | 314 | 5.00 | 15.0 | | mg/L | 50 | 05/23/19 12:07 PM |
| Chromium | 0.00346 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 04:04 PM |
| Cobalt | 0.0146 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 04:04 PM |
| Iron | 263 | 1.50 | 5.00 | | mg/L | 50 | 05/23/19 12:07 PM |
| Lead | 0.00194 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:04 PM |
| Lithium | 0.00864 | 0.00500 | 0.0100 | J | mg/L | 1 | 05/22/19 04:04 PM |
| Magnesium | 204 | 5.00 | 15.0 | | mg/L | 50 | 05/23/19 12:07 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:04 PM |
| Potassium | 19.2 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:04 PM |
| Selenium | 0.00274 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 04:04 PM |
| Sodium | 792 | 5.00 | 15.0 | | mg/L | 50 | 05/23/19 12:07 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 04:04 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:10 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 2040 | 30.0 | 100 | | mg/L | 100 | 05/20/19 02:43 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/17/19 07:32 PM |
| Nitrate-N | 0.107 | 0.100 | 0.500 | J | mg/L | 1 | 05/17/19 07:32 PM |
| Sulfate | 173 | 10.0 | 30.0 | | mg/L | 10 | 05/17/19 04:04 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 516 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/21/19 11:30 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/21/19 11:30 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/21/19 11:30 AM |
| Alkalinity, Total (As CaCO3) | 516 | 20.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/21/19 11:30 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 61.0 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | 202 | 50.0 | 100 | N | mg/L | 1000 | 05/21/19 05:59 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-07 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 03:45 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.219 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:40 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 3970 | 50.0 | 50.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-08 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 04:40 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 04:06 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:06 PM |
| Barium | 0.347 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 04:06 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:06 PM |
| Boron | 0.108 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 04:06 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:06 PM |
| Calcium | 85.0 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 12:09 PM |
| Chromium | 0.0280 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:06 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 04:06 PM |
| Iron | 1.28 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 04:06 PM |
| Lead | 0.000576 | 0.000300 | 0.00100 | J | mg/L | 1 | 05/22/19 04:06 PM |
| Lithium | 0.0145 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 04:06 PM |
| Magnesium | 30.6 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 12:09 PM |
| Molybdenum | 0.00358 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 04:06 PM |
| Potassium | 4.13 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:06 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:06 PM |
| Sodium | 328 | 2.00 | 6.00 | | mg/L | 20 | 05/23/19 12:09 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 04:06 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:12 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 566 | 30.0 | 100 | | mg/L | 100 | 05/20/19 02:59 PM |
| Fluoride | 0.380 | 0.100 | 0.400 | J | mg/L | 1 | 05/17/19 07:48 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 07:48 PM |
| Sulfate | 50.9 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 07:48 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 256 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 11:40 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 11:40 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 11:40 AM |
| Alkalinity, Total (As CaCO3) | 256 | 20.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/21/19 11:40 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 1.28 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:44 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-08 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 04:40 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.200 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:41 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1350 | 50.0 | 50.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-09 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 05:35 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/22/19 04:08 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:08 PM |
| Barium | 0.0474 | 0.00300 | 0.0100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Boron | 0.0723 | 0.0100 | 0.0300 | | mg/L | 1 | 05/22/19 04:08 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Calcium | 6.79 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:08 PM |
| Chromium | 0.00295 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/22/19 04:08 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/22/19 04:08 PM |
| Iron | 0.425 | 0.0300 | 0.100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Lithium | 0.0221 | 0.00500 | 0.0100 | | mg/L | 1 | 05/22/19 04:08 PM |
| Magnesium | 2.97 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:08 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:08 PM |
| Potassium | 1.55 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:08 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/22/19 04:08 PM |
| Sodium | 20.1 | 0.100 | 0.300 | | mg/L | 1 | 05/22/19 04:08 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/22/19 04:08 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/24/19 11:15 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 15.6 | 0.300 | 1.00 | | mg/L | 1 | 05/17/19 08:04 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/17/19 08:04 PM |
| Nitrate-N | 1.42 | 0.100 | 0.500 | | mg/L | 1 | 05/17/19 08:04 PM |
| Sulfate | 15.0 | 1.00 | 3.00 | | mg/L | 1 | 05/17/19 08:04 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 36.6 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/21/19 11:44 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/21/19 11:44 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/21/19 11:44 AM |
| Alkalinity, Total (As CaCO3) | 36.6 | 20.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/21/19 11:44 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.425 | 0.0500 | 0.100 | N | mg/L | 1 | 05/30/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/19 05:44 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *05-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1905205-09 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/16/19 05:35 PM |
| **Lab Order:** | 1905205 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **CC** |
| Phosphorus, Total Orthophosphate (As P) | 0.168 | 0.0300 | 0.100 | | mg/L | 1 | 05/17/19 12:41 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 140 | 10.0 | 10.0 | | mg/L | 1 | 05/21/19 10:00 AM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190524A**

The QC data in batch 91060 applies to the following samples: 1905205-01B, 1905205-02B, 1905205-03B, 1905205-04B, 1905205-05B, 1905205-06B, 1905205-07B, 1905205-08B, 1905205-09B

| Sample ID | **MB-91060** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:41:16 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-91060** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:43:31 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00188 | 0.000200 | 0.00200 | 0 | 94.0 | 85 | 115 | | | |

| Sample ID | **LCSD-91060** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:45:47 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00188 | 0.000200 | 0.00200 | 0 | 94.0 | 85 | 115 | 0 | 15 | |

| Sample ID | **1905205-02B MS** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:52:35 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00183 | 0.000200 | 0.00200 | 0 | 91.5 | 80 | 120 | | | |

| Sample ID | **1905205-02B MSD** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:54:51 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00186 | 0.000200 | 0.00200 | 0 | 93.0 | 80 | 120 | 1.63 | 15 | |

| Sample ID | **1905205-02B SD** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:57:06 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1905205-02B PDS** | Batch ID: | **91060** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:59:22 AM** | Prep Date: | **5/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00233 | 0.000200 | 0.00250 | 0 | 93.2 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190524A**

| Sample ID | **ICV-190524** | Batch ID: | **R104261** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 9:24:00 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00400 | 0.000200 | 0.00400 | 0 | 100 | 90 | 110 | | | |

| Sample ID | **CCV2-190524** | Batch ID: | **R104261** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 10:36:42 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00212 | 0.000200 | 0.00200 | 0 | 106 | 90 | 110 | | | |

| Sample ID | **CCV3-190524** | Batch ID: | **R104261** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_190524A** | Analysis Date: | **5/24/2019 11:19:48 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00200 | 0.000200 | 0.00200 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

The QC data in batch 90989 applies to the following samples: 1905205-01B, 1905205-02B, 1905205-03B, 1905205-04B, 1905205-05B, 1905205-06B, 1905205-07B, 1905205-08B, 1905205-09B

Sample ID **MB-90989** Batch ID: **90989** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_190522D** Analysis Date: **5/22/2019 2:44:00 PM** Prep Date: **5/20/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Iron | <0.0300 | 0.100 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Magnesium | <0.100 | 0.300 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Potassium | <0.100 | 0.300 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Sodium | <0.100 | 0.300 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-90989** Batch ID: **90989** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_190522D** Analysis Date: **5/22/2019 2:46:00 PM** Prep Date: **5/20/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Arsenic | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.2 | 80 | 120 | | | |
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 80 | 120 | | | |
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Calcium | 4.60 | 0.300 | 5.00 | 0 | 92.1 | 80 | 120 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Iron | 5.23 | 0.100 | 5.00 | 0 | 105 | 80 | 120 | | | |
| Lead | 0.184 | 0.00100 | 0.200 | 0 | 91.9 | 80 | 120 | | | |
| Lithium | 0.196 | 0.0100 | 0.200 | 0 | 98.0 | 80 | 120 | | | |
| Magnesium | 5.02 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | | | |
| Molybdenum | 0.190 | 0.00500 | 0.200 | 0 | 95.1 | 80 | 120 | | | |
| Potassium | 5.06 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | | | |
| Selenium | 0.209 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **LCS-90989** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:46:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sodium | 5.02 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | | | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID **LCSD-90989** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:48:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | 0.333 | 15 | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.942 | 15 | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.3 | 80 | 120 | 0.128 | 15 | |
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 80 | 120 | 0.129 | 15 | |
| Boron | 0.201 | 0.0300 | 0.200 | 0 | 101 | 80 | 120 | 0.298 | 15 | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 80 | 120 | 0.362 | 15 | |
| Calcium | 4.62 | 0.300 | 5.00 | 0 | 92.4 | 80 | 120 | 0.325 | 15 | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 80 | 120 | 0.085 | 15 | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.820 | 15 | |
| Iron | 5.15 | 0.100 | 5.00 | 0 | 103 | 80 | 120 | 1.50 | 15 | |
| Lead | 0.185 | 0.00100 | 0.200 | 0 | 92.3 | 80 | 120 | 0.421 | 15 | |
| Lithium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 80 | 120 | 2.22 | 15 | |
| Magnesium | 5.07 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.937 | 15 | |
| Molybdenum | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 80 | 120 | 0.081 | 15 | |
| Potassium | 5.12 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | 1.16 | 15 | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 2.39 | 15 | |
| Sodium | 5.05 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.519 | 15 | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.3 | 80 | 120 | 1.55 | 15 | |

| Sample ID **1905185-06B SD** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:54:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.0256 | 0.0500 | 0 | 0.0253 | | | | 1.30 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Boron | 0.501 | 0.150 | 0 | 0.449 | | | | 10.8 | 10 | R |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Iron | <0.150 | 0.500 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.109 | 0.0500 | 0 | 0.101 | | | | 7.40 | 10 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **1905185-06B SD** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:54:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Molybdenum | <0.0100 | 0.0250 | 0 | 0.00218 | | | | 0 | 10 | |
| Potassium | 13.4 | 1.50 | 0 | 13.2 | | | | 1.21 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1905185-06B PDS** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:13:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Barium | 0.218 | 0.0100 | 0.200 | 0.0253 | 96.3 | 80 | 120 | | | |
| Beryllium | 0.174 | 0.00100 | 0.200 | 0 | 87.2 | 80 | 120 | | | |
| Boron | 0.613 | 0.0300 | 0.200 | 0.449 | 81.7 | 80 | 120 | | | |
| Cadmium | 0.183 | 0.00100 | 0.200 | 0 | 91.4 | 80 | 120 | | | |
| Chromium | 0.188 | 0.00500 | 0.200 | 0 | 94.2 | 80 | 120 | | | |
| Cobalt | 0.193 | 0.00500 | 0.200 | 0 | 96.4 | 80 | 120 | | | |
| Iron | 4.70 | 0.100 | 5.00 | 0 | 94.1 | 80 | 120 | | | |
| Lead | 0.186 | 0.00100 | 0.200 | 0 | 93.0 | 80 | 120 | | | |
| Lithium | 0.265 | 0.0100 | 0.200 | 0.101 | 81.8 | 80 | 120 | | | |
| Molybdenum | 0.186 | 0.00500 | 0.200 | 0.00218 | 91.9 | 80 | 120 | | | |
| Potassium | 17.5 | 0.300 | 5.00 | 13.3 | 84.0 | 80 | 120 | | | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 80 | 120 | | | |

| Sample ID **1905185-06B MS** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:15:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Barium | 0.226 | 0.0100 | 0.200 | 0.0253 | 100 | 80 | 120 | | | |
| Beryllium | 0.174 | 0.00100 | 0.200 | 0 | 87.0 | 80 | 120 | | | |
| Boron | 0.654 | 0.0300 | 0.200 | 0.449 | 103 | 80 | 120 | | | |
| Cadmium | 0.185 | 0.00100 | 0.200 | 0 | 92.7 | 80 | 120 | | | |
| Calcium | 197 | 0.300 | 5.00 | 194 | 64.2 | 80 | 120 | | | S |
| Chromium | 0.186 | 0.00500 | 0.200 | 0 | 93.0 | 80 | 120 | | | |
| Cobalt | 0.193 | 0.00500 | 0.200 | 0 | 96.7 | 80 | 120 | | | |
| Iron | 4.82 | 0.100 | 5.00 | 0 | 96.4 | 80 | 120 | | | |
| Lead | 0.187 | 0.00100 | 0.200 | 0 | 93.7 | 80 | 120 | | | |
| Lithium | 0.270 | 0.0100 | 0.200 | 0.101 | 84.2 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **1905185-06B MS** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:15:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Magnesium | 128 | 0.300 | 5.00 | 128 | -3.79 | 80 | 120 | | | S |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0.00218 | 96.2 | 80 | 120 | | | |
| Potassium | 18.5 | 0.300 | 5.00 | 13.3 | 105 | 80 | 120 | | | |
| Selenium | 0.214 | 0.00500 | 0.200 | 0 | 107 | 80 | 120 | | | |
| Sodium | 252 | 0.300 | 5.00 | 257 | -103 | 80 | 120 | | | S |
| Thallium | 0.203 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID **1905185-06B MSD** | Batch ID: **90989** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:17:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | 0.836 | 15 | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 0.067 | 15 | |
| Barium | 0.227 | 0.0100 | 0.200 | 0.0253 | 101 | 80 | 120 | 0.141 | 15 | |
| Beryllium | 0.174 | 0.00100 | 0.200 | 0 | 86.8 | 80 | 120 | 0.265 | 15 | |
| Boron | 0.618 | 0.0300 | 0.200 | 0.449 | 84.6 | 80 | 120 | 5.65 | 15 | |
| Cadmium | 0.184 | 0.00100 | 0.200 | 0 | 92.1 | 80 | 120 | 0.555 | 15 | |
| Calcium | 195 | 0.300 | 5.00 | 194 | 16.8 | 80 | 120 | 1.21 | 15 | S |
| Chromium | 0.187 | 0.00500 | 0.200 | 0 | 93.6 | 80 | 120 | 0.569 | 15 | |
| Cobalt | 0.192 | 0.00500 | 0.200 | 0 | 95.8 | 80 | 120 | 1.00 | 15 | |
| Iron | 4.73 | 0.100 | 5.00 | 0 | 94.7 | 80 | 120 | 1.78 | 15 | |
| Lead | 0.190 | 0.00100 | 0.200 | 0 | 94.8 | 80 | 120 | 1.15 | 15 | |
| Lithium | 0.265 | 0.0100 | 0.200 | 0.101 | 81.8 | 80 | 120 | 1.82 | 15 | |
| Magnesium | 127 | 0.300 | 5.00 | 128 | -17.7 | 80 | 120 | 0.544 | 15 | S |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0.00218 | 97.5 | 80 | 120 | 1.33 | 15 | |
| Potassium | 18.3 | 0.300 | 5.00 | 13.3 | 100 | 80 | 120 | 1.25 | 15 | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 80 | 120 | 0.639 | 15 | |
| Sodium | 256 | 0.300 | 5.00 | 257 | -34.0 | 80 | 120 | 1.36 | 15 | S |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 80 | 120 | 1.46 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **ICV-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 11:38:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.101 | 0.00250 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.0975 | 0.0100 | 0.100 | 0 | 97.5 | 90 | 110 | | | |
| Beryllium | 0.0986 | 0.00100 | 0.100 | 0 | 98.6 | 90 | 110 | | | |
| Boron | 0.104 | 0.0300 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Cadmium | 0.0995 | 0.00100 | 0.100 | 0 | 99.5 | 90 | 110 | | | |
| Calcium | 2.35 | 0.300 | 2.50 | 0 | 94.2 | 90 | 110 | | | |
| Chromium | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Iron | 2.57 | 0.100 | 2.50 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.0926 | 0.00100 | 0.100 | 0 | 92.6 | 90 | 110 | | | |
| Lithium | 0.103 | 0.0100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Magnesium | 2.45 | 0.300 | 2.50 | 0 | 98.2 | 90 | 110 | | | |
| Molybdenum | 0.0911 | 0.00500 | 0.100 | 0 | 91.1 | 90 | 110 | | | |
| Potassium | 2.52 | 0.300 | 2.50 | 0 | 101 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Sodium | 2.53 | 0.300 | 2.50 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.0926 | 0.00150 | 0.100 | 0 | 92.6 | 90 | 110 | | | |

| Sample ID **LCVL-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 11:43:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00190 | 0.00250 | 0.00200 | 0 | 95.0 | 70 | 130 | | | |
| Arsenic | 0.00497 | 0.00500 | 0.00500 | 0 | 99.4 | 70 | 130 | | | |
| Barium | 0.00463 | 0.0100 | 0.00500 | 0 | 92.6 | 70 | 130 | | | |
| Beryllium | 0.00117 | 0.00100 | 0.00100 | 0 | 117 | 70 | 130 | | | |
| Boron | 0.0197 | 0.0300 | 0.0200 | 0 | 98.5 | 70 | 130 | | | |
| Cadmium | 0.000953 | 0.00100 | 0.00100 | 0 | 95.3 | 70 | 130 | | | |
| Calcium | 0.0981 | 0.300 | 0.100 | 0 | 98.1 | 70 | 130 | | | |
| Chromium | 0.00486 | 0.00500 | 0.00500 | 0 | 97.2 | 70 | 130 | | | |
| Cobalt | 0.00493 | 0.00500 | 0.00500 | 0 | 98.7 | 70 | 130 | | | |
| Iron | 0.111 | 0.100 | 0.100 | 0 | 111 | 70 | 130 | | | |
| Lead | 0.000870 | 0.00100 | 0.00100 | 0 | 87.0 | 70 | 130 | | | |
| Lithium | 0.00926 | 0.0100 | 0.0100 | 0 | 92.6 | 70 | 130 | | | |
| Magnesium | 0.0967 | 0.300 | 0.100 | 0 | 96.7 | 70 | 130 | | | |
| Molybdenum | 0.00458 | 0.00500 | 0.00500 | 0 | 91.5 | 70 | 130 | | | |
| Potassium | 0.0964 | 0.300 | 0.100 | 0 | 96.4 | 70 | 130 | | | |
| Selenium | 0.00494 | 0.00500 | 0.00500 | 0 | 98.8 | 70 | 130 | | | |
| Sodium | 0.0966 | 0.300 | 0.100 | 0 | 96.6 | 70 | 130 | | | |
| Thallium | 0.000843 | 0.00150 | 0.00100 | 0 | 84.3 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **CCV4-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:34:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.209 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Barium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Boron | 0.215 | 0.0300 | 0.200 | 0 | 108 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.66 | 0.300 | 5.00 | 0 | 93.3 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cobalt | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Iron | 5.05 | 0.100 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.7 | 90 | 110 | | | |
| Lithium | 0.195 | 0.0100 | 0.200 | 0 | 97.5 | 90 | 110 | | | |
| Magnesium | 5.05 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.193 | 0.00500 | 0.200 | 0 | 96.4 | 90 | 110 | | | |
| Potassium | 5.13 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Selenium | 0.212 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Sodium | 5.03 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.205 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL4-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 2:40:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00194 | 0.00250 | 0.00200 | 0 | 96.9 | 70 | 130 | | | |
| Arsenic | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Barium | 0.00472 | 0.0100 | 0.00500 | 0 | 94.5 | 70 | 130 | | | |
| Beryllium | 0.00124 | 0.00100 | 0.00100 | 0 | 124 | 70 | 130 | | | |
| Boron | 0.0223 | 0.0300 | 0.0200 | 0 | 111 | 70 | 130 | | | |
| Cadmium | 0.000955 | 0.00100 | 0.00100 | 0 | 95.5 | 70 | 130 | | | |
| Calcium | 0.111 | 0.300 | 0.100 | 0 | 111 | 70 | 130 | | | |
| Chromium | 0.00487 | 0.00500 | 0.00500 | 0 | 97.4 | 70 | 130 | | | |
| Cobalt | 0.00501 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Iron | 0.114 | 0.100 | 0.100 | 0 | 114 | 70 | 130 | | | |
| Lead | 0.000846 | 0.00100 | 0.00100 | 0 | 84.6 | 70 | 130 | | | |
| Lithium | 0.00964 | 0.0100 | 0.0100 | 0 | 96.4 | 70 | 130 | | | |
| Magnesium | 0.101 | 0.300 | 0.100 | 0 | 101 | 70 | 130 | | | |
| Molybdenum | 0.00453 | 0.00500 | 0.00500 | 0 | 90.7 | 70 | 130 | | | |
| Potassium | 0.0997 | 0.300 | 0.100 | 0 | 99.7 | 70 | 130 | | | |
| Selenium | 0.00427 | 0.00500 | 0.00500 | 0 | 85.3 | 70 | 130 | | | |
| Sodium | 0.111 | 0.300 | 0.100 | 0 | 111 | 70 | 130 | | | |
| Thallium | 0.000835 | 0.00150 | 0.00100 | 0 | 83.5 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **CCV5-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.205 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Boron | 0.220 | 0.0300 | 0.200 | 0 | 110 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.68 | 0.300 | 5.00 | 0 | 93.5 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Iron | 5.15 | 0.100 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.188 | 0.00100 | 0.200 | 0 | 93.8 | 90 | 110 | | | |
| Lithium | 0.203 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 5.17 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.195 | 0.00500 | 0.200 | 0 | 97.3 | 90 | 110 | | | |
| Potassium | 5.20 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Sodium | 5.13 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL5-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 3:46:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00186 | 0.00250 | 0.00200 | 0 | 93.2 | 70 | 130 | | | |
| Arsenic | 0.00475 | 0.00500 | 0.00500 | 0 | 95.0 | 70 | 130 | | | |
| Barium | 0.00461 | 0.0100 | 0.00500 | 0 | 92.3 | 70 | 130 | | | |
| Beryllium | 0.000947 | 0.00100 | 0.00100 | 0 | 94.7 | 70 | 130 | | | |
| Boron | 0.0229 | 0.0300 | 0.0200 | 0 | 115 | 70 | 130 | | | |
| Cadmium | 0.000924 | 0.00100 | 0.00100 | 0 | 92.4 | 70 | 130 | | | |
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |
| Chromium | 0.00452 | 0.00500 | 0.00500 | 0 | 90.4 | 70 | 130 | | | |
| Cobalt | 0.00479 | 0.00500 | 0.00500 | 0 | 95.8 | 70 | 130 | | | |
| Iron | 0.106 | 0.100 | 0.100 | 0 | 106 | 70 | 130 | | | |
| Lead | 0.000756 | 0.00100 | 0.00100 | 0 | 75.6 | 70 | 130 | | | |
| Lithium | 0.00948 | 0.0100 | 0.0100 | 0 | 94.8 | 70 | 130 | | | |
| Magnesium | 0.0981 | 0.300 | 0.100 | 0 | 98.1 | 70 | 130 | | | |
| Molybdenum | 0.00455 | 0.00500 | 0.00500 | 0 | 91.0 | 70 | 130 | | | |
| Potassium | 0.0951 | 0.300 | 0.100 | 0 | 95.1 | 70 | 130 | | | |
| Selenium | 0.00474 | 0.00500 | 0.00500 | 0 | 94.7 | 70 | 130 | | | |
| Sodium | 0.126 | 0.300 | 0.100 | 0 | 126 | 70 | 130 | | | |
| Thallium | 0.000763 | 0.00150 | 0.00100 | 0 | 76.3 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190522D**

| Sample ID **CCV6-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 4:12:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.208 | 0.00250 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Arsenic | 0.211 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Barium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.5 | 90 | 110 | | | |
| Boron | 0.207 | 0.0300 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 4.74 | 0.300 | 5.00 | 0 | 94.8 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.209 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Iron | 5.12 | 0.100 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 96.1 | 90 | 110 | | | |
| Lithium | 0.197 | 0.0100 | 0.200 | 0 | 98.7 | 90 | 110 | | | |
| Magnesium | 5.05 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Molybdenum | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 90 | 110 | | | |
| Potassium | 5.17 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Sodium | 5.09 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.206 | 0.00150 | 0.200 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL6-190522** | Batch ID: **R104232** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190522D** | Analysis Date: **5/22/2019 4:22:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00200 | 0.00250 | 0.00200 | 0 | 100 | 70 | 130 | | | |
| Arsenic | 0.00486 | 0.00500 | 0.00500 | 0 | 97.1 | 70 | 130 | | | |
| Barium | 0.00495 | 0.0100 | 0.00500 | 0 | 99.0 | 70 | 130 | | | |
| Beryllium | 0.000939 | 0.00100 | 0.00100 | 0 | 93.9 | 70 | 130 | | | |
| Boron | 0.0216 | 0.0300 | 0.0200 | 0 | 108 | 70 | 130 | | | |
| Cadmium | 0.00101 | 0.00100 | 0.00100 | 0 | 101 | 70 | 130 | | | |
| Calcium | 0.113 | 0.300 | 0.100 | 0 | 113 | 70 | 130 | | | |
| Chromium | 0.00486 | 0.00500 | 0.00500 | 0 | 97.1 | 70 | 130 | | | |
| Cobalt | 0.00489 | 0.00500 | 0.00500 | 0 | 97.8 | 70 | 130 | | | |
| Iron | 0.113 | 0.100 | 0.100 | 0 | 113 | 70 | 130 | | | |
| Lead | 0.000805 | 0.00100 | 0.00100 | 0 | 80.5 | 70 | 130 | | | |
| Lithium | 0.00903 | 0.0100 | 0.0100 | 0 | 90.3 | 70 | 130 | | | |
| Magnesium | 0.104 | 0.300 | 0.100 | 0 | 104 | 70 | 130 | | | |
| Molybdenum | 0.00464 | 0.00500 | 0.00500 | 0 | 92.8 | 70 | 130 | | | |
| Potassium | 0.0982 | 0.300 | 0.100 | 0 | 98.2 | 70 | 130 | | | |
| Selenium | 0.00531 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Sodium | 0.147 | 0.300 | 0.100 | 0 | 147 | 70 | 130 | | | S |
| Thallium | 0.000807 | 0.00150 | 0.00100 | 0 | 80.7 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190523A**

The QC data in batch 90989 applies to the following samples: 1905205-01B, 1905205-02B, 1905205-03B, 1905205-04B, 1905205-05B, 1905205-06B, 1905205-07B, 1905205-08B, 1905205-09B

Sample ID **1905185-06B SD** Batch ID: **90989** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_190523A** Analysis Date: **5/23/2019 11:20:00 AM** Prep Date: **5/20/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 207 | 30.0 | 0 | 200 | | | | 3.62 | 10 | |
| Magnesium | 134 | 30.0 | 0 | 130 | | | | 2.71 | 10 | |
| Sodium | 266 | 30.0 | 0 | 265 | | | | 0.189 | 10 | |

Sample ID **1905185-06B PDS** Batch ID: **90989** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_190523A** Analysis Date: **5/23/2019 11:40:00 AM** Prep Date: **5/20/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 295 | 6.00 | 100 | 200 | 95.2 | 80 | 120 | | | |
| Magnesium | 227 | 6.00 | 100 | 130 | 96.8 | 80 | 120 | | | |
| Sodium | 365 | 6.00 | 100 | 265 | 99.6 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

| Sample ID **ICV-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 11:01:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.39 | 0.300 | 2.50 | 0 | 95.8 | 90 | 110 | | | |
| Iron | 2.56 | 0.100 | 2.50 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 2.53 | 0.300 | 2.50 | 0 | 101 | 90 | 110 | | | |
| Sodium | 2.56 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 11:09:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0901 | 0.300 | 0.100 | 0 | 90.1 | 70 | 130 | | | |
| Iron | 0.105 | 0.100 | 0.100 | 0 | 105 | 70 | 130 | | | |
| Magnesium | 0.0985 | 0.300 | 0.100 | 0 | 98.5 | 70 | 130 | | | |
| Sodium | 0.0949 | 0.300 | 0.100 | 0 | 94.9 | 70 | 130 | | | |

| Sample ID **CCV1-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 11:42:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.76 | 0.300 | 5.00 | 0 | 95.2 | 90 | 110 | | | |
| Iron | 5.10 | 0.100 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 5.21 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Sodium | 5.14 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **LCVL1-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 11:48:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0899 | 0.300 | 0.100 | 0 | 89.9 | 70 | 130 | | | |
| Iron | 0.105 | 0.100 | 0.100 | 0 | 105 | 70 | 130 | | | |
| Magnesium | 0.0985 | 0.300 | 0.100 | 0 | 98.5 | 70 | 130 | | | |
| Sodium | 0.0973 | 0.300 | 0.100 | 0 | 97.3 | 70 | 130 | | | |

| Sample ID **CCV2-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 12:21:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.79 | 0.300 | 5.00 | 0 | 95.7 | 90 | 110 | | | |
| Iron | 5.15 | 0.100 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Magnesium | 5.29 | 0.300 | 5.00 | 0 | 106 | 90 | 110 | | | |
| Sodium | 5.22 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190523A**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **LCVL2-190523** | Batch ID: **R104240** | TestNo: **SW6020A** | | Units: **mg/L** | |
| SampType: **LCVL** | Run ID: **ICP-MS4_190523A** | Analysis Date: **5/23/2019 12:29:00 PM** | | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.101 | 0.300 | 0.100 | 0 | 101 | 70 | 130 | | | |
| Iron | 0.105 | 0.100 | 0.100 | 0 | 105 | 70 | 130 | | | |
| Magnesium | 0.0985 | 0.300 | 0.100 | 0 | 98.5 | 70 | 130 | | | |
| Sodium | 0.0994 | 0.300 | 0.100 | 0 | 99.4 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190517A**

The QC data in batch 90965 applies to the following samples: 1905205-01C, 1905205-02C, 1905205-03C, 1905205-04C, 1905205-05C, 1905205-06C, 1905205-07C, 1905205-08C, 1905205-09C

Sample ID **MB-90965** Batch ID: **90965** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_190517A** Analysis Date: **5/17/2019 10:28:41 AM** Prep Date: **5/17/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Nitrate-N | <0.100 | 0.500 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID **LCS-90965** Batch ID: **90965** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_190517A** Analysis Date: **5/17/2019 10:44:41 AM** Prep Date: **5/17/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.65 | 1.00 | 10.00 | 0 | 96.5 | 90 | 110 | | | |
| Fluoride | 4.17 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 5.13 | 0.500 | 5.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 29.8 | 3.00 | 30.00 | 0 | 99.5 | 90 | 110 | | | |

Sample ID **LCSD-90965** Batch ID: **90965** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_190517A** Analysis Date: **5/17/2019 11:00:41 AM** Prep Date: **5/17/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.72 | 1.00 | 10.00 | 0 | 97.2 | 90 | 110 | 0.774 | 20 | |
| Fluoride | 4.22 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | 1.24 | 20 | |
| Nitrate-N | 5.18 | 0.500 | 5.000 | 0 | 104 | 90 | 110 | 0.847 | 20 | |
| Sulfate | 30.0 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | 0.565 | 20 | |

Sample ID **1905205-01CMS** Batch ID: **90965** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_190517A** Analysis Date: **5/17/2019 1:40:13 PM** Prep Date: **5/17/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 365 | 10.0 | 200.0 | 170.3 | 97.2 | 90 | 110 | | | |
| Fluoride | 216 | 4.00 | 200.0 | 0 | 108 | 90 | 110 | | | |
| Nitrate-N | 44.7 | 5.00 | 45.16 | 0 | 99.1 | 90 | 110 | | | |
| Sulfate | 251 | 30.0 | 200.0 | 49.70 | 101 | 90 | 110 | | | |

Sample ID **1905205-01CMSD** Batch ID: **90965** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_190517A** Analysis Date: **5/17/2019 1:56:13 PM** Prep Date: **5/17/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 363 | 10.0 | 200.0 | 170.3 | 96.3 | 90 | 110 | 0.462 | 20 | |
| Fluoride | 217 | 4.00 | 200.0 | 0 | 108 | 90 | 110 | 0.421 | 20 | |
| Nitrate-N | 46.1 | 5.00 | 45.16 | 0 | 102 | 90 | 110 | 2.98 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190517A**

| Sample ID **1905205-01CMSD** | Batch ID: **90965** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 1:56:13 PM** | Prep Date: **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 251 | 30.0 | 200.0 | 49.70 | 101 | 90 | 110 | 0.050 | 20 | |

| Sample ID **1905205-02CMS** | Batch ID: **90965** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 2:28:13 PM** | Prep Date: **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 393 | 10.0 | 200.0 | 204.5 | 94.3 | 90 | 110 | | | |
| Fluoride | 215 | 4.00 | 200.0 | 0 | 107 | 90 | 110 | | | |
| Nitrate-N | 45.4 | 5.00 | 45.16 | 0 | 100 | 90 | 110 | | | |
| Sulfate | 239 | 30.0 | 200.0 | 41.25 | 98.7 | 90 | 110 | | | |

| Sample ID **1905205-02CMSD** | Batch ID: **90965** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 2:44:13 PM** | Prep Date: **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 396 | 10.0 | 200.0 | 204.5 | 95.8 | 90 | 110 | 0.770 | 20 | |
| Fluoride | 218 | 4.00 | 200.0 | 0 | 109 | 90 | 110 | 1.50 | 20 | |
| Nitrate-N | 46.0 | 5.00 | 45.16 | 0 | 102 | 90 | 110 | 1.44 | 20 | |
| Sulfate | 242 | 30.0 | 200.0 | 41.25 | 100 | 90 | 110 | 1.42 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190517A**

| Sample ID **ICV-190517** | Batch ID: **R104153** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 9:56:41 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.0 | 1.00 | 25.00 | 0 | 99.8 | 90 | 110 | | | |
| Fluoride | 10.2 | 0.400 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Nitrate-N | 13.0 | 0.500 | 12.50 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 75.7 | 3.00 | 75.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **CCV1-190517** | Batch ID: **R104153** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 5:24:12 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.74 | 1.00 | 10.00 | 0 | 97.4 | 90 | 110 | | | |
| Fluoride | 4.33 | 0.400 | 4.000 | 0 | 108 | 90 | 110 | | | |
| Nitrate-N | 5.19 | 0.500 | 5.000 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 30.1 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV2-190517** | Batch ID: **R104153** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190517A** | Analysis Date: **5/17/2019 9:08:12 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.75 | 1.00 | 10.00 | 0 | 97.5 | 90 | 110 | | | |
| Fluoride | 4.40 | 0.400 | 4.000 | 0 | 110 | 90 | 110 | | | |
| Nitrate-N | 5.18 | 0.500 | 5.000 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 30.1 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190520A**

The QC data in batch 90986 applies to the following samples: 1905205-07C, 1905205-08C

| Sample ID | **MB-90986** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 10:20:17 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |

| Sample ID | **LCS-90986** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 10:36:17 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.25 | 1.00 | 10.00 | 0 | 92.5 | 90 | 110 | | | |

| Sample ID | **LCSD-90986** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 10:52:17 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.37 | 1.00 | 10.00 | 0 | 93.7 | 90 | 110 | 1.29 | 20 | |

| Sample ID | **1905193-02DMS** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 12:51:06 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2120 | 100 | 2000 | 187.2 | 96.4 | 90 | 110 | | | |

| Sample ID | **1905193-02DMSD** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 1:07:06 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2130 | 100 | 2000 | 187.2 | 97.0 | 90 | 110 | 0.536 | 20 | |

| Sample ID | **1905194-01DMS** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 1:39:06 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2020 | 100 | 2000 | 0 | 101 | 90 | 110 | | | |

| Sample ID | **1905194-01DMSD** | Batch ID: | **90986** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC4_190520A** | Analysis Date: | **5/20/2019 1:55:06 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2020 | 100 | 2000 | 0 | 101 | 90 | 110 | 0.304 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190520A**

| Sample ID **ICV-190520** | Batch ID: **R104175** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_190520A** | Analysis Date: **5/20/2019 9:48:17 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 23.6 | 1.00 | 25.00 | 0 | 94.4 | 90 | 110 | | | |

| Sample ID **CCV1-190520** | Batch ID: **R104175** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190520A** | Analysis Date: **5/20/2019 4:03:05 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.60 | 1.00 | 10.00 | 0 | 96.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190521A**

The QC data in batch 91010 applies to the following samples: 1905205-01C, 1905205-02C, 1905205-03C, 1905205-04C, 1905205-05C, 1905205-06C, 1905205-07C, 1905205-08C, 1905205-09C

Sample ID **MB-91010** Batch ID: **91010** TestNo: **M2320 B** Units: **mg/L @ pH 4.17**
SampType: **MBLK** Run ID: **TITRATOR_190521A** Analysis Date: **5/21/2019 9:19:00 AM** Prep Date: **5/21/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Total (As CaCO3) | <20.0 | 20.0 | | | | | | | | |

Sample ID **LCS-91010** Batch ID: **91010** TestNo: **M2320 B** Units: **mg/L @ pH 3.91**
SampType: **LCS** Run ID: **TITRATOR_190521A** Analysis Date: **5/21/2019 9:23:00 AM** Prep Date: **5/21/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 54.4 | 20.0 | 50.00 | 0 | 109 | 74 | 129 | | | |

Sample ID **LCSD-91010** Batch ID: **91010** TestNo: **M2320 B** Units: **mg/L @ pH 3.97**
SampType: **LCSD** Run ID: **TITRATOR_190521A** Analysis Date: **5/21/2019 9:27:00 AM** Prep Date: **5/21/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 53.6 | 20.0 | 50.00 | 0 | 107 | 74 | 129 | 1.48 | 20 | |

Sample ID **1905205-01C DUP** Batch ID: **91010** TestNo: **M2320 B** Units: **mg/L @ pH 4.53**
SampType: **DUP** Run ID: **TITRATOR_190521A** Analysis Date: **5/21/2019 10:14:00 AM** Prep Date: **5/21/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 267 | 20.0 | 0 | 261.5 | | | | 2.04 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 267 | 20.0 | 0 | 261.5 | | | | 2.04 | 20 | |

Sample ID **1905229-02B DUP** Batch ID: **91010** TestNo: **M2320 B** Units: **mg/L @ pH 4.53**
SampType: **DUP** Run ID: **TITRATOR_190521A** Analysis Date: **5/21/2019 4:14:00 PM** Prep Date: **5/21/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 250 | 20.0 | 0 | 251.0 | | | | 0.319 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 250 | 20.0 | 0 | 251.0 | | | | 0.319 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190521A**

| Sample ID **ICV-190521** | Batch ID: **R104203** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.08** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **TITRATOR_190521A** | Analysis Date: **5/21/2019 9:15:00 AM** | Prep Date: **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 8.08 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 96.5 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 105 | 20.0 | 100.0 | 0 | 105 | 98 | 102 | | | S |

| Sample ID **CCV1-190521** | Batch ID: **R104203** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.14** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190521A** | Analysis Date: **5/21/2019 12:25:00 PM** | Prep Date: **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 13.9 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 86.6 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 100 | 20.0 | 100.0 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV2-190521** | Batch ID: **R104203** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.2** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190521A** | Analysis Date: **5/21/2019 4:19:00 PM** | Prep Date: **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 16.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 82.9 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.0 | 20.0 | 100.0 | 0 | 99.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190530A**

The QC data in batch 91142 applies to the following samples: 1905205-05C, 1905205-06C

| Sample ID **MB-91142** | Batch ID: **91142** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.2** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 3:08:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Total (As CaCO3) | <20.0 | 20.0 | | | | | | | | |

| Sample ID **LCS-91142** | Batch ID: **91142** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.3** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 3:12:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 50.5 | 20.0 | 50.00 | 0 | 101 | 74 | 129 | | | |

| Sample ID **1905205-05C DUP** | Batch ID: **91142** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.52** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 3:41:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 236 | 20.0 | 0 | 237.0 | | | | 0.296 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 236 | 20.0 | 0 | 237.0 | | | | 0.296 | 20 | |

| Sample ID **LCSD-91142** | Batch ID: **91142** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.18** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 4:10:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 50.9 | 20.0 | 50.00 | 0 | 102 | 74 | 129 | 0.789 | 20 | |

| Sample ID **1905321-02A DUP** | Batch ID: **91142** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.51** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 5:07:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 142 | 20.0 | 0 | 138.0 | | | | 2.86 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 142 | 20.0 | 0 | 138.0 | | | | 2.86 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190530A**

| Sample ID **ICV-190530** | Batch ID: **R104367** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.31** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 2:50:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 11.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 88.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.8 | 20.0 | 100.0 | 0 | 99.8 | 98 | 102 | | | |

| Sample ID **CCV1-190530** | Batch ID: **R104367** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.27** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 4:23:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 14.6 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 83.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 97.8 | 20.0 | 100.0 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID **CCV2-190530** | Batch ID: **R104367** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.5** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190530A** | Analysis Date: **5/30/2019 5:10:00 PM** | Prep Date: **5/30/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 95.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 95.8 | 20.0 | 100.0 | 0 | 95.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190517B**

The QC data in batch 90972 applies to the following samples: 1905205-01C, 1905205-02C, 1905205-03C, 1905205-04C, 1905205-05C, 1905205-06C, 1905205-07C, 1905205-08C, 1905205-09C

| Sample ID | **MB-90972** | Batch ID: | **90972** | TestNo: | **M4500-P E** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **UV/VIS_2_190517B** | Analysis Date: | **5/17/2019 12:34:00 PM** | Prep Date: | **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | <0.0300 | 0.100 | | | | | | | | |

| Sample ID | **LCS-90972** | Batch ID: | **90972** | TestNo: | **M4500-P E** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **UV/VIS_2_190517B** | Analysis Date: | **5/17/2019 12:34:00 PM** | Prep Date: | **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.520 | 0.100 | 0.5000 | 0 | 104 | 80 | 120 | | | |

| Sample ID | **LCSD-90972** | Batch ID: | **90972** | TestNo: | **M4500-P E** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **UV/VIS_2_190517B** | Analysis Date: | **5/17/2019 12:34:00 PM** | Prep Date: | **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.503 | 0.100 | 0.5000 | 0 | 101 | 80 | 120 | 3.32 | 15 | |

| Sample ID | **1905205-01CMS** | Batch ID: | **90972** | TestNo: | **M4500-P E** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **UV/VIS_2_190517B** | Analysis Date: | **5/17/2019 12:42:00 PM** | Prep Date: | **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 1.61 | 0.200 | 1.000 | 0.7140 | 90.0 | 80 | 120 | | | |

| Sample ID | **1905205-01CMSD** | Batch ID: | **90972** | TestNo: | **M4500-P E** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **UV/VIS_2_190517B** | Analysis Date: | **5/17/2019 12:42:00 PM** | Prep Date: | **5/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 1.59 | 0.200 | 1.000 | 0.7140 | 87.2 | 80 | 120 | 1.75 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190517B**

| Sample ID **ICV-190517** | Batch ID: **R104132** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_190517B** | Analysis Date: **5/17/2019 12:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.218 | 0.100 | 0.2000 | 0 | 109 | 85 | 115 | | | |

| Sample ID **CCV1-190517** | Batch ID: **R104132** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190517B** | Analysis Date: **5/17/2019 12:42:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.536 | 0.100 | 0.5000 | 0 | 107 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190521B**

The QC data in batch 91028 applies to the following samples: 1905205-01A, 1905205-02A, 1905205-03A, 1905205-04A, 1905205-05A, 1905205-06A, 1905205-07A, 1905205-08A, 1905205-09A

| Sample ID | **MB-91028** | Batch ID: | **91028** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:39:00 PM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | <0.0500 | 0.100 | | | | | | | | N |

| Sample ID | **LCS-91028** | Batch ID: | **91028** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:40:00 PM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.103 | 0.100 | 0.1000 | 0 | 103 | 85 | 115 | | | N |

| Sample ID | **LCSD-91028** | Batch ID: | **91028** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:40:00 PM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.0959 | 0.100 | 0.1000 | 0 | 95.9 | 85 | 115 | 7.39 | 15 | N |

| Sample ID | **1905205-09AMS** | Batch ID: | **91028** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:45:00 PM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.108 | 0.100 | 0.1000 | 0 | 108 | 85 | 115 | | | N |

| Sample ID | **1905205-09AMSD** | Batch ID: | **91028** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:45:00 PM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.110 | 0.100 | 0.1000 | 0 | 110 | 85 | 115 | 2.25 | 15 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190521B**

| Sample ID | **ICV-190521** | Batch ID: | **R104200** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:38:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.0971 | 0.100 | 0.1000 | 0 | 97.1 | 85 | 115 | | | N |

| Sample ID | **CCV1-190521** | Batch ID: | **R104200** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 5:46:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.221 | 0.100 | 0.2000 | 0 | 111 | 85 | 115 | | | N |

| Sample ID | **CCV2-190521** | Batch ID: | **R104200** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **UV/VIS_2_190521B** | Analysis Date: | **5/21/2019 6:00:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.212 | 0.100 | 0.2000 | 0 | 106 | 85 | 115 | | | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905205
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_190521C**

The QC data in batch 91019 applies to the following samples: 1905205-01C, 1905205-02C, 1905205-03C, 1905205-04C, 1905205-05C, 1905205-06C, 1905205-07C, 1905205-08C, 1905205-09C

| Sample ID | **MB-91019** | Batch ID: | **91019** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_190521C** | Analysis Date: | **5/21/2019 10:00:00 AM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-91019** | Batch ID: | **91019** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_190521C** | Analysis Date: | **5/21/2019 10:00:00 AM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 748 | 10.0 | 745.6 | 0 | 100 | 90 | 113 | | | |

| Sample ID | **1905188-01E-DUP** | Batch ID: | **91019** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190521C** | Analysis Date: | **5/21/2019 10:00:00 AM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 9980 | 200 | 0 | 10160 | | | | 1.79 | 5 | |

| Sample ID | **1905188-02E-DUP** | Batch ID: | **91019** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190521C** | Analysis Date: | **5/21/2019 10:00:00 AM** | Prep Date: | **5/21/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 10800 | 200 | 0 | 10840 | | | | 0.370 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

May 29, 2019



## DHL Analytical, Inc.

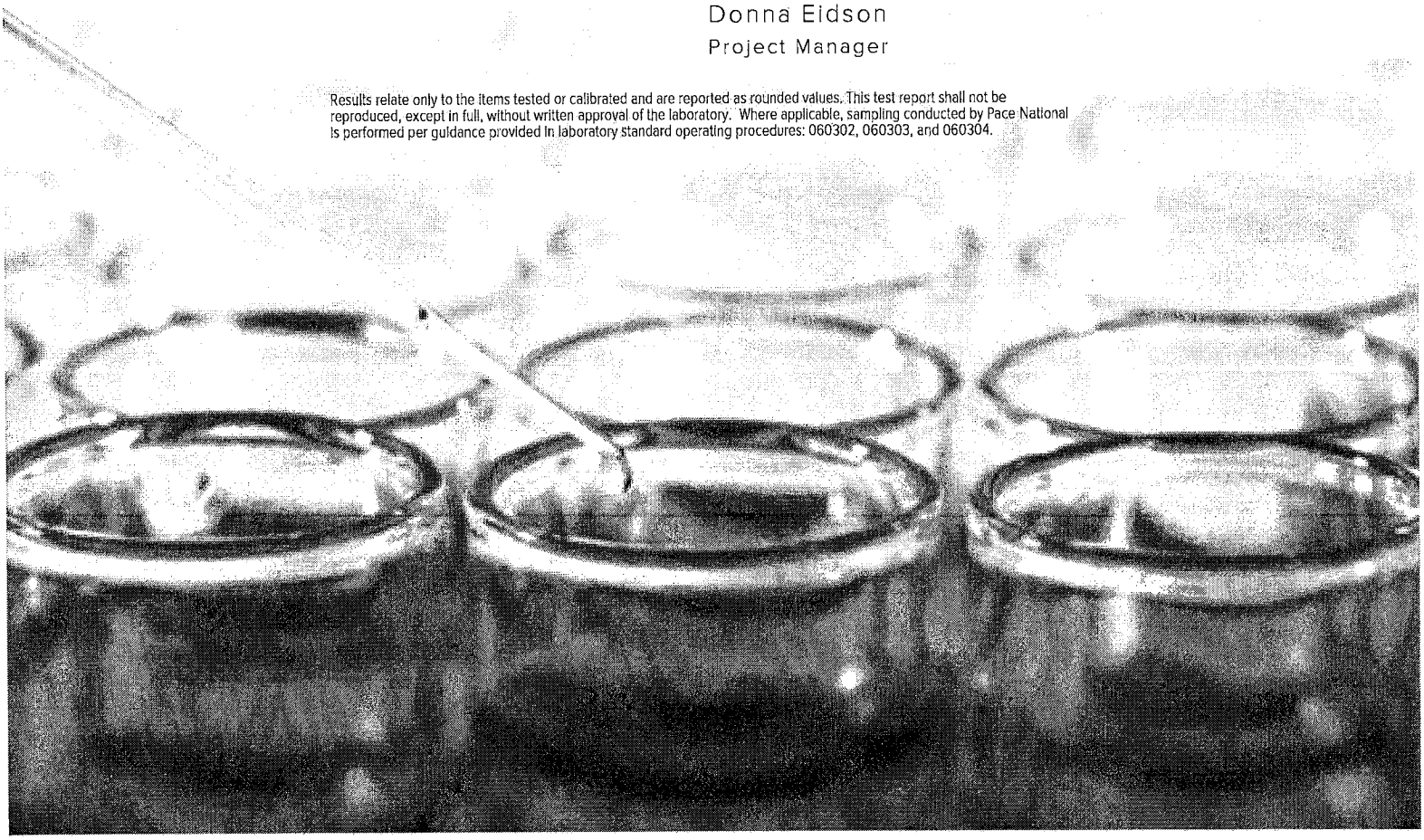
| | |
|---|---|
| Sample Delivery Group: | L1100949 |
| Samples Received: | 05/21/2019 |
| Project Number: | 1905205 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager


Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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## FGD-6 L1100949-01 Non-Potable Water

Collected by | Collected date/time 05/16/19 09:20 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 10:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 10:55 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:05 | RRE | Mt. Juliet, TN |

## FGD-4 L1100949-02 Non-Potable Water

Collected by | Collected date/time 05/16/19 10:15 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 10:55 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 10:55 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:05 | RRE | Mt. Juliet, TN |

## FGD-3 L1100949-03 Non-Potable Water

Collected by | Collected date/time 05/16/19 11:10 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:05 | RRE | Mt. Juliet, TN |

## FGD-2 L1100949-04 Non-Potable Water

Collected by | Collected date/time 05/16/19 12:00 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

## FGD-5 L1100949-05 Non-Potable Water

Collected by | Collected date/time 05/16/19 13:50 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

## FGD-1 L1100949-06 Non-Potable Water

Collected by | Collected date/time 05/16/19 14:50 | Received date/time 05/21/19 10:10

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

## FGD-8 L1100949-07 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time |
|---|---|---|---|---|---|
| | | | | 05/16/19 15:45 | 05/21/19 10:10 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

## FGD-11 L1100949-08 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time |
|---|---|---|---|---|---|
| | | | | 05/16/19 16:40 | 05/21/19 10:10 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

## FGD-12 L1100949-09 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time |
|---|---|---|---|---|---|
| | | | | 05/16/19 17:35 | 05/21/19 10:10 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1284744 | 1 | 05/22/19 08:25 | 05/28/19 14:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1284773 | 1 | 05/23/19 15:02 | 05/28/19 14:05 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1284773 | 1 | 05/23/19 15:02 | 05/24/19 17:18 | RRE | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 1.67 | | 0.422 | 0.593 | 05/28/2019 10:55 | WG1284744 |
| *(T) Barium* | *97.9* | | | *62.0-143* | *05/28/2019 10:55* | WG1284744 |
| *(T) Yttrium* | *113* | | | *79.0-136* | *05/28/2019 10:55* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 3.10 | | 0.890 | 0.863 | 05/28/2019 10:55 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 1.43 | | 0.468 | 0.27 | 05/24/2019 17:05 | WG1284773 |
| *(T) Barium-133* | *90.8* | | | *30.0-143* | *05/24/2019 17:05* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.745 | | 0.407 | 0.556 | 05/28/2019 10:55 | WG1284744 |
| *(T) Barium* | *109* | | | *62.0-143* | *05/28/2019 10:55* | WG1284744 |
| *(T) Yttrium* | *110* | | | *79.0-136* | *05/28/2019 10:55* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 1.37 | | 0.716 | 0.755 | 05/28/2019 10:55 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.627 | | 0.309 | 0.199 | 05/24/2019 17:05 | WG1284773 |
| *(T) Barium-133* | *92.0* | | | *30.0-143* | *05/24/2019 17:05* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.403 | | 0.412 | 0.638 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *92.8* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *112* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.797 | | 0.752 | 1.04 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.394 | | 0.340 | 0.403 | 05/24/2019 17:05 | WG1284773 |
| *(T) Barium-133* | *59.2* | | | *30.0-143* | *05/24/2019 17:05* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 0.588 | | 0.391 | 0.541 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *109* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *109* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 1.24 | | 0.819 | 0.937 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.648 | | 0.428 | 0.396 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *92.1* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.0624 | | 0.333 | 0.506 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *105* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *108* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.404 | | 0.552 | 0.696 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.342 | | 0.219 | 0.19 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *86.7* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | -0.0608 | | 0.401 | 0.593 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *95.4* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *110* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 0.184 | | 0.635 | 0.923 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.184 | | 0.234 | 0.33 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *83.4* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 5.27 | | 0.459 | 0.616 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *91.3* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 8.40 | | 1.14 | 0.795 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 3.14 | | 0.685 | 0.179 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *88.2* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 2.75 | | 0.444 | 0.645 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *112* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *108* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 5.14 | | 0.963 | 0.952 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 2.39 | | 0.519 | 0.307 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *97.4* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 1.43 | | 0.395 | 0.572 | 05/28/2019 14:05 | WG1284744 |
| *(T) Barium* | *111* | | | *62.0-143* | *05/28/2019 14:05* | WG1284744 |
| *(T) Yttrium* | *115* | | | *79.0-136* | *05/28/2019 14:05* | WG1284744 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 1.81 | | 0.642 | 0.813 | 05/28/2019 14:05 | WG1284773 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.385 | | 0.247 | 0.241 | 05/24/2019 17:18 | WG1284773 |
| *(T) Barium-133* | *96.0* | | | *30.0-143* | *05/24/2019 17:18* | WG1284773 |

## Method Blank (MB)

(MB) R3415641-1 05/28/19 10:55

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | -0.164 | | 0.413 |
| *(T) Barium* | *108* | | |
| *(T) Yttrium* | *115* | | |

## L1100192-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1100192-01 05/28/19 10:55 • (DUP) R3415641-5 05/28/19 10:55

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.157 | -0.0367 | 1 | 200 | 0.366 | | 20 | 3 |
| *(T) Barium* | *91.7* | *102* | | | | | | |
| *(T) Yttrium* | *110* | *107* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3415641-2 05/28/19 10:55

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 4.47 | 89.4 | 80.0-120 | |
| *(T) Barium* | | | *103* | | |
| *(T) Yttrium* | | | *107* | | |

## L1100922-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1100922-01 05/28/19 10:55 • (MS) R3415641-3 05/28/19 10:55 • (MSD) R3415641-4 05/28/19 10:55

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 7.14 | -0.136 | 7.62 | 7.50 | 107 | 105 | 1 | 70.0-130 | | | 1.50 | | 20 |
| *(T) Barium* | | *111* | | | *107* | *110* | | | | | | | |
| *(T) Yttrium* | | *114* | | | *107* | *110* | | | | | | | |

## Method Blank (MB)

(MB) R3415635-1 05/24/19 17:04

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-226 | 0.459 | | 0.209 |
| *(T) Barium-133* | *84.6* | | |

## L1100844-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1100844-01 05/24/19 17:04 • (DUP) R3415635-5 05/24/19 17:04

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.495 | 0.573 | 1 | 14.6 | 0.182 | | 20 | 3 |
| *(T) Barium-133* | *90.4* | *88.8* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3415635-2 05/24/19 17:04

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 20.1 | 19.1 | 95.0 | 80.0-120 | |
| *(T) Barium-133* | | | *79.1* | | |

## L1100433-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1100433-01 05/24/19 17:04 • (MS) R3415635-3 05/24/19 17:04 • (MSD) R3415635-4 05/24/19 17:04

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 20.1 | 1.16 | 19.9 | 20.9 | 93.2 | 98.0 | 1 | 75.0-125 | | | 4.71 | | 20 |
| *(T) Barium-133* | | *83.2* | | | *81.1* | *84.7* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| | The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG. |

# ACCREDITATIONS & LOCATIONS

ONE LAB. NATIONWIDE.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.



## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LA000356 |
| Kentucky [1 6] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

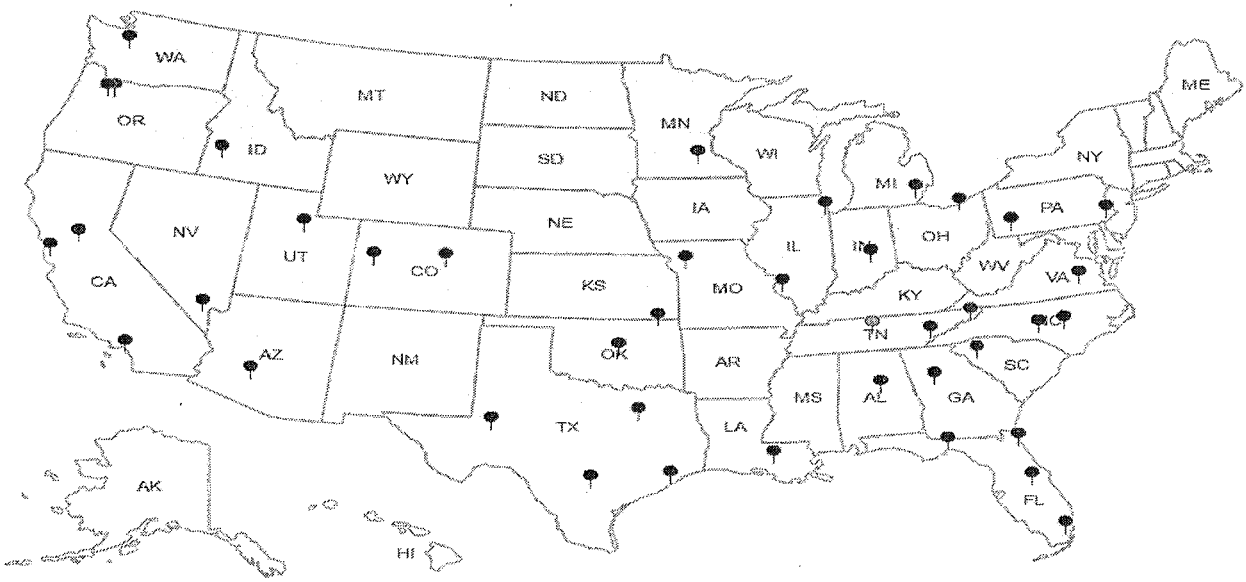
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



# Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | | |
|---|---|---|---|
| Client: DHLRTX | SDG#: | 1100949 | |
| Cooler Received/Opened On: 5/21/19 | Temperature: | Amb | |
| Received By: Brock Fariss | | | |
| Signature: BF Fariss | | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | ✓ | | |
| COC Signed / Accurate? | | ✓ | |
| Bottles arrive intact? | | ✓ | |
| Correct bottles used? | | ✓ | |
| Sufficient volume sent? | | ✓ | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | | | ✓ |

Pace Analytical®
National Center for Testing & Innovation

| Login #:L1100949 | Client:DHLRRTX | Date:05/21 | Evaluated by:Kelsey S |
|---|---|---|---|

**Non-Conformance (check applicable items)**

| | Sample Integrity | | Chain of Custody Clarification | | |
|---|---|---|---|---|---|
| | Parameter(s) past holding time | | Login Clarification Needed | | **If Broken Container:** |
| | Temperature not in range | | Chain of custody is incomplete | | Insufficient packing material around container |
| | Improper container type | | Please specify Metals requested. | | Insufficient packing material inside cooler |
| x | pH not in range. | | Please specify TCLP requested. | | Improper handling by carrier (FedEx / UPS / Courie |
| | Insufficient sample volume. | | Received additional samples not listed on coc. | | Sample was frozen |
| | Sample is biphasic. | | Sample ids on containers do not match ids on coc | | Container lid not intact |
| | Vials received with headspace. | | Trip Blank not received. | | **If no Chain of Custody:** |
| | Broken container | | Client did not "X" analysis. | | Received by: |
| | Broken container: | | Chain of Custody is missing | | Date/Time: |
| | Sufficient sample remains | | | | Temp./Cont. Rec./pH: |
| | | | | | Carrier: |
| | | | | | Tracking# |

**Login Comments: 2 of 2 FGD-8 was received with a pH of 6. pH adj in login 1424 05/21**

| Client informed by: | | Call | | Email | | Voice Mail | | Date: | Time: |
|---|---|---|---|---|---|---|---|---|---|
| TSR Initials: | Client Contact: | | | | | | | | |

**Login Instructions:**

Noted. DE 5/24/19

1100949

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



H005

Work Order: 1905205

**Subcontractor:**

Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

17-May-19

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Ra-228 E904.0 | Ra-226 M7500 Ra B M | Requested Tests | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | Aqueous | -01D | 05/16/19 09:20 AM | 1LHDPEHNO3 | | 1 | | | | -01 |
| FGD-6 | Aqueous | -01E | 05/16/19 09:20 AM | 1LHDPEHNO3 | 1 | | | | | 01 |
| FGD-4 | Aqueous | -02D | 05/16/19 10:15 AM | 1LHDPEHNO3 | | 1 | | | | 02 |
| FGD-4 | Aqueous | -02E | 05/16/19 10:15 AM | 1LHDPEHNO3 | 1 | | | | | 02 |
| FGD-3 | Aqueous | -03D | 05/16/19 11:10 AM | 1LHDPEHNO3 | | 1 | | | | 03 |
| FGD-3 | Aqueous | -03E | 05/16/19 11:10 AM | 1LHDPEHNO3 | 1 | | | | | 03 |
| FGD-2 | Aqueous | -04D | 05/16/19 12:00 PM | 1LHDPEHNO3 | | 1 | | | | 04 |
| FGD-2 | Aqueous | -04E | 05/16/19 12:00 PM | 1LHDPEHNO3 | 1 | | | | | 04 |
| FGD-5 | Aqueous | -05D | 05/16/19 01:50 PM | 1LHDPEHNO3 | | 1 | | | | 05 |
| FGD-5 | Aqueous | -05E | 05/16/19 01:50 PM | 1LHDPEHNO3 | 1 | | | | | 05 |
| FGD-1 | Aqueous | -06D | 05/16/19 02:50 PM | 1LHDPEHNO3 | | 1 | | | | 06 |
| FGD-1 | Aqueous | -06E | 05/16/19 02:50 PM | 1LHDPEHNO3 | 1 | | | | | 06 |
| FGD-8 | Aqueous | -07D | 05/16/19 03:45 PM | 1LHDPEHNO3 | | 1 | | | | 07 |
| FGD-8 | Aqueous | -07E | 05/16/19 03:45 PM | 1LHDPEHNO3 | 1 | | | | | 07 |
| FGD-11 | Aqueous | -08D | 05/16/19 04:40 PM | 1LHDPEHNO3 | | 1 | | | | 08 |
| FGD-11 | Aqueous | -08E | 05/16/19 04:40 PM | 1LHDPEHNO3 | 1 | | | | | 08 |
| FGD-12 | Aqueous | -09D | 05/16/19 05:35 PM | 1LHDPEHNO3 | | 1 | | | | 09 |
| FGD-12 | Aqueous | -09E | 05/16/19 05:35 PM | 1LHDPEHNO3 | 1 | | | | | 09 |

< 2 < 2

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

UPS
Rec: 18

| | Date/Time | | Date/Time |
|---|---|---|---|
| **Relinquished by:** | 5/17/19 1700 | **Received by:** | 5/21/19 1010 |
| **Relinquished by:** | | **Received by:** | |

pH adj @ 1424

NCL

AM RAD SCREEN: <0.5 mR/hr

May 29, 2019

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1905222

RE: Luminant-OGSES-FGD Pond

Dear Will Vienne:

DHL Analytical, Inc. received 1 sample(s) on 5/18/2019 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-19-24

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**Analytical Report 1905222** ..... **10**

**AnalyticalQCSummaryReport 1905222** ..... **11**

DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 86481

# CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR, ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-17-19 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 1905222
PROJECT LOCATION OR NAME: LUMINANT - OGSES - FGD POND
CLENT PROJECT #: 19122262-F COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL P=PAINT
W=WATER SL=SLUDGE
A=AIR O=OTHER
L=LIQUID SO=SOLID
SE=SEDIMENT

PRESERVATION: HCl, $HNO_3$, $H_2SO_4$ ☐ NaOH ☐, ICE, UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ (METHOD 8021) | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO (METHOD 8015) ☐ DRO (METHOD 8105) ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ 8082 PCB ☐ 8270 PCB ☐ | 8270 O-P PEST ☐ 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ | RCRA ☐ TX11 ☐ ____ ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ____ ☐ | TCLP SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | SULFATE, COBALT, LITHIUM, SELENIUM

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | SULFATE, COBALT, LITHIUM, SELENIUM | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-14 | 01 | 5-17-19 | 0750 | W | P | 2 | | | | | | X X | |

RELINQUISHED BY: (Signature) DATE/TIME 5-17-19 1730 RECEIVED BY: (Signature) FEDEX
RELINQUISHED BY: (Signature) FEDEX DATE/TIME 5/18/19 4:30 PM RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

APPENDIX F-Revision 1 November 21, 2022
☐ DHL DISPOSAL @ $5.00 each ☐ Return

3

**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 3.0 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

DHL COC Rev 1 | FEB 2010

ORIGIN ID:FWHA (512) 671-3434
J. BRAYTON
GOLDER
2201 DOUBLE CREEK DR

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 17MAY19
ACTWGT: 45.40 LB
CAD: 6981003/SSFO2002
DIMS: 25x14x14 IN

BILL THIRD PARTY

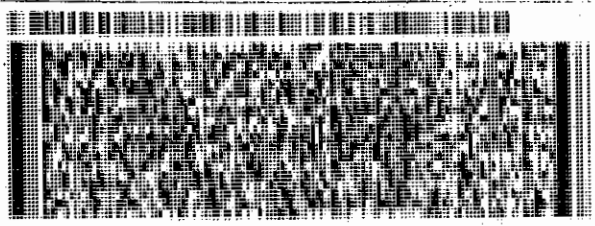
Part # 156[illegible]
DB2 EXP 03/20

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664

(512) 388-8222 REF:
INV:
PO: DEPT:



FedEx
Express

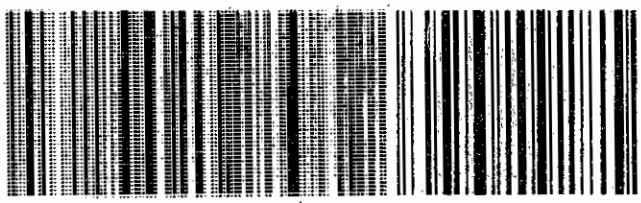
2 of 2

MPS# 0263 7873 2787 1824

Mstr# 7873 2787 1813 0201

XO BSMA

SATURDAY 12:00P
PRIORITY OVERNIGHT
AHS
78664
TX-US AUS



DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Golder | Date Received: 5/18/2019

Work Order Number 1905222 | Received by AH

Checklist completed by: _____ (Signature) 5/20/2019 (Date) | Reviewed by CC (Initials) 5/20/2019 (Date)

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 3.0 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 11837 |
| | Adjusted? no | | Checked by CC |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes | No | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

Page 1 of 1

**DHL Analytical, Inc.** **Date:** *29-May-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES-FGD Pond
**Lab Order:** 1905222

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method E300 - Anions Analysis

LOG IN

The sample was received and log-in performed on 5/18/19. A total of 1 sample was received. The sample arrived in good condition and was properly packaged. All method blanks, laboratory spikes, and/or matrix spikes met quality assurance objectives.

## DHL Analytical, Inc.

**Date:** *29-May-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES-FGD Pond
**Lab Order:** 1905222

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1905222-01 | FGD-14 | | 05/17/19 07:50 AM | 5/18/2019 |

**Lab Order:** 1905222
**Client:** Golder
**Project:** Luminant-OGSES-FGD Pond

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1905222-01A | FGD-14 | 05/17/19 07:50 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/20/19 09:41 AM | 90992 |
| 1905222-01B | FGD-14 | 05/17/19 07:50 AM | Aqueous | E300 | Anion Preparation | 05/20/19 09:15 AM | 90987 |

**Lab Order:** 1905222
**Client:** Golder
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1905222-01A | FGD-14 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 90992 | 1 | 05/21/19 01:06 PM | ICP-MS4_190521B |
| 1905222-01B | FGD-14 | Aqueous | E300 | Anions by IC method - Water | 90987 | 10 | 05/20/19 05:25 PM | IC2_190520A |

# DHL Analytical, Inc.

**Date:** *29-May-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-14 |
| **Project:** | Luminant-OGSES-FGD Pond | **Lab ID:** | 1905222-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 05/17/19 07:50 AM |
| **Lab Order:** | 1905222 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **RO** |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/21/19 01:06 PM |
| Lithium | 0.00564 | 0.00500 | 0.0100 | J | mg/L | 1 | 05/21/19 01:06 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/21/19 01:06 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Sulfate | 41.6 | 10.0 | 30.0 | | mg/L | 10 | 05/20/19 05:25 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190521B**

The QC data in batch 90992 applies to the following samples: 1905222-01A

| Sample ID | **MB-90992** | Batch ID: | **90992** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS4_190521B** | Analysis Date: | **5/21/2019 12:50:00 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |

| Sample ID | **LCS-90992** | Batch ID: | **90992** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS4_190521B** | Analysis Date: | **5/21/2019 12:52:00 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID | **LCSD-90992** | Batch ID: | **90992** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS4_190521B** | Analysis Date: | **5/21/2019 12:54:00 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 1.11 | 15 | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 3.06 | 15 | |
| Selenium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.424 | 15 | |

| Sample ID | **1905201-01A SD** | Batch ID: | **90992** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS4_190521B** | Analysis Date: | **5/21/2019 1:00:00 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.0251 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1905201-01A PDS** | Batch ID: | **90992** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS4_190521B** | Analysis Date: | **5/21/2019 1:14:00 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 80 | 120 | | | |
| Lithium | 0.209 | 0.0100 | 0.200 | 0.0251 | 92.0 | 80 | 120 | | | |
| Selenium | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190521B**

| Sample ID **1905201-01A MS** | Batch ID: **90992** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 1:16:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.194 | 0.00500 | 0.200 | 0 | 96.8 | 80 | 120 | | | |
| Lithium | 0.211 | 0.0100 | 0.200 | 0.0251 | 93.2 | 80 | 120 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 80 | 120 | | | |

| Sample ID **1905201-01A MSD** | Batch ID: **90992** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 1:18:00 PM** | Prep Date: **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.193 | 0.00500 | 0.200 | 0 | 96.5 | 80 | 120 | 0.256 | 15 | |
| Lithium | 0.216 | 0.0100 | 0.200 | 0.0251 | 95.3 | 80 | 120 | 2.00 | 15 | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 2.05 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190521B**

| Sample ID **ICV-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 11:02:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Lithium | 0.105 | 0.0100 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Selenium | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 11:07:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.00507 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Selenium | 0.00506 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |

| Sample ID **CCV2-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 12:37:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lithium | 0.196 | 0.0100 | 0.200 | 0 | 97.9 | 90 | 110 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL2-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 12:42:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.00505 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |
| Selenium | 0.00483 | 0.00500 | 0.00500 | 0 | 96.6 | 70 | 130 | | | |

| Sample ID **CCV3-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 1:20:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Lithium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |

| Sample ID **LCVL3-190521** | Batch ID: **R104193** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190521B** | Analysis Date: **5/21/2019 1:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.00509 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190521B**

Sample ID **LCVL3-190521** Batch ID: **R104193** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS4_190521B** Analysis Date: **5/21/2019 1:26:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.0102 | 0.0100 | 0.0100 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00554 | 0.00500 | 0.00500 | 0 | 111 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190520A**

The QC data in batch 90987 applies to the following samples: 1905222-01B

| Sample ID | **MB-90987** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 10:20:40 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-90987** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 10:36:40 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 30.7 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID | **LCSD-90987** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 10:52:40 AM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 30.7 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | 0.038 | 20 | |

| Sample ID | **1905221-01BMS** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 3:01:53 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 238 | 30.0 | 200.0 | 29.76 | 104 | 90 | 110 | | | |

| Sample ID | **1905221-01BMSD** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 3:17:53 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 236 | 30.0 | 200.0 | 29.76 | 103 | 90 | 110 | 0.887 | 20 | |

| Sample ID | **1905221-02BMS** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 3:49:53 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 218 | 30.0 | 200.0 | 12.12 | 103 | 90 | 110 | | | |

| Sample ID | **1905221-02BMSD** | Batch ID: | **90987** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_190520A** | Analysis Date: | **5/20/2019 4:05:53 PM** | Prep Date: | **5/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 221 | 30.0 | 200.0 | 12.12 | 104 | 90 | 110 | 1.08 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1905222
**Project:** Luminant-OGSES-FGD Pond

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190520A**

| Sample ID **ICV-190520** | Batch ID: **R104174** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_190520A** | Analysis Date: **5/20/2019 9:48:40 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 78.2 | 3.00 | 75.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID **CCV1-190520** | Batch ID: **R104174** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190520A** | Analysis Date: **5/20/2019 6:29:53 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate | 31.3 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

June 18, 2019

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1906072

RE: LUMINANT-OGSES-FGD

Dear Will Vienne:

DHL Analytical, Inc. received 2 sample(s) on 6/7/2019 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-19-24

# Table of Contents

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**AnalyticalQCSummaryReport 1906072** ..... **13**

DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# № 83076 CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671 3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 6-6-19 PAGE 1 OF 1
PO #: 19122262-F DHL WORK ORDER #: 1906072
PROJECT LOCATION OR NAME: LUMINANT - OGSES - FGD
CLENT PROJECT #: 19122262-F COLLECTOR: J. BRAXTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT
P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ | RCRA ☐ TX11 ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | LITHIUM | CATIONS | ANIONS | FERROUS | FERRIC | TBM

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-16 | 01 | 6-6-19 | 1300 | W | | 7 | | X | | X | | |
| FGD-15 | 02 | 6-6-19 | 1445 | W | | 7 | | X | | X | | |

RELINQUISHED BY: (Signature) DATE/TIME 6-6-19 1830 RECEIVED BY: (Signature) Fed EX
RELINQUISHED BY: (Signature) Fed EX DATE/TIME 6-7-19 1029 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

APPENDIX F-Revision 1 November 21, 2022

☐ DHL DISPOSAL @ $5.00 each ☐ Return



**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐

**LABORATORY USE ONLY:**
RECEIVING TEMP: 5.3°C THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

DHL COC Rev 1 | FEB 2010

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

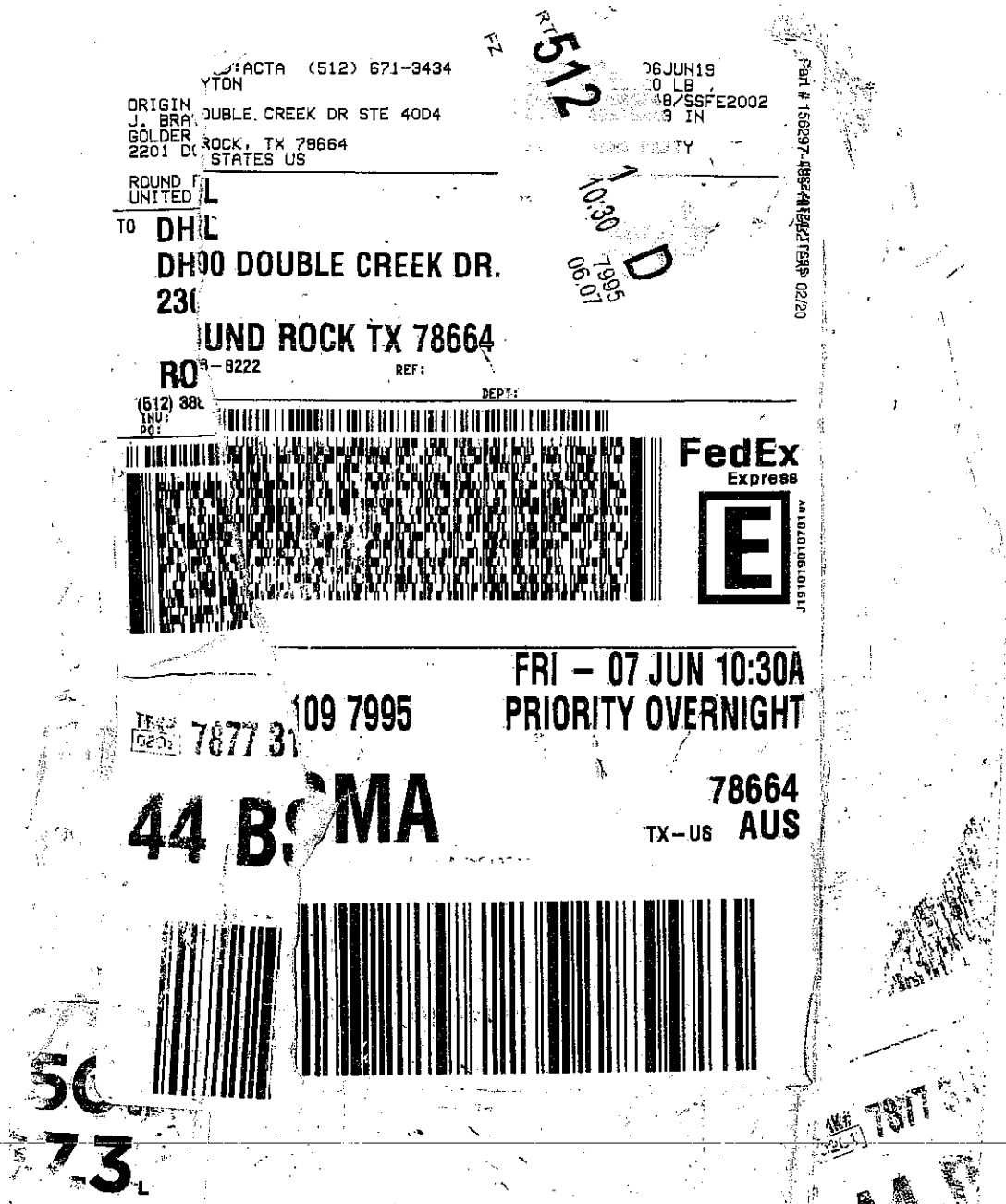
Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

---

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis


ORIGIN
DOUBLE CREEK DR STE 40D4
ROCK, TX 78664
STATES US
TO DHL
DH00 DOUBLE CREEK DR.
UND ROCK TX 78664
REF:
DEPT:
FedEx
Express
FRI - 07 JUN 10:30A
PRIORITY OVERNIGHT
78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Golder | Date Received: 6/7/2019

Work Order Number 1906072 | Received by EL

Checklist completed by: _____ 6/17/2019 (Signature / Date) | Reviewed by JD 6/17/2019 (Initials / Date)

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 5.5 °C |
| Water - VOA vials have zero headspace? | Yes ☑ | No ☐ | No VOA vials submitted ☐ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 11837 |
| | Adjusted? no | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? _____ | | Checked by _____ |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**DHL Analytical, Inc.** **Date:** *18-Jun-19*

**CLIENT:** Golder
**Project:** LUMINANT-OGSES-FGD
**Lab Order:** 1906072

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method E300 - Anions Analysis
Method M2320 B - Alkalinity Analysis
Method M3500-Fe D - Ferrous Iron Analysis (this parameter is not NELAP certified)
Method M3500-Fe D - Ferric Iron (calculation) (this calculation is not NELAP certified).
Method M4500-P E - Orthophosphate Analysis
Method M2540C - TDS Analysis

## LOG IN

The samples were received and log-in performed on 6/7/19. A total of 2 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 6/12/19 the matrix spike and matrix spike duplicate recoveries were below control limits for Sodium. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

## FERRIC IRON CALCULATION

The Ferric Iron is calculated as the Total Iron minus the Ferrous Iron.

## DHL Analytical, Inc.

**Date:** *18-Jun-19*

**CLIENT:** Golder
**Project:** LUMINANT-OGSES-FGD
**Lab Order:** 1906072

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1906072-01 | FGD-16 | | 06/06/19 01:00 PM | 6/7/2019 |
| 1906072-02 | FGD-15 | | 06/06/19 02:45 PM | 6/7/2019 |

**Lab Order:** 1906072
**Client:** Golder
**Project:** LUMINANT-OGSES-FGD

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1906072-01A | FGD-16 | 06/06/19 01:00 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 06/10/19 09:28 AM | 91267 |
| 1906072-01B | FGD-16 | 06/06/19 01:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| 1906072-01C | FGD-16 | 06/06/19 01:00 PM | Aqueous | M2320 B | Alkalinity Preparation | 06/10/19 09:34 AM | 91271 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | E300 | Anion Preparation | 06/07/19 12:27 PM | 91226 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | E300 | Anion Preparation | 06/17/19 08:40 AM | 91349 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | E300 | Anion Preparation | 06/17/19 08:40 AM | 91349 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | M4500-P E | Orthophosphate Prep | 06/07/19 01:20 PM | 91254 |
| | FGD-16 | 06/06/19 01:00 PM | Aqueous | M2540C | TDS Preparation | 06/13/19 04:04 PM | 91332 |
| 1906072-02A | FGD-15 | 06/06/19 02:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 06/10/19 09:28 AM | 91267 |
| 1906072-02B | FGD-15 | 06/06/19 02:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| 1906072-02C | FGD-15 | 06/06/19 02:45 PM | Aqueous | M2320 B | Alkalinity Preparation | 06/10/19 09:34 AM | 91271 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | E300 | Anion Preparation | 06/07/19 12:27 PM | 91226 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | E300 | Anion Preparation | 06/17/19 08:40 AM | 91349 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | M4500-P E | Orthophosphate Prep | 06/07/19 01:20 PM | 91254 |
| | FGD-15 | 06/06/19 02:45 PM | Aqueous | M2540C | TDS Preparation | 06/13/19 04:04 PM | 91332 |

**Lab Order:** 1906072
**Client:** Golder
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1906072-01A | FGD-16 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R104593 | 1 | 06/14/19 | UV/VIS_2_190614A |
| | FGD-16 | Aqueous | M3500-Fe D | Ferrous Iron | 91267 | 1 | 06/10/19 11:01 AM | UV/VIS_2_190610A |
| 1906072-01B | FGD-16 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 10 | 06/12/19 11:53 AM | ICP-MS4_190612A |
| | FGD-16 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 1 | 06/12/19 01:41 PM | ICP-MS4_190612A |
| | FGD-16 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 1 | 06/11/19 04:05 PM | ICP-MS5_190611D |
| 1906072-01C | FGD-16 | Aqueous | M2320 B | Alkalinity | 91271 | 1 | 06/10/19 12:47 PM | TITRATOR_190610A |
| | FGD-16 | Aqueous | E300 | Anions by IC method - Water | 91226 | 1 | 06/07/19 04:58 PM | IC2_190607A |
| | FGD-16 | Aqueous | E300 | Anions by IC method - Water | 91349 | 10 | 06/17/19 10:56 AM | IC2_190617A |
| | FGD-16 | Aqueous | E300 | Anions by IC method - Water | 91349 | 1 | 06/17/19 12:16 PM | IC2_190617A |
| | FGD-16 | Aqueous | M4500-P E | Orthophosphate | 91254 | 1 | 06/07/19 01:51 PM | UV/VIS_2_190607B |
| | FGD-16 | Aqueous | M2540C | Total Dissolved Solids | 91332 | 1 | 06/14/19 12:00 PM | WC_190614B |
| 1906072-02A | FGD-15 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R104593 | 1 | 06/14/19 | UV/VIS_2_190614A |
| | FGD-15 | Aqueous | M3500-Fe D | Ferrous Iron | 91267 | 1 | 06/10/19 11:03 AM | UV/VIS_2_190610A |
| 1906072-02B | FGD-15 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 50 | 06/12/19 11:55 AM | ICP-MS4_190612A |
| | FGD-15 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 1 | 06/12/19 01:43 PM | ICP-MS4_190612A |
| | FGD-15 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 1 | 06/11/19 04:08 PM | ICP-MS5_190611D |
| 1906072-02C | FGD-15 | Aqueous | M2320 B | Alkalinity | 91271 | 1 | 06/10/19 12:56 PM | TITRATOR_190610A |
| | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 91226 | 1 | 06/07/19 05:14 PM | IC2_190607A |
| | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 91349 | 100 | 06/17/19 11:44 AM | IC2_190617A |
| | FGD-15 | Aqueous | M4500-P E | Orthophosphate | 91254 | 1 | 06/07/19 01:52 PM | UV/VIS_2_190607B |
| | FGD-15 | Aqueous | M2540C | Total Dissolved Solids | 91332 | 1 | 06/14/19 12:00 PM | WC_190614B |

# DHL Analytical, Inc.

**Date:** *18-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-16 |
| **Project:** | LUMINANT-OGSES-FGD | **Lab ID:** | 1906072-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 06/06/19 01:00 PM |
| **Lab Order:** | 1906072 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Calcium | 16.5 | 1.00 | 3.00 | | mg/L | 10 | 06/12/19 11:53 AM |
| Iron | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 06/11/19 04:05 PM |
| Magnesium | 3.33 | 0.100 | 0.300 | | mg/L | 1 | 06/11/19 04:05 PM |
| Potassium | 3.06 | 0.100 | 0.300 | | mg/L | 1 | 06/12/19 01:41 PM |
| Sodium | 82.1 | 1.00 | 3.00 | | mg/L | 10 | 06/12/19 11:53 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 74.8 | 3.00 | 10.0 | | mg/L | 10 | 06/17/19 10:56 AM |
| Fluoride | 0.164 | 0.100 | 0.400 | J | mg/L | 1 | 06/07/19 04:58 PM |
| Nitrate-N | 0.361 | 0.100 | 0.500 | J | mg/L | 1 | 06/07/19 04:58 PM |
| Sulfate | 13.9 | 1.00 | 3.00 | | mg/L | 1 | 06/17/19 12:16 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 159 | 10.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 12:47 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 12:47 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 12:47 PM |
| Alkalinity, Total (As CaCO3) | 159 | 20.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 12:47 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/14/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/10/19 11:01 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.0490 | 0.0300 | 0.100 | J | mg/L | 1 | 06/07/19 01:51 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 325 | 10.0 | 10.0 | | mg/L | 1 | 06/14/19 12:00 PM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *18-Jun-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-15 |
| **Project:** | LUMINANT-OGSES-FGD | **Lab ID:** | 1906072-02 |
| **Project No:** | 19122262-F | **Collection Date:** | 06/06/19 02:45 PM |
| **Lab Order:** | 1906072 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Calcium | 252 | 5.00 | 15.0 | | mg/L | 50 | 06/12/19 11:55 AM |
| Iron | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 06/11/19 04:08 PM |
| Lithium | 0.0768 | 0.00500 | 0.0100 | | mg/L | 1 | 06/11/19 04:08 PM |
| Magnesium | 97.2 | 5.00 | 15.0 | | mg/L | 50 | 06/12/19 11:55 AM |
| Potassium | 5.06 | 0.100 | 0.300 | | mg/L | 1 | 06/12/19 01:43 PM |
| Sodium | 457 | 5.00 | 15.0 | | mg/L | 50 | 06/12/19 11:55 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 634 | 30.0 | 100 | | mg/L | 100 | 06/17/19 11:44 AM |
| Fluoride | 0.622 | 0.100 | 0.400 | | mg/L | 1 | 06/07/19 05:14 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 06/07/19 05:14 PM |
| Sulfate | 926 | 100 | 300 | | mg/L | 100 | 06/17/19 11:44 AM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 178 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:56 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:56 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:56 PM |
| Alkalinity, Total (As CaCO3) | 178 | 20.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:56 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/14/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/10/19 11:03 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.0840 | 0.0300 | 0.100 | J | mg/L | 1 | 06/07/19 01:52 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 2880 | 50.0 | 50.0 | | mg/L | 1 | 06/14/19 12:00 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190612A**

The QC data in batch 91261 applies to the following samples: 1906072-01B, 1906072-02B

Sample ID **MB-91261** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 10:50:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Potassium | <0.100 | 0.300 | | | | | | | | |
| Sodium | <0.100 | 0.300 | | | | | | | | |

Sample ID **LCS-91261** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 10:52:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.66 | 0.300 | 5.00 | 0 | 93.2 | 80 | 120 | | | |
| Potassium | 4.97 | 0.300 | 5.00 | 0 | 99.4 | 80 | 120 | | | |
| Sodium | 5.11 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | | | |

Sample ID **LCSD-91261** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 10:54:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.67 | 0.300 | 5.00 | 0 | 93.4 | 80 | 120 | 0.234 | 15 | |
| Potassium | 4.93 | 0.300 | 5.00 | 0 | 98.5 | 80 | 120 | 0.913 | 15 | |
| Sodium | 5.15 | 0.300 | 5.00 | 0 | 103 | 80 | 120 | 0.824 | 15 | |

Sample ID **1906056-01A SD** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 11:00:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 39.0 | 75.0 | 0 | 38.0 | | | | 2.46 | 10 | |
| Potassium | <25.0 | 75.0 | 0 | 0 | | | | 0 | 10 | |
| Sodium | 116 | 75.0 | 0 | 115 | | | | 0.316 | 10 | |

Sample ID **1906056-01A PDS** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 11:20:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 276 | 15.0 | 250 | 38.0 | 95.0 | 80 | 120 | | | |
| Potassium | 247 | 15.0 | 250 | 0 | 98.7 | 80 | 120 | | | |
| Sodium | 379 | 15.0 | 250 | 115 | 105 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190612A**

| Sample ID **1906056-01A MS** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:22:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 42.9 | 15.0 | 5.00 | 38.0 | 98.3 | 80 | 120 | | | |
| Potassium | 5.61 | 15.0 | 5.00 | 0 | 112 | 80 | 120 | | | |
| Sodium | 118 | 15.0 | 5.00 | 115 | 44.1 | 80 | 120 | | | S |

| Sample ID **1906056-01A MSD** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:24:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 42.4 | 15.0 | 5.00 | 38.0 | 87.2 | 80 | 120 | 1.30 | 15 | |
| Potassium | 5.65 | 15.0 | 5.00 | 0 | 113 | 80 | 120 | 0.726 | 15 | |
| Sodium | 116 | 15.0 | 5.00 | 115 | 20.3 | 80 | 120 | 1.02 | 15 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190612A**

| Sample ID **ICV-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 10:34:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.45 | 0.300 | 2.50 | 0 | 98.1 | 90 | 110 | | | |
| Magnesium | 2.44 | 0.300 | 2.50 | 0 | 97.4 | 90 | 110 | | | |
| Potassium | 2.48 | 0.300 | 2.50 | 0 | 99.1 | 90 | 110 | | | |
| Sodium | 2.55 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 10:44:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0989 | 0.300 | 0.100 | 0 | 98.9 | 70 | 130 | | | |
| Magnesium | 0.0972 | 0.300 | 0.100 | 0 | 97.2 | 70 | 130 | | | |
| Potassium | 0.101 | 0.300 | 0.100 | 0 | 101 | 70 | 130 | | | |
| Sodium | 0.103 | 0.300 | 0.100 | 0 | 103 | 70 | 130 | | | |

| Sample ID **CCV1-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:26:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.71 | 0.300 | 5.00 | 0 | 94.3 | 90 | 110 | | | |
| Magnesium | 4.96 | 0.300 | 5.00 | 0 | 99.1 | 90 | 110 | | | |
| Potassium | 5.03 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Sodium | 4.99 | 0.300 | 5.00 | 0 | 99.8 | 90 | 110 | | | |

| Sample ID **LCVL1-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:42:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |
| Magnesium | 0.0966 | 0.300 | 0.100 | 0 | 96.6 | 70 | 130 | | | |
| Potassium | 0.0990 | 0.300 | 0.100 | 0 | 99.0 | 70 | 130 | | | |
| Sodium | 0.103 | 0.300 | 0.100 | 0 | 103 | 70 | 130 | | | |

| Sample ID **CCV2-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 12:01:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.65 | 0.300 | 5.00 | 0 | 93.1 | 90 | 110 | | | |
| Magnesium | 5.02 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |
| Sodium | 5.11 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190612A**

| Sample ID | **LCVL2-190612** | Batch ID: | **R104563** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_190612A** | Analysis Date: | **6/12/2019 12:08:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.0958 | 0.300 | 0.100 | 0 | 95.8 | 70 | 130 | | | |
| Magnesium | 0.0967 | 0.300 | 0.100 | 0 | 96.7 | 70 | 130 | | | |
| Sodium | 0.103 | 0.300 | 0.100 | 0 | 103 | 70 | 130 | | | |

| Sample ID | **CCV4-190612** | Batch ID: | **R104563** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_190612A** | Analysis Date: | **6/12/2019 1:23:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Potassium | 5.05 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID | **LCVL4-190612** | Batch ID: | **R104563** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_190612A** | Analysis Date: | **6/12/2019 1:27:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Potassium | 0.0950 | 0.300 | 0.100 | 0 | 95.0 | 70 | 130 | | | |

| Sample ID | **CCV5-190612** | Batch ID: | **R104563** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **ICP-MS4_190612A** | Analysis Date: | **6/12/2019 1:45:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Potassium | 5.00 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID | **LCVL5-190612** | Batch ID: | **R104563** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCVL** | Run ID: | **ICP-MS4_190612A** | Analysis Date: | **6/12/2019 1:50:00 PM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Potassium | 0.0947 | 0.300 | 0.100 | 0 | 94.7 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

The QC data in batch 91261 applies to the following samples: 1906072-01B, 1906072-02B

| Sample ID | **MB-91261** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:05:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | <0.0300 | 0.100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Magnesium | <0.100 | 0.300 | | | | | | | | |

| Sample ID | **LCS-91261** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:07:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.05 | 0.100 | 5.00 | 0 | 101 | 80 | 120 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Magnesium | 5.05 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | | | |

| Sample ID | **LCSD-91261** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:10:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.01 | 0.100 | 5.00 | 0 | 100 | 80 | 120 | 0.604 | 15 | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 0.952 | 15 | |
| Magnesium | 5.04 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.085 | 15 | |

| Sample ID | **1906056-01A SD** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:16:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.190 | 0.500 | 0 | 0.0550 | | | | 110 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.00980 | | | | 0 | 10 | |
| Magnesium | 8.05 | 1.50 | 0 | 7.98 | | | | 0.840 | 10 | |

| Sample ID | **1906056-01A PDS** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:39:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 4.99 | 0.100 | 5.00 | 0.0550 | 98.7 | 80 | 120 | | | |
| Lithium | 0.215 | 0.0100 | 0.200 | 0.00980 | 103 | 80 | 120 | | | |
| Magnesium | 12.3 | 0.300 | 5.00 | 7.98 | 87.2 | 80 | 120 | | | |

| Sample ID | **1906056-01A MS** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:41:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **1906056-01A MS** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:41:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.06 | 0.100 | 5.00 | 0.0550 | 100 | 80 | 120 | | | |
| Lithium | 0.210 | 0.0100 | 0.200 | 0.00980 | 100 | 80 | 120 | | | |
| Magnesium | 12.9 | 0.300 | 5.00 | 7.98 | 97.7 | 80 | 120 | | | |

| Sample ID **1906056-01A MSD** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:43:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.08 | 0.100 | 5.00 | 0.0550 | 101 | 80 | 120 | 0.370 | 15 | |
| Lithium | 0.209 | 0.0100 | 0.200 | 0.00980 | 99.7 | 80 | 120 | 0.400 | 15 | |
| Magnesium | 13.0 | 0.300 | 5.00 | 7.98 | 99.4 | 80 | 120 | 0.654 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **ICV-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 10:46:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 2.45 | 0.100 | 2.50 | 0 | 98.2 | 90 | 110 | | | |
| Lithium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 2.39 | 0.300 | 2.50 | 0 | 95.6 | 90 | 110 | | | |

| Sample ID **LCVL-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 10:52:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.0944 | 0.100 | 0.100 | 0 | 94.4 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Magnesium | 0.0959 | 0.300 | 0.100 | 0 | 95.9 | 70 | 130 | | | |

| Sample ID **CCV3-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 2:53:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 4.97 | 0.100 | 5.00 | 0 | 99.4 | 90 | 110 | | | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 4.96 | 0.300 | 5.00 | 0 | 99.2 | 90 | 110 | | | |

| Sample ID **LCVL3-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 2:57:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.0963 | 0.100 | 0.100 | 0 | 96.3 | 70 | 130 | | | |
| Lithium | 0.0104 | 0.0100 | 0.0100 | 0 | 104 | 70 | 130 | | | |
| Magnesium | 0.0942 | 0.300 | 0.100 | 0 | 94.2 | 70 | 130 | | | |

| Sample ID **CCV4-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:48:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 4.93 | 0.100 | 5.00 | 0 | 98.6 | 90 | 110 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Magnesium | 4.99 | 0.300 | 5.00 | 0 | 99.7 | 90 | 110 | | | |

| Sample ID **LCVL4-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.0969 | 0.100 | 0.100 | 0 | 96.9 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **LCVL4-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |
| Magnesium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |

| Sample ID **CCV5-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 4:21:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 4.87 | 0.100 | 5.00 | 0 | 97.5 | 90 | 110 | | | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 5.01 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID **LCVL5-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 4:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.0924 | 0.100 | 0.100 | 0 | 92.4 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Magnesium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190607A**

The QC data in batch 91226 applies to the following samples: 1906072-01C, 1906072-02C

| Sample ID | **MB-91226** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 10:25:46 AM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Nitrate-N | <0.100 | 0.500 | | | | | | | | |

| Sample ID | **LCS-91226** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 10:41:46 AM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 4.06 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | | | |
| Nitrate-N | 5.17 | 0.500 | 5.000 | 0 | 103 | 90 | 110 | | | |

| Sample ID | **LCSD-91226** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 10:57:46 AM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 4.07 | 0.400 | 4.000 | 0 | 102 | 90 | 110 | 0.405 | 20 | |
| Nitrate-N | 5.11 | 0.500 | 5.000 | 0 | 102 | 90 | 110 | 1.10 | 20 | |

| Sample ID | **1906064-01EMS** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 12:01:26 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 21.2 | 0.400 | 20.00 | 0.1842 | 105 | 90 | 110 | | | |
| Nitrate-N | 4.75 | 0.500 | 4.516 | 0.1911 | 101 | 90 | 110 | | | |

| Sample ID | **1906064-01EMSD** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 12:17:26 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 21.2 | 0.400 | 20.00 | 0.1842 | 105 | 90 | 110 | 0.188 | 20 | |
| Nitrate-N | 4.75 | 0.500 | 4.516 | 0.1911 | 101 | 90 | 110 | 0.115 | 20 | |

| Sample ID | **1906066-01DMS** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 1:46:15 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 2110 | 40.0 | 2000 | 0 | 106 | 90 | 110 | | | |
| Nitrate-N | 456 | 50.0 | 451.6 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190607A**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **1906066-01DMSD** | Batch ID: **91226** | TestNo: **E300** | Units: **mg/L** | | |
| SampType: **MSD** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 2:02:15 PM** | Prep Date: **6/7/2019** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 2110 | 40.0 | 2000 | 0 | 105 | 90 | 110 | 0.071 | 20 | |
| Nitrate-N | 455 | 50.0 | 451.6 | 0 | 101 | 90 | 110 | 0.150 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190607A**

| Sample ID **ICV-190607** | Batch ID: **R104496** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 9:53:47 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 10.4 | 0.400 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 13.2 | 0.500 | 12.50 | 0 | 106 | 90 | 110 | | | |

| Sample ID **CCV1-190607** | Batch ID: **R104496** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 3:38:14 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 4.14 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 5.23 | 0.500 | 5.000 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV2-190607** | Batch ID: **R104496** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 6:18:14 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Fluoride | 4.16 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 5.17 | 0.500 | 5.000 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190617A**

The QC data in batch 91349 applies to the following samples: 1906072-01C, 1906072-02C

| Sample ID | **MB-91349** | Batch ID: | **91349** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC2_190617A** | Analysis Date: | **6/17/2019 9:53:33 AM** | Prep Date: | **6/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-91349** | Batch ID: | **91349** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC2_190617A** | Analysis Date: | **6/17/2019 10:09:33 AM** | Prep Date: | **6/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.0 | 1.00 | 10.00 | 0 | 100 | 90 | 110 | | | |
| Sulfate | 30.4 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID | **LCSD-91349** | Batch ID: | **91349** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC2_190617A** | Analysis Date: | **6/17/2019 10:25:33 AM** | Prep Date: | **6/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | 1.27 | 20 | |
| Sulfate | 30.8 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | 1.19 | 20 | |

| Sample ID | **1906072-01CMS** | Batch ID: | **91349** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190617A** | Analysis Date: | **6/17/2019 11:12:11 AM** | Prep Date: | **6/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 284 | 10.0 | 200.0 | 74.78 | 105 | 90 | 110 | | | |
| Sulfate | 219 | 30.0 | 200.0 | 15.57 | 102 | 90 | 110 | | | |

| Sample ID | **1906072-01CMSD** | Batch ID: | **91349** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_190617A** | Analysis Date: | **6/17/2019 11:28:11 AM** | Prep Date: | **6/17/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 287 | 10.0 | 200.0 | 74.78 | 106 | 90 | 110 | 0.914 | 20 | |
| Sulfate | 222 | 30.0 | 200.0 | 15.57 | 103 | 90 | 110 | 1.08 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190617A**

| Sample ID **ICV-190615** | Batch ID: **R104618** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_190617A** | Analysis Date: **6/17/2019 9:21:33 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.5 | 1.00 | 25.00 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 77.0 | 3.00 | 75.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **CCV1-190617** | Batch ID: **R104618** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190617A** | Analysis Date: **6/17/2019 1:20:11 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 30.8 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190610A**

The QC data in batch 91271 applies to the following samples: 1906072-01C, 1906072-02C

| Sample ID **MB-91271** | Batch ID: **91271** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.27** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 10:17:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Total (As CaCO3) | <20.0 | 20.0 | | | | | | | | |

| Sample ID **LCS-91271** | Batch ID: **91271** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.39** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 10:22:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 49.8 | 20.0 | 50.00 | 0 | 99.5 | 74 | 129 | | | |

| Sample ID **1906073-02C DUP** | Batch ID: **91271** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.54** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 1:11:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 66.8 | 20.0 | 0 | 68.00 | | | | 1.78 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 66.8 | 20.0 | 0 | 68.00 | | | | 1.78 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190610A**

| Sample ID **ICV-190610** | Batch ID: **R104513** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.29** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 10:15:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 4.00 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 96.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 100 | 20.0 | 100.0 | 0 | 100 | 98 | 102 | | | |

| Sample ID **CCV1-190610** | Batch ID: **R104513** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.22** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 1:08:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 27.7 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 74.1 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 102 | 20.0 | 100.0 | 0 | 102 | 90 | 110 | | | |

| Sample ID **CCV2-190610** | Batch ID: **R104513** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.21** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 1:16:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 26.1 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 73.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.8 | 20.0 | 100.0 | 0 | 99.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190607B**

The QC data in batch 91254 applies to the following samples: 1906072-01C, 1906072-02C

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **MB-91254** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MBLK** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:50:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | <0.0300 | 0.100 | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **LCS-91254** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **LCS** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:50:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.509 | 0.100 | 0.5000 | 0 | 102 | 80 | 120 | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **LCSD-91254** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **LCSD** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:50:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.507 | 0.100 | 0.5000 | 0 | 101 | 80 | 120 | 0.394 | 15 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **1906073-02CMS** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MS** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:53:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.517 | 0.100 | 0.5000 | 0 | 103 | 80 | 120 | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **1906073-02CMSD** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MSD** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:53:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.518 | 0.100 | 0.5000 | 0 | 104 | 80 | 120 | 0.193 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190607B**

| Sample ID **ICV-190607** | Batch ID: **R104504** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_190607B** | Analysis Date: **6/7/2019 1:49:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.203 | 0.100 | 0.2000 | 0 | 102 | 85 | 115 | | | |

| Sample ID **CCV1-190607** | Batch ID: **R104504** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190607B** | Analysis Date: **6/7/2019 1:53:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.566 | 0.100 | 0.5000 | 0 | 113 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190610A**

The QC data in batch 91267 applies to the following samples: 1906072-01A, 1906072-02A

| Sample ID | **MB-91267** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 10:55:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | <0.0500 | 0.100 | | | | | | | | N |

| Sample ID | **LCS-91267** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 10:57:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.110 | 0.100 | 0.1000 | 0 | 110 | 85 | 115 | | | N |

| Sample ID | **LCSD-91267** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 10:57:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.110 | 0.100 | 0.1000 | 0 | 110 | 85 | 115 | 0.609 | 15 | N |

| Sample ID | **1906073-02AMS** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 11:05:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.107 | 0.100 | 0.1000 | 0 | 107 | 85 | 115 | | | N |

| Sample ID | **1906073-02AMSD** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 11:05:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.102 | 0.100 | 0.1000 | 0 | 102 | 85 | 115 | 4.86 | 15 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190610A**

| Sample ID **ICV-190610** | Batch ID: **R104507** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_190610A** | Analysis Date: **6/10/2019 10:51:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.0908 | 0.100 | 0.1000 | 0 | 90.8 | 85 | 115 | | | N |

| Sample ID **CCV1-190610** | Batch ID: **R104507** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190610A** | Analysis Date: **6/10/2019 11:01:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.223 | 0.100 | 0.2000 | 0 | 112 | 85 | 115 | | | N |

| Sample ID **CCV2-190610** | Batch ID: **R104507** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190610A** | Analysis Date: **6/10/2019 11:06:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.204 | 0.100 | 0.2000 | 0 | 102 | 85 | 115 | | | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906072
**Project:** LUMINANT-OGSES-FGD

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_190614B**

The QC data in batch 91332 applies to the following samples: 1906072-01C, 1906072-02C

| Sample ID | **MB-91332** | Batch ID: | **91332** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_190614B** | Analysis Date: | **6/14/2019 12:00:00 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-91332** | Batch ID: | **91332** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_190614B** | Analysis Date: | **6/14/2019 12:00:00 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 762 | 10.0 | 745.6 | 0 | 102 | 90 | 113 | | | |

| Sample ID | **1906109-02B-DUP** | Batch ID: | **91332** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190614B** | Analysis Date: | **6/14/2019 12:00:00 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1800 | 50.0 | 0 | 1825 | | | | 1.38 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

## Quantitative X-Ray Diffraction by Rietveld Refinement

| | |
|---|---|
| ***Report Prepared for:*** | *Golder Associates* |
| ***Project Number/ LIMS No.*** | *17431-01 / MI7024-MAY19* |
| ***Batch:*** | *Oak Grove FDG Ponds* |
| ***Sample Receipt:*** | *May 30, 2019* |
| ***Sample Analysis:*** | *June 12, 2019* |
| ***Reporting Date:*** | *June 14, 2019* |
| ***Instrument:*** | Panalytical X'pert Pro Diffractometer |
| ***Test Conditions:*** | Co radiation, 40 kV, 45 mA<br>Regular Scanning: Step: 0.033°, Step time:0.15s, 2θ range: 6-70° |
| ***Interpretations*** : | HighScore Plus software using Crystallography Open Database (COD) and Joint Committee on Powder Diffraction Standards -International Center for Diffraction Data (JCPDS-ICDD). |
| ***Detection Limit*** : | 0.5-2%. Strongly dependent on crystallinity. |

***Contents:***


1) Method Summary
2) Summary of Mineral Assemblages
3) Quantitative XRD Results
4) XRD Pattern(s)



Lain Glossop H.B.Sc / Ben Eaton
Senior Mineralogist / Junior Mineralogist

Sarah Prout, Ph.D.,
Manager: Metallurgy

# Method Summary

***Mineral Identification and Interpretation:***

Mineral identification and interpretation involve matching the diffraction pattern of a test sample material to patterns of single-phase reference materials. The reference patterns from the Crystallography Open Database (COD) and the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards have been added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Mineral or compound identification and quantitative analysis results should be accompanied by supporting chemical assay data or other additional tests.

***Quantitative Rietveld Analysis:***

Panalytcal Highscore Plus software was used to perform the quantitative Rietveld Analysis. This software uses a graphics based profile analysis program built around a non-linear least squares fitting system, to quantitatively determine the amount of different phases present in a multicomponent sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental and specimen factors. Unlike other peak intensity-based methods, the Rietveld method uses a least squares approach to refine a theoretical line profile (shown as a blue pattern in the analyses plots) until it matches the obtained experimental patterns (shown as the coloured pattern in the analyses plots).

Rietveld refinement is completed with a set of minerals specifically identified for the sample. Zero values indicate that the mineral was included in the refinement calculations, but the calculated concentration was less than 0.5 wt%. Minerals not identified by the analyst are not included in refinement calculations for specific samples and are indicated with a dash.

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**WARNING:** The sample(s) to which the findings recorded herein (the "Findings") relate was(were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted.

SGS Minerals
a division of SGS Canada Inc.
3260 Production Way, Burnaby, British Columbia, Canada V5A 4W4
Tel: (604) 638-2349 Fax: (604) 444-5486 www.sgs.com www.sgs.com/met
Member of the SGS Group (SGS SA)

## Summary of Rietveld Quantitative Analysis X-ray Diffraction Results

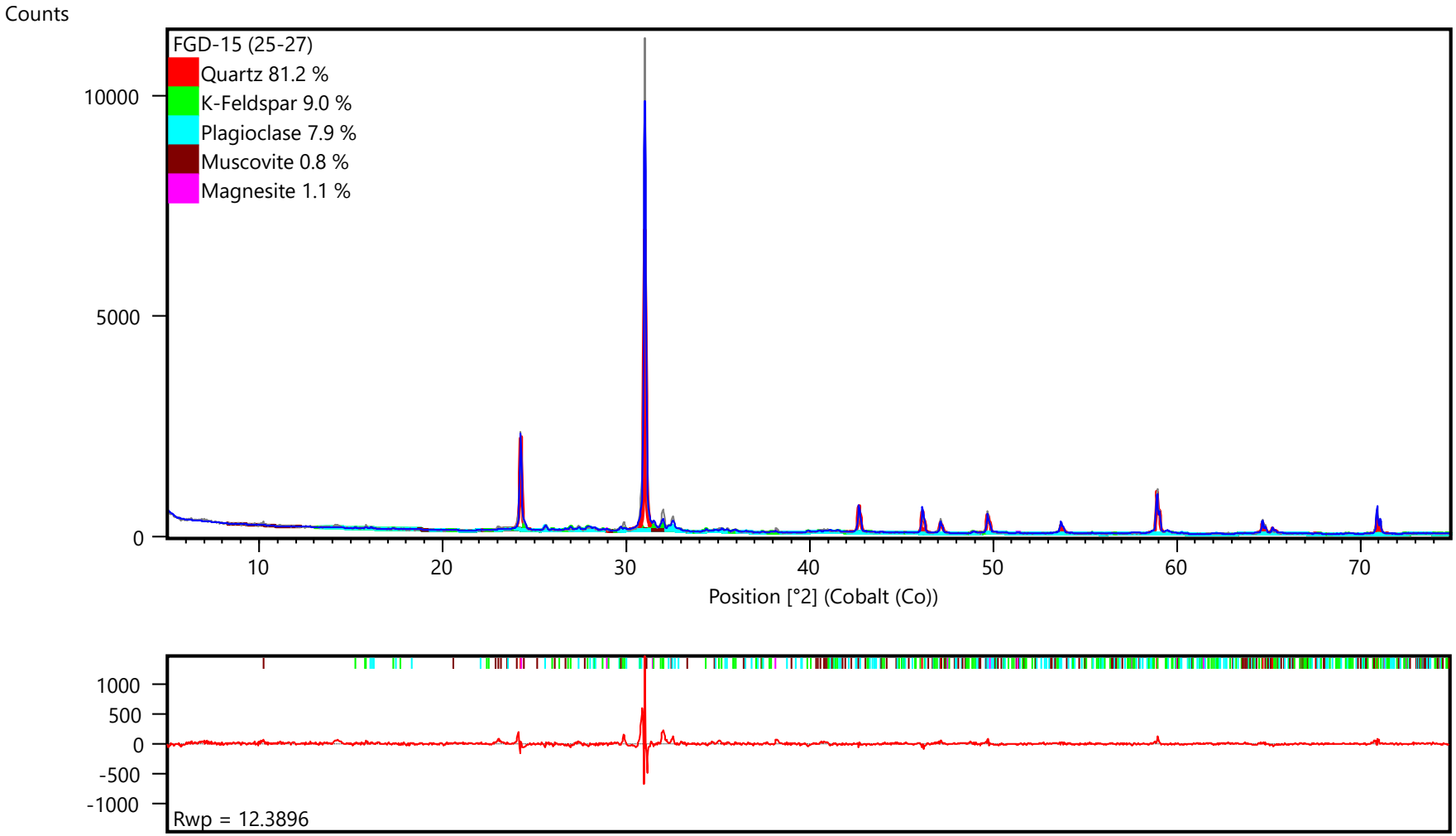
### Quantitative X-ray Diffraction Results

| Mineral/Compound | 1<br>FGD-15 (25-27) | 2<br>FGD-16 (30-32) | 3<br>FGD-2019-1 (23-25) |
|---|---|---|---|
| | (wt %) | (wt %) | (wt %) |
| Quartz | 81.2 | 80.5 | 84.9 |
| K-feldspar | 9.0 | 10.4 | 6.8 |
| Plagioclase | 7.9 | 9.0 | 7.3 |
| Muscovite | 0.8 | 0.1 | 1.0 |
| Magnesite | 1.1 | -- | -- |
| TOTAL | 100 | 100 | 100 |

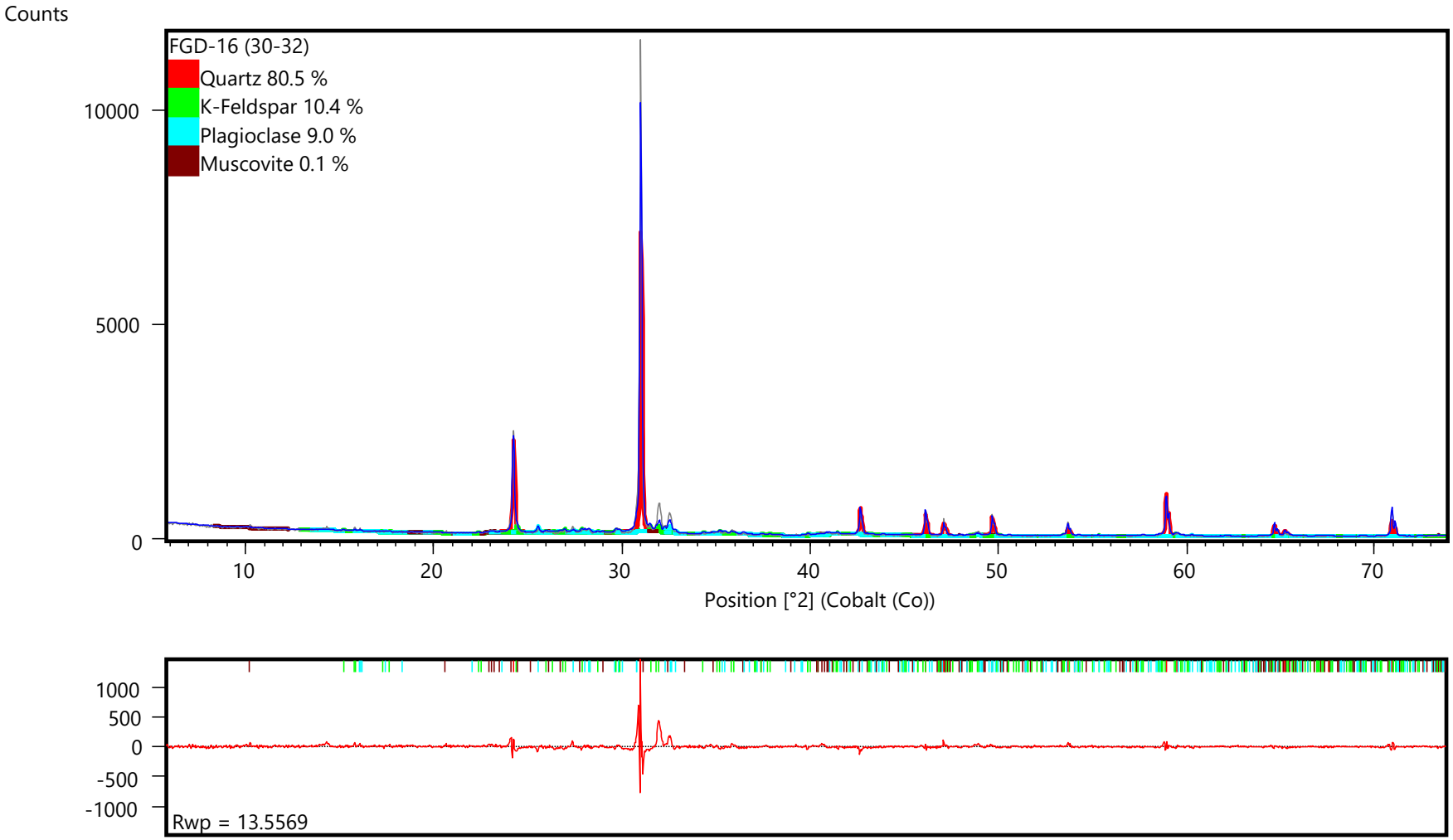
*Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.*

*Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.*

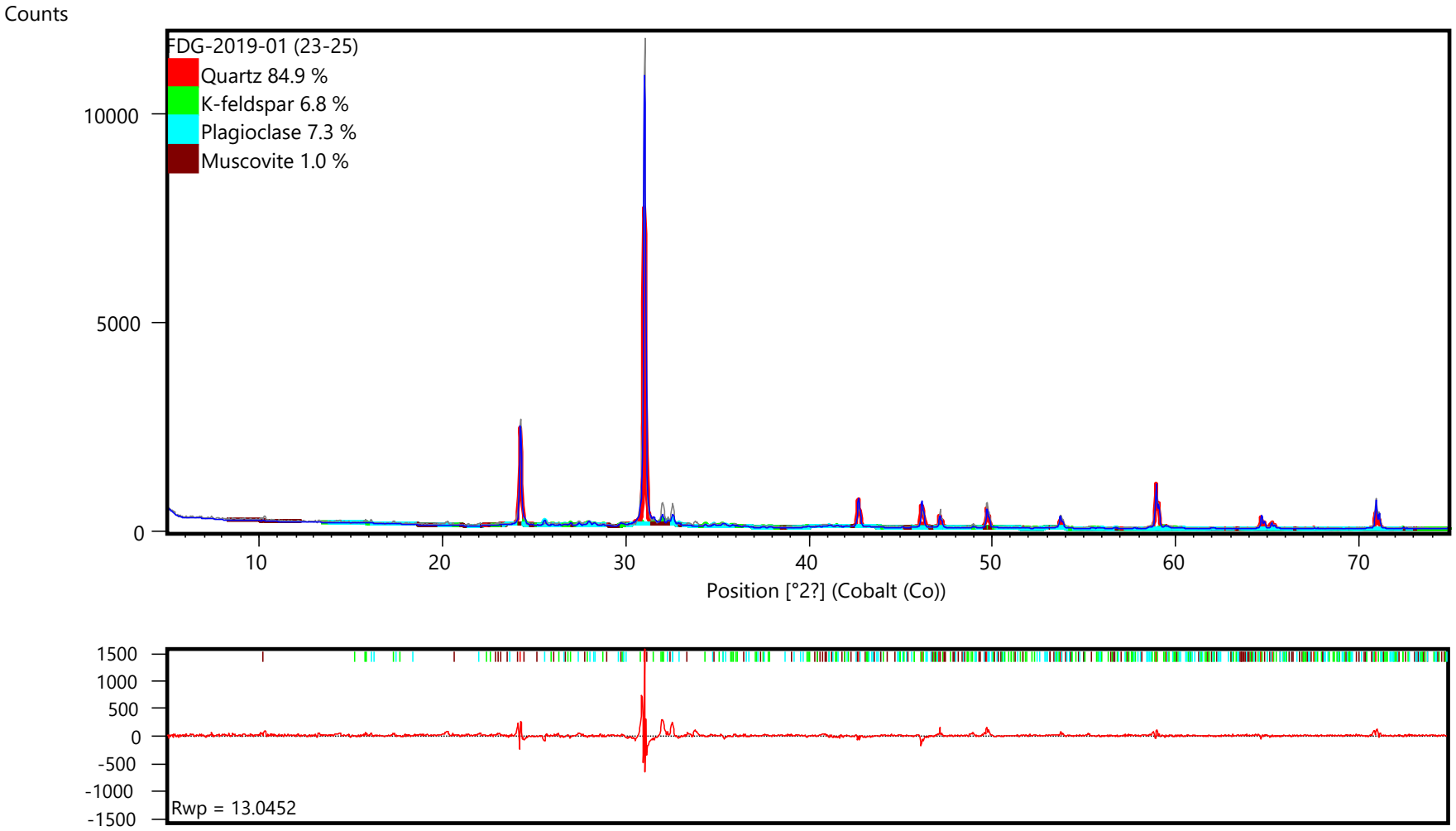
| Mineral/Compound | Formula |
|---|---|
| Quartz | $SiO_2$ |
| K-feldspar | $KAlSi_3O_8$ |
| Plagioclase | $(Na,Ca)[Al(Si,Al)Si_2O_8]$ |
| Muscovite | $KAl_2(AlSi_3O_{10})(OH)_2$ |
| Magnesite | $MgCO_3$ |




X-ray diffractogram. The upper pattern is the measured diffractogram, the blue curve is the calculated pattern from the Rietveld Refinement and the lower red curve is the difference plot.




X-ray diffractogram. The upper pattern is the measured diffractogram, the blue curve is the calculated pattern from the Rietveld Refinement and the lower red curve is the difference plot.




X-ray diffractogram. The upper pattern is the measured diffractogram, the blue curve is the calculated pattern from the Rietveld Refinement and the lower red curve is the difference plot.

July 12, 2019

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1906073

RE: LUMINANT-OGSES-PONDS

Dear Will Vienne:

DHL Analytical, Inc. received 2 sample(s) on 6/7/2019 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-19-24

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 83077

# CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 6-6-19 PAGE 1 OF 1
PO #: 19122262-F DHL WORK ORDER #: 1906073
PROJECT LOCATION OR NAME: LUMINANT - OGSES - PONDS
CLENT PROJECT #: 19122262-F COLLECTOR: J. BRAMLETT

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 608 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ | RCRA ☐ TX11 ☐ ___ ☐ | PH ☐ HEX. CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ___ ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | RPP 3 AND 4 | CATIONS - ANIONS | FERROUS - FERRIC - ORDN

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | RPP 3 AND 4 | CATIONS - ANIONS | FERROUS - FERRIC - ORDN | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-A-2019-1 | 01 | 6-6-19 | 1325 | W | | 3 | | X | | X | | X | X | X | |
| FGD-B-2019-1 | 02 | 6-6-19 | 1345 | W | | 3 | | X | | X | | X | X | X | |

RELINQUISHED BY: (Signature) DATE/TIME 6-6-19 1830 RECEIVED BY: (Signature) FedEx
RELINQUISHED BY: (Signature) FedEx DATE/TIME 6-7-19 1029 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

APPENDIX E-Revision 1 November 21, 2022

☐ DHL DISPOSAL @ $5.00 each ☐ Return



**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 9.5°C THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☑ NOT USED
CARRIER: ☐ LONE STAR ☑ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

DHL COC Rev 1 | FEB 2010

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

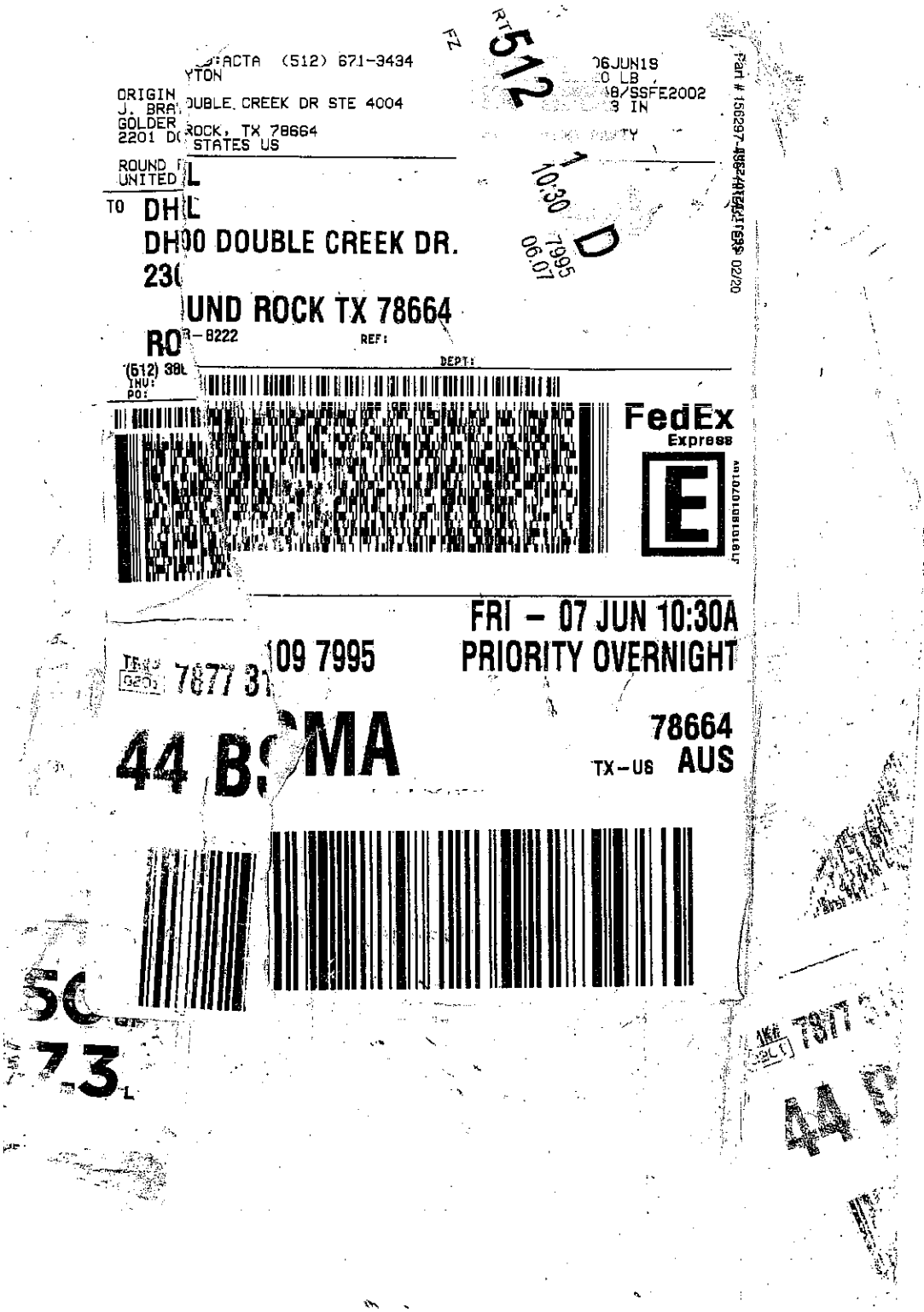
Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

---

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis


ACTA (512) 671-3434
YTON
06JUN1S
ORIGIN
DUBLE CREEK DR STE 4004
ROCK, TX 78664
STATES US
TO DHL
DH00 DOUBLE CREEK DR.
UND ROCK TX 78664
REF:
DEPT:
FedEx
Express
FRI - 07 JUN 10:30A
PRIORITY OVERNIGHT
78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Golder | Date Received: 6/7/2019

Work Order Number 1906073 | Received by EL

Checklist completed by: _____ (Signature) 6/7/2019 (Date) | Reviewed by DL (Initials) 6/7/2019 (Date)

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ✓ | No | Not Present |
| Custody seals intact on shippping container/cooler? | Yes | No | Not Present ✓ |
| Custody seals intact on sample bottles? | Yes | No | Not Present ✓ |
| Chain of custody present? | Yes ✓ | No | |
| Chain of custody signed when relinquished and received? | Yes ✓ | No | |
| Chain of custody agrees with sample labels? | Yes ✓ | No | |
| Samples in proper container/bottle? | Yes ✓ | No | |
| Sample containers intact? | Yes ✓ | No | |
| Sufficient sample volume for indicated test? | Yes ✓ | No | |
| All samples received within holding time? | Yes ✓ | No | |
| Container/Temp Blank temperature in compliance? | Yes ✓ | No | 5.5 °C |
| Water - VOA vials have zero headspace? | Yes ✓ | No | No VOA vials submitted |
| Water - pH<2 acceptable upon receipt? | Yes ✓ | No | NA LOT # 11837 |
| | Adjusted? No | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes | No | NA ✓ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

Page 1 of 1

**DHL Analytical, Inc.** **Date:** *12-Jul-19*

**CLIENT:** Golder
**Project:** LUMINANT-OGSES-PONDS
**Lab Order:** 1906073

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2320 B - Alkalinity Analysis
Method M3500-Fe D - Ferrous Iron Analysis (this parameter is not NELAP certified)
Method M3500-Fe D - Ferric Iron (calculation) (this parameter is not NELAP certified)
Method M4500-P E - Orthophosphate Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904 and SM 7500 Ra B M. Analyzed at Pace Analytical.

## LOG IN

The samples were received and log-in performed on 6/7/19. A total of 2 samples were received. The samples arrived in good condition and were properly packaged.

## METALS ANALYSIS

For Metals analysis performed on 6/12/19 the matrix spike and matrix spike duplicate recoveries were out of control limits for Boron and Sodium. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *12-Jul-19*

**CLIENT:** Golder
**Project:** LUMINANT-OGSES-PONDS
**Lab Order:** 1906073

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1906073-01 | FGD-A-2019-1 | | 06/06/19 01:25 PM | 6/7/2019 |
| 1906073-02 | FGD-B-2019-1 | | 06/06/19 01:45 PM | 6/7/2019 |

**Lab Order:** 1906073
**Client:** Golder
**Project:** LUMINANT-OGSES-PONDS

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1906073-01A | FGD-A-2019-1 | 06/06/19 01:25 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 06/10/19 09:28 AM | 91267 |
| 1906073-01B | FGD-A-2019-1 | 06/06/19 01:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-A-2019-1 | 06/06/19 01:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-A-2019-1 | 06/06/19 01:25 PM | Aqueous | SW7470A | Mercury Aq Prep | 06/13/19 09:34 AM | 91319 |
| 1906073-01C | FGD-A-2019-1 | 06/06/19 01:25 PM | Aqueous | M2320 B | Alkalinity Preparation | 06/10/19 09:34 AM | 91271 |
| | FGD-A-2019-1 | 06/06/19 01:25 PM | Aqueous | E300 | Anion Preparation | 06/07/19 12:27 PM | 91226 |
| | FGD-A-2019-1 | 06/06/19 01:25 PM | Aqueous | E300 | Anion Preparation | 06/07/19 12:27 PM | 91226 |
| | FGD-A-2019-1 | 06/06/19 01:25 PM | Aqueous | E300 | Anion Preparation | 06/10/19 09:06 AM | 91262 |
| | FGD-A-2019-1 | 06/06/19 01:25 PM | Aqueous | M4500-P E | Orthophosphate Prep | 06/07/19 01:20 PM | 91254 |
| | FGD-A-2019-1 | 06/06/19 01:25 PM | Aqueous | M2540C | TDS Preparation | 06/07/19 01:39 PM | 91255 |
| 1906073-02A | FGD-B-2019-1 | 06/06/19 01:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 06/10/19 09:28 AM | 91267 |
| 1906073-02B | FGD-B-2019-1 | 06/06/19 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-B-2019-1 | 06/06/19 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 06/10/19 08:17 AM | 91261 |
| | FGD-B-2019-1 | 06/06/19 01:45 PM | Aqueous | SW7470A | Mercury Aq Prep | 06/13/19 09:34 AM | 91319 |
| 1906073-02C | FGD-B-2019-1 | 06/06/19 01:45 PM | Aqueous | M2320 B | Alkalinity Preparation | 06/10/19 09:34 AM | 91271 |
| | FGD-B-2019-1 | 06/06/19 01:45 PM | Aqueous | E300 | Anion Preparation | 06/07/19 12:27 PM | 91226 |
| | FGD-B-2019-1 | 06/06/19 01:45 PM | Aqueous | E300 | Anion Preparation | 06/07/19 12:27 PM | 91226 |
| | FGD-B-2019-1 | 06/06/19 01:45 PM | Aqueous | E300 | Anion Preparation | 06/10/19 09:06 AM | 91262 |
| | FGD-B-2019-1 | 06/06/19 01:45 PM | Aqueous | M4500-P E | Orthophosphate Prep | 06/07/19 01:20 PM | 91254 |
| | FGD-B-2019-1 | 06/06/19 01:45 PM | Aqueous | M2540C | TDS Preparation | 06/07/19 01:39 PM | 91255 |

**Lab Order:** 1906073
**Client:** Golder
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1906073-01A | FGD-A-2019-1 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91267 | 1 | 06/18/19 | UV/VIS_2_190618B |
| | FGD-A-2019-1 | Aqueous | M3500-Fe D | Ferrous Iron | 91267 | 1 | 06/10/19 11:04 AM | UV/VIS_2_190610A |
| 1906073-01B | FGD-A-2019-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 91319 | 1 | 06/14/19 01:11 PM | CETAC2_HG_190614C |
| | FGD-A-2019-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 250 | 06/12/19 11:02 AM | ICP-MS4_190612A |
| | FGD-A-2019-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 1 | 06/11/19 04:10 PM | ICP-MS5_190611D |
| 1906073-01C | FGD-A-2019-1 | Aqueous | M2320 B | Alkalinity | 91271 | 1 | 06/10/19 12:59 PM | TITRATOR_190610A |
| | FGD-A-2019-1 | Aqueous | E300 | Anions by IC method - Water | 91226 | 10 | 06/07/19 02:18 PM | IC2_190607A |
| | FGD-A-2019-1 | Aqueous | E300 | Anions by IC method - Water | 91226 | 1 | 06/07/19 04:26 PM | IC2_190607A |
| | FGD-A-2019-1 | Aqueous | E300 | Anions by IC method - Water | 91262 | 100 | 06/10/19 11:08 AM | IC2_190610A |
| | FGD-A-2019-1 | Aqueous | M4500-P E | Orthophosphate | 91254 | 1 | 06/07/19 01:52 PM | UV/VIS_2_190607B |
| | FGD-A-2019-1 | Aqueous | M2540C | Total Dissolved Solids | 91255 | 1 | 06/07/19 04:00 PM | WC_190607A |
| 1906073-02A | FGD-B-2019-1 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 91267 | 1 | 06/18/19 | UV/VIS_2_190618B |
| | FGD-B-2019-1 | Aqueous | M3500-Fe D | Ferrous Iron | 91267 | 1 | 06/10/19 11:05 AM | UV/VIS_2_190610A |
| 1906073-02B | FGD-B-2019-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 91319 | 1 | 06/14/19 01:13 PM | CETAC2_HG_190614C |
| | FGD-B-2019-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 250 | 06/12/19 11:04 AM | ICP-MS4_190612A |
| | FGD-B-2019-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 91261 | 1 | 06/11/19 04:12 PM | ICP-MS5_190611D |
| 1906073-02C | FGD-B-2019-1 | Aqueous | M2320 B | Alkalinity | 91271 | 1 | 06/10/19 01:03 PM | TITRATOR_190610A |
| | FGD-B-2019-1 | Aqueous | E300 | Anions by IC method - Water | 91226 | 10 | 06/07/19 02:34 PM | IC2_190607A |
| | FGD-B-2019-1 | Aqueous | E300 | Anions by IC method - Water | 91226 | 1 | 06/07/19 04:42 PM | IC2_190607A |
| | FGD-B-2019-1 | Aqueous | E300 | Anions by IC method - Water | 91262 | 100 | 06/10/19 11:56 AM | IC2_190610A |
| | FGD-B-2019-1 | Aqueous | M4500-P E | Orthophosphate | 91254 | 1 | 06/07/19 01:53 PM | UV/VIS_2_190607B |
| | FGD-B-2019-1 | Aqueous | M2540C | Total Dissolved Solids | 91255 | 1 | 06/07/19 04:00 PM | WC_190607A |

# DHL Analytical, Inc.

**Date:** *12-Jul-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-A-2019-1 |
| **Project:** | LUMINANT-OGSES-PONDS | **Lab ID:** | 1906073-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 06/06/19 01:25 PM |
| **Lab Order:** | 1906073 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | 0.00155 | 0.000800 | 0.00250 | J | mg/L | 1 | 06/11/19 04:10 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/11/19 04:10 PM |
| Barium | 0.0781 | 0.00300 | 0.0100 | | mg/L | 1 | 06/11/19 04:10 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/11/19 04:10 PM |
| Boron | 72.1 | 2.50 | 7.50 | | mg/L | 250 | 06/12/19 11:02 AM |
| Cadmium | 0.000348 | 0.000300 | 0.00100 | J | mg/L | 1 | 06/11/19 04:10 PM |
| Calcium | 487 | 25.0 | 75.0 | | mg/L | 250 | 06/12/19 11:02 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/11/19 04:10 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/11/19 04:10 PM |
| Iron | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 06/11/19 04:10 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/11/19 04:10 PM |
| Lithium | 0.167 | 0.00500 | 0.0100 | | mg/L | 1 | 06/11/19 04:10 PM |
| Magnesium | 809 | 25.0 | 75.0 | | mg/L | 250 | 06/12/19 11:02 AM |
| Molybdenum | 0.152 | 0.00200 | 0.00500 | | mg/L | 1 | 06/11/19 04:10 PM |
| Potassium | 82.1 | 25.0 | 75.0 | | mg/L | 250 | 06/12/19 11:02 AM |
| Selenium | 1.30 | 0.00200 | 0.00500 | | mg/L | 1 | 06/11/19 04:10 PM |
| Sodium | 270 | 25.0 | 75.0 | | mg/L | 250 | 06/12/19 11:02 AM |
| Thallium | 0.00144 | 0.000500 | 0.00150 | J | mg/L | 1 | 06/11/19 04:10 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | 0.000615 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/14/19 01:11 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 1510 | 30.0 | 100 | | mg/L | 100 | 06/10/19 11:08 AM |
| Fluoride | 17.2 | 0.100 | 0.400 | | mg/L | 1 | 06/07/19 04:26 PM |
| Nitrate-N | 1.87 | 0.100 | 0.500 | | mg/L | 1 | 06/07/19 04:26 PM |
| Sulfate | 3260 | 100 | 300 | | mg/L | 100 | 06/10/19 11:08 AM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 58.6 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:59 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:59 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:59 PM |
| Alkalinity, Total (As CaCO3) | 58.6 | 20.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 06/10/19 12:59 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/18/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/10/19 11:04 AM |

**Qualifiers:**

| | | | |
|---|---|---|---|
| * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *12-Jul-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-A-2019-1 |
| **Project:** | LUMINANT-OGSES-PONDS | **Lab ID:** | 1906073-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 06/06/19 01:25 PM |
| **Lab Order:** | 1906073 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 06/07/19 01:52 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 7410 | 50.0 | 50.0 | | mg/L | 1 | 06/07/19 04:00 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *12-Jul-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-B-2019-1 |
| **Project:** | LUMINANT-OGSES-PONDS | **Lab ID:** | 1906073-02 |
| **Project No:** | 19122262-F | **Collection Date:** | 06/06/19 01:45 PM |
| **Lab Order:** | 1906073 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | 0.00146 | 0.000800 | 0.00250 | J | mg/L | 1 | 06/11/19 04:12 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 06/11/19 04:12 PM |
| Barium | 0.0835 | 0.00300 | 0.0100 | | mg/L | 1 | 06/11/19 04:12 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/11/19 04:12 PM |
| Boron | 73.3 | 2.50 | 7.50 | | mg/L | 250 | 06/12/19 11:04 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/11/19 04:12 PM |
| Calcium | 458 | 25.0 | 75.0 | | mg/L | 250 | 06/12/19 11:04 AM |
| Chromium | 0.00427 | 0.00200 | 0.00500 | J | mg/L | 1 | 06/11/19 04:12 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 06/11/19 04:12 PM |
| Iron | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 06/11/19 04:12 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 06/11/19 04:12 PM |
| Lithium | 0.172 | 0.00500 | 0.0100 | | mg/L | 1 | 06/11/19 04:12 PM |
| Magnesium | 796 | 25.0 | 75.0 | | mg/L | 250 | 06/12/19 11:04 AM |
| Molybdenum | 0.241 | 0.00200 | 0.00500 | | mg/L | 1 | 06/11/19 04:12 PM |
| Potassium | 86.9 | 25.0 | 75.0 | | mg/L | 250 | 06/12/19 11:04 AM |
| Selenium | 1.20 | 0.00200 | 0.00500 | | mg/L | 1 | 06/11/19 04:12 PM |
| Sodium | 287 | 25.0 | 75.0 | | mg/L | 250 | 06/12/19 11:04 AM |
| Thallium | 0.000788 | 0.000500 | 0.00150 | J | mg/L | 1 | 06/11/19 04:12 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | 0.00134 | 0.0000800 | 0.000200 | | mg/L | 1 | 06/14/19 01:13 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **JL** |
| Chloride | 1470 | 30.0 | 100 | | mg/L | 100 | 06/10/19 11:56 AM |
| Fluoride | 17.5 | 0.100 | 0.400 | | mg/L | 1 | 06/07/19 04:42 PM |
| Nitrate-N | 3.24 | 0.100 | 0.500 | | mg/L | 1 | 06/07/19 04:42 PM |
| Sulfate | 3040 | 100 | 300 | | mg/L | 100 | 06/10/19 11:56 AM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **CC** |
| Alkalinity, Bicarbonate (As CaCO3) | 68.0 | 10.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 01:03 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 01:03 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 01:03 PM |
| Alkalinity, Total (As CaCO3) | 68.0 | 20.0 | 20.0 | | mg/L @ pH 4.55 | 1 | 06/10/19 01:03 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.00427 | 0.00200 | 0.00500 | JN | mg/L | 1 | 06/18/19 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **BTJ** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 06/10/19 11:05 AM |

**Qualifiers:**

| | |
|---|---|
| * | Value exceeds TCLP Maximum Concentration Level |
| C | Sample Result or QC discussed in the Case Narrative |
| DF | Dilution Factor |
| E | TPH pattern not Gas or Diesel Range Pattern |
| J | Analyte detected between MDL and RL |
| MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit |
| S | Spike Recovery outside control limits |
| N | Parameter not NELAP certified |

# DHL Analytical, Inc.

**Date:** *12-Jul-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-B-2019-1 |
| **Project:** | LUMINANT-OGSES-PONDS | **Lab ID:** | 1906073-02 |
| **Project No:** | 19122262-F | **Collection Date:** | 06/06/19 01:45 PM |
| **Lab Order:** | 1906073 | **Matrix:** | AQUEOUS |

| Analyses | Result | MDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 06/07/19 01:53 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 7240 | 50.0 | 50.0 | | mg/L | 1 | 06/07/19 04:00 PM |

| | | | | | |
|---|---|---|---|---|---|
| **Qualifiers:** | * | Value exceeds TCLP Maximum Concentration Level | C | Sample Result or QC discussed in the Case Narrative |
| | DF | Dilution Factor | E | TPH pattern not Gas or Diesel Range Pattern |
| | J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| | ND | Not Detected at the Method Detection Limit | RL | Reporting Limit |
| | S | Spike Recovery outside control limits | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190614C**

The QC data in batch 91319 applies to the following samples: 1906073-01B, 1906073-02B

| Sample ID | **MB-91319** | Batch ID: | **91319** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_190614** | Analysis Date: | **6/14/2019 12:48:31 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-91319** | Batch ID: | **91319** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_190614** | Analysis Date: | **6/14/2019 12:53:03 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00201 | 0.000200 | 0.00200 | 0 | 101 | 85 | 115 | | | |

| Sample ID | **LCSD-91319** | Batch ID: | **91319** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_190614** | Analysis Date: | **6/14/2019 12:55:19 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00196 | 0.000200 | 0.00200 | 0 | 98.0 | 85 | 115 | 2.52 | 15 | |

| Sample ID | **1906077-01A MS** | Batch ID: | **91319** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_190614** | Analysis Date: | **6/14/2019 1:17:57 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0105 | 0.00100 | 0.0100 | 0 | 105 | 80 | 120 | | | |

| Sample ID | **1906077-01A MSD** | Batch ID: | **91319** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_190614** | Analysis Date: | **6/14/2019 1:20:13 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0104 | 0.00100 | 0.0100 | 0 | 104 | 80 | 120 | 1.44 | 15 | |

| Sample ID | **1906077-01A SD** | Batch ID: | **91319** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_190614** | Analysis Date: | **6/14/2019 1:22:29 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.00200 | 0.00500 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1906077-01A PDS** | Batch ID: | **91319** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_190614** | Analysis Date: | **6/14/2019 1:24:45 PM** | Prep Date: | **6/13/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0125 | 0.00100 | 0.0125 | 0 | 99.6 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190614C**

| Sample ID **ICV-190614** | Batch ID: **R104600** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_190614** | Analysis Date: **6/14/2019 12:43:57 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00425 | 0.000200 | 0.00400 | 0 | 106 | 90 | 110 | | | |

| Sample ID **CCV1-190613** | Batch ID: **R104600** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_190614** | Analysis Date: **6/14/2019 1:29:19 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00206 | 0.000200 | 0.00200 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS4_190612A**

The QC data in batch 91261 applies to the following samples: 1906073-01B, 1906073-02B

Sample ID **MB-91261** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 10:50:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Potassium | <0.100 | 0.300 | | | | | | | | |
| Sodium | <0.100 | 0.300 | | | | | | | | |

Sample ID **LCS-91261** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 10:52:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.204 | 0.0300 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Calcium | 4.66 | 0.300 | 5.00 | 0 | 93.2 | 80 | 120 | | | |
| Potassium | 4.97 | 0.300 | 5.00 | 0 | 99.4 | 80 | 120 | | | |
| Sodium | 5.11 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | | | |

Sample ID **LCSD-91261** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 10:54:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.211 | 0.0300 | 0.200 | 0 | 106 | 80 | 120 | 3.53 | 15 | |
| Calcium | 4.67 | 0.300 | 5.00 | 0 | 93.4 | 80 | 120 | 0.234 | 15 | |
| Potassium | 4.93 | 0.300 | 5.00 | 0 | 98.5 | 80 | 120 | 0.913 | 15 | |
| Sodium | 5.15 | 0.300 | 5.00 | 0 | 103 | 80 | 120 | 0.824 | 15 | |

Sample ID **1906056-01A SD** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 11:00:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 10.3 | 7.50 | 0 | 10.0 | | | | 2.62 | 10 | |
| Calcium | 39.0 | 75.0 | 0 | 38.0 | | | | 2.46 | 10 | |
| Potassium | <25.0 | 75.0 | 0 | 0 | | | | 0 | 10 | |
| Sodium | 116 | 75.0 | 0 | 115 | | | | 0.316 | 10 | |

Sample ID **1906056-01A PDS** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS4_190612A** Analysis Date: **6/12/2019 11:20:00 AM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 20.3 | 1.50 | 10.0 | 10.0 | 103 | 80 | 120 | | | |
| Calcium | 276 | 15.0 | 250 | 38.0 | 95.0 | 80 | 120 | | | |
| Potassium | 247 | 15.0 | 250 | 0 | 98.7 | 80 | 120 | | | |
| Sodium | 379 | 15.0 | 250 | 115 | 105 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190612A**

| Sample ID **1906056-01A MS** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:22:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 10.6 | 1.50 | 0.200 | 10.0 | 294 | 80 | 120 | | | S |
| Calcium | 42.9 | 15.0 | 5.00 | 38.0 | 98.3 | 80 | 120 | | | |
| Potassium | 5.61 | 15.0 | 5.00 | 0 | 112 | 80 | 120 | | | |
| Sodium | 118 | 15.0 | 5.00 | 115 | 44.1 | 80 | 120 | | | S |

| Sample ID **1906056-01A MSD** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:24:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 9.81 | 1.50 | 0.200 | 10.0 | -111 | 80 | 120 | 7.95 | 15 | S |
| Calcium | 42.4 | 15.0 | 5.00 | 38.0 | 87.2 | 80 | 120 | 1.30 | 15 | |
| Potassium | 5.65 | 15.0 | 5.00 | 0 | 113 | 80 | 120 | 0.726 | 15 | |
| Sodium | 116 | 15.0 | 5.00 | 115 | 20.3 | 80 | 120 | 1.02 | 15 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190612A**

| Sample ID **ICV-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 10:34:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0999 | 0.0300 | 0.100 | 0 | 99.9 | 90 | 110 | | | |
| Calcium | 2.45 | 0.300 | 2.50 | 0 | 98.1 | 90 | 110 | | | |
| Magnesium | 2.44 | 0.300 | 2.50 | 0 | 97.4 | 90 | 110 | | | |
| Potassium | 2.48 | 0.300 | 2.50 | 0 | 99.1 | 90 | 110 | | | |
| Sodium | 2.55 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 10:44:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0212 | 0.0300 | 0.0200 | 0 | 106 | 70 | 130 | | | |
| Calcium | 0.0989 | 0.300 | 0.100 | 0 | 98.9 | 70 | 130 | | | |
| Magnesium | 0.0972 | 0.300 | 0.100 | 0 | 97.2 | 70 | 130 | | | |
| Potassium | 0.101 | 0.300 | 0.100 | 0 | 101 | 70 | 130 | | | |
| Sodium | 0.103 | 0.300 | 0.100 | 0 | 103 | 70 | 130 | | | |

| Sample ID **CCV1-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:26:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.215 | 0.0300 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Calcium | 4.71 | 0.300 | 5.00 | 0 | 94.3 | 90 | 110 | | | |
| Magnesium | 4.96 | 0.300 | 5.00 | 0 | 99.1 | 90 | 110 | | | |
| Potassium | 5.03 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Sodium | 4.99 | 0.300 | 5.00 | 0 | 99.8 | 90 | 110 | | | |

| Sample ID **LCVL1-190612** | Batch ID: **R104563** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190612A** | Analysis Date: **6/12/2019 11:42:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0230 | 0.0300 | 0.0200 | 0 | 115 | 70 | 130 | | | |
| Calcium | 0.102 | 0.300 | 0.100 | 0 | 102 | 70 | 130 | | | |
| Magnesium | 0.0966 | 0.300 | 0.100 | 0 | 96.6 | 70 | 130 | | | |
| Potassium | 0.0990 | 0.300 | 0.100 | 0 | 99.0 | 70 | 130 | | | |
| Sodium | 0.103 | 0.300 | 0.100 | 0 | 103 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

The QC data in batch 91261 applies to the following samples: 1906073-01B, 1906073-02B

| Sample ID | **MB-91261** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:05:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Iron | <0.0300 | 0.100 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Magnesium | <0.100 | 0.300 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

| Sample ID | **LCS-91261** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:07:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Arsenic | 0.211 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Beryllium | 0.195 | 0.00100 | 0.200 | 0 | 97.6 | 80 | 120 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Iron | 5.05 | 0.100 | 5.00 | 0 | 101 | 80 | 120 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 97.9 | 80 | 120 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Magnesium | 5.05 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | | | |
| Molybdenum | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Selenium | 0.215 | 0.00500 | 0.200 | 0 | 107 | 80 | 120 | | | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 97.9 | 80 | 120 | | | |

| Sample ID | **LCSD-91261** | Batch ID: | **91261** | TestNo: | **SW6020A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **ICP-MS5_190611D** | Analysis Date: | **6/11/2019 3:10:00 PM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.7 | 80 | 120 | 0.129 | 15 | |
| Arsenic | 0.211 | 0.00500 | 0.200 | 0 | 105 | 80 | 120 | 0.014 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

Sample ID **LCSD-91261** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_190611D** Analysis Date: **6/11/2019 3:10:00 PM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Barium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | 1.13 | 15 | |
| Beryllium | 0.194 | 0.00100 | 0.200 | 0 | 96.9 | 80 | 120 | 0.710 | 15 | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.819 | 15 | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.363 | 15 | |
| Cobalt | 0.207 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 0.342 | 15 | |
| Iron | 5.01 | 0.100 | 5.00 | 0 | 100 | 80 | 120 | 0.604 | 15 | |
| Lead | 0.195 | 0.00100 | 0.200 | 0 | 97.5 | 80 | 120 | 0.470 | 15 | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 0.952 | 15 | |
| Magnesium | 5.04 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.085 | 15 | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.473 | 15 | |
| Selenium | 0.219 | 0.00500 | 0.200 | 0 | 110 | 80 | 120 | 2.02 | 15 | |
| Thallium | 0.195 | 0.00150 | 0.200 | 0 | 97.4 | 80 | 120 | 0.582 | 15 | |

Sample ID **1906056-01A SD** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS5_190611D** Analysis Date: **6/11/2019 3:16:00 PM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | 0.0137 | 0.0250 | 0 | 0.0135 | | | | 0.978 | 10 | |
| Barium | 0.0549 | 0.0500 | 0 | 0.0554 | | | | 0.861 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Iron | 0.190 | 0.500 | 0 | 0.0550 | | | | 110 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | <0.0250 | 0.0500 | 0 | 0.00980 | | | | 0 | 10 | |
| Magnesium | 8.05 | 1.50 | 0 | 7.98 | | | | 0.840 | 10 | |
| Molybdenum | 0.146 | 0.0250 | 0 | 0.148 | | | | 0.851 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

Sample ID **1906056-01A PDS** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS5_190611D** Analysis Date: **6/11/2019 3:39:00 PM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 99.1 | 80 | 120 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0.0135 | 97.3 | 80 | 120 | | | |
| Barium | 0.249 | 0.0100 | 0.200 | 0.0554 | 96.7 | 80 | 120 | | | |
| Beryllium | 0.187 | 0.00100 | 0.200 | 0 | 93.4 | 80 | 120 | | | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 80 | 120 | | | |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **1906056-01A PDS** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:39:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Cobalt | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 80 | 120 | | | |
| Iron | 4.99 | 0.100 | 5.00 | 0.0550 | 98.7 | 80 | 120 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 96.9 | 80 | 120 | | | |
| Lithium | 0.215 | 0.0100 | 0.200 | 0.00980 | 103 | 80 | 120 | | | |
| Magnesium | 12.3 | 0.300 | 5.00 | 7.98 | 87.2 | 80 | 120 | | | |
| Molybdenum | 0.337 | 0.00500 | 0.200 | 0.148 | 94.9 | 80 | 120 | | | |
| Selenium | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 80 | 120 | | | |
| Thallium | 0.194 | 0.00150 | 0.200 | 0 | 97.0 | 80 | 120 | | | |

| Sample ID **1906056-01A MS** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:41:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Arsenic | 0.213 | 0.00500 | 0.200 | 0.0135 | 99.9 | 80 | 120 | | | |
| Barium | 0.256 | 0.0100 | 0.200 | 0.0554 | 100 | 80 | 120 | | | |
| Beryllium | 0.186 | 0.00100 | 0.200 | 0 | 93.1 | 80 | 120 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 80 | 120 | | | |
| Iron | 5.06 | 0.100 | 5.00 | 0.0550 | 100 | 80 | 120 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 97.1 | 80 | 120 | | | |
| Lithium | 0.210 | 0.0100 | 0.200 | 0.00980 | 100 | 80 | 120 | | | |
| Magnesium | 12.9 | 0.300 | 5.00 | 7.98 | 97.7 | 80 | 120 | | | |
| Molybdenum | 0.355 | 0.00500 | 0.200 | 0.148 | 104 | 80 | 120 | | | |
| Selenium | 0.196 | 0.00500 | 0.200 | 0 | 98.0 | 80 | 120 | | | |
| Thallium | 0.195 | 0.00150 | 0.200 | 0 | 97.3 | 80 | 120 | | | |

| Sample ID **1906056-01A MSD** | Batch ID: **91261** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:43:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.199 | 0.00250 | 0.200 | 0 | 99.3 | 80 | 120 | 0.921 | 15 | |
| Arsenic | 0.214 | 0.00500 | 0.200 | 0.0135 | 100 | 80 | 120 | 0.278 | 15 | |
| Barium | 0.257 | 0.0100 | 0.200 | 0.0554 | 101 | 80 | 120 | 0.287 | 15 | |
| Beryllium | 0.187 | 0.00100 | 0.200 | 0 | 93.5 | 80 | 120 | 0.464 | 15 | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | 0.488 | 15 | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.016 | 15 | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | 0.064 | 15 | |
| Iron | 5.08 | 0.100 | 5.00 | 0.0550 | 101 | 80 | 120 | 0.370 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

Sample ID **1906056-01A MSD** Batch ID: **91261** TestNo: **SW6020A** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS5_190611D** Analysis Date: **6/11/2019 3:43:00 PM** Prep Date: **6/10/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.5 | 80 | 120 | 0.562 | 15 | |
| Lithium | 0.209 | 0.0100 | 0.200 | 0.00980 | 99.7 | 80 | 120 | 0.400 | 15 | |
| Magnesium | 13.0 | 0.300 | 5.00 | 7.98 | 99.4 | 80 | 120 | 0.654 | 15 | |
| Molybdenum | 0.358 | 0.00500 | 0.200 | 0.148 | 105 | 80 | 120 | 0.791 | 15 | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.6 | 80 | 120 | 0.595 | 15 | |
| Thallium | 0.194 | 0.00150 | 0.200 | 0 | 97.0 | 80 | 120 | 0.390 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **ICV-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 10:46:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.0982 | 0.00250 | 0.100 | 0 | 98.2 | 90 | 110 | | | |
| Arsenic | 0.103 | 0.00500 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.0976 | 0.0100 | 0.100 | 0 | 97.6 | 90 | 110 | | | |
| Beryllium | 0.0929 | 0.00100 | 0.100 | 0 | 92.9 | 90 | 110 | | | |
| Cadmium | 0.0986 | 0.00100 | 0.100 | 0 | 98.6 | 90 | 110 | | | |
| Chromium | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Iron | 2.45 | 0.100 | 2.50 | 0 | 98.2 | 90 | 110 | | | |
| Lead | 0.0957 | 0.00100 | 0.100 | 0 | 95.7 | 90 | 110 | | | |
| Lithium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 2.39 | 0.300 | 2.50 | 0 | 95.6 | 90 | 110 | | | |
| Molybdenum | 0.0956 | 0.00500 | 0.100 | 0 | 95.6 | 90 | 110 | | | |
| Selenium | 0.103 | 0.00500 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.0957 | 0.00150 | 0.100 | 0 | 95.7 | 90 | 110 | | | |

| Sample ID **LCVL-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 10:52:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00196 | 0.00250 | 0.00200 | 0 | 97.8 | 70 | 130 | | | |
| Arsenic | 0.00500 | 0.00500 | 0.00500 | 0 | 100 | 70 | 130 | | | |
| Barium | 0.00471 | 0.0100 | 0.00500 | 0 | 94.2 | 70 | 130 | | | |
| Beryllium | 0.000890 | 0.00100 | 0.00100 | 0 | 89.0 | 70 | 130 | | | |
| Cadmium | 0.000934 | 0.00100 | 0.00100 | 0 | 93.4 | 70 | 130 | | | |
| Chromium | 0.00465 | 0.00500 | 0.00500 | 0 | 93.0 | 70 | 130 | | | |
| Cobalt | 0.00487 | 0.00500 | 0.00500 | 0 | 97.5 | 70 | 130 | | | |
| Iron | 0.0944 | 0.100 | 0.100 | 0 | 94.4 | 70 | 130 | | | |
| Lead | 0.000939 | 0.00100 | 0.00100 | 0 | 93.9 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Magnesium | 0.0959 | 0.300 | 0.100 | 0 | 95.9 | 70 | 130 | | | |
| Molybdenum | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | | | |
| Selenium | 0.00564 | 0.00500 | 0.00500 | 0 | 113 | 70 | 130 | | | |
| Thallium | 0.000930 | 0.00150 | 0.00100 | 0 | 93.0 | 70 | 130 | | | |

| Sample ID **CCV3-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 2:53:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **CCV3-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 2:53:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.193 | 0.00100 | 0.200 | 0 | 96.4 | 90 | 110 | | | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Iron | 4.97 | 0.100 | 5.00 | 0 | 99.4 | 90 | 110 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.7 | 90 | 110 | | | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 4.96 | 0.300 | 5.00 | 0 | 99.2 | 90 | 110 | | | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Selenium | 0.207 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.4 | 90 | 110 | | | |

| Sample ID **LCVL3-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 2:57:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00207 | 0.00250 | 0.00200 | 0 | 104 | 70 | 130 | | | |
| Arsenic | 0.00490 | 0.00500 | 0.00500 | 0 | 98.1 | 70 | 130 | | | |
| Barium | 0.00516 | 0.0100 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Beryllium | 0.000878 | 0.00100 | 0.00100 | 0 | 87.8 | 70 | 130 | | | |
| Cadmium | 0.00113 | 0.00100 | 0.00100 | 0 | 113 | 70 | 130 | | | |
| Chromium | 0.00488 | 0.00500 | 0.00500 | 0 | 97.6 | 70 | 130 | | | |
| Cobalt | 0.00515 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Iron | 0.0963 | 0.100 | 0.100 | 0 | 96.3 | 70 | 130 | | | |
| Lead | 0.000922 | 0.00100 | 0.00100 | 0 | 92.2 | 70 | 130 | | | |
| Lithium | 0.0104 | 0.0100 | 0.0100 | 0 | 104 | 70 | 130 | | | |
| Magnesium | 0.0942 | 0.300 | 0.100 | 0 | 94.2 | 70 | 130 | | | |
| Molybdenum | 0.00507 | 0.00500 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Selenium | 0.00495 | 0.00500 | 0.00500 | 0 | 99.0 | 70 | 130 | | | |
| Thallium | 0.000988 | 0.00150 | 0.00100 | 0 | 98.8 | 70 | 130 | | | |

| Sample ID **CCV4-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:48:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.205 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.187 | 0.00100 | 0.200 | 0 | 93.7 | 90 | 110 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **CCV4-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:48:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Iron | 4.93 | 0.100 | 5.00 | 0 | 98.6 | 90 | 110 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.7 | 90 | 110 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Magnesium | 4.99 | 0.300 | 5.00 | 0 | 99.7 | 90 | 110 | | | |
| Molybdenum | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Selenium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.5 | 90 | 110 | | | |

| Sample ID **LCVL4-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 3:59:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00205 | 0.00250 | 0.00200 | 0 | 103 | 70 | 130 | | | |
| Arsenic | 0.00491 | 0.00500 | 0.00500 | 0 | 98.2 | 70 | 130 | | | |
| Barium | 0.00520 | 0.0100 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Beryllium | 0.000861 | 0.00100 | 0.00100 | 0 | 86.1 | 70 | 130 | | | |
| Cadmium | 0.000971 | 0.00100 | 0.00100 | 0 | 97.1 | 70 | 130 | | | |
| Chromium | 0.00490 | 0.00500 | 0.00500 | 0 | 98.0 | 70 | 130 | | | |
| Cobalt | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Iron | 0.0969 | 0.100 | 0.100 | 0 | 96.9 | 70 | 130 | | | |
| Lead | 0.000944 | 0.00100 | 0.00100 | 0 | 94.4 | 70 | 130 | | | |
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |
| Magnesium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |
| Molybdenum | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00552 | 0.00500 | 0.00500 | 0 | 110 | 70 | 130 | | | |
| Thallium | 0.00101 | 0.00150 | 0.00100 | 0 | 101 | 70 | 130 | | | |

| Sample ID **CCV5-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 4:21:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.191 | 0.00100 | 0.200 | 0 | 95.3 | 90 | 110 | | | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Iron | 4.87 | 0.100 | 5.00 | 0 | 97.5 | 90 | 110 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 97.1 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_190611D**

| Sample ID **CCV5-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 4:21:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 5.01 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |
| Molybdenum | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Selenium | 0.216 | 0.00500 | 0.200 | 0 | 108 | 90 | 110 | | | |
| Thallium | 0.194 | 0.00150 | 0.200 | 0 | 97.1 | 90 | 110 | | | |

| Sample ID **LCVL5-190611** | Batch ID: **R104548** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_190611D** | Analysis Date: **6/11/2019 4:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00190 | 0.00250 | 0.00200 | 0 | 94.8 | 70 | 130 | | | |
| Arsenic | 0.00482 | 0.00500 | 0.00500 | 0 | 96.5 | 70 | 130 | | | |
| Barium | 0.00464 | 0.0100 | 0.00500 | 0 | 92.9 | 70 | 130 | | | |
| Beryllium | 0.000880 | 0.00100 | 0.00100 | 0 | 88.0 | 70 | 130 | | | |
| Cadmium | 0.000935 | 0.00100 | 0.00100 | 0 | 93.5 | 70 | 130 | | | |
| Chromium | 0.00464 | 0.00500 | 0.00500 | 0 | 92.8 | 70 | 130 | | | |
| Cobalt | 0.00480 | 0.00500 | 0.00500 | 0 | 96.0 | 70 | 130 | | | |
| Iron | 0.0924 | 0.100 | 0.100 | 0 | 92.4 | 70 | 130 | | | |
| Lead | 0.000913 | 0.00100 | 0.00100 | 0 | 91.3 | 70 | 130 | | | |
| Lithium | 0.0101 | 0.0100 | 0.0100 | 0 | 101 | 70 | 130 | | | |
| Magnesium | 0.100 | 0.300 | 0.100 | 0 | 100 | 70 | 130 | | | |
| Molybdenum | 0.00498 | 0.00500 | 0.00500 | 0 | 99.6 | 70 | 130 | | | |
| Selenium | 0.00652 | 0.00500 | 0.00500 | 0 | 130 | 70 | 130 | | | |
| Thallium | 0.000948 | 0.00150 | 0.00100 | 0 | 94.8 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190607A**

The QC data in batch 91226 applies to the following samples: 1906073-01C, 1906073-02C

| Sample ID | **MB-91226** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 10:25:46 AM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Nitrate-N | <0.100 | 0.500 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-91226** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 10:41:46 AM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Fluoride | 4.06 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | | | |
| Nitrate-N | 5.17 | 0.500 | 5.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 30.9 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID | **LCSD-91226** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 10:57:46 AM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | 0.438 | 20 | |
| Fluoride | 4.07 | 0.400 | 4.000 | 0 | 102 | 90 | 110 | 0.405 | 20 | |
| Nitrate-N | 5.11 | 0.500 | 5.000 | 0 | 102 | 90 | 110 | 1.10 | 20 | |
| Sulfate | 31.1 | 3.00 | 30.00 | 0 | 104 | 90 | 110 | 0.707 | 20 | |

| Sample ID | **1906064-01EMS** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 12:01:26 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 34.9 | 1.00 | 20.00 | 14.68 | 101 | 90 | 110 | | | |
| Fluoride | 21.2 | 0.400 | 20.00 | 0.1842 | 105 | 90 | 110 | | | |
| Nitrate-N | 4.75 | 0.500 | 4.516 | 0.1911 | 101 | 90 | 110 | | | |
| Sulfate | 24.4 | 3.00 | 20.00 | 4.032 | 102 | 90 | 110 | | | |

| Sample ID | **1906064-01EMSD** | Batch ID: | **91226** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_190607A** | Analysis Date: | **6/7/2019 12:17:26 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 35.0 | 1.00 | 20.00 | 14.68 | 101 | 90 | 110 | 0.143 | 20 | |
| Fluoride | 21.2 | 0.400 | 20.00 | 0.1842 | 105 | 90 | 110 | 0.188 | 20 | |
| Nitrate-N | 4.75 | 0.500 | 4.516 | 0.1911 | 101 | 90 | 110 | 0.115 | 20 | |
| Sulfate | 24.5 | 3.00 | 20.00 | 4.032 | 102 | 90 | 110 | 0.366 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190607A**

| Sample ID **1906066-01DMS** | Batch ID: **91226** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 1:46:15 PM** | Prep Date: **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2150 | 100 | 2000 | 65.56 | 104 | 90 | 110 | | | |
| Fluoride | 2110 | 40.0 | 2000 | 0 | 106 | 90 | 110 | | | |
| Nitrate-N | 456 | 50.0 | 451.6 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 2060 | 300 | 2000 | 0 | 103 | 90 | 110 | | | |

| Sample ID **1906066-01DMSD** | Batch ID: **91226** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 2:02:15 PM** | Prep Date: **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2150 | 100 | 2000 | 65.56 | 104 | 90 | 110 | 0.028 | 20 | |
| Fluoride | 2110 | 40.0 | 2000 | 0 | 105 | 90 | 110 | 0.071 | 20 | |
| Nitrate-N | 455 | 50.0 | 451.6 | 0 | 101 | 90 | 110 | 0.150 | 20 | |
| Sulfate | 2060 | 300 | 2000 | 0 | 103 | 90 | 110 | 0.420 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190607A**

| Sample ID **ICV-190607** | Batch ID: **R104496** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 9:53:47 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 26.1 | 1.00 | 25.00 | 0 | 104 | 90 | 110 | | | |
| Fluoride | 10.4 | 0.400 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 13.2 | 0.500 | 12.50 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 78.5 | 3.00 | 75.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID **CCV1-190607** | Batch ID: **R104496** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 3:38:14 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.4 | 1.00 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Fluoride | 4.14 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 5.23 | 0.500 | 5.000 | 0 | 105 | 90 | 110 | | | |
| Sulfate | 31.7 | 3.00 | 30.00 | 0 | 106 | 90 | 110 | | | |

| Sample ID **CCV2-190607** | Batch ID: **R104496** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190607A** | Analysis Date: **6/7/2019 6:18:14 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.6 | 1.00 | 10.00 | 0 | 106 | 90 | 110 | | | |
| Fluoride | 4.16 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Nitrate-N | 5.17 | 0.500 | 5.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 32.2 | 3.00 | 30.00 | 0 | 107 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190610A**

The QC data in batch 91262 applies to the following samples: 1906073-01C, 1906073-02C

| Sample ID | **MB-91262** | Batch ID: | **91262** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC2_190610A** | Analysis Date: | **6/10/2019 10:16:07 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-91262** | Batch ID: | **91262** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC2_190610A** | Analysis Date: | **6/10/2019 10:32:07 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.1 | 1.00 | 10.00 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 30.4 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID | **LCSD-91262** | Batch ID: | **91262** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC2_190610A** | Analysis Date: | **6/10/2019 10:48:07 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.1 | 1.00 | 10.00 | 0 | 101 | 90 | 110 | 0.568 | 20 | |
| Sulfate | 30.7 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | 0.872 | 20 | |

| Sample ID | **1906073-01CMS** | Batch ID: | **91262** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC2_190610A** | Analysis Date: | **6/10/2019 11:24:48 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3510 | 100 | 2000 | 1510 | 100 | 90 | 110 | | | |
| Sulfate | 5260 | 300 | 2000 | 3263 | 99.9 | 90 | 110 | | | |

| Sample ID | **1906073-01CMSD** | Batch ID: | **91262** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC2_190610A** | Analysis Date: | **6/10/2019 11:40:48 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3490 | 100 | 2000 | 1510 | 98.9 | 90 | 110 | 0.754 | 20 | |
| Sulfate | 5250 | 300 | 2000 | 3263 | 99.3 | 90 | 110 | 0.226 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_190610A**

| Sample ID **ICV-190610** | Batch ID: **R104514** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_190610A** | Analysis Date: **6/10/2019 9:44:07 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.5 | 1.00 | 25.00 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 77.4 | 3.00 | 75.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID **CCV1-190610** | Batch ID: **R104514** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_190610A** | Analysis Date: **6/10/2019 1:32:48 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 31.0 | 3.00 | 30.00 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190610A**

The QC data in batch 91271 applies to the following samples: 1906073-01C, 1906073-02C

| Sample ID **MB-91271** | Batch ID: **91271** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.27** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 10:17:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Total (As CaCO3) | <20.0 | 20.0 | | | | | | | | |

| Sample ID **LCS-91271** | Batch ID: **91271** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.39** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 10:22:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 49.8 | 20.0 | 50.00 | 0 | 99.5 | 74 | 129 | | | |

| Sample ID **1906073-02C DUP** | Batch ID: **91271** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.54** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 1:11:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 66.8 | 20.0 | 0 | 68.00 | | | | 1.78 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 66.8 | 20.0 | 0 | 68.00 | | | | 1.78 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_190610A**

| Sample ID **ICV-190610** | Batch ID: **R104513** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.29** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 10:15:00 AM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 4.00 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 96.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 100 | 20.0 | 100.0 | 0 | 100 | 98 | 102 | | | |

| Sample ID **CCV1-190610** | Batch ID: **R104513** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.22** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 1:08:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 27.7 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 74.1 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 102 | 20.0 | 100.0 | 0 | 102 | 90 | 110 | | | |

| Sample ID **CCV2-190610** | Batch ID: **R104513** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.21** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_190610A** | Analysis Date: **6/10/2019 1:16:00 PM** | Prep Date: **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 26.1 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 73.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.8 | 20.0 | 100.0 | 0 | 99.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190607B**

The QC data in batch 91254 applies to the following samples: 1906073-01C, 1906073-02C

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **MB-91254** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MBLK** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:50:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | <0.0300 | 0.100 | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **LCS-91254** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **LCS** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:50:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.509 | 0.100 | 0.5000 | 0 | 102 | 80 | 120 | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **LCSD-91254** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **LCSD** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:50:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.507 | 0.100 | 0.5000 | 0 | 101 | 80 | 120 | 0.394 | 15 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **1906073-02CMS** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MS** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:53:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.517 | 0.100 | 0.5000 | 0 | 103 | 80 | 120 | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID **1906073-02CMSD** | Batch ID: **91254** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MSD** | Run ID: **UV/VIS_2_190607B** | | | Analysis Date: **6/7/2019 1:53:00 PM** | | | | Prep Date: **6/7/2019** | | | |
| Analyte | | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
| Phosphorus, Total Orthophosphate (As | | 0.518 | 0.100 | 0.5000 | 0 | 104 | 80 | 120 | 0.193 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190607B**

| Sample ID **ICV-190607** | Batch ID: **R104504** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_190607B** | Analysis Date: **6/7/2019 1:49:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.203 | 0.100 | 0.2000 | 0 | 102 | 85 | 115 | | | |

| Sample ID **CCV1-190607** | Batch ID: **R104504** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190607B** | Analysis Date: **6/7/2019 1:53:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.566 | 0.100 | 0.5000 | 0 | 113 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190610A**

The QC data in batch 91267 applies to the following samples: 1906073-01A, 1906073-02A

| Sample ID | **MB-91267** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 10:55:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | <0.0500 | 0.100 | | | | | | | | N |

| Sample ID | **LCS-91267** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 10:57:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.110 | 0.100 | 0.1000 | 0 | 110 | 85 | 115 | | | N |

| Sample ID | **LCSD-91267** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 10:57:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.110 | 0.100 | 0.1000 | 0 | 110 | 85 | 115 | 0.609 | 15 | N |

| Sample ID | **1906073-02AMS** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 11:05:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.107 | 0.100 | 0.1000 | 0 | 107 | 85 | 115 | | | N |

| Sample ID | **1906073-02AMSD** | Batch ID: | **91267** | TestNo: | **M3500-Fe D** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **UV/VIS_2_190610A** | Analysis Date: | **6/10/2019 11:05:00 AM** | Prep Date: | **6/10/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.102 | 0.100 | 0.1000 | 0 | 102 | 85 | 115 | 4.86 | 15 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_190610A**

| Sample ID **ICV-190610** | Batch ID: **R104507** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_190610A** | Analysis Date: **6/10/2019 10:51:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.0908 | 0.100 | 0.1000 | 0 | 90.8 | 85 | 115 | | | N |

| Sample ID **CCV1-190610** | Batch ID: **R104507** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190610A** | Analysis Date: **6/10/2019 11:01:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.223 | 0.100 | 0.2000 | 0 | 112 | 85 | 115 | | | N |

| Sample ID **CCV2-190610** | Batch ID: **R104507** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_190610A** | Analysis Date: **6/10/2019 11:06:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.204 | 0.100 | 0.2000 | 0 | 102 | 85 | 115 | | | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1906073
**Project:** LUMINANT-OGSES-PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_190607A**

The QC data in batch 91255 applies to the following samples: 1906073-01C, 1906073-02C

| Sample ID | **MB-91255** | Batch ID: | **91255** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_190607A** | Analysis Date: | **6/7/2019 4:00:00 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-91255** | Batch ID: | **91255** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_190607A** | Analysis Date: | **6/7/2019 4:00:00 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 752 | 10.0 | 745.6 | 0 | 101 | 90 | 113 | | | |

| Sample ID | **1906040-01A-DUP** | Batch ID: | **91255** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190607A** | Analysis Date: | **6/7/2019 4:00:00 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1240 | 50.0 | 0 | 1235 | | | | 0.404 | 5 | |

| Sample ID | **1906073-01C-DUP** | Batch ID: | **91255** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190607A** | Analysis Date: | **6/7/2019 4:00:00 PM** | Prep Date: | **6/7/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 7310 | 50.0 | 0 | 7405 | | | | 1.36 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

July 11, 2019



## DHL Analytical, Inc.

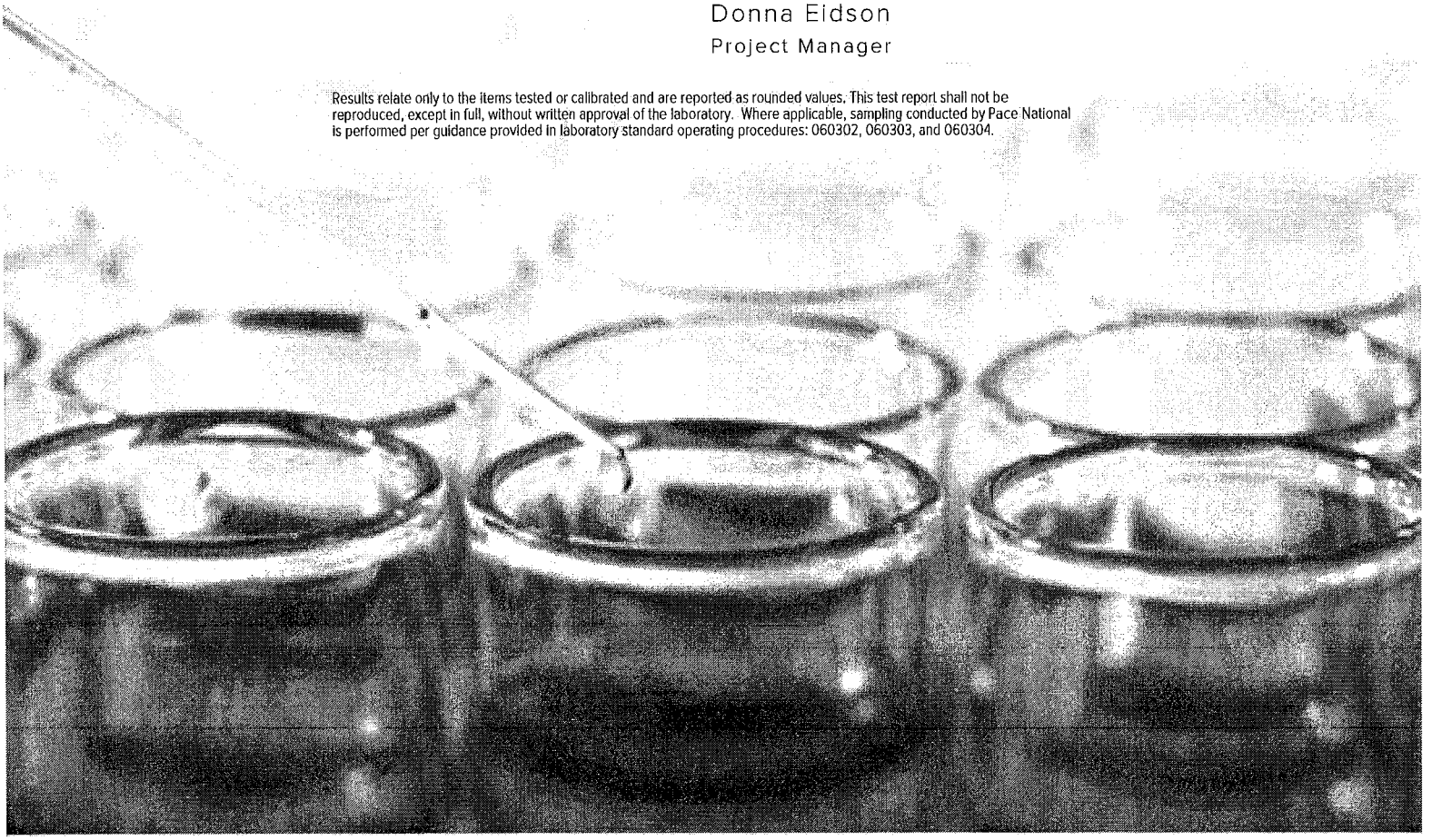
| | |
|---|---|
| Sample Delivery Group: | L1108602 |
| Samples Received: | 06/13/2019 |
| Project Number: | 1906073 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By: Donna Eidson

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



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ONE LAB. NATIONWIDE.


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| | Collected by | Collected date/time | Received date/time |
|---|---|---|---|
| FGD-A-2019-1 L1108602-01 Non-Potable Water | | 06/06/19 13:25 | 06/13/19 09:30 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1302066 | 1 | 06/26/19 13:32 | 07/10/19 11:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1300120 | 1 | 06/25/19 09:40 | 07/10/19 11:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1300120 | 1 | 06/25/19 09:40 | 06/26/19 17:14 | RGT | Mt. Juliet, TN |

| | Collected by | Collected date/time | Received date/time |
|---|---|---|---|
| FGD-B-2019-1 L1108602-02 Non-Potable Water | | 06/06/19 13:45 | 06/13/19 09:30 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1302066 | 1 | 06/26/19 13:32 | 07/10/19 11:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1300120 | 1 | 06/25/19 09:40 | 07/10/19 11:05 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1300120 | 1 | 06/25/19 09:40 | 06/26/19 17:14 | RGT | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 0.391 | | 0.393 | 0.691 | 07/10/2019 11:05 | WG1302066 |
| *(T) Barium* | *97.9* | | | *62.0-143* | *07/10/2019 11:05* | WG1302066 |
| *(T) Yttrium* | *99.7* | | | *79.0-136* | *07/10/2019 11:05* | WG1302066 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 0.406 | | 0.604 | 1.07 | 07/10/2019 11:05 | WG1300120 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.0156 | | 0.211 | 0.383 | 06/26/2019 17:14 | WG1300120 |
| *(T) Barium-133* | *86.1* | | | *30.0-143* | *06/26/2019 17:14* | WG1300120 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 0.411 | | 0.488 | 0.82 | 07/10/2019 11:05 | WG1302066 |
| *(T) Barium* | *95.4* | | | *62.0-143* | *07/10/2019 11:05* | WG1302066 |
| *(T) Yttrium* | *90.6* | | | *79.0-136* | *07/10/2019 11:05* | WG1302066 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 0.709 | | 0.796 | 1.22 | 07/10/2019 11:05 | WG1300120 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.298 | | 0.308 | 0.402 | 06/26/2019 17:14 | WG1300120 |
| *(T) Barium-133* | *75.7* | | | *30.0-143* | *06/26/2019 17:14* | WG1300120 |

## Method Blank (MB)

(MB) R3429617-1 07/10/19 11:05

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | 0.284 | | 0.447 |
| *(T) Barium* | *111* | | |
| *(T) Yttrium* | *92.7* | | |

## L1107592-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1107592-01 07/10/19 11:05 • (DUP) R3429617-5 07/10/19 11:05

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-228 | 0.627 | 0.940 | 1 | 39.9 | 0.487 | | 20 | 3 |
| *(T) Barium* | *108* | *111* | | | | | | |
| *(T) Yttrium* | *86.9* | *94.5* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3429617-2 07/10/19 11:05

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 5.80 | 116 | 80.0-120 | |
| *(T) Barium* | | | *110* | | |
| *(T) Yttrium* | | | *87.7* | | |

## L1108597-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1108597-01 07/10/19 11:05 • (MS) R3429617-3 07/10/19 11:05 • (MSD) R3429617-4 07/10/19 11:05

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 7.14 | 0.711 | 7.45 | 7.59 | 94.4 | 96.3 | 1 | 70.0-130 | | | 1.78 | | 20 |
| *(T) Barium* | | *112* | | | *115* | *109* | | | | | | | |
| *(T) Yttrium* | | *94.4* | | | *97.9* | *99.3* | | | | | | | |

## Method Blank (MB)

(MB) R3425425-1 06/26/19 12:51

| | MB Result | MB Qualifier | MB MDA |
|---|---|---|---|
| Analyte | pCi/l | | pCi/l |
| Radium-226 | 0.481 | B | 0.0511 |
| *(T) Barium-133* | *82.2* | | |

## L1111912-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1111912-03 06/26/19 17:14 • (DUP) R3425425-5 06/26/19 12:51

| | Original Result | DUP Result | Dilution | DUP RPD | DUP RER | DUP Qualifier | DUP RPD Limits | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Analyte | pCi/l | pCi/l | | % | | | % | |
| Radium-226 | 0.637 | 0.531 | 1 | 18.1 | 0.207 | | 20 | 3 |
| *(T) Barium-133* | *77.5* | *71.9* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3425425-2 06/26/19 12:51

| | Spike Amount | LCS Result | LCS Rec. | Rec. Limits | LCS Qualifier |
|---|---|---|---|---|---|
| Analyte | pCi/l | pCi/l | % | % | |
| Radium-226 | 5.02 | 4.73 | 94.2 | 80.0-120 | |
| *(T) Barium-133* | | | *80.0* | | |

## L1111912-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1111912-01 06/26/19 17:14 • (MS) R3425425-3 06/26/19 12:51 • (MSD) R3425425-4 06/26/19 12:51

| | Spike Amount | Original Result | MS Result | MSD Result | MS Rec. | MSD Rec. | Dilution | Rec. Limits | MS Qualifier | MSD Qualifier | RPD | MS RER | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analyte | pCi/l | pCi/l | pCi/l | pCi/l | % | % | | % | | | % | | % |
| Radium-226 | 20.1 | 0.471 | 20.4 | 20.3 | 99.0 | 98.4 | 1 | 75.0-125 | | | 0.591 | | 20 |
| *(T) Barium-133* | | *63.5* | | | *87.6* | *79.5* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| B | The same analyte is found in the associated blank. |

# ACCREDITATIONS & LOCATIONS

ONE LAB. NATIONWIDE.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.



## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LA000356 |
| Kentucky [1 6] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

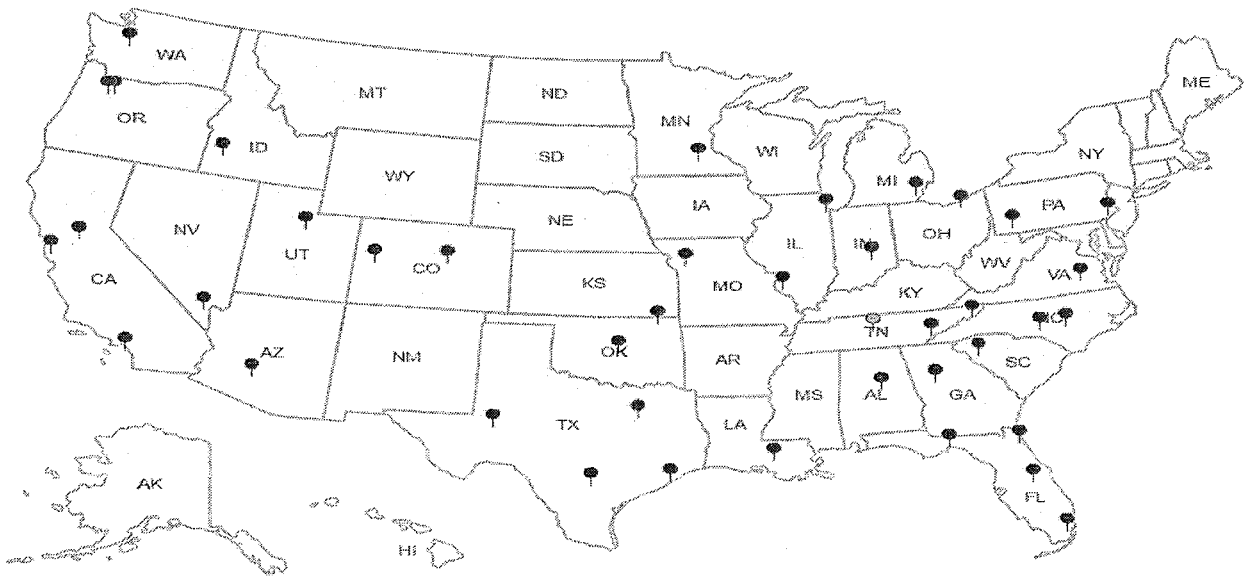
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



# Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | |
|---|---|---|
| Client: DHURTA | SDG#: | 1108602 |
| Cooler Received/Opened On: 6/13/19 | Temperature: | Amb |
| Received By: Brock Fariss | | |
| Signature: | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | ✓ | | |
| COC Signed / Accurate? | | — | |
| Bottles arrive intact? | | — | |
| Correct bottles used? | | — | |
| Sufficient volume sent? | | — | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | | — | |

1108602

# CHAIN-OF-CUSTODY RECORD



DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

Work Order: 1906073

H117

Subcontractor:
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

11-Jun-19

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Ra-228 E904.0 | Ra-226 M7500 Ra B M | Requested Tests | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | < 2 | < 2 | | | | | |
| FGD-A-2019-1 | Aqueous | -01D | 06/06/19 01:25 PM | 1LHDPEHNO3 | | 1 | | | | | -01 |
| FGD-A-2019-1 | Aqueous | -01E | 06/06/19 01:25 PM | 1LHDPEHNO3 | 1 | | | | | | |
| FGD-B-2019-1 | Aqueous | -02D | 06/06/19 01:45 PM | 1LHDPEHNO3 | | 1 | | | | | -02 |
| FGD-B-2019-1 | Aqueous | -02E | 06/06/19 01:45 PM | 1LHDPEHNO3 | 1 | | | | | | |

RAD SCREEN: <0.5 mR/hr

Amb

General Comments:
Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | Date/Time | | Date/Time |
|---|---|---|---|
| Relinquished by: | 6/11/19 1700 | Received by: | 6/13/19 0845 BF 0930 |
| Relinquished by: | | Received by: | |

UPS Rec: 4

eurofins | Environment Testing TestAmerica

# ANALYTICAL REPORT

Eurofins TestAmerica, Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
Tel: (865)291-3000

Laboratory Job ID: 140-15376-1
Client Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals
Revision: 1

For:
Golder Associates Inc.
2201 Double Creek Dr
Suite 4004
Round Rock, Texas 78664

Attn: Will Vienne

Ryan Henry

*Authorized for release by:*
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Ryan Henry, Project Manager I
(865)291-3000
william.henry@testamericainc.com

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# Definitions/Glossary

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Qualifiers

### Metals

| Qualifier | Qualifier Description |
|---|---|
| * | LCS or LCSD is outside acceptance limits. |
| * | RPD of the LCS and LCSD exceeds the control limits |
| B | Compound was found in the blank and sample. |
| F3 | Duplicate RPD exceeds the control limit |
| F5 | Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL. The data are considered valid because the absolute difference is less than the RL. |
| J | Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value. |

## Glossary

| Abbreviation | These commonly used abbreviations may or may not be present in this report. |
|---|---|
| ¤ | Listed under the "D" column to designate that the result is reported on a dry weight basis |
| %R | Percent Recovery |
| CFL | Contains Free Liquid |
| CNF | Contains No Free Liquid |
| DER | Duplicate Error Ratio (normalized absolute difference) |
| Dil Fac | Dilution Factor |
| DL | Detection Limit (DoD/DOE) |
| DL, RA, RE, IN | Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample |
| DLC | Decision Level Concentration (Radiochemistry) |
| EDL | Estimated Detection Limit (Dioxin) |
| LOD | Limit of Detection (DoD/DOE) |
| LOQ | Limit of Quantitation (DoD/DOE) |
| MDA | Minimum Detectable Activity (Radiochemistry) |
| MDC | Minimum Detectable Concentration (Radiochemistry) |
| MDL | Method Detection Limit |
| ML | Minimum Level (Dioxin) |
| NC | Not Calculated |
| ND | Not Detected at the reporting limit (or MDL or EDL if shown) |
| PQL | Practical Quantitation Limit |
| QC | Quality Control |
| RER | Relative Error Ratio (Radiochemistry) |
| RL | Reporting Limit or Requested Limit (Radiochemistry) |
| RPD | Relative Percent Difference, a measure of the relative difference between two points |
| TEF | Toxicity Equivalent Factor (Dioxin) |
| TEQ | Toxicity Equivalent Quotient (Dioxin) |

## Job ID: 140-15376-1

### Laboratory: Eurofins TestAmerica, Knoxville

**Narrative**

**Job Narrative**
**140-15376-1**
**Revised**

This report has been revised to change the sample IDs as requested by the client.

**Receipt**
The samples were received on 5/24/2019 at 9:40 AM. The samples arrived in good condition, properly preserved, and on ice. The temperature of the cooler at receipt was 0.8º C.

**Metals - 7 Step Sequential Extraction Procedure**
These soil samples were prepared and analyzed using Eurofins TestAmerica Knoxville standard operating procedure KNOX-MT-0008, "7 Step Sequential Extraction Procedure". SW-846 Method 6010B as incorporated in Eurofins TestAmerica Knoxville standard operating procedure KNOX-MT-0007 was used to perform the final instrument analyses.

An aliquot of each sample was sequentially extracted using the steps listed below:

- ***Step 1 - Exchangeable Fraction***: A 5 gram aliquot of sample was extracted with 25 mL of 1M magnesium sulfate (MgSO4), centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 2 - Carbonate Fraction:*** The sample residue from step 1 was extracted with 25 mL of 1M sodium acetate/acetic acid (NaOAc/HOAc) at pH 5, centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 3 - Non-crystalline Materials Fraction:*** The sample residue from step 2 was extracted with 25 mL of 0.2M ammonium oxalate (pH 3), centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 4 - Metal Hydroxide Fraction:*** The sample residue from step 3 was extracted with 25 mL of 1M hydroxylamine hydrochloride solution in 25% v/v acetic acid, centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 5 - Organic-bound Fraction:*** The sample residue from step 4 was extracted three times with 25 mL of 5% sodium hypochlorite (NaClO) at pH 9.5, centrifuged and filtered. The resulting leachates were combined and 5 mL were digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 6 - Acid/Sulfide Fraction***: The sample residue from step 5 was extracted with 25 mL of a 3:1:2 v/v solution of HCl-HNO3-H2O, centrifuged and filtered. 5 mL of the resulting leachate was diluted to 50 mL with reagent water and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- ***Step 7 - Residual Fraction:*** A 1.0 g aliquot of the sample residue from step 6 was digested using HF, HNO3, HCl and H3BO3. The digestate was analyzed by ICP using method 6010B. Results are reported in mg/kg on a dry weight basis.

In addition, a 1.0 g aliquot of the original sample was digested using HF, HNO3, HCl and H3BO3. The digestate was analyzed by ICP using method 6010B. Total metal results are reported in mg/kg on a dry weight basis.

Results were calculated using the following equation:

Result, µg/g or mg/Kg, dry weight = (C × V × V1 × D) / (W × S × V2)

Where:
C = Concentration from instrument readout, µg/mL
V = Final volume of digestate, mL
D = Instrument dilution factor
V1 = Total volume of leachate, mL
V2 = Volume of leachate digested, mL
W = Wet weight of sample, g
S = Percent solids/100

A method blank, laboratory control sample and laboratory control sample duplicate were prepared and analyzed with each SEP step in

## Job ID: 140-15376-1 (Continued)

### Laboratory: Eurofins TestAmerica, Knoxville (Continued)

order to provide information about both the presence of elements of interest in the extraction solutions, and the recovery of elements of interest from the extraction solutions. Results outside of laboratory QC limits do not reflect out of control performance, but rather the effect of the extraction solution upon the analyte.

A laboratory sample duplicate was prepared and analyzed with each batch of samples in order to provide information regarding the reproducibility of the procedure.

**SEP Report Notes:**
The final report lists the results for each step, the result for the total digestion of the sample, and a sum of the results of steps 1 through 7 by element.

Magnesium was not reported for step 1 because the extraction solution for this step (magnesium sulfate) contains high levels of magnesium. Sodium was not reported for steps 2 and 5 since the extraction solutions for these steps contain high levels of sodium. The sum of steps 1 through 7 is much higher than the total result for sodium and magnesium due to the magnesium and sodium introduced by the extraction solutions.

The step 1 digestates were reanalyzed for vanadium at a 1/10 dilution due to positive interelement interferences resulting from the high magnesium results. The reporting limits were adjusted accordingly.

The digestates for steps 1, 2 and 5 were analyzed at a dilution due to instrument problems caused by the high solids content of the digestates. The reporting limits were adjusted accordingly.

The serial dilution performed for the following samples associated with batch 140-31255 was outside control limits: (140-15376-A-1-A SD ^5), (140-15376-A-1-A SD ^50) and (140-15376-A-1-AA SD ^50)

Samples FGD-15 (25-27) (140-15376-1), FGD-16 (30-32) (140-15376-2), FGD-2019-1 (23-25) (140-15376-3), (140-15376-A-1-AB DU) and (140-15376-A-1-B DU) were diluted due to the presence of silicon or titanium which interferes with Arsenic, Cobalt, Selenium and Thallium. Elevated reporting limits (RLs) are provided.

Sample FGD-2019-1 (23-25) (140-15376-3) was diluted due to the presence of titanium which interferes with Cobalt. Elevated reporting limits (RLs) are provided.

There was a difference between the Total Metals results for cobalt and the Total SEP result for cobalt. At the client's request, the cobalt results for SEP 3 and SEP 4 were confirmed by reanalysis, and the total analysis for metals was reanalyzed with a separate aliquot. The original results for SEP 3 and SEP 4 were confirmed, but the reanalysis of the totals was much higher than the original test result. This suggests that the sample is heterogeneous, as different total cobalt results are obtained by the three tests. The affected sample is FGD-2019-1 (23-25) (140-15376-3).

The sample duplicate (DUP) precision for preparation batch 140-30453, 140-30480, 140-30481, 140-31696 and 140-31697 and analytical batch 140-31197 was outside control limits. Sample non-homogeneity is suspected.

The sample duplicate (DUP) precision for preparation batch 140-30852 and analytical batch 140-31255 was outside control limits. Sample non-homogeneity is suspected.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

**General Chemistry - % Moisture**
The samples were analyzed for percent moisture using SOP number KNOX-WC-0012 (based on Modified MCAWW 160.3 and SM2540B and on the percent moisture determinations described in methods 3540C and 3550B).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

**Comments**
No additional comments.

# Sample Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

| Lab Sample ID | Client Sample ID | Matrix | Collected | Received | Asset ID |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Solid | 05/22/19 19:15 | 05/24/19 09:40 | |
| 140-15376-2 | FGD-16 (30-32) | Solid | 05/23/19 10:40 | 05/24/19 09:40 | |
| 140-15376-3 | FGD-2019-1 (23-25) | Solid | 05/23/19 15:20 | 05/24/19 09:40 | |

## Client Sample ID: FGD-15 (25-27)
**Date Collected: 05/22/19 19:15**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-1
**Matrix: Solid**
**Percent Solids: 76.6**

### Method: 6010B SEP - SEP Metals (ICP) - Step 1

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 52 | 8.4 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Antimony | ND | | 16 | 1.5 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Arsenic | ND | | 2.6 | 0.68 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Barium | ND | | 13 | 0.63 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Beryllium | ND | | 1.3 | 0.40 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Cobalt | ND | | 13 | 0.24 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Iron | ND | | 26 | 15 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Li | ND | | 13 | 0.78 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| **Manganese** | **0.47** | **J** | 3.9 | 0.16 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Mo | ND | | 10 | 0.43 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Selenium | ND | | 2.6 | 0.89 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |
| Thallium | ND | | 9.1 | 1.1 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:14 | 4 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 2

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | * | 39 | 6.3 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Antimony | ND | | 12 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Arsenic | ND | | 2.0 | 0.51 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Barium | ND | * | 9.8 | 0.47 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Beryllium | ND | * | 0.98 | 0.063 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Cobalt | ND | | 9.8 | 0.25 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Iron | ND | * | 20 | 11 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Li | ND | | 9.8 | 0.59 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| **Manganese** | **1.4** | **J** | 2.9 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Mo | ND | | 7.8 | 0.32 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Selenium | ND | | 2.0 | 0.67 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |
| Thallium | ND | | 6.9 | 0.82 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:37 | 3 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 3

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **23** | | 13 | 2.7 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Antimony | ND | | 3.9 | 0.37 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Arsenic | ND | | 0.65 | 0.17 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| **Barium** | **1.4** | **J B** | 3.3 | 0.16 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| **Beryllium** | **0.020** | **J** | 0.33 | 0.020 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| **Cobalt** | **0.63** | **J** | 3.3 | 0.059 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| **Iron** | **58** | | 6.5 | 3.8 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Li | ND | | 3.3 | 0.20 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| **Manganese** | **14** | **B** | 0.98 | 0.035 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Mo | ND | | 2.6 | 0.11 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |
| Thallium | ND | | 2.3 | 0.27 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:30 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 4

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **600** | | 13 | 2.1 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Antimony | ND | | 3.9 | 0.59 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| **Arsenic** | **0.64** | **J B** | 0.65 | 0.29 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| **Barium** | **9.6** | | 3.3 | 0.16 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| **Beryllium** | **0.12** | **J** | 0.33 | 0.021 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

**Client Sample ID: FGD-15 (25-27)**
**Lab Sample ID: 140-15376-1**
**Date Collected: 05/22/19 19:15**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 76.6**

### Method: 6010B SEP - SEP Metals (ICP) - Step 4 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.41 | J | 3.3 | 0.069 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Iron | 1400 | | 6.5 | 3.8 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Li | 0.93 | J | 3.3 | 0.20 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Manganese | 6.9 | | 0.98 | 0.17 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Mo | ND | | 2.6 | 0.11 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Selenium | 0.65 | * B | 0.65 | 0.61 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |
| Thallium | ND | | 2.3 | 0.38 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 18:52 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 5

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 67 | J * | 200 | 31 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Antimony | ND | | 59 | 5.5 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Arsenic | ND | | 9.8 | 2.5 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Barium | ND | * | 49 | 2.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Beryllium | ND | * | 4.9 | 0.41 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Cobalt | ND | * | 49 | 0.78 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Iron | ND | * | 98 | 57 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Li | ND | | 49 | 2.9 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Manganese | ND | * | 15 | 2.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Mo | ND | | 39 | 1.6 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Selenium | ND | | 9.8 | 3.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |
| Thallium | ND | * | 34 | 4.6 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:25 | 5 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 6

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 1200 | | 13 | 2.1 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Antimony | ND | | 3.9 | 0.37 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Arsenic | 0.62 | J | 0.65 | 0.20 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Barium | 6.0 | | 3.3 | 0.16 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Beryllium | 0.053 | J | 0.33 | 0.016 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Cobalt | 0.27 | J | 3.3 | 0.060 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Iron | 1100 | | 6.5 | 3.8 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Li | 0.93 | J | 3.3 | 0.20 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Manganese | 10 | | 0.98 | 0.33 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Mo | ND | | 2.6 | 0.13 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |
| Thallium | ND | | 2.3 | 0.27 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 21:48 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 28000 | | 130 | 21 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:17 | 10 |
| Antimony | ND | | 3.9 | 0.18 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |
| Arsenic | 0.90 | J | 1.3 | 0.34 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:43 | 2 |
| Barium | 510 | | 33 | 1.6 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:17 | 10 |
| Beryllium | 0.48 | | 0.33 | 0.0098 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |
| Cobalt | 0.48 | J | 6.5 | 0.39 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:43 | 2 |
| Iron | 2900 | | 6.5 | 5.4 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |
| Li | 7.0 | | 3.3 | 0.20 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |
| Manganese | 54 | B | 0.98 | 0.068 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |
| Mo | 0.11 | J | 2.6 | 0.11 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 12:53 | 1 |

**Client Sample ID: FGD-15 (25-27)** **Lab Sample ID: 140-15376-1**
**Date Collected: 05/22/19 19:15** **Matrix: Solid**
**Date Received: 05/24/19 09:40** **Percent Solids: 76.6**

## Method: 6010B SEP - SEP Metals (ICP) - Step 7 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Selenium | ND | | 1.3 | 0.44 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:43 | 2 |
| **Thallium** | **0.59** | **J** | 4.6 | 0.47 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:43 | 2 |

## Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **30000** | | 10 | 1.6 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Antimony | ND | | 3.0 | 0.14 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Arsenic** | **2.2** | | 0.50 | 0.13 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Barium** | **530** | | 2.5 | 0.12 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Beryllium** | **0.67** | | 0.25 | 0.0075 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Cobalt** | **1.8** | **J** | 2.5 | 0.023 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Iron** | **5400** | | 5.0 | 4.1 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Li** | **8.9** | | 2.5 | 0.15 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Manganese** | **88** | | 0.75 | 0.052 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Mo** | **0.11** | **J** | 2.0 | 0.082 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Selenium** | **0.65** | | 0.50 | 0.17 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Thallium** | **0.59** | **J** | 1.8 | 0.18 | mg/Kg | | | 07/11/19 10:59 | 1 |

## Method: 6010B - Metals (ICP)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 24 | 12 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:27 | 1 |
| **Chromium** | **4.2** | | 1.8 | 0.27 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:27 | 1 |
| **Lead** | **3.2** | | 1.8 | 0.34 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:27 | 1 |
| **Phosphorus** | **69** | | 36 | 2.9 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:27 | 1 |

## Method: 6010B - SEP Metals (ICP) - Total

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **46000** | | 130 | 21 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:37 | 10 |
| Antimony | ND | | 3.9 | 0.18 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Arsenic** | **1.6** | | 0.65 | 0.17 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Barium** | **670** | | 33 | 1.6 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:37 | 10 |
| **Beryllium** | **0.71** | | 0.33 | 0.0098 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Cobalt** | **1.8** | **J** | 6.5 | 0.39 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:40 | 2 |
| **Iron** | **5700** | | 6.5 | 5.4 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Lithium** | **10** | | 3.3 | 0.20 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Manganese** | **93** | | 0.98 | 0.068 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| **Molybdenum** | **0.21** | **J** | 2.6 | 0.11 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:23 | 1 |
| Thallium | ND | | 4.6 | 0.47 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:40 | 2 |

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGD-16 (30-32)
**Date Collected: 05/23/19 10:40**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-2
**Matrix: Solid**
**Percent Solids: 79.2**

### Method: 6010B SEP - SEP Metals (ICP) - Step 1

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 51 | 8.1 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Antimony | ND | | 15 | 1.4 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Arsenic | ND | | 2.5 | 0.66 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| **Barium** | **0.67** | **J** | 13 | 0.61 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Beryllium | ND | | 1.3 | 0.39 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Cobalt | ND | | 13 | 0.23 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Iron | ND | | 25 | 15 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Li | ND | | 13 | 0.76 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| **Manganese** | **0.20** | **J** | 3.8 | 0.16 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Mo | ND | | 10 | 0.41 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Selenium | ND | | 2.5 | 0.86 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |
| Thallium | ND | | 8.8 | 1.1 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:24 | 4 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 2

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | * | 38 | 6.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Antimony | ND | | 11 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Arsenic | ND | | 1.9 | 0.49 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| **Barium** | **0.55** | **J *** | 9.5 | 0.45 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Beryllium | ND | * | 0.95 | 0.061 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Cobalt | ND | | 9.5 | 0.24 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Iron | ND | * | 19 | 11 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Li | ND | | 9.5 | 0.57 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Manganese | ND | | 2.8 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Mo | ND | | 7.6 | 0.31 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Selenium | ND | | 1.9 | 0.64 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |
| Thallium | ND | | 6.6 | 0.80 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 15:58 | 3 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 3

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **40** | | 13 | 2.7 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| Antimony | ND | | 3.8 | 0.35 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Arsenic** | **0.28** | **J** | 0.63 | 0.16 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Barium** | **6.4** | **B** | 3.2 | 0.15 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Beryllium** | **0.036** | **J** | 0.32 | 0.019 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Cobalt** | **0.63** | **J** | 3.2 | 0.057 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Iron** | **31** | | 6.3 | 3.7 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| Li | ND | | 3.2 | 0.19 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| **Manganese** | **4.4** | **B** | 0.95 | 0.034 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| Mo | ND | | 2.5 | 0.10 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| Selenium | ND | | 0.63 | 0.21 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |
| Thallium | ND | | 2.2 | 0.27 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:40 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 4

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **990** | | 13 | 2.0 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| Antimony | ND | | 3.8 | 0.57 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Arsenic** | **1.1** | **B** | 0.63 | 0.28 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Barium** | **12** | | 3.2 | 0.15 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Beryllium** | **0.18** | **J** | 0.32 | 0.020 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |

## Client Sample ID: FGD-16 (30-32)
**Date Collected: 05/23/19 10:40**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-2
**Matrix: Solid**
**Percent Solids: 79.2**

### Method: 6010B SEP - SEP Metals (ICP) - Step 4 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Cobalt** | **0.63** | **J** | 3.2 | 0.067 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Iron** | **2100** | | 6.3 | 3.7 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Li** | **0.27** | **J** | 3.2 | 0.19 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| **Manganese** | **4.8** | | 0.95 | 0.16 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| Mo | ND | | 2.5 | 0.10 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| Selenium | ND | * | 0.63 | 0.59 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |
| Thallium | ND | | 2.2 | 0.37 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:13 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 5

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **90** | **J *** | 190 | 30 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Antimony | ND | | 57 | 5.3 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Arsenic | ND | | 9.5 | 2.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Barium | ND | * | 47 | 2.3 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Beryllium | ND | * | 4.7 | 0.40 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Cobalt | ND | * | 47 | 0.76 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Iron | ND | * | 95 | 56 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Li | ND | | 47 | 2.8 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Manganese | ND | * | 14 | 2.3 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Mo | ND | | 38 | 1.6 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Selenium | ND | | 9.5 | 3.3 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |
| Thallium | ND | * | 33 | 4.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:35 | 5 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 6

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **1600** | | 13 | 2.0 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| Antimony | ND | | 3.8 | 0.35 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Arsenic** | **0.69** | | 0.63 | 0.19 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Barium** | **4.2** | | 3.2 | 0.15 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Beryllium** | **0.056** | **J** | 0.32 | 0.015 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Cobalt** | **0.32** | **J** | 3.2 | 0.058 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Iron** | **1300** | | 6.3 | 3.7 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Li** | **0.57** | **J** | 3.2 | 0.19 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| **Manganese** | **6.4** | | 0.95 | 0.32 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| Mo | ND | | 2.5 | 0.13 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| Selenium | ND | | 0.63 | 0.21 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |
| Thallium | ND | | 2.2 | 0.27 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:14 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **39000** | | 130 | 20 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:27 | 10 |
| Antimony | ND | | 3.8 | 0.18 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |
| **Arsenic** | **0.47** | **J** | 1.3 | 0.33 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:53 | 2 |
| **Barium** | **520** | | 32 | 1.5 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:27 | 10 |
| **Beryllium** | **0.59** | | 0.32 | 0.0095 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |
| **Cobalt** | **0.62** | **J** | 6.3 | 0.38 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:53 | 2 |
| **Iron** | **3100** | | 6.3 | 5.2 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |
| **Li** | **7.9** | | 3.2 | 0.19 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |
| **Manganese** | **18** | **B** | 0.95 | 0.066 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |
| Mo | ND | | 2.5 | 0.10 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:19 | 1 |

## Client Sample ID: FGD-16 (30-32)
**Date Collected: 05/23/19 10:40**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-2
**Matrix: Solid**
**Percent Solids: 79.2**

### Method: 6010B SEP - SEP Metals (ICP) - Step 7 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Selenium | ND | | 1.3 | 0.43 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:53 | 2 |
| **Thallium** | **0.95** | **J** | 4.4 | 0.45 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:53 | 2 |

### Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **42000** | | 10 | 1.6 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Antimony | ND | | 3.0 | 0.14 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Arsenic** | **2.5** | | 0.50 | 0.13 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Barium** | **540** | | 2.5 | 0.12 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Beryllium** | **0.86** | | 0.25 | 0.0075 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Cobalt** | **2.2** | **J** | 2.5 | 0.023 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Iron** | **6600** | | 5.0 | 4.1 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Li** | **8.7** | | 2.5 | 0.15 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Manganese** | **34** | | 0.75 | 0.052 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Mo | ND | | 2.0 | 0.082 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Selenium | ND | | 0.50 | 0.17 | mg/Kg | | | 07/11/19 10:59 | 1 |
| **Thallium** | **0.95** | **J** | 1.8 | 0.18 | mg/Kg | | | 07/11/19 10:59 | 1 |

### Method: 6010B - Metals (ICP)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 24 | 12 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:41 | 1 |
| **Chromium** | **3.3** | | 1.8 | 0.26 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:41 | 1 |
| **Lead** | **3.4** | | 1.8 | 0.33 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:41 | 1 |
| **Phosphorus** | **43** | | 35 | 2.8 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:41 | 1 |

### Method: 6010B - SEP Metals (ICP) - Total

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **44000** | | 130 | 20 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:47 | 10 |
| Antimony | ND | | 3.8 | 0.18 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| **Arsenic** | **2.5** | | 1.3 | 0.33 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:50 | 2 |
| **Barium** | **760** | | 32 | 1.5 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:47 | 10 |
| **Beryllium** | **0.85** | | 0.32 | 0.0095 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| **Cobalt** | **1.7** | **J** | 6.3 | 0.38 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:50 | 2 |
| **Iron** | **5900** | | 6.3 | 5.2 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| **Lithium** | **7.6** | | 3.2 | 0.19 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| **Manganese** | **34** | | 0.95 | 0.066 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| **Molybdenum** | **0.16** | **J** | 2.5 | 0.10 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:34 | 1 |
| Selenium | ND | | 1.3 | 0.43 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:50 | 2 |
| **Thallium** | **0.68** | **J** | 4.4 | 0.45 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 18:50 | 2 |

### Method: 7470A - SEP Mercury (CVAA) - Total

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Hg | ND | | 0.13 | 0.051 | mg/Kg | ☼ | 05/30/19 08:00 | 06/03/19 14:52 | 1 |

# Client Sample Results

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

**Client Sample ID: FGD-2019-1 (23-25)**
**Lab Sample ID: 140-15376-3**
**Date Collected: 05/23/19 15:20**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 77.2**

## Method: 6010B SEP - SEP Metals (ICP) - Step 1

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 52 | 8.3 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Antimony | ND | | 16 | 1.5 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Arsenic | ND | | 2.6 | 0.67 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| **Barium** | **0.86** | **J** | 13 | 0.62 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Beryllium | ND | | 1.3 | 0.40 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Cobalt | ND | | 13 | 0.23 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Iron | ND | | 26 | 15 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Li | ND | | 13 | 0.78 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| **Manganese** | **0.99** | **J** | 3.9 | 0.16 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Mo | ND | | 10 | 0.43 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Selenium | ND | | 2.6 | 0.88 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |
| Thallium | ND | | 9.1 | 1.1 | mg/Kg | ☼ | 05/31/19 08:00 | 06/17/19 14:29 | 4 |

## Method: 6010B SEP - SEP Metals (ICP) - Step 2

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | * | 39 | 6.2 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Antimony | ND | | 12 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Arsenic | ND | | 1.9 | 0.51 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| **Barium** | **1.9** | **J *** | 9.7 | 0.47 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Beryllium | ND | * | 0.97 | 0.062 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Cobalt | ND | | 9.7 | 0.24 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Iron | ND | * | 19 | 11 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Li | ND | | 9.7 | 0.58 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Manganese | ND | | 2.9 | 1.1 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Mo | ND | | 7.8 | 0.32 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| **Selenium** | **0.88** | **J B** | 1.9 | 0.66 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |
| Thallium | ND | | 6.8 | 0.82 | mg/Kg | ☼ | 06/03/19 08:00 | 06/17/19 16:03 | 3 |

## Method: 6010B SEP - SEP Metals (ICP) - Step 3

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **62** | | 13 | 2.7 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| Antimony | ND | | 3.9 | 0.36 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Arsenic** | **0.30** | **J** | 0.65 | 0.17 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Barium** | **4.0** | **B** | 3.2 | 0.16 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Beryllium** | **0.10** | **J** | 0.32 | 0.019 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Cobalt** | **29** | | 3.2 | 0.058 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Cobalt** | **29** | | 3.2 | 0.058 | mg/Kg | ☼ | 07/16/19 08:00 | 07/17/19 11:32 | 1 |
| **Iron** | **61** | | 6.5 | 3.8 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Li** | **0.80** | **J** | 3.2 | 0.19 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| **Manganese** | **110** | **B** | 0.97 | 0.035 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| Mo | ND | | 2.6 | 0.11 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |
| Thallium | ND | | 2.3 | 0.27 | mg/Kg | ☼ | 06/04/19 08:00 | 06/26/19 17:45 | 1 |

## Method: 6010B SEP - SEP Metals (ICP) - Step 4

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **1800** | | 13 | 2.1 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| Antimony | ND | | 3.9 | 0.58 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Arsenic** | **1.9** | **B** | 0.65 | 0.29 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Barium** | **14** | | 3.2 | 0.16 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |

## Client Sample ID: FGD-2019-1 (23-25)
**Date Collected: 05/23/19 15:20**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-3
**Matrix: Solid**
**Percent Solids: 77.2**

### Method: 6010B SEP - SEP Metals (ICP) - Step 4 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Beryllium** | **0.25** | **J** | 0.32 | 0.021 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Cobalt** | **36** | | 3.2 | 0.069 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Cobalt** | **35** | | 3.2 | 0.069 | mg/Kg | ☼ | 07/16/19 08:00 | 07/17/19 11:53 | 1 |
| **Iron** | **3400** | | 6.5 | 3.8 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Li** | **3.9** | | 3.2 | 0.19 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Manganese** | **98** | | 0.97 | 0.17 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| **Mo** | **0.18** | **J** | 2.6 | 0.11 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| Selenium | ND | * | 0.65 | 0.61 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |
| Thallium | ND | | 2.3 | 0.38 | mg/Kg | ☼ | 06/10/19 08:00 | 06/26/19 19:18 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 5

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **65** | **J *** | 190 | 30 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Antimony | ND | | 58 | 5.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Arsenic | ND | | 9.7 | 2.5 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| **Barium** | **27** | **J *** | 49 | 2.3 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Beryllium | ND | * | 4.9 | 0.41 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| **Cobalt** | **2.6** | **J *** | 49 | 0.78 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Iron | ND | * | 97 | 57 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Li | ND | | 49 | 2.9 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Manganese | ND | * | 15 | 2.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Mo | ND | | 39 | 1.6 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Selenium | ND | | 9.7 | 3.4 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |
| Thallium | ND | * | 34 | 4.5 | mg/Kg | ☼ | 06/12/19 08:00 | 06/26/19 20:41 | 5 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 6

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **2600** | | 13 | 2.1 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| Antimony | ND | | 3.9 | 0.36 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Arsenic** | **1.6** | | 0.65 | 0.19 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Barium** | **35** | | 3.2 | 0.16 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Beryllium** | **0.074** | **J** | 0.32 | 0.016 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Cobalt** | **1.6** | **J** | 3.2 | 0.060 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Iron** | **1100** | | 6.5 | 3.8 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Li** | **1.2** | **J** | 3.2 | 0.19 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Manganese** | **10** | | 0.97 | 0.32 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| **Mo** | **0.21** | **J** | 2.6 | 0.13 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |
| Thallium | ND | | 2.3 | 0.27 | mg/Kg | ☼ | 06/15/19 08:00 | 06/26/19 22:20 | 1 |

### Method: 6010B SEP - SEP Metals (ICP) - Step 7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Aluminum** | **33000** | | 130 | 21 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:32 | 10 |
| Antimony | ND | | 3.9 | 0.18 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| **Arsenic** | **1.2** | | 0.65 | 0.17 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| **Barium** | **410** | | 32 | 1.6 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 14:32 | 10 |
| **Beryllium** | **0.39** | | 0.32 | 0.0097 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| **Cobalt** | **0.70** | **J** | 6.5 | 0.39 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:58 | 2 |
| **Iron** | **4400** | | 6.5 | 5.3 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| **Li** | **14** | | 3.2 | 0.19 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

**Client Sample ID: FGD-2019-1 (23-25)**
**Lab Sample ID: 140-15376-3**
**Date Collected: 05/23/19 15:20**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 77.2**

### Method: 6010B SEP - SEP Metals (ICP) - Step 7 (Continued)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Manganese | 19 | B | 0.97 | 0.067 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| Mo | 0.80 | J | 2.6 | 0.11 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 13:24 | 1 |
| Thallium | ND | | 4.5 | 0.47 | mg/Kg | ☼ | 06/16/19 08:00 | 06/28/19 17:58 | 2 |

### Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 38000 | | 10 | 1.6 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Antimony | ND | | 3.0 | 0.14 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Arsenic | 5.0 | | 0.50 | 0.13 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Barium | 490 | | 2.5 | 0.12 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Beryllium | 0.81 | | 0.25 | 0.0075 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Cobalt | 69 | | 2.5 | 0.023 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Iron | 9100 | | 5.0 | 4.1 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Li | 20 | | 2.5 | 0.15 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Manganese | 230 | | 0.75 | 0.052 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Mo | 1.2 | J | 2.0 | 0.082 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Selenium | 0.88 | | 0.50 | 0.17 | mg/Kg | | | 07/11/19 10:59 | 1 |
| Thallium | ND | | 1.8 | 0.18 | mg/Kg | | | 07/11/19 10:59 | 1 |

### Method: 6010B - Metals (ICP)

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 24 | 12 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:47 | 1 |
| Chromium | 4.8 | | 1.8 | 0.27 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:47 | 1 |
| Lead | 6.0 | | 1.8 | 0.34 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:47 | 1 |
| Phosphorus | 65 | | 36 | 2.9 | mg/Kg | ☼ | 06/16/19 08:00 | 06/17/19 11:47 | 1 |

### Method: 6010B - SEP Metals (ICP) - Total

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 43000 | | 130 | 21 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:52 | 10 |
| Antimony | ND | | 3.9 | 0.18 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Arsenic | 7.6 | | 0.65 | 0.17 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Barium | 730 | | 32 | 1.6 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 16:52 | 10 |
| Beryllium | 0.76 | | 0.32 | 0.0097 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Cobalt | 6.9 | | 3.2 | 0.19 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Cobalt | 17 | | 6.5 | 0.39 | mg/Kg | ☼ | 07/16/19 08:00 | 07/17/19 12:03 | 2 |
| Iron | 8400 | | 6.5 | 5.3 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Lithium | 14 | | 3.2 | 0.19 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Manganese | 61 | | 0.97 | 0.067 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Molybdenum | 1.1 | J | 2.6 | 0.11 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Selenium | ND | | 0.65 | 0.22 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |
| Thallium | 0.85 | J | 2.3 | 0.23 | mg/Kg | ☼ | 05/30/19 08:00 | 06/28/19 15:40 | 1 |

### Method: 7470A - SEP Mercury (CVAA) - Total

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Hg | 0.15 | | 0.13 | 0.052 | mg/Kg | ☼ | 05/30/19 08:00 | 06/03/19 14:54 | 1 |

# Default Detection Limits

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Method: 6010B SEP - SEP Metals (ICP) - Step 1

### Prep: 3010A

### SEP: Exchangeable

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.28 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.077 | mg/Kg |
| Cobalt | 2.5 | 0.045 | mg/Kg |
| Iron | 5.0 | 2.9 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.031 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.21 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 2

### Prep: 3010A

### SEP: Carbonate

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.28 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.016 | mg/Kg |
| Cobalt | 2.5 | 0.063 | mg/Kg |
| Iron | 5.0 | 2.9 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.28 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.21 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 3

### Prep: 3010A

### SEP: Non-Crystalline

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 2.1 | mg/Kg |
| Antimony | 3.0 | 0.28 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.015 | mg/Kg |
| Cobalt | 2.5 | 0.045 | mg/Kg |
| Iron | 5.0 | 2.9 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.027 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.21 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 4

### Prep: 3010A

### SEP: Metal Hydroxide

# Default Detection Limits

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Method: 6010B SEP - SEP Metals (ICP) - Step 4

### Prep: 3010A

### SEP: Metal Hydroxide

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.45 | mg/Kg |
| Arsenic | 0.50 | 0.22 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.016 | mg/Kg |
| Cobalt | 2.5 | 0.053 | mg/Kg |
| Iron | 5.0 | 2.9 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.13 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.47 | mg/Kg |
| Thallium | 1.8 | 0.29 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 5

### Prep: 3010A

### SEP: Organic-Bound

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 30 | 4.7 | mg/Kg |
| Antimony | 9.0 | 0.84 | mg/Kg |
| Arsenic | 1.5 | 0.38 | mg/Kg |
| Barium | 7.5 | 0.36 | mg/Kg |
| Beryllium | 0.75 | 0.063 | mg/Kg |
| Cobalt | 7.5 | 0.12 | mg/Kg |
| Iron | 15 | 8.8 | mg/Kg |
| Li | 7.5 | 0.44 | mg/Kg |
| Manganese | 2.3 | 0.37 | mg/Kg |
| Mo | 6.0 | 0.25 | mg/Kg |
| Selenium | 1.5 | 0.52 | mg/Kg |
| Thallium | 5.3 | 0.70 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 6

### SEP: Acid/Sulfide

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.28 | mg/Kg |
| Arsenic | 0.50 | 0.15 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.012 | mg/Kg |
| Cobalt | 2.5 | 0.046 | mg/Kg |
| Iron | 5.0 | 2.9 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.25 | mg/Kg |
| Mo | 2.0 | 0.099 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.21 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Step 7

### Prep: Residual

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |

# Default Detection Limits

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Method: 6010B SEP - SEP Metals (ICP) - Step 7 (Continued)

### Prep: Residual

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Antimony | 3.0 | 0.14 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.0075 | mg/Kg |
| Cobalt | 2.5 | 0.15 | mg/Kg |
| Iron | 5.0 | 4.1 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.052 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.18 | mg/Kg |

## Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.14 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.0075 | mg/Kg |
| Cobalt | 2.5 | 0.023 | mg/Kg |
| Iron | 5.0 | 4.1 | mg/Kg |
| Li | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.052 | mg/Kg |
| Mo | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.18 | mg/Kg |

## Method: 6010B - Metals (ICP)

### Prep: 3050B

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Boron | 20 | 10 | mg/Kg |
| Chromium | 1.5 | 0.22 | mg/Kg |
| Lead | 1.5 | 0.28 | mg/Kg |
| Phosphorus | 30 | 2.4 | mg/Kg |

## Method: 6010B - SEP Metals (ICP) - Total

### Prep: Total

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Aluminum | 10 | 1.6 | mg/Kg |
| Antimony | 3.0 | 0.14 | mg/Kg |
| Arsenic | 0.50 | 0.13 | mg/Kg |
| Barium | 2.5 | 0.12 | mg/Kg |
| Beryllium | 0.25 | 0.0075 | mg/Kg |
| Cobalt | 2.5 | 0.15 | mg/Kg |
| Iron | 5.0 | 4.1 | mg/Kg |
| Lithium | 2.5 | 0.15 | mg/Kg |
| Manganese | 0.75 | 0.052 | mg/Kg |
| Molybdenum | 2.0 | 0.082 | mg/Kg |
| Selenium | 0.50 | 0.17 | mg/Kg |
| Thallium | 1.8 | 0.18 | mg/Kg |

# Default Detection Limits

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Method: 7470A - SEP Mercury (CVAA) - Total

### Prep: Total

| Analyte | RL | MDL | Units |
|---|---|---|---|
| Hg | 0.10 | 0.040 | mg/Kg |

## Method: 6010B - Metals (ICP)

**Lab Sample ID: MB 140-30853/8-A**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 30853**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 20 | 10 | mg/Kg | | 06/16/19 08:00 | 06/17/19 11:06 | 1 |
| Chromium | ND | | 1.5 | 0.22 | mg/Kg | | 06/16/19 08:00 | 06/17/19 11:06 | 1 |
| Lead | ND | | 1.5 | 0.28 | mg/Kg | | 06/16/19 08:00 | 06/17/19 11:06 | 1 |
| Phosphorus | ND | | 30 | 2.4 | mg/Kg | | 06/16/19 08:00 | 06/17/19 11:06 | 1 |

**Lab Sample ID: LCS 140-30853/9-A**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 30853**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Boron | 100 | 99.1 | | mg/Kg | | 99 | 80 - 120 |
| Chromium | 20.0 | 20.5 | | mg/Kg | | 102 | 90 - 110 |
| Lead | 10.0 | 10.2 | | mg/Kg | | 102 | 90 - 110 |
| Phosphorus | 500 | 507 | | mg/Kg | | 101 | 80 - 120 |

**Lab Sample ID: 140-15376-1 MS**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30853**

| Analyte | Sample Result | Sample Qualifier | Spike Added | MS Result | MS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 128 | 121 | | mg/Kg | ☼ | 95 | 75 - 125 |
| Chromium | 4.2 | | 25.5 | 33.9 | | mg/Kg | ☼ | 117 | 75 - 125 |
| Lead | 3.2 | | 12.8 | 15.4 | | mg/Kg | ☼ | 96 | 75 - 125 |
| Phosphorus | 69 | | 638 | 680 | | mg/Kg | ☼ | 96 | 75 - 125 |

**Lab Sample ID: 140-15376-1 MSD**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30853**

| Analyte | Sample Result | Sample Qualifier | Spike Added | MSD Result | MSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Boron | ND | | 127 | 122 | | mg/Kg | ☼ | 96 | 75 - 125 | 1 | 20 |
| Chromium | 4.2 | | 25.4 | 33.5 | | mg/Kg | ☼ | 116 | 75 - 125 | 1 | 20 |
| Lead | 3.2 | | 12.7 | 15.4 | | mg/Kg | ☼ | 96 | 75 - 125 | 1 | 20 |
| Phosphorus | 69 | | 635 | 672 | | mg/Kg | ☼ | 95 | 75 - 125 | 1 | 20 |

## Method: 6010B - SEP Metals (ICP) - Total

**Lab Sample ID: MB 140-30373/11-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 10 | 1.6 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Antimony | ND | | 3.0 | 0.14 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Arsenic | ND | | 0.50 | 0.13 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Barium | ND | | 2.5 | 0.12 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Beryllium | ND | | 0.25 | 0.0075 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Cobalt | ND | | 2.5 | 0.15 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Iron | ND | | 5.0 | 4.1 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Lithium | ND | | 2.5 | 0.15 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |

## Method: 6010B - SEP Metals (ICP) - Total (Continued)

**Lab Sample ID: MB 140-30373/11-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Manganese | ND | | 0.75 | 0.052 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Molybdenum | ND | | 2.0 | 0.082 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Selenium | ND | | 0.50 | 0.17 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |
| Thallium | ND | | 1.8 | 0.18 | mg/Kg | | 05/30/19 08:00 | 06/28/19 12:27 | 1 |

**Lab Sample ID: LCS 140-30373/12-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 96.4 | | mg/Kg | | 96 | 75 - 125 |
| Antimony | 25.0 | 25.3 | | mg/Kg | | 101 | 75 - 125 |
| Arsenic | 5.00 | 5.23 | | mg/Kg | | 105 | 75 - 125 |
| Barium | 5.00 | 5.07 | | mg/Kg | | 101 | 75 - 125 |
| Beryllium | 2.50 | 2.47 | | mg/Kg | | 99 | 75 - 125 |
| Cobalt | 5.00 | 5.25 | | mg/Kg | | 105 | 75 - 125 |
| Iron | 50.0 | 50.6 | | mg/Kg | | 101 | 75 - 125 |
| Lithium | 5.00 | 5.37 | | mg/Kg | | 107 | 75 - 125 |
| Manganese | 5.00 | 5.27 | | mg/Kg | | 105 | 75 - 125 |
| Molybdenum | 25.0 | 26.5 | | mg/Kg | | 106 | 75 - 125 |
| Selenium | 7.50 | 7.36 | | mg/Kg | | 98 | 75 - 125 |
| Thallium | 20.0 | 21.6 | | mg/Kg | | 108 | 75 - 125 |

**Lab Sample ID: LCSD 140-30373/13-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 95.8 | | mg/Kg | | 96 | 75 - 125 | 1 | 30 |
| Antimony | 25.0 | 25.3 | | mg/Kg | | 101 | 75 - 125 | 0 | 30 |
| Arsenic | 5.00 | 5.23 | | mg/Kg | | 105 | 75 - 125 | 0 | 30 |
| Barium | 5.00 | 5.06 | | mg/Kg | | 101 | 75 - 125 | 0 | 30 |
| Beryllium | 2.50 | 2.47 | | mg/Kg | | 99 | 75 - 125 | 0 | 30 |
| Cobalt | 5.00 | 5.22 | | mg/Kg | | 104 | 75 - 125 | 0 | 30 |
| Iron | 50.0 | 50.6 | | mg/Kg | | 101 | 75 - 125 | 0 | 30 |
| Lithium | 5.00 | 5.35 | | mg/Kg | | 107 | 75 - 125 | 0 | 30 |
| Manganese | 5.00 | 5.25 | | mg/Kg | | 105 | 75 - 125 | 0 | 30 |
| Molybdenum | 25.0 | 26.4 | | mg/Kg | | 106 | 75 - 125 | 0 | 30 |
| Selenium | 7.50 | 7.37 | | mg/Kg | | 98 | 75 - 125 | 0 | 30 |
| Thallium | 20.0 | 21.4 | | mg/Kg | | 107 | 75 - 125 | 1 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Antimony | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Arsenic | 1.6 | | 1.73 | | mg/Kg | ☼ | 10 | 30 |
| Beryllium | 0.71 | | 0.709 | | mg/Kg | ☼ | 0.6 | 30 |

## Method: 6010B - SEP Metals (ICP) - Total (Continued)

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Iron | 5700 | | 5780 | | mg/Kg | ☼ | 2 | 30 |
| Lithium | 10 | | 10.4 | | mg/Kg | ☼ | 0.9 | 30 |
| Manganese | 93 | | 86.6 | | mg/Kg | ☼ | 7 | 30 |
| Molybdenum | 0.21 | J | 0.176 | J | mg/Kg | ☼ | 17 | 30 |
| Selenium | ND | | ND | | mg/Kg | ☼ | NC | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Aluminum | 46000 | | 46400 | | mg/Kg | ☼ | 1 | 30 |
| Barium | 670 | | 697 | | mg/Kg | ☼ | 3 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Cobalt | 1.8 | J | 1.74 | J | mg/Kg | ☼ | 5 | 30 |
| Thallium | ND | | ND | | mg/Kg | ☼ | NC | 30 |

**Lab Sample ID: MB 140-31695/2-A**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 31695**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | ND | | 2.5 | 0.15 | mg/Kg | | 07/16/19 08:00 | 07/17/19 11:17 | 1 |

**Lab Sample ID: LCS 140-31695/3-A**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 31695**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Cobalt | 5.00 | 5.28 | | mg/Kg | | 106 | 75 - 125 |

**Lab Sample ID: LCSD 140-31695/4-A**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Total/NA**
**Prep Batch: 31695**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 5.00 | 5.29 | | mg/Kg | | 106 | 75 - 125 | 0 | 30 |

## Method: 6010B SEP - SEP Metals (ICP)

**Lab Sample ID: MB 140-30374/11-B ^4**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Method Blank**
**Prep Type: Step 1**
**Prep Batch: 30422**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 40 | 6.4 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Antimony | ND | | 12 | 1.1 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Arsenic | ND | | 2.0 | 0.52 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Barium | ND | | 10 | 0.48 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Beryllium | ND | | 1.0 | 0.31 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Cobalt | ND | | 10 | 0.18 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Iron | ND | | 20 | 12 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Li | ND | | 10 | 0.60 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Manganese | ND | | 3.0 | 0.12 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Mo | ND | | 8.0 | 0.33 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Selenium | ND | | 2.0 | 0.68 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |
| Thallium | ND | | 7.0 | 0.84 | mg/Kg | | 05/31/19 08:00 | 06/17/19 13:48 | 4 |

**Lab Sample ID: LCS 140-30374/12-B ^5**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 1**
**Prep Batch: 30422**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 94.0 | | mg/Kg | | 94 | 75 - 125 |
| Antimony | 25.0 | 24.7 | | mg/Kg | | 99 | 75 - 125 |
| Arsenic | 5.00 | 4.79 | | mg/Kg | | 96 | 75 - 125 |
| Barium | 5.00 | 5.16 | J | mg/Kg | | 103 | 75 - 125 |
| Beryllium | 2.50 | 2.57 | | mg/Kg | | 103 | 75 - 125 |
| Cobalt | 5.00 | 5.06 | J | mg/Kg | | 101 | 75 - 125 |
| Iron | 50.0 | 51.3 | | mg/Kg | | 103 | 75 - 125 |
| Li | 5.00 | 5.37 | J | mg/Kg | | 107 | 75 - 125 |
| Manganese | 5.00 | 4.96 | | mg/Kg | | 99 | 75 - 125 |
| Mo | 25.0 | 25.8 | | mg/Kg | | 103 | 75 - 125 |
| Selenium | 7.50 | 7.86 | | mg/Kg | | 105 | 75 - 125 |
| Thallium | 20.0 | 19.6 | | mg/Kg | | 98 | 75 - 125 |

**Lab Sample ID: LCSD 140-30374/13-B ^5**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 1**
**Prep Batch: 30422**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 96.4 | | mg/Kg | | 96 | 75 - 125 | 3 | 30 |
| Antimony | 25.0 | 23.9 | | mg/Kg | | 95 | 75 - 125 | 4 | 30 |
| Arsenic | 5.00 | 4.66 | | mg/Kg | | 93 | 75 - 125 | 3 | 30 |
| Barium | 5.00 | 5.00 | J | mg/Kg | | 100 | 75 - 125 | 3 | 30 |
| Beryllium | 2.50 | 2.55 | | mg/Kg | | 102 | 75 - 125 | 1 | 30 |
| Cobalt | 5.00 | 4.97 | J | mg/Kg | | 99 | 75 - 125 | 2 | 30 |
| Iron | 50.0 | 50.4 | | mg/Kg | | 101 | 75 - 125 | 2 | 30 |
| Li | 5.00 | 5.04 | J | mg/Kg | | 101 | 75 - 125 | 6 | 30 |
| Manganese | 5.00 | 4.92 | | mg/Kg | | 98 | 75 - 125 | 1 | 30 |
| Mo | 25.0 | 25.3 | | mg/Kg | | 101 | 75 - 125 | 2 | 30 |
| Selenium | 7.50 | 7.98 | | mg/Kg | | 106 | 75 - 125 | 2 | 30 |
| Thallium | 20.0 | 19.4 | | mg/Kg | | 97 | 75 - 125 | 1 | 30 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Step 1**
**Prep Batch: 30422**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Antimony | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Arsenic | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Barium | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Beryllium | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Cobalt | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Iron | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Li | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Manganese | 0.47 | J | 1.04 | J F5 | mg/Kg | ☼ | 76 | 30 |
| Mo | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Selenium | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Thallium | ND | | ND | | mg/Kg | ☼ | NC | 30 |

**Lab Sample ID: MB 140-30423/11-B ^3**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Method Blank**
**Prep Type: Step 2**
**Prep Batch: 30452**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 30 | 4.8 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Antimony | ND | | 9.0 | 0.84 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Arsenic | ND | | 1.5 | 0.39 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Barium | ND | | 7.5 | 0.36 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Beryllium | ND | | 0.75 | 0.048 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Cobalt | ND | | 7.5 | 0.19 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Iron | ND | | 15 | 8.7 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Li | ND | | 7.5 | 0.45 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Manganese | ND | | 2.3 | 0.84 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Mo | ND | | 6.0 | 0.25 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Selenium | 0.644 | J | 1.5 | 0.51 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |
| Thallium | ND | | 5.3 | 0.63 | mg/Kg | | 06/03/19 08:00 | 06/17/19 15:11 | 3 |

**Lab Sample ID: LCS 140-30423/12-B ^5**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 2**
**Prep Batch: 30452**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Aluminum | 100 | ND | * | mg/Kg | | -4 | 75 - 125 |
| Antimony | 25.0 | 21.2 | | mg/Kg | | 85 | 75 - 125 |
| Arsenic | 5.00 | 3.93 | | mg/Kg | | 79 | 75 - 125 |
| Barium | 5.00 | 2.38 | J * | mg/Kg | | 48 | 75 - 125 |
| Beryllium | 2.50 | 1.28 | J * | mg/Kg | | 51 | 75 - 125 |
| Cobalt | 5.00 | 4.75 | J | mg/Kg | | 95 | 75 - 125 |
| Iron | 50.0 | ND | * | mg/Kg | | 2 | 75 - 125 |
| Li | 5.00 | 4.71 | J | mg/Kg | | 94 | 75 - 125 |
| Manganese | 5.00 | 4.63 | | mg/Kg | | 93 | 75 - 125 |
| Mo | 25.0 | 21.1 | | mg/Kg | | 84 | 75 - 125 |
| Selenium | 7.50 | 6.91 | | mg/Kg | | 92 | 75 - 125 |
| Thallium | 20.0 | 18.1 | | mg/Kg | | 90 | 75 - 125 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCSD 140-30423/13-B ^5**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 2**
**Prep Batch: 30452**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 100 | ND | * | mg/Kg | | -0.3 | 75 - 125 | 167 | 30 |
| Antimony | | | 25.0 | 21.3 | | mg/Kg | | 85 | 75 - 125 | 0 | 30 |
| Arsenic | | | 5.00 | 4.07 | | mg/Kg | | 81 | 75 - 125 | 4 | 30 |
| Barium | | | 5.00 | 2.40 | J * | mg/Kg | | 48 | 75 - 125 | 1 | 30 |
| Beryllium | | | 2.50 | 1.27 | J * | mg/Kg | | 51 | 75 - 125 | 0 | 30 |
| Cobalt | | | 5.00 | 4.76 | J | mg/Kg | | 95 | 75 - 125 | 0 | 30 |
| Iron | | | 50.0 | ND | * | mg/Kg | | 4 | 75 - 125 | 57 | 30 |
| Li | | | 5.00 | 5.06 | J | mg/Kg | | 101 | 75 - 125 | 7 | 30 |
| Manganese | | | 5.00 | 4.64 | | mg/Kg | | 93 | 75 - 125 | 0 | 30 |
| Mo | | | 25.0 | 21.2 | | mg/Kg | | 85 | 75 - 125 | 0 | 30 |
| Selenium | | | 7.50 | 6.76 | | mg/Kg | | 90 | 75 - 125 | 2 | 30 |
| Thallium | | | 20.0 | 18.8 | | mg/Kg | | 94 | 75 - 125 | 4 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 30900**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Step 2**
**Prep Batch: 30452**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Antimony | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Arsenic | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Barium | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Beryllium | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Cobalt | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Iron | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Li | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Manganese | 1.4 | J | | 1.49 | J | mg/Kg | ☼ | | | 8 | 30 |
| Mo | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Selenium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Thallium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |

**Lab Sample ID: MB 140-30453/11-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Method Blank**
**Prep Type: Step 3**
**Prep Batch: 30480**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 10 | 2.1 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Antimony | ND | | 3.0 | 0.28 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Arsenic | ND | | 0.50 | 0.13 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Barium | 0.487 | J | 2.5 | 0.12 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Beryllium | ND | | 0.25 | 0.015 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Cobalt | ND | | 2.5 | 0.045 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Iron | ND | | 5.0 | 2.9 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Li | ND | | 2.5 | 0.15 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Manganese | 0.0625 | J | 0.75 | 0.027 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Mo | ND | | 2.0 | 0.082 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Selenium | ND | | 0.50 | 0.17 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |
| Thallium | ND | | 1.8 | 0.21 | mg/Kg | | 06/04/19 08:00 | 06/26/19 17:04 | 1 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCS 140-30453/12-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 3**
**Prep Batch: 30480**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 95.1 | | mg/Kg | | 95 | 75 - 125 |
| Antimony | 25.0 | 24.2 | | mg/Kg | | 97 | 75 - 125 |
| Arsenic | 5.00 | 5.01 | | mg/Kg | | 100 | 75 - 125 |
| Barium | 5.00 | 4.36 | | mg/Kg | | 87 | 75 - 125 |
| Beryllium | 2.50 | 2.53 | | mg/Kg | | 101 | 75 - 125 |
| Cobalt | 5.00 | 4.87 | | mg/Kg | | 97 | 75 - 125 |
| Iron | 50.0 | 49.3 | | mg/Kg | | 99 | 75 - 125 |
| Li | 5.00 | 4.84 | | mg/Kg | | 97 | 75 - 125 |
| Manganese | 5.00 | 4.86 | | mg/Kg | | 97 | 75 - 125 |
| Mo | 25.0 | 24.5 | | mg/Kg | | 98 | 75 - 125 |
| Selenium | 7.50 | 7.45 | | mg/Kg | | 99 | 75 - 125 |
| Thallium | 20.0 | 20.0 | | mg/Kg | | 100 | 75 - 125 |

**Lab Sample ID: LCSD 140-30453/13-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 3**
**Prep Batch: 30480**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 98.4 | | mg/Kg | | 98 | 75 - 125 | 3 | 30 |
| Antimony | 25.0 | 25.0 | | mg/Kg | | 100 | 75 - 125 | 3 | 30 |
| Arsenic | 5.00 | 5.11 | | mg/Kg | | 102 | 75 - 125 | 2 | 30 |
| Barium | 5.00 | 4.42 | | mg/Kg | | 88 | 75 - 125 | 2 | 30 |
| Beryllium | 2.50 | 2.64 | | mg/Kg | | 106 | 75 - 125 | 4 | 30 |
| Cobalt | 5.00 | 4.99 | | mg/Kg | | 100 | 75 - 125 | 2 | 30 |
| Iron | 50.0 | 50.9 | | mg/Kg | | 102 | 75 - 125 | 3 | 30 |
| Li | 5.00 | 4.97 | | mg/Kg | | 99 | 75 - 125 | 3 | 30 |
| Manganese | 5.00 | 5.00 | | mg/Kg | | 100 | 75 - 125 | 3 | 30 |
| Mo | 25.0 | 25.2 | | mg/Kg | | 101 | 75 - 125 | 3 | 30 |
| Selenium | 7.50 | 7.80 | | mg/Kg | | 104 | 75 - 125 | 5 | 30 |
| Thallium | 20.0 | 20.7 | | mg/Kg | | 104 | 75 - 125 | 3 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Step 3**
**Prep Batch: 30480**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Aluminum | 23 | | 21.4 | | mg/Kg | ☼ | 7 | 30 |
| Antimony | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Arsenic | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Barium | 1.4 | J B | 1.37 | J | mg/Kg | ☼ | 5 | 30 |
| Beryllium | 0.020 | J | 0.0202 | J | mg/Kg | ☼ | 3 | 30 |
| Cobalt | 0.63 | J | 0.599 | J | mg/Kg | ☼ | 4 | 30 |
| Iron | 58 | | 54.6 | | mg/Kg | ☼ | 6 | 30 |
| Li | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Manganese | 14 | B | 7.32 | F3 | mg/Kg | ☼ | 63 | 30 |
| Mo | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Selenium | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Thallium | ND | | ND | | mg/Kg | ☼ | NC | 30 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: MB 140-30453/11-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Method Blank**
**Prep Type: Step 3**
**Prep Batch: 31696**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | ND | | 2.5 | 0.045 | mg/Kg | | 07/16/19 08:00 | 07/17/19 10:47 | 1 |

**Lab Sample ID: LCS 140-30453/12-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 3**
**Prep Batch: 31696**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Cobalt | 5.00 | 4.88 | | mg/Kg | | 98 | 75 - 125 |

**Lab Sample ID: LCSD 140-30453/13-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 3**
**Prep Batch: 31696**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 5.00 | 5.04 | | mg/Kg | | 101 | 75 - 125 | 3 | 30 |

**Lab Sample ID: MB 140-30481/11-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Method Blank**
**Prep Type: Step 4**
**Prep Batch: 30528**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 10 | 1.6 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Antimony | ND | | 3.0 | 0.45 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Arsenic | 0.220 | J | 0.50 | 0.22 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Barium | ND | | 2.5 | 0.12 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Beryllium | ND | | 0.25 | 0.016 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Cobalt | ND | | 2.5 | 0.053 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Iron | ND | | 5.0 | 2.9 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Li | ND | | 2.5 | 0.15 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Manganese | ND | | 0.75 | 0.13 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Mo | ND | | 2.0 | 0.082 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Selenium | 0.473 | J | 0.50 | 0.47 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |
| Thallium | ND | | 1.8 | 0.29 | mg/Kg | | 06/10/19 08:00 | 06/26/19 18:27 | 1 |

**Lab Sample ID: LCS 140-30481/12-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 4**
**Prep Batch: 30528**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 96.7 | | mg/Kg | | 97 | 75 - 125 |
| Antimony | 25.0 | 24.7 | | mg/Kg | | 99 | 75 - 125 |
| Arsenic | 5.00 | 5.37 | | mg/Kg | | 107 | 75 - 125 |
| Barium | 5.00 | 4.86 | | mg/Kg | | 97 | 75 - 125 |
| Beryllium | 2.50 | 2.61 | | mg/Kg | | 104 | 75 - 125 |
| Cobalt | 5.00 | 4.98 | | mg/Kg | | 100 | 75 - 125 |
| Iron | 50.0 | 50.1 | | mg/Kg | | 100 | 75 - 125 |
| Li | 5.00 | 5.01 | | mg/Kg | | 100 | 75 - 125 |
| Manganese | 5.00 | 4.99 | | mg/Kg | | 100 | 75 - 125 |
| Mo | 25.0 | 25.1 | | mg/Kg | | 100 | 75 - 125 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCS 140-30481/12-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 4**
**Prep Batch: 30528**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Selenium | 7.50 | 0.489 | J * | mg/Kg | | 7 | 75 - 125 |
| Thallium | 20.0 | 18.2 | | mg/Kg | | 91 | 75 - 125 |

**Lab Sample ID: LCSD 140-30481/13-B**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 4**
**Prep Batch: 30528**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 100 | | mg/Kg | | 100 | 75 - 125 | 4 | 30 |
| Antimony | 25.0 | 26.1 | | mg/Kg | | 104 | 75 - 125 | 5 | 30 |
| Arsenic | 5.00 | 5.60 | | mg/Kg | | 112 | 75 - 125 | 4 | 30 |
| Barium | 5.00 | 5.02 | | mg/Kg | | 100 | 75 - 125 | 3 | 30 |
| Beryllium | 2.50 | 2.71 | | mg/Kg | | 108 | 75 - 125 | 4 | 30 |
| Cobalt | 5.00 | 5.15 | | mg/Kg | | 103 | 75 - 125 | 3 | 30 |
| Iron | 50.0 | 51.4 | | mg/Kg | | 103 | 75 - 125 | 3 | 30 |
| Li | 5.00 | 5.15 | | mg/Kg | | 103 | 75 - 125 | 3 | 30 |
| Manganese | 5.00 | 5.14 | | mg/Kg | | 103 | 75 - 125 | 3 | 30 |
| Mo | 25.0 | 26.7 | | mg/Kg | | 107 | 75 - 125 | 6 | 30 |
| Selenium | 7.50 | 0.529 | * | mg/Kg | | 7 | 75 - 125 | 8 | 30 |
| Thallium | 20.0 | 18.7 | | mg/Kg | | 94 | 75 - 125 | 3 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Step 4**
**Prep Batch: 30528**

| Analyte | Sample Result | Sample Qualifier | DU Result | DU Qualifier | Unit | D | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|
| Aluminum | 600 | | 659 | | mg/Kg | ☼ | 9 | 30 |
| Antimony | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Arsenic | 0.64 | J B | 0.637 | J | mg/Kg | ☼ | 0.5 | 30 |
| Barium | 9.6 | | 10.1 | | mg/Kg | ☼ | 5 | 30 |
| Beryllium | 0.12 | J | 0.120 | J | mg/Kg | ☼ | 4 | 30 |
| Cobalt | 0.41 | J | 0.445 | J | mg/Kg | ☼ | 8 | 30 |
| Iron | 1400 | | 1370 | | mg/Kg | ☼ | 2 | 30 |
| Li | 0.93 | J | 1.11 | J | mg/Kg | ☼ | 18 | 30 |
| Manganese | 6.9 | | 5.98 | | mg/Kg | ☼ | 14 | 30 |
| Mo | ND | | ND | | mg/Kg | ☼ | NC | 30 |
| Selenium | 0.65 | * B | 0.697 | * | mg/Kg | ☼ | 8 | 30 |
| Thallium | ND | | ND | | mg/Kg | ☼ | NC | 30 |

**Lab Sample ID: MB 140-30481/11-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Method Blank**
**Prep Type: Step 4**
**Prep Batch: 31697**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | ND | | 2.5 | 0.053 | mg/Kg | | 07/16/19 08:00 | 07/17/19 11:02 | 1 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCS 140-30481/12-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 4**
**Prep Batch: 31697**

| Analyte | | | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | | | 5.00 | 5.05 | | mg/Kg | | 101 | 75 - 125 | | |

**Lab Sample ID: LCSD 140-30481/13-C**
**Matrix: Solid**
**Analysis Batch: 31812**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 4**
**Prep Batch: 31697**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | | | 5.00 | 5.21 | | mg/Kg | | 104 | 75 - 125 | 3 | 30 |

**Lab Sample ID: MB 140-30529/11-B ^5**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Method Blank**
**Prep Type: Step 5**
**Prep Batch: 30726**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 150 | 24 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Antimony | ND | | 45 | 4.2 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Arsenic | ND | | 7.5 | 1.9 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Barium | ND | | 38 | 1.8 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Beryllium | ND | | 3.8 | 0.32 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Cobalt | ND | | 38 | 0.60 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Iron | ND | | 75 | 44 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Li | ND | | 38 | 2.2 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Manganese | ND | | 11 | 1.9 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Mo | ND | | 30 | 1.3 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Selenium | ND | | 7.5 | 2.6 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |
| Thallium | ND | | 26 | 3.5 | mg/Kg | | 06/12/19 08:00 | 06/26/19 19:48 | 5 |

**Lab Sample ID: LCS 140-30529/12-B ^5**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 5**
**Prep Batch: 30726**

| Analyte | | | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 300 | 30.0 | J * | mg/Kg | | 10 | 75 - 125 | | |
| Antimony | | | 75.0 | 85.8 | | mg/Kg | | 114 | 75 - 125 | | |
| Arsenic | | | 15.0 | 12.7 | | mg/Kg | | 85 | 75 - 125 | | |
| Barium | | | 15.0 | 8.33 | J * | mg/Kg | | 56 | 75 - 125 | | |
| Beryllium | | | 7.50 | 4.27 | * | mg/Kg | | 57 | 75 - 125 | | |
| Cobalt | | | 15.0 | 5.06 | J * | mg/Kg | | 34 | 75 - 125 | | |
| Iron | | | 150 | ND | * | mg/Kg | | 0.4 | 75 - 125 | | |
| Li | | | 15.0 | 16.5 | J | mg/Kg | | 110 | 75 - 125 | | |
| Manganese | | | 15.0 | 3.17 | J * | mg/Kg | | 21 | 75 - 125 | | |
| Mo | | | 75.0 | 63.7 | | mg/Kg | | 85 | 75 - 125 | | |
| Selenium | | | 22.5 | 26.1 | | mg/Kg | | 116 | 75 - 125 | | |
| Thallium | | | 60.0 | 25.2 | J * | mg/Kg | | 42 | 75 - 125 | | |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCSD 140-30529/13-B ^5**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 5**
**Prep Batch: 30726**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 300 | ND | * | mg/Kg | | 6 | 75 - 125 | 43 | 30 |
| Antimony | | | 75.0 | 85.4 | | mg/Kg | | 114 | 75 - 125 | 0 | 30 |
| Arsenic | | | 15.0 | 12.5 | | mg/Kg | | 84 | 75 - 125 | 2 | 30 |
| Barium | | | 15.0 | 8.04 | J * | mg/Kg | | 54 | 75 - 125 | 3 | 30 |
| Beryllium | | | 7.50 | 4.25 | * | mg/Kg | | 57 | 75 - 125 | 0 | 30 |
| Cobalt | | | 15.0 | 4.94 | J * | mg/Kg | | 33 | 75 - 125 | 2 | 30 |
| Iron | | | 150 | ND | * | mg/Kg | | 1 | 75 - 125 | 103 | 30 |
| Li | | | 15.0 | 17.4 | J | mg/Kg | | 116 | 75 - 125 | 5 | 30 |
| Manganese | | | 15.0 | 4.43 | J * | mg/Kg | | 30 | 75 - 125 | 33 | 30 |
| Mo | | | 75.0 | 64.0 | | mg/Kg | | 85 | 75 - 125 | 0 | 30 |
| Selenium | | | 22.5 | 27.5 | | mg/Kg | | 122 | 75 - 125 | 5 | 30 |
| Thallium | | | 60.0 | 26.1 | * | mg/Kg | | 44 | 75 - 125 | 3 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Step 5**
**Prep Batch: 30726**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 67 | J * | | 61.2 | J * | mg/Kg | ☼ | | | 10 | 30 |
| Antimony | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Arsenic | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Barium | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Beryllium | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Cobalt | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Iron | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Li | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Manganese | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |
| Mo | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Selenium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Thallium | ND | * | | ND | * | mg/Kg | ☼ | | | NC | 30 |

**Lab Sample ID: MB 140-30781/11-A**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Method Blank**
**Prep Type: Step 6**
**Prep Batch: 30781**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 10 | 1.6 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Antimony | ND | | 3.0 | 0.28 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Arsenic | ND | | 0.50 | 0.15 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Barium | ND | | 2.5 | 0.12 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Beryllium | ND | | 0.25 | 0.012 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Cobalt | ND | | 2.5 | 0.046 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Iron | ND | | 5.0 | 2.9 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Li | ND | | 2.5 | 0.15 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Manganese | ND | | 0.75 | 0.25 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Mo | ND | | 2.0 | 0.099 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Selenium | ND | | 0.50 | 0.17 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |
| Thallium | ND | | 1.8 | 0.21 | mg/Kg | | 06/15/19 08:00 | 06/26/19 21:23 | 1 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: LCS 140-30781/12-A**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 6**
**Prep Batch: 30781**

| Analyte | | | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 100 | 97.3 | | mg/Kg | | 97 | 75 - 125 | | |
| Antimony | | | 25.0 | 25.0 | | mg/Kg | | 100 | 75 - 125 | | |
| Arsenic | | | 5.00 | 5.14 | | mg/Kg | | 103 | 75 - 125 | | |
| Barium | | | 5.00 | 4.63 | | mg/Kg | | 93 | 75 - 125 | | |
| Beryllium | | | 2.50 | 2.59 | | mg/Kg | | 104 | 75 - 125 | | |
| Cobalt | | | 5.00 | 4.78 | | mg/Kg | | 96 | 75 - 125 | | |
| Iron | | | 50.0 | 49.6 | | mg/Kg | | 99 | 75 - 125 | | |
| Li | | | 5.00 | 4.67 | | mg/Kg | | 93 | 75 - 125 | | |
| Manganese | | | 5.00 | 4.87 | | mg/Kg | | 97 | 75 - 125 | | |
| Mo | | | 25.0 | 24.3 | | mg/Kg | | 97 | 75 - 125 | | |
| Selenium | | | 7.50 | 7.24 | | mg/Kg | | 97 | 75 - 125 | | |
| Thallium | | | 20.0 | 19.7 | | mg/Kg | | 99 | 75 - 125 | | |

**Lab Sample ID: LCSD 140-30781/13-A**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 6**
**Prep Batch: 30781**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | | | 100 | 103 | | mg/Kg | | 103 | 75 - 125 | 5 | 30 |
| Antimony | | | 25.0 | 26.5 | | mg/Kg | | 106 | 75 - 125 | 6 | 30 |
| Arsenic | | | 5.00 | 5.49 | | mg/Kg | | 110 | 75 - 125 | 7 | 30 |
| Barium | | | 5.00 | 4.90 | | mg/Kg | | 98 | 75 - 125 | 6 | 30 |
| Beryllium | | | 2.50 | 2.76 | | mg/Kg | | 110 | 75 - 125 | 6 | 30 |
| Cobalt | | | 5.00 | 5.04 | | mg/Kg | | 101 | 75 - 125 | 5 | 30 |
| Iron | | | 50.0 | 52.4 | | mg/Kg | | 105 | 75 - 125 | 5 | 30 |
| Li | | | 5.00 | 4.93 | | mg/Kg | | 99 | 75 - 125 | 5 | 30 |
| Manganese | | | 5.00 | 5.14 | | mg/Kg | | 103 | 75 - 125 | 5 | 30 |
| Mo | | | 25.0 | 25.7 | | mg/Kg | | 103 | 75 - 125 | 6 | 30 |
| Selenium | | | 7.50 | 7.77 | | mg/Kg | | 104 | 75 - 125 | 7 | 30 |
| Thallium | | | 20.0 | 20.7 | | mg/Kg | | 104 | 75 - 125 | 5 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31197**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Step 6**
**Prep Batch: 30781**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 1200 | | | 1360 | | mg/Kg | ☼ | | | 9 | 30 |
| Antimony | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Arsenic | 0.62 | J | | 0.568 | J | mg/Kg | ☼ | | | 9 | 30 |
| Barium | 6.0 | | | 6.53 | | mg/Kg | ☼ | | | 8 | 30 |
| Beryllium | 0.053 | J | | 0.0522 | J | mg/Kg | ☼ | | | 1 | 30 |
| Cobalt | 0.27 | J | | 0.286 | J | mg/Kg | ☼ | | | 8 | 30 |
| Iron | 1100 | | | 1090 | | mg/Kg | ☼ | | | 2 | 30 |
| Li | 0.93 | J | | 0.902 | J | mg/Kg | ☼ | | | 3 | 30 |
| Manganese | 10 | | | 10.8 | | mg/Kg | ☼ | | | 5 | 30 |
| Mo | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Selenium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Thallium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: MB 140-30852/11-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Method Blank**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | ND | | 10 | 1.6 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Antimony | ND | | 3.0 | 0.14 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Arsenic | ND | | 0.50 | 0.13 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Barium | ND | | 2.5 | 0.12 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Beryllium | ND | | 0.25 | 0.0075 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Cobalt | ND | | 2.5 | 0.15 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Iron | ND | | 5.0 | 4.1 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Li | ND | | 2.5 | 0.15 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Manganese | 0.0585 | J | 0.75 | 0.052 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Mo | ND | | 2.0 | 0.082 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Selenium | ND | | 0.50 | 0.17 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |
| Thallium | ND | | 1.8 | 0.18 | mg/Kg | | 06/16/19 08:00 | 06/28/19 12:11 | 1 |

**Lab Sample ID: LCS 140-30852/12-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Lab Control Sample**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 96.0 | | mg/Kg | | 96 | 75 - 125 |
| Antimony | 25.0 | 25.5 | | mg/Kg | | 102 | 75 - 125 |
| Arsenic | 5.00 | 5.23 | | mg/Kg | | 105 | 75 - 125 |
| Barium | 5.00 | 5.07 | | mg/Kg | | 101 | 75 - 125 |
| Beryllium | 2.50 | 2.50 | | mg/Kg | | 100 | 75 - 125 |
| Cobalt | 5.00 | 5.26 | | mg/Kg | | 105 | 75 - 125 |
| Iron | 50.0 | 51.1 | | mg/Kg | | 102 | 75 - 125 |
| Li | 5.00 | 5.34 | | mg/Kg | | 107 | 75 - 125 |
| Manganese | 5.00 | 5.28 | | mg/Kg | | 106 | 75 - 125 |
| Mo | 25.0 | 26.6 | | mg/Kg | | 106 | 75 - 125 |
| Selenium | 7.50 | 7.39 | | mg/Kg | | 98 | 75 - 125 |
| Thallium | 20.0 | 21.5 | | mg/Kg | | 108 | 75 - 125 |

**Lab Sample ID: LCSD 140-30852/13-A**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 100 | 95.8 | | mg/Kg | | 96 | 75 - 125 | 0 | 30 |
| Antimony | 25.0 | 25.6 | | mg/Kg | | 102 | 75 - 125 | 0 | 30 |
| Arsenic | 5.00 | 5.24 | | mg/Kg | | 105 | 75 - 125 | 0 | 30 |
| Barium | 5.00 | 5.13 | | mg/Kg | | 103 | 75 - 125 | 1 | 30 |
| Beryllium | 2.50 | 2.51 | | mg/Kg | | 100 | 75 - 125 | 0 | 30 |
| Cobalt | 5.00 | 5.29 | | mg/Kg | | 106 | 75 - 125 | 1 | 30 |
| Iron | 50.0 | 51.1 | | mg/Kg | | 102 | 75 - 125 | 0 | 30 |
| Li | 5.00 | 5.47 | | mg/Kg | | 109 | 75 - 125 | 2 | 30 |
| Manganese | 5.00 | 5.42 | | mg/Kg | | 108 | 75 - 125 | 3 | 30 |
| Mo | 25.0 | 26.8 | | mg/Kg | | 107 | 75 - 125 | 1 | 30 |
| Selenium | 7.50 | 7.49 | | mg/Kg | | 100 | 75 - 125 | 1 | 30 |
| Thallium | 20.0 | 21.6 | | mg/Kg | | 108 | 75 - 125 | 0 | 30 |

## Method: 6010B SEP - SEP Metals (ICP) (Continued)

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Beryllium | 0.48 | | | 0.502 | | mg/Kg | ☼ | | | 5 | 30 |
| Iron | 2900 | | | 3090 | | mg/Kg | ☼ | | | 5 | 30 |
| Li | 7.0 | | | 8.01 | | mg/Kg | ☼ | | | 13 | 30 |
| Manganese | 54 | B | | 51.4 | | mg/Kg | ☼ | | | 6 | 30 |
| Mo | 0.11 | J | | ND | | mg/Kg | ☼ | | | NC | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 28000 | | | 35200 | | mg/Kg | ☼ | | | 23 | 30 |
| Barium | 510 | | | 545 | | mg/Kg | ☼ | | | 6 | 30 |

**Lab Sample ID: 140-15376-1 DU**
**Matrix: Solid**
**Analysis Batch: 31255**

**Client Sample ID: FGD-15 (25-27)**
**Prep Type: Step 7**
**Prep Batch: 30852**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.90 | J | | 0.478 | J F5 | mg/Kg | ☼ | | | 61 | 30 |
| Cobalt | 0.48 | J | | 0.509 | J | mg/Kg | ☼ | | | 7 | 30 |
| Selenium | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |
| Thallium | 0.59 | J | | 0.828 | J F5 | mg/Kg | ☼ | | | 34 | 30 |

## Method: 7470A - SEP Mercury (CVAA) - Total

**Lab Sample ID: MB 140-30373/11-B**
**Matrix: Solid**
**Analysis Batch: 30491**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Hg | ND | | 0.10 | 0.040 | mg/Kg | | 05/30/19 08:00 | 06/03/19 14:34 | 1 |

**Lab Sample ID: LCS 140-30373/12-B**
**Matrix: Solid**
**Analysis Batch: 30491**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | | | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hg | | | 2.50 | 2.54 | | mg/Kg | | 101 | 75 - 125 | | |

**Lab Sample ID: LCSD 140-30373/13-B**
**Matrix: Solid**
**Analysis Batch: 30491**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Total/NA**
**Prep Batch: 30373**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hg | | | 2.50 | 2.53 | | mg/Kg | | 101 | 75 - 125 | 0 | 30 |

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Method: 7470A - SEP Mercury (CVAA) - Total (Continued)

**Lab Sample ID: 140-15376-A-1-J DU**
**Client Sample ID: 140-15376-A-1-J DU**
**Matrix: Solid**
**Prep Type: Total/NA**
**Analysis Batch: 30491**
**Prep Batch: 30373**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hg | ND | | | ND | | mg/Kg | ☼ | | | NC | 30 |

# QC Association Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Metals

### Prep Batch: 30373

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Total/NA | Solid | Total | |
| 140-15376-2 | FGD-16 (30-32) | Total/NA | Solid | Total | |
| 140-15376-3 | FGD-2019-1 (23-25) | Total/NA | Solid | Total | |
| MB 140-30373/11-A | Method Blank | Total/NA | Solid | Total | |
| MB 140-30373/11-B | Method Blank | Total/NA | Solid | Total | |
| LCS 140-30373/12-A | Lab Control Sample | Total/NA | Solid | Total | |
| LCS 140-30373/12-B | Lab Control Sample | Total/NA | Solid | Total | |
| LCSD 140-30373/13-A | Lab Control Sample Dup | Total/NA | Solid | Total | |
| LCSD 140-30373/13-B | Lab Control Sample Dup | Total/NA | Solid | Total | |
| 140-15376-1 DU | FGD-15 (25-27) | Total/NA | Solid | Total | |
| 140-15376-A-1-J DU | 140-15376-A-1-J DU | Total/NA | Solid | Total | |

### SEP Batch: 30374

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 1 | Solid | Exchangeable | |
| 140-15376-2 | FGD-16 (30-32) | Step 1 | Solid | Exchangeable | |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 1 | Solid | Exchangeable | |
| MB 140-30374/11-B ^4 | Method Blank | Step 1 | Solid | Exchangeable | |
| LCS 140-30374/12-B ^5 | Lab Control Sample | Step 1 | Solid | Exchangeable | |
| LCSD 140-30374/13-B ^5 | Lab Control Sample Dup | Step 1 | Solid | Exchangeable | |
| 140-15376-1 DU | FGD-15 (25-27) | Step 1 | Solid | Exchangeable | |

### Prep Batch: 30422

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 1 | Solid | 3010A | 30374 |
| 140-15376-2 | FGD-16 (30-32) | Step 1 | Solid | 3010A | 30374 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 1 | Solid | 3010A | 30374 |
| MB 140-30374/11-B ^4 | Method Blank | Step 1 | Solid | 3010A | 30374 |
| LCS 140-30374/12-B ^5 | Lab Control Sample | Step 1 | Solid | 3010A | 30374 |
| LCSD 140-30374/13-B ^5 | Lab Control Sample Dup | Step 1 | Solid | 3010A | 30374 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 1 | Solid | 3010A | 30374 |

### SEP Batch: 30423

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 2 | Solid | Carbonate | |
| 140-15376-2 | FGD-16 (30-32) | Step 2 | Solid | Carbonate | |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 2 | Solid | Carbonate | |
| MB 140-30423/11-B ^3 | Method Blank | Step 2 | Solid | Carbonate | |
| LCS 140-30423/12-B ^5 | Lab Control Sample | Step 2 | Solid | Carbonate | |
| LCSD 140-30423/13-B ^5 | Lab Control Sample Dup | Step 2 | Solid | Carbonate | |
| 140-15376-1 DU | FGD-15 (25-27) | Step 2 | Solid | Carbonate | |

### Prep Batch: 30447

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-2 | FGD-16 (30-32) | Total/NA | Solid | 7470A | 30373 |
| 140-15376-3 | FGD-2019-1 (23-25) | Total/NA | Solid | 7470A | 30373 |
| MB 140-30373/11-B | Method Blank | Total/NA | Solid | 7470A | 30373 |
| LCS 140-30373/12-B | Lab Control Sample | Total/NA | Solid | 7470A | 30373 |
| LCSD 140-30373/13-B | Lab Control Sample Dup | Total/NA | Solid | 7470A | 30373 |
| 140-15376-A-1-J DU | 140-15376-A-1-J DU | Total/NA | Solid | 7470A | 30373 |

# QC Association Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Metals

### Prep Batch: 30452

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 2 | Solid | 3010A | 30423 |
| 140-15376-2 | FGD-16 (30-32) | Step 2 | Solid | 3010A | 30423 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 2 | Solid | 3010A | 30423 |
| MB 140-30423/11-B ^3 | Method Blank | Step 2 | Solid | 3010A | 30423 |
| LCS 140-30423/12-B ^5 | Lab Control Sample | Step 2 | Solid | 3010A | 30423 |
| LCSD 140-30423/13-B ^5 | Lab Control Sample Dup | Step 2 | Solid | 3010A | 30423 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 2 | Solid | 3010A | 30423 |

### SEP Batch: 30453

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 3 | Solid | Non-Crystalline | |
| 140-15376-2 | FGD-16 (30-32) | Step 3 | Solid | Non-Crystalline | |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 3 | Solid | Non-Crystalline | |
| MB 140-30453/11-B | Method Blank | Step 3 | Solid | Non-Crystalline | |
| MB 140-30453/11-C | Method Blank | Step 3 | Solid | Non-Crystalline | |
| LCS 140-30453/12-B | Lab Control Sample | Step 3 | Solid | Non-Crystalline | |
| LCS 140-30453/12-C | Lab Control Sample | Step 3 | Solid | Non-Crystalline | |
| LCSD 140-30453/13-B | Lab Control Sample Dup | Step 3 | Solid | Non-Crystalline | |
| LCSD 140-30453/13-C | Lab Control Sample Dup | Step 3 | Solid | Non-Crystalline | |
| 140-15376-1 DU | FGD-15 (25-27) | Step 3 | Solid | Non-Crystalline | |

### Prep Batch: 30480

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 3 | Solid | 3010A | 30453 |
| 140-15376-2 | FGD-16 (30-32) | Step 3 | Solid | 3010A | 30453 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 3 | Solid | 3010A | 30453 |
| MB 140-30453/11-B | Method Blank | Step 3 | Solid | 3010A | 30453 |
| LCS 140-30453/12-B | Lab Control Sample | Step 3 | Solid | 3010A | 30453 |
| LCSD 140-30453/13-B | Lab Control Sample Dup | Step 3 | Solid | 3010A | 30453 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 3 | Solid | 3010A | 30453 |

### SEP Batch: 30481

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 4 | Solid | Metal Hydroxide | |
| 140-15376-2 | FGD-16 (30-32) | Step 4 | Solid | Metal Hydroxide | |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 4 | Solid | Metal Hydroxide | |
| MB 140-30481/11-B | Method Blank | Step 4 | Solid | Metal Hydroxide | |
| MB 140-30481/11-C | Method Blank | Step 4 | Solid | Metal Hydroxide | |
| LCS 140-30481/12-B | Lab Control Sample | Step 4 | Solid | Metal Hydroxide | |
| LCS 140-30481/12-C | Lab Control Sample | Step 4 | Solid | Metal Hydroxide | |
| LCSD 140-30481/13-B | Lab Control Sample Dup | Step 4 | Solid | Metal Hydroxide | |
| LCSD 140-30481/13-C | Lab Control Sample Dup | Step 4 | Solid | Metal Hydroxide | |
| 140-15376-1 DU | FGD-15 (25-27) | Step 4 | Solid | Metal Hydroxide | |

### Analysis Batch: 30491

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-2 | FGD-16 (30-32) | Total/NA | Solid | 7470A | 30447 |
| 140-15376-3 | FGD-2019-1 (23-25) | Total/NA | Solid | 7470A | 30447 |
| MB 140-30373/11-B | Method Blank | Total/NA | Solid | 7470A | 30447 |
| LCS 140-30373/12-B | Lab Control Sample | Total/NA | Solid | 7470A | 30447 |
| LCSD 140-30373/13-B | Lab Control Sample Dup | Total/NA | Solid | 7470A | 30447 |

## Metals (Continued)

### Analysis Batch: 30491 (Continued)

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-A-1-J DU | 140-15376-A-1-J DU | Total/NA | Solid | 7470A | 30447 |

### Prep Batch: 30528

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 4 | Solid | 3010A | 30481 |
| 140-15376-2 | FGD-16 (30-32) | Step 4 | Solid | 3010A | 30481 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 4 | Solid | 3010A | 30481 |
| MB 140-30481/11-B | Method Blank | Step 4 | Solid | 3010A | 30481 |
| LCS 140-30481/12-B | Lab Control Sample | Step 4 | Solid | 3010A | 30481 |
| LCSD 140-30481/13-B | Lab Control Sample Dup | Step 4 | Solid | 3010A | 30481 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 4 | Solid | 3010A | 30481 |

### SEP Batch: 30529

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 5 | Solid | Organic-Bound | |
| 140-15376-2 | FGD-16 (30-32) | Step 5 | Solid | Organic-Bound | |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 5 | Solid | Organic-Bound | |
| MB 140-30529/11-B ^5 | Method Blank | Step 5 | Solid | Organic-Bound | |
| LCS 140-30529/12-B ^5 | Lab Control Sample | Step 5 | Solid | Organic-Bound | |
| LCSD 140-30529/13-B ^5 | Lab Control Sample Dup | Step 5 | Solid | Organic-Bound | |
| 140-15376-1 DU | FGD-15 (25-27) | Step 5 | Solid | Organic-Bound | |

### Prep Batch: 30726

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 5 | Solid | 3010A | 30529 |
| 140-15376-2 | FGD-16 (30-32) | Step 5 | Solid | 3010A | 30529 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 5 | Solid | 3010A | 30529 |
| MB 140-30529/11-B ^5 | Method Blank | Step 5 | Solid | 3010A | 30529 |
| LCS 140-30529/12-B ^5 | Lab Control Sample | Step 5 | Solid | 3010A | 30529 |
| LCSD 140-30529/13-B ^5 | Lab Control Sample Dup | Step 5 | Solid | 3010A | 30529 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 5 | Solid | 3010A | 30529 |

### SEP Batch: 30781

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 6 | Solid | Acid/Sulfide | |
| 140-15376-2 | FGD-16 (30-32) | Step 6 | Solid | Acid/Sulfide | |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 6 | Solid | Acid/Sulfide | |
| MB 140-30781/11-A | Method Blank | Step 6 | Solid | Acid/Sulfide | |
| LCS 140-30781/12-A | Lab Control Sample | Step 6 | Solid | Acid/Sulfide | |
| LCSD 140-30781/13-A | Lab Control Sample Dup | Step 6 | Solid | Acid/Sulfide | |
| 140-15376-1 DU | FGD-15 (25-27) | Step 6 | Solid | Acid/Sulfide | |

### Prep Batch: 30852

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 7 | Solid | Residual | |
| 140-15376-2 | FGD-16 (30-32) | Step 7 | Solid | Residual | |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 7 | Solid | Residual | |
| MB 140-30852/11-A | Method Blank | Step 7 | Solid | Residual | |
| LCS 140-30852/12-A | Lab Control Sample | Step 7 | Solid | Residual | |
| LCSD 140-30852/13-A | Lab Control Sample Dup | Step 7 | Solid | Residual | |
| 140-15376-1 DU | FGD-15 (25-27) | Step 7 | Solid | Residual | |

# QC Association Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Metals

### Prep Batch: 30853

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Total/NA | Solid | 3050B | |
| 140-15376-2 | FGD-16 (30-32) | Total/NA | Solid | 3050B | |
| 140-15376-3 | FGD-2019-1 (23-25) | Total/NA | Solid | 3050B | |
| MB 140-30853/8-A | Method Blank | Total/NA | Solid | 3050B | |
| LCS 140-30853/9-A | Lab Control Sample | Total/NA | Solid | 3050B | |
| 140-15376-1 MS | FGD-15 (25-27) | Total/NA | Solid | 3050B | |
| 140-15376-1 MSD | FGD-15 (25-27) | Total/NA | Solid | 3050B | |

### Analysis Batch: 30900

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 1 | Solid | 6010B SEP | 30422 |
| 140-15376-1 | FGD-15 (25-27) | Step 2 | Solid | 6010B SEP | 30452 |
| 140-15376-1 | FGD-15 (25-27) | Total/NA | Solid | 6010B | 30853 |
| 140-15376-2 | FGD-16 (30-32) | Step 1 | Solid | 6010B SEP | 30422 |
| 140-15376-2 | FGD-16 (30-32) | Step 2 | Solid | 6010B SEP | 30452 |
| 140-15376-2 | FGD-16 (30-32) | Total/NA | Solid | 6010B | 30853 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 1 | Solid | 6010B SEP | 30422 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 2 | Solid | 6010B SEP | 30452 |
| 140-15376-3 | FGD-2019-1 (23-25) | Total/NA | Solid | 6010B | 30853 |
| MB 140-30374/11-B ^4 | Method Blank | Step 1 | Solid | 6010B SEP | 30422 |
| MB 140-30423/11-B ^3 | Method Blank | Step 2 | Solid | 6010B SEP | 30452 |
| MB 140-30853/8-A | Method Blank | Total/NA | Solid | 6010B | 30853 |
| LCS 140-30374/12-B ^5 | Lab Control Sample | Step 1 | Solid | 6010B SEP | 30422 |
| LCS 140-30423/12-B ^5 | Lab Control Sample | Step 2 | Solid | 6010B SEP | 30452 |
| LCS 140-30853/9-A | Lab Control Sample | Total/NA | Solid | 6010B | 30853 |
| LCSD 140-30374/13-B ^5 | Lab Control Sample Dup | Step 1 | Solid | 6010B SEP | 30422 |
| LCSD 140-30423/13-B ^5 | Lab Control Sample Dup | Step 2 | Solid | 6010B SEP | 30452 |
| 140-15376-1 MS | FGD-15 (25-27) | Total/NA | Solid | 6010B | 30853 |
| 140-15376-1 MSD | FGD-15 (25-27) | Total/NA | Solid | 6010B | 30853 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 1 | Solid | 6010B SEP | 30422 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 2 | Solid | 6010B SEP | 30452 |

### Analysis Batch: 31197

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 3 | Solid | 6010B SEP | 30480 |
| 140-15376-1 | FGD-15 (25-27) | Step 4 | Solid | 6010B SEP | 30528 |
| 140-15376-1 | FGD-15 (25-27) | Step 5 | Solid | 6010B SEP | 30726 |
| 140-15376-1 | FGD-15 (25-27) | Step 6 | Solid | 6010B SEP | 30781 |
| 140-15376-2 | FGD-16 (30-32) | Step 3 | Solid | 6010B SEP | 30480 |
| 140-15376-2 | FGD-16 (30-32) | Step 4 | Solid | 6010B SEP | 30528 |
| 140-15376-2 | FGD-16 (30-32) | Step 5 | Solid | 6010B SEP | 30726 |
| 140-15376-2 | FGD-16 (30-32) | Step 6 | Solid | 6010B SEP | 30781 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 3 | Solid | 6010B SEP | 30480 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 4 | Solid | 6010B SEP | 30528 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 5 | Solid | 6010B SEP | 30726 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 6 | Solid | 6010B SEP | 30781 |
| MB 140-30453/11-B | Method Blank | Step 3 | Solid | 6010B SEP | 30480 |
| MB 140-30481/11-B | Method Blank | Step 4 | Solid | 6010B SEP | 30528 |
| MB 140-30529/11-B ^5 | Method Blank | Step 5 | Solid | 6010B SEP | 30726 |
| MB 140-30781/11-A | Method Blank | Step 6 | Solid | 6010B SEP | 30781 |
| LCS 140-30453/12-B | Lab Control Sample | Step 3 | Solid | 6010B SEP | 30480 |

## Metals (Continued)

### Analysis Batch: 31197 (Continued)

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| LCS 140-30481/12-B | Lab Control Sample | Step 4 | Solid | 6010B SEP | 30528 |
| LCS 140-30529/12-B ^5 | Lab Control Sample | Step 5 | Solid | 6010B SEP | 30726 |
| LCS 140-30781/12-A | Lab Control Sample | Step 6 | Solid | 6010B SEP | 30781 |
| LCSD 140-30453/13-B | Lab Control Sample Dup | Step 3 | Solid | 6010B SEP | 30480 |
| LCSD 140-30481/13-B | Lab Control Sample Dup | Step 4 | Solid | 6010B SEP | 30528 |
| LCSD 140-30529/13-B ^5 | Lab Control Sample Dup | Step 5 | Solid | 6010B SEP | 30726 |
| LCSD 140-30781/13-A | Lab Control Sample Dup | Step 6 | Solid | 6010B SEP | 30781 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 3 | Solid | 6010B SEP | 30480 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 4 | Solid | 6010B SEP | 30528 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 5 | Solid | 6010B SEP | 30726 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 6 | Solid | 6010B SEP | 30781 |

### Analysis Batch: 31255

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 | FGD-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 | FGD-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 | FGD-15 (25-27) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-1 | FGD-15 (25-27) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-1 | FGD-15 (25-27) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-2 | FGD-16 (30-32) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-2 | FGD-16 (30-32) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-2 | FGD-16 (30-32) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-2 | FGD-16 (30-32) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-2 | FGD-16 (30-32) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-2 | FGD-16 (30-32) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-3 | FGD-2019-1 (23-25) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-3 | FGD-2019-1 (23-25) | Total/NA | Solid | 6010B | 30373 |
| MB 140-30373/11-A | Method Blank | Total/NA | Solid | 6010B | 30373 |
| MB 140-30852/11-A | Method Blank | Step 7 | Solid | 6010B SEP | 30852 |
| LCS 140-30373/12-A | Lab Control Sample | Total/NA | Solid | 6010B | 30373 |
| LCS 140-30852/12-A | Lab Control Sample | Step 7 | Solid | 6010B SEP | 30852 |
| LCSD 140-30373/13-A | Lab Control Sample Dup | Total/NA | Solid | 6010B | 30373 |
| LCSD 140-30852/13-A | Lab Control Sample Dup | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 DU | FGD-15 (25-27) | Step 7 | Solid | 6010B SEP | 30852 |
| 140-15376-1 DU | FGD-15 (25-27) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-1 DU | FGD-15 (25-27) | Total/NA | Solid | 6010B | 30373 |
| 140-15376-1 DU | FGD-15 (25-27) | Total/NA | Solid | 6010B | 30373 |

### Analysis Batch: 31570

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Sum of Steps 1-7 | Solid | 6010B SEP | |
| 140-15376-2 | FGD-16 (30-32) | Sum of Steps 1-7 | Solid | 6010B SEP | |
| 140-15376-3 | FGD-2019-1 (23-25) | Sum of Steps 1-7 | Solid | 6010B SEP | |

# QC Association Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Metals

### Prep Batch: 31695

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-3 | FGD-2019-1 (23-25) | Total/NA | Solid | Total | |
| MB 140-31695/2-A | Method Blank | Total/NA | Solid | Total | |
| LCS 140-31695/3-A | Lab Control Sample | Total/NA | Solid | Total | |
| LCSD 140-31695/4-A | Lab Control Sample Dup | Total/NA | Solid | Total | |

### Prep Batch: 31696

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-3 | FGD-2019-1 (23-25) | Step 3 | Solid | 3010A | 30453 |
| MB 140-30453/11-C | Method Blank | Step 3 | Solid | 3010A | 30453 |
| LCS 140-30453/12-C | Lab Control Sample | Step 3 | Solid | 3010A | 30453 |
| LCSD 140-30453/13-C | Lab Control Sample Dup | Step 3 | Solid | 3010A | 30453 |

### Prep Batch: 31697

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-3 | FGD-2019-1 (23-25) | Step 4 | Solid | 3010A | 30481 |
| MB 140-30481/11-C | Method Blank | Step 4 | Solid | 3010A | 30481 |
| LCS 140-30481/12-C | Lab Control Sample | Step 4 | Solid | 3010A | 30481 |
| LCSD 140-30481/13-C | Lab Control Sample Dup | Step 4 | Solid | 3010A | 30481 |

### Analysis Batch: 31812

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-3 | FGD-2019-1 (23-25) | Step 3 | Solid | 6010B SEP | 31696 |
| 140-15376-3 | FGD-2019-1 (23-25) | Step 4 | Solid | 6010B SEP | 31697 |
| 140-15376-3 | FGD-2019-1 (23-25) | Total/NA | Solid | 6010B | 31695 |
| MB 140-30453/11-C | Method Blank | Step 3 | Solid | 6010B SEP | 31696 |
| MB 140-30481/11-C | Method Blank | Step 4 | Solid | 6010B SEP | 31697 |
| MB 140-31695/2-A | Method Blank | Total/NA | Solid | 6010B | 31695 |
| LCS 140-30453/12-C | Lab Control Sample | Step 3 | Solid | 6010B SEP | 31696 |
| LCS 140-30481/12-C | Lab Control Sample | Step 4 | Solid | 6010B SEP | 31697 |
| LCS 140-31695/3-A | Lab Control Sample | Total/NA | Solid | 6010B | 31695 |
| LCSD 140-30453/13-C | Lab Control Sample Dup | Step 3 | Solid | 6010B SEP | 31696 |
| LCSD 140-30481/13-C | Lab Control Sample Dup | Step 4 | Solid | 6010B SEP | 31697 |
| LCSD 140-31695/4-A | Lab Control Sample Dup | Total/NA | Solid | 6010B | 31695 |

## General Chemistry

### Analysis Batch: 30352

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-15376-1 | FGD-15 (25-27) | Total/NA | Solid | Moisture | |
| 140-15376-2 | FGD-16 (30-32) | Total/NA | Solid | Moisture | |
| 140-15376-3 | FGD-2019-1 (23-25) | Total/NA | Solid | Moisture | |
| 140-15376-1 DU | FGD-15 (25-27) | Total/NA | Solid | Moisture | |

# Lab Chronicle

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGD-15 (25-27)
**Date Collected: 05/22/19 19:15**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-1
**Matrix: Solid**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Sum of Steps 1-7 | Analysis | 6010B SEP | | 1 | | | 31570 | 07/11/19 10:59 | CLJ | TAL KNX |
| | Instrument ID: NOEQUIP | | | | | | | | | |
| Total/NA | Analysis | Moisture | | 1 | | | 30352 | 05/28/19 16:16 | BKD | TAL KNX |
| | Instrument ID: W3 | | | | | | | | | |

## Client Sample ID: FGD-15 (25-27)
**Date Collected: 05/22/19 19:15**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-1
**Matrix: Solid**
**Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.542 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:27 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 15:23 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 10 | | | 31255 | 06/28/19 16:37 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 2 | | | 31255 | 06/28/19 18:40 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 4 | | | 30900 | 06/17/19 14:14 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 3 | | | 30900 | 06/17/19 15:37 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:30 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 18:52 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 20:25 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 21:48 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGD-15 (25-27) Lab Sample ID: 140-15376-1

**Date Collected: 05/22/19 19:15** **Matrix: Solid**
**Date Received: 05/24/19 09:40** **Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 12:53 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 10 | | | 31255 | 06/28/19 14:17 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 2 | | | 31255 | 06/28/19 17:43 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: FGD-16 (30-32) Lab Sample ID: 140-15376-2

**Date Collected: 05/23/19 10:40** **Matrix: Solid**
**Date Received: 05/24/19 09:40**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Sum of Steps 1-7 | Analysis | 6010B SEP | | 1 | | | 31570 | 07/11/19 10:59 | CLJ | TAL KNX |
| | Instrument ID: NOEQUIP | | | | | | | | | |
| Total/NA | Analysis | Moisture | | 1 | | | 30352 | 05/28/19 16:16 | BKD | TAL KNX |
| | Instrument ID: W3 | | | | | | | | | |

## Client Sample ID: FGD-16 (30-32) Lab Sample ID: 140-15376-2

**Date Collected: 05/23/19 10:40** **Matrix: Solid**
**Date Received: 05/24/19 09:40** **Percent Solids: 79.2**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.535 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:41 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 15:34 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 10 | | | 31255 | 06/28/19 16:47 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 2 | | | 31255 | 06/28/19 18:50 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 4 | | | 30900 | 06/17/19 14:24 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 3 | | | 30900 | 06/17/19 15:58 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGD-16 (30-32)
**Lab Sample ID: 140-15376-2**
**Date Collected: 05/23/19 10:40**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 79.2**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:40 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 19:13 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 20:35 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 22:14 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 13:19 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 10 | | | 31255 | 06/28/19 14:27 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 2 | | | 31255 | 06/28/19 17:53 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:52 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

## Client Sample ID: FGD-2019-1 (23-25)
**Lab Sample ID: 140-15376-3**
**Date Collected: 05/23/19 15:20**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Sum of Steps 1-7 | Analysis | 6010B SEP | | 1 | | | 31570 | 07/11/19 10:59 | CLJ | TAL KNX |
| | Instrument ID: NOEQUIP | | | | | | | | | |
| Total/NA | Analysis | Moisture | | 1 | | | 30352 | 05/28/19 16:16 | BKD | TAL KNX |
| | Instrument ID: W3 | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

**Client Sample ID: FGD-2019-1 (23-25)**
**Lab Sample ID: 140-15376-3**
**Date Collected: 05/23/19 15:20**
**Matrix: Solid**
**Date Received: 05/24/19 09:40**
**Percent Solids: 77.2**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.534 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:47 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 15:40 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 10 | | | 31255 | 06/28/19 16:52 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 31695 | 07/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 2 | | | 31812 | 07/17/19 12:03 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 4 | | | 30900 | 06/17/19 14:29 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 3 | | | 30900 | 06/17/19 16:03 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:45 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 31696 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 11:32 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 19:18 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 31697 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 11:53 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 20:41 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 22:20 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 13:24 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGD-2019-1 (23-25)
**Lab Sample ID: 140-15376-3**
**Date Collected: 05/23/19 15:20** **Matrix: Solid**
**Date Received: 05/24/19 09:40** **Percent Solids: 77.2**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 10 | | | 31255 | 06/28/19 14:32 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 2 | | | 31255 | 06/28/19 17:58 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:54 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

## Client Sample ID: Method Blank
**Lab Sample ID: MB 140-30373/11-A**
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 12:27 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank
**Lab Sample ID: MB 140-30373/11-B**
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:34 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

## Client Sample ID: Method Blank
**Lab Sample ID: MB 140-30374/11-B ^4**
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 4 | | | 30900 | 06/17/19 13:48 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30423/11-B ^3
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 3 | | | 30900 | 06/17/19 15:11 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30453/11-B
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:04 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30453/11-C
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 31696 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 10:47 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30481/11-B
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 18:27 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30481/11-C
**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 31697 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 11:02 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30529/11-B ^5

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 19:48 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30781/11-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 21:23 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30852/11-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 12:11 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-30853/8-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.500 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:06 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Method Blank — Lab Sample ID: MB 140-31695/2-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 31695 | 07/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31812 | 07/17/19 11:17 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30373/12-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 12:32 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30373/12-B

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:37 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30374/12-B ^5

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 5 | | | 30900 | 06/17/19 13:53 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30423/12-B ^5

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 5 | | | 30900 | 06/17/19 15:16 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30453/12-B

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:09 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30453/12-C

**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 31696 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 10:52 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30481/12-B

**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 18:32 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30481/12-C

**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 31697 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 11:07 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30529/12-B ^5

**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 19:54 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30781/12-A

**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 21:28 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30852/12-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 12:17 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-30853/9-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.500 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:11 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-31695/3-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 31695 | 07/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31812 | 07/17/19 11:22 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30373/13-A
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 12:37 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30373/13-B
**Date Collected: N/A** — **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:40 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30374/13-B ^5

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 5 | | | 30900 | 06/17/19 13:58 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30423/13-B ^5

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 5 | | | 30900 | 06/17/19 15:21 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30453/13-B

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:14 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30453/13-C

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 31696 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 10:57 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30481/13-B

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 18:37 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30481/13-C

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 31697 | 07/16/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31812 | 07/17/19 11:12 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30529/13-B ^5

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 20:09 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30781/13-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 21:33 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-30852/13-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 12:22 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-31695/4-A

**Date Collected: N/A** **Matrix: Solid**
**Date Received: N/A**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 31695 | 07/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31812 | 07/17/19 11:27 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc. Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGD-15 (25-27) — Lab Sample ID: 140-15376-1 MS

**Date Collected: 05/22/19 19:15** — **Matrix: Solid**
**Date Received: 05/24/19 09:40** — **Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.512 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:32 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: FGD-15 (25-27) — Lab Sample ID: 140-15376-1 MSD

**Date Collected: 05/22/19 19:15** — **Matrix: Solid**
**Date Received: 05/24/19 09:40** — **Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3050B | | | 0.514 g | 50 mL | 30853 | 06/16/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 30900 | 06/17/19 11:37 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: FGD-15 (25-27) — Lab Sample ID: 140-15376-1 DU

**Date Collected: 05/22/19 19:15** — **Matrix: Solid**
**Date Received: 05/24/19 09:40**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Analysis | Moisture | | 1 | | | 30352 | 05/28/19 16:16 | BKD | TAL KNX |
| | Instrument ID: W3 | | | | | | | | | |

## Client Sample ID: FGD-15 (25-27) — Lab Sample ID: 140-15376-1 DU

**Date Collected: 05/22/19 19:15** — **Matrix: Solid**
**Date Received: 05/24/19 09:40** — **Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 1 | | | 31255 | 06/28/19 15:29 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 10 | | | 31255 | 06/28/19 16:42 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Analysis | 6010B | | 2 | | | 31255 | 06/28/19 18:45 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 1 | SEP | Exchangeable | | | 5.000 g | 25 mL | 30374 | 05/30/19 08:00 | KNC | TAL KNX |
| Step 1 | Prep | 3010A | | | 5 mL | 50 mL | 30422 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 1 | Analysis | 6010B SEP | | 4 | | | 30900 | 06/17/19 14:19 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 2 | SEP | Carbonate | | | 5.000 g | 25 mL | 30423 | 05/31/19 08:00 | KNC | TAL KNX |
| Step 2 | Prep | 3010A | | | 5 mL | 50 mL | 30452 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 2 | Analysis | 6010B SEP | | 3 | | | 30900 | 06/17/19 15:53 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

# Lab Chronicle

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

## Client Sample ID: FGD-15 (25-27)
**Date Collected: 05/22/19 19:15**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-1 DU
**Matrix: Solid**
**Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Step 3 | SEP | Non-Crystalline | | | 5.000 g | 25 mL | 30453 | 06/03/19 08:00 | KNC | TAL KNX |
| Step 3 | Prep | 3010A | | | 5 mL | 50 mL | 30480 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 3 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 17:35 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 4 | SEP | Metal Hydroxide | | | 5.000 g | 25 mL | 30481 | 06/04/19 08:00 | KNC | TAL KNX |
| Step 4 | Prep | 3010A | | | 5 mL | 50 mL | 30528 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 4 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 19:08 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 5 | SEP | Organic-Bound | | | 5.000 g | 75 mL | 30529 | 06/10/19 08:00 | KNC | TAL KNX |
| Step 5 | Prep | 3010A | | | 5 mL | 50 mL | 30726 | 06/12/19 08:00 | KNC | TAL KNX |
| Step 5 | Analysis | 6010B SEP | | 5 | | | 31197 | 06/26/19 20:30 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 6 | SEP | Acid/Sulfide | | | 5.000 g | 250 mL | 30781 | 06/15/19 08:00 | KNC | TAL KNX |
| Step 6 | Analysis | 6010B SEP | | 1 | | | 31197 | 06/26/19 21:54 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 1 | | | 31255 | 06/28/19 13:13 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 10 | | | 31255 | 06/28/19 14:22 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |
| Step 7 | Prep | Residual | | | 1.000 g | 50 mL | 30852 | 06/16/19 08:00 | KNC | TAL KNX |
| Step 7 | Analysis | 6010B SEP | | 2 | | | 31255 | 06/28/19 17:48 | KNC | TAL KNX |
| | Instrument ID: DUO | | | | | | | | | |

## Client Sample ID: 140-15376-A-1-J DU
**Date Collected: 05/22/19 19:15**
**Date Received: 05/24/19 09:40**

## Lab Sample ID: 140-15376-A-1-J DU
**Matrix: Solid**
**Percent Solids: 76.6**

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | Total | | | 1.000 g | 50 mL | 30373 | 05/30/19 08:00 | KNC | TAL KNX |
| Total/NA | Prep | 7470A | | | 5.0 mL | 50.0 mL | 30447 | 05/31/19 12:19 | DKW | TAL KNX |
| Total/NA | Analysis | 7470A | | 1 | | | 30491 | 06/03/19 14:49 | DKW | TAL KNX |
| | Instrument ID: HG | | | | | | | | | |

**Laboratory References:**

TAL KNX = Eurofins TestAmerica, Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

# Method Summary

Client: Golder Associates Inc.
Job ID: 140-15376-1
Project/Site: Oak Grove FGD Ponds - 7-Step SEP Metals

| Method | Method Description | Protocol | Laboratory |
|---|---|---|---|
| 6010B | Metals (ICP) | SW846 | TAL KNX |
| 6010B | SEP Metals (ICP) - Total | SW846 | TAL KNX |
| 6010B SEP | SEP Metals (ICP) | SW846 | TAL KNX |
| 7470A | SEP Mercury (CVAA) - Total | SW846 | TAL KNX |
| Moisture | Percent Moisture | EPA | TAL KNX |
| 3010A | Preparation, Total Metals | SW846 | TAL KNX |
| 3050B | Preparation, Metals | SW846 | TAL KNX |
| 7470A | Preparation, Mercury | SW846 | TAL KNX |
| Acid/Sulfide | Sequential Extraction Procedure, Acid/Sulfide Fraction | TAL-KNOX | TAL KNX |
| Carbonate | Sequential Extraction Procedure, Carbonate Fraction | TAL-KNOX | TAL KNX |
| Exchangeable | Sequential Extraction Procedure, Exchangeable Fraction | TAL-KNOX | TAL KNX |
| Metal Hydroxide | Sequential Extraction Procedure, Metal Hydroxide Fraction | TAL-KNOX | TAL KNX |
| Non-Crystalline | Sequential Extraction Procedure, Non-crystalline Materials | TAL-KNOX | TAL KNX |
| Organic-Bound | Sequential Extraction Procedure, Organic Bound Fraction | TAL-KNOX | TAL KNX |
| Residual | Sequential Extraction Procedure, Residual Fraction | TAL-KNOX | TAL KNX |
| Total | Preparation, Total Material | TAL-KNOX | TAL KNX |

**Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL-KNOX = TestAmerica Laboratories, Knoxville, Facility Standard Operating Procedure.

**Laboratory References:**

TAL KNX = Eurofins TestAmerica, Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

**Eurofins TestAmerica, Knoxville**
5815 Middlebrook Pike
Knoxville, TN 37921
Phone (865) 291-3000 Fax (865) 584-4315

# Chain of Custody Record

eurofins | Environment Testing TestAmerica

| Client Information | Sampler: Jacob Jarvis | Lab PM: Walker Wasmund, Terry | Carrier Tracking No(s): | COC No: 140-6678-2224.1 |
|---|---|---|---|---|
| Client Contact: Will Vienne | Phone: 361 877 5553 | E-Mail: terry.wasmund@testamericainc.com | | Page: Page 1 of 1 |
| Company: Golder Associates Inc. | | | | Job #: |
| Address: 2201 Double Creek Dr Suite 4004 | Due Date Requested: | | | |
| City: Round Rock | TAT Requested (days): | | | |
| State, Zip: TX, 78664 | | | | |
| Phone: 512-671-3434(Tel) | PO #: 19122434-F | | | |
| Email: William_Vienne@golder.com | WO #: 1922434-F | | | |
| Project Name: Oak Grove FGD Ponds - SEP and Totals | Project #: 14005266 | | | |
| Site: | SSOW#: | | | |

**Analysis Requested**

140-15376 Chain of Custody

**Preservation Codes:**

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

| Sample Identification | Sample Date | Sample Time | Sample Type (C=comp, G=grab) | Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air) | Field Filtered Sample (Yes or No) | Perform MS/MSD (Yes or No) | 6010B_SEP - 7-Step SEP (12 metals) | 6010B Total B, Cr, Pb, P | Total Number of containers | Special Instructions/Note: |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Preservation Code: | | | | N | | | |
| FGD-15 (25-27) | 5/22/19 | 1415 | C | S | N | | X | X | | |
| FGD-121 (30-32) | 5/23/19 | 1040 | C | ES | | | | | | |
| FGD-2019-1 (23-25) | 5/23/19 | 1520 | C | S | | | | | | |
| RT: 0.8°C CT: 0.8°C | | | | | | | | | | |
| 1 Cooler, Fedex Po | | | | | | | | | | |
| Custody seal intact | | | | | | | | | | |
| tr#7874 5047 1949 | | | | | | | | | | |
| KLS/24/19 | | | | | | | | | | |

**Possible Hazard Identification**
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

**Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)**
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

| Empty Kit Relinquished by: | Date: | Time: | Method of Shipment: | | |
|---|---|---|---|---|---|
| Relinquished by: | Date/Time: 5/23/19 5:50p | Company | Received by: | Date/Time: 5/24/19 0940 | Company TA-Knx |
| Relinquished by: | Date/Time: | Company | Received by: | Date/Time: | Company |
| Relinquished by: | Date/Time: | Company | Received by: | Date/Time: | Company |

| Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks: |
|---|---|---|

Ver: 01/16/2019

## TESTAMERICA KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST

**Log In Number:** Loc: 140 **15376**

| Review Items | Yes | No | NA | If No, what was the problem? |
|---|---|---|---|---|
| 1. Are the shipping containers intact? | ✓ | | | ☐ **Containers, Broken** |
| 2. Were ambient air containers received intact? | | | ✓ | ☐ Checked in lab |
| 3. The coolers/containers custody seal if present, is it intact? | ✓ | | | ☐ Yes<br>☐ NA |
| 4. Is the cooler temperature within limits? (> freezing temp. of water to 6 °C, VOST: 10°C)<br>Thermometer ID : VC68<br>Correction factor: +0.2 | ✓ | | | ☐ **Cooler Out of Temp, Client Contacted, Proceed/Cancel**<br>☐ **Cooler Out of Temp, Same Day Receipt** |
| 5. Were all of the sample containers received intact? | ✓ | | | ☐ **Containers, Broken** |
| 6. Were samples received in appropriate containers? | ✓ | | | ☐ **Containers, Improper; Client Contacted; Proceed/Cancel** |
| 7. Do sample container labels match COC? (IDs, Dates, Times) | ✓ | | | ☐ **COC & Samples Do Not Match**<br>☐ **COC Incorrect/Incomplete**<br>☐ **COC Not Received** |
| 8. Were all of the samples listed on the COC received? | ✓ | | | ☐ **Sample Received, Not on COC**<br>☐ **Sample on COC, Not Received** |
| 9. Is the date/time of sample collection noted? | ✓ | | | ☐ **COC; No Date/Time; Client Contacted** |
| 10. Was the sampler identified on the COC? | ✓ | | | ☐ **Sampler Not Listed on COC** |
| 11. Is the client and project name/# identified? | ✓ | | | ☐ **COC Incorrect/Incomplete** |
| 12. Are tests/parameters listed for each sample? | ✓ | | | ☐ **COC No tests on COC** |
| 13. Is the matrix of the samples noted? | ✓ | | | ☐ **COC Incorrect/Incomplete** |
| 14. Was COC relinquished? (Signed/Dated/Timed) | ✓ | | | ☐ **COC Incorrect/Incomplete** |
| 15. Were samples received within holding time? | ✓ | | | ☐ **Holding Time - Receipt** |
| 16. Were samples received with correct chemical preservative (excluding Encore)? | | | ✓ | ☐ **pH Adjusted, pH Included (See box 16A)**<br>☐ **Incorrect Preservative** |
| 17. Were VOA samples received without headspace? | | | ✓ | ☐ **Headspace (VOA only)** |
| 18. Did you check for residual chlorine, if necessary? (e.g. 1613B, 1668)<br>Chlorine test strip lot number: | | | ✓ | ☐ **Residual Chlorine** |
| 19. For 1613B water samples is pH<9? | | | ✓ | ☐ If no, notify lab to adjust |
| 20. For rad samples was sample activity info. Provided? | | | ✓ | ☐ Project missing info |

**Comments/Actions Taken**

**Labeling Verified by:** **Date:**

**pH test strip lot number:**

| | Box 16A: pH Preservation | Box 18A: Residual Chlorine |
|---|---|---|
| Preservative: | | |
| Lot Number: | | |
| Exp Date: | | |
| Analyst: | | |
| Date: | | |
| Time: | | |

Project #: 140s266 PM Instructions: _____

Sample Receiving Associate: _____ Date: 5/24/19

QA026R31.doc, 112618

**APPENDIX C**

# GROUNDWATER SAMPLING RECORDS

# RECORD OF WATER LEVEL READINGS

GOLDER

Project Name: LUMINANT-OGSES-PONDS Location: NEAR FRANKLIN, TX Project No.: 19122262-F

| Borehole No. | Date | Time | Measuring Device / Serial No. | Measurement Point (M.P) | Water Level Below M.P. | Correction To Survey Mark | Survey Mark Elevation | Water Level Elevation | By | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-16 | 5-16-19 | 08 | SOLINST | TOC | 16.37 | | | | JTB | |
| FGD-4 | 5-16-19 | | | TOC | 19.52 | | | | | |
| FGD-3 | 5-16-19 | | | TOC | 22.13 | | | | | |
| FGD-2 | 5-16-19 | | | TOC | 27.97 | | | | | |
| FGD-5 | 5-16-19 | | | TOC | 20.41 | | | | | |
| FGD-1 | 5-16-19 | | | TOC | 12.34 | | | | | |
| FGD-8 | 5-16-19 | | | TOC | 29.11 | | | | | |
| FGD-11 | 5-16-19 | | | TOC | 38.72 | | | | | |
| FGD-12 | 5-16-19 | | | TOC | 30.18 | | | | | |

Sheet 1 of 1

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191|22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-1
Sampling Location (well ID, etc.): FGD-1
Sampled by: JTB
Measuring Point (MP) of Well: TOC|PVC
Screened Interval (ft. BGL): –
Filter Pack Interval (ft. BGL): –

Starting Water Level (ft. BMP): 12.34
Casing Stickup (ft.): –
Starting Water Level (ft. BGL): 12.34
Total Depth (ft. BGL): –
Casing Diameter (In ID): 2.0
Casing Volume (gal.): –

## QUALITY ASSURANCE

METHODS (describe):
Cleaning Equipment: alconox & DI rinse
Purging: peristaltic / bladder Sampling: same
Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA
pH Meter: HORIBA Field Calibration: 7-4
Conductivity Meter: HORIBA Field Calibration: 1413
Filter / Filter Size: – Other:

## SAMPLING MEASUREMENTS

| 1412 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1422 | – | .2 | 22.6 | 6.71 | 1430 | 0.71 | -26 | 4.2 | 12.52 |
| 1426 | | | 22.7 | 6.64 | 1460 | 0.59 | -31 | 4.6 | 12.53 |
| 1433 | | ↓ | 22.7 | 6.63 | 1470 | 0.58 | -32 | 4.7 | 12.52 |
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Water Level (ft. BMP) at End of Purge: 12.52 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration (Y / N) | Preservation | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | | | |
| 1450 | 250mL | P | 1 | N | – | GEN CHEM |
| 1450 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191|22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-2

Sampling Location (well ID, etc.): FGD-2

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 27.97

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 27.97

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.):

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: bailer

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1126 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1136 | - | .2 | 23.1 | 6.86 | 1320 | 0.47 | -92 | 6.2 | 28.17 |
| 1141 | | 1 | 22.9 | 6.87 | 1360 | 0.39 | -91 | 7.1 | 28.16 |
| 1147 | | ↓ | 22.9 | 6.86 | 1370 | 0.40 | -91 | 6.8 | 28.16 |
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Water Level (ft. BMP) at End of Purge: 28.16 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1200 | 250mL | P | 1 | N | - | GEN CHEM |
| 1200 | 500mL | P | 1 | N | HNO3 | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-3

Sampling Location (well ID, etc.): FGD-3

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 22.13

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 22.13

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.):

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1032 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1041 | - | .2 | 23.1 | 6.71 | 1620 | 0.71 | -57 | 6.7 | 22.31 |
| 1047 | | 1 | 22.7 | 6.74 | 1630 | 0.61 | -56 | 7.1 | 22.32 |
| 1053 | | ↓ | 22.7 | 6.73 | 1630 | 0.62 | -56 | 7.2 | 22.31 |
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Water Level (ft. BMP) at End of Purge: 22.31 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1110 | 250mL | P | 1 | N | - | GEN CHEM |
| 1110 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191|22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-4

Sampling Location (well ID, etc.): FGD-4

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 19.52

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 19.52

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.):

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 0939 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 0949 | - | .2 | 22.4 | 6.59 | 1730 | 0.63 | -42 | 3.6 | 19.71 |
| 0954 | | 1 | 22.6 | 6.56 | 1760 | 0.51 | -41 | 4.1 | 19.72 |
| 0958 | | ↓ | 22.7 | 6.57 | 1770 | 0.52 | -41 | 4.0 | 19.71 |
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Water Level (ft. BMP) at End of Purge: 19.71 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1015 | 250mL | P | 1 | N | - | GEN CHEM |
| 1015 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-S
Sampling Location (well ID, etc.): FGD-S
Sampled by: JTB
Measuring Point (MP) of Well: TOC/PVC
Screened Interval (ft. BGL): -
Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 20.41
Casing Stickup (ft.): -
Starting Water Level (ft. BGL): 20.41
Total Depth (ft. BGL): -
Casing Diameter (In ID): 2.0
Casing Volume (gal.):

## QUALITY ASSURANCE

METHODS (describe):
Cleaning Equipment: alconox & DI rinse
Purging: peristaltic / bladder Sampling: same
Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA
pH Meter: HORIBA Field Calibration: 7-4
Conductivity Meter: HORIBA Field Calibration: 1413
Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1315 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O. | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1323 | - | .2 | 22.6 | 6.41 | 1620 | 0.71 | -26 | 7.4 | 20.69 |
| 1329 | | | 22.8 | 6.46 | 1610 | 0.46 | -31 | 6.7 | 20.71 |
| 1334 | | | 22.8 | 6.46 | 1620 | 0.51 | -31 | 6.8 | 20.70 |
| | | | | | | | | | |
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Water Level (ft. BMP) at End of Purge: 20.70
Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1350 | 250mL | P | 1 | N | - | GEN CHEM |
| 1350 | 500mL | P | 1 | N | HNO3 | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-6

Sampling Location (well ID, etc.): FGD-6

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): —

Filter Pack Interval (ft. BGL): —

Starting Water Level (ft. BMP): 16.37

Casing Stickup (ft.): —

Starting Water Level (ft. BGL): 16.37

Total Depth (ft. BGL): —

Casing Diameter (in ID): 2.0

Casing Volume (gal.): —

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: — Other:

## SAMPLING MEASUREMENTS

| 0843 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 0852 | — | .2 | 22.7 | 6.91 | 1410 | 1.06 | -31 | 11 | 16.61 |
| 0857 | | 1 | 22.8 | 6.86 | 1440 | 0.81 | -29 | 6.6 | 16.62 |
| 0904 | | ↓ | 22.9 | 6.85 | 1450 | 0.84 | -28 | 6.2 | 16.61 |

Water Level (ft. BMP) at End of Purge: 16.61 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 0920 | 250mL | P | 1 | N | — | GEN CHEM |
| 0920 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191|22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-8

Sampling Location (well ID, etc.): FGD-8

Sampled by: JTB

Measuring Point (MP) of Well: TOC|PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 29.11

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 29.11

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.): -

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1513 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1522 | - | .2 | 23.1 | 6.71 | 1320 | 0.76 | -36 | 7.4 | 29.34 |
| 1527 | | ↓ | 22.6 | 6.68 | 1340 | 0.71 | -41 | 7.6 | 29.34 |
| 1534 | | ↓ | 22.7 | 6.67 | 1340 | 0.70 | -42 | 7.7 | 29.35 |
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Water Level (ft. BMP) at End of Purge: 29.35 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration (Y / N) | Preservation | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | | | |
| 1545 | 250mL | P | 1 | N | - | GEN CHEM |
| 1545 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-11

Sampling Location (well ID, etc.): FGD-11

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 38.72

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 38.72

Total Depth (ft. BGL):

Casing Diameter (In ID): 2.0

Casing Volume (gal.):

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1606 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1616 | - | .2 | 23.4 | 6.81 | 1360 | 0.91 | -47 | 9.1 | 38.93 |
| 1622 | | 1 | 23.5 | 6.82 | 1340 | 0.77 | -48 | 6.8 | 38.94 |
| 1627 | | 1 | 23.5 | 6.83 | 1340 | 0.78 | -48 | 6.9 | 38.94 |
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Water Level (ft. BMP) at End of Purge: 38.94 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration (Y / N) | Preservation | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | | | |
| 1640 | 250mL | P | 1 | N | - | GEN CHEM |
| 1640 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

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Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191|22262-F Project Name: LUMINANT - OGSES Date: 5-16-19

Sample Number: FGD-12

Sampling Location (well ID, etc.): FGD-12

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): —

Filter Pack Interval (ft. BGL): —

Starting Water Level (ft. BMP): 30.18

Casing Stickup (ft.): —

Starting Water Level (ft. BGL): 30.18

Total Depth (ft. BGL): —

Casing Diameter (In ID): 2.0

Casing Volume (gal.): —

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter: HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: — Other:

## SAMPLING MEASUREMENTS

| 1703 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L /m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1713 | — | .2 | 23.2 | 6.96 | 1530 | 0.71 | -17 | 7.1 | 30.31 |
| 1717 | | .1 | 23.0 | 6.51 | 1510 | 0.44 | -19 | 7.7 | 30.32 |
| 1724 | | .1 | 23.0 | 6.52 | 1510 | 0.46 | -19 | 7.8 | 30.32 |
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Water Level (ft. BMP) at End of Purge: 30.32 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration (Y / N) | Preservation | Remarks (quality control sample, other) |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | | | |
| 1735 | 250mL | P | 1 | N | — | GEN CHEM |
| 1735 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
| | | | | | | |

Comments:

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2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

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Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 5-17-19

Sample Number: FGD-14

Sampling Location (well ID, etc.): FGD-14

Sampled by: HTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 15.52

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 15.52

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.): -

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 0724 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O. | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 0733 | - | .2 | 22.7 | 6.63 | 1410 | 1.24 | -6 | 4.7 | 15.81 |
| 0738 | | ↓ | 22.9 | 6.65 | 1440 | 1.07 | -7 | 5.2 | 15.82 |
| 0744 | | ↓ | 22.9 | 6.65 | 1430 | 1.06 | -7 | 5.7 | 15.82 |
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Water Level (ft. BMP) at End of Purge: 15.82 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 0750 | 250mL | P | 1 | N | - | GEN CHEM |
| 0750 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| | | | | | | |
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Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 6-6-19

Sample Number: FGD-15

Sampling Location (well ID, etc.): FGD-15

Sampled by: JTB

Measuring Point (MP) of Well: TOC/PVC

Screened Interval (ft. BGL): -

Filter Pack Interval (ft. BGL): -

Starting Water Level (ft. BMP): 25.22

Casing Stickup (ft.): -

Starting Water Level (ft. BGL): 25.22

Total Depth (ft. BGL): -

Casing Diameter (In ID): 2.0

Casing Volume (gal.): -

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: same

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: KECK Thermometer: HORIBA

pH Meter HORIBA Field Calibration: 7-4

Conductivity Meter: HORIBA Field Calibration: 1413

Filter / Filter Size: - Other:

## SAMPLING MEASUREMENTS

| 1412 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O. | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1421 | - | .2 | 20.9 | 6.67 | 1570 | 1.29 | -17 | 7.7 | 25.41 |
| 1426 | | ↓ | 20.7 | 6.62 | 1560 | 1.06 | -16 | 5.2 | 25.42 |
| 1432 | | ↓ | 20.6 | 6.62 | 1560 | 1.07 | -16 | 5.9 | 25.41 |
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Water Level (ft. BMP) at End of Purge: Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1445 | 250mL | P | 1 | N | - | GEN CHEM |
| 1445 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| 1445 | 1L | P | 2 | N | $HNO_3$ | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

# GROUNDWATER SAMPLING RECORD

PAGE 1 of 1

Project Number: 191 22262-F Project Name: LUMINANT - OGSES Date: 6-6-19

| | | | |
|---|---|---|---|
| Sample Number: | FGD-16 | Starting Water Level (ft. BMP): | 31.06 |
| Sampling Location (well ID, etc.): | FGD-16 | Casing Stickup (ft.): | - |
| Sampled by: | JTB | Starting Water Level (ft. BGL): | 31.06 |
| Measuring Point (MP) of Well: | TOC/PVC | Total Depth (ft. BGL): | - |
| Screened Interval (ft. BGL): | - | Casing Diameter (In ID): | 2.0 |
| Filter Pack Interval (ft. BGL): | - | Casing Volume (gal.): | - |

## QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment: alconox & DI rinse

Purging: peristaltic / bladder Sampling: bailer

Disposal of Discharged Water: on site

INSTRUMENTS (Indicate make, model, I.d.)

| | | | |
|---|---|---|---|
| Water Level: | KECK | Thermometer: | HORIBA |
| pH Meter | HORIBA | Field Calibration: | 7-4 |
| Conductivity Meter: | HORIBA | Field Calibration: | 1413 |
| Filter / Filter Size: | - | Other: | |

## SAMPLING MEASUREMENTS

| 1232 Time | Cum. Vol. (gal. or L) | Purge Rate (gal. or L/m) | Temp. (oC) | pH | Spec. Cond. (mmhos/cm) | D.O | Redox (mV) | Turbidity & Color | Water Depth (ft BMP) |
|---|---|---|---|---|---|---|---|---|---|
| 1241 | - | .2 | 21.7 | 6.74 | 1760 | 0.71 | -39 | 5.7 | 31.27 |
| 1246 | | ↓ | 21.6 | 6.73 | 1740 | 0.56 | -31 | 6.7 | 31.26 |
| 1253 | | ↓ | 21.6 | 6.73 | 1740 | 0.57 | -32 | 6.9 | 31.26 |
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Water Level (ft. BMP) at End of Purge: 31.26 Sample Intake Depth (ft. BMP):

## SAMPLE INVENTORY

| Bottles Collected | | | | Filtration | | Remarks |
|---|---|---|---|---|---|---|
| Time | Volume | Composition (G, P) | No. | (Y / N) | Preservation | (quality control sample, other) |
| 1300 | 250mL | P | 1 | N | - | GEN CHEM |
| 1300 | 500mL | P | 1 | N | $HNO_3$ | METALS |
| 1300 | 1L | P | 2 | N | $HNO_3$ | |
| | | | | | | |

Comments:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
(512) 671-3434 Fax (512) 671-3446

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# APPENDIX B

## Tier II and Tier III Monitored Natural Attenuation Evaluation

**REPORT**

# OAK GROVE STEAM ELECTRIC STATION - FGD PONDS TIER II AND III MNA EVALUATION

Submitted to:

**Luminant Generation Company LLC**

6555 Sierra Drive
Irving, Texas 75039

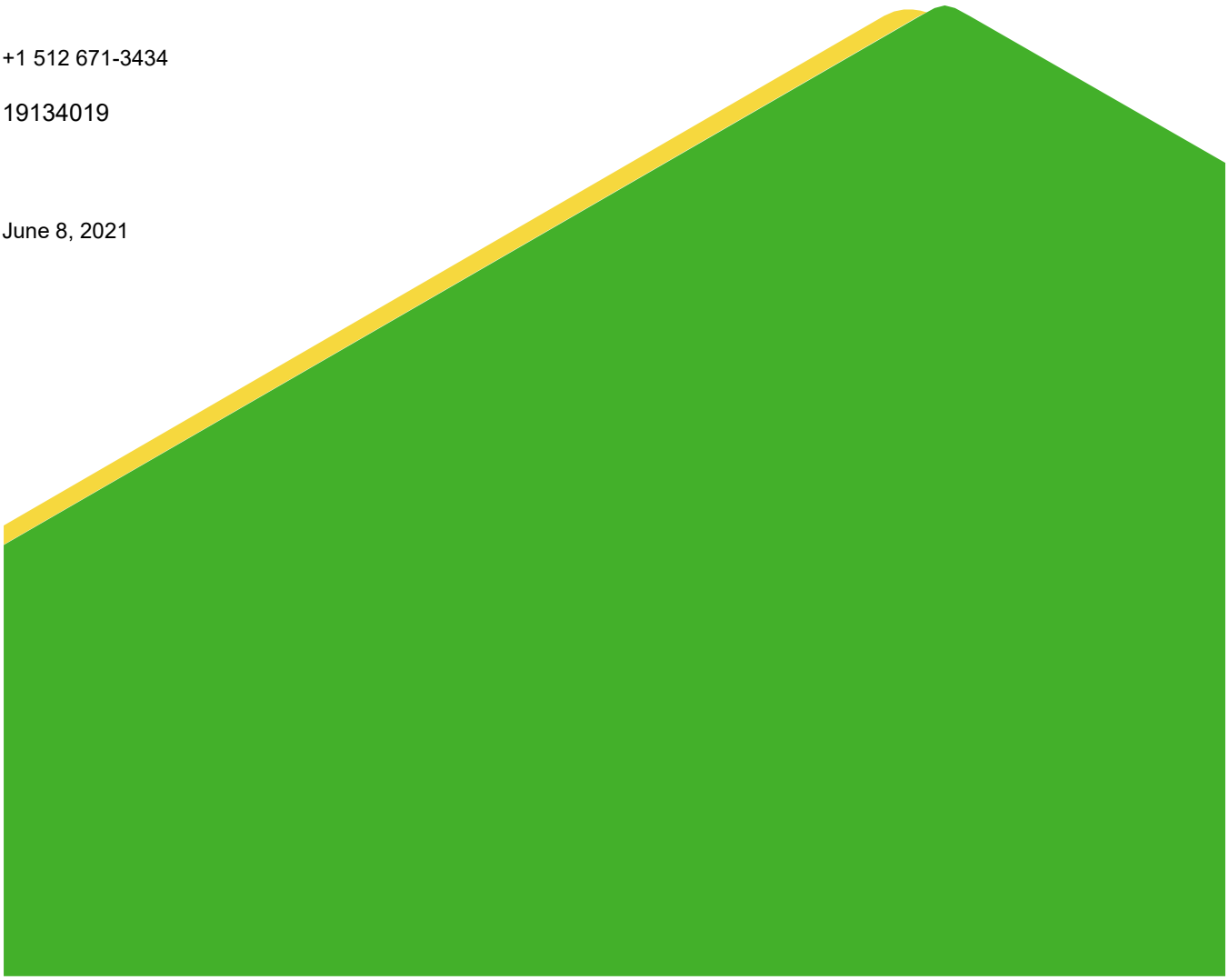
Submitted by:

**Golder Associates Inc.**
2201 Double Creek Drive, Suite 4004
Round Rock, Texas 78664

+1 512 671-3434

19134019

June 8, 2021



# Distribution List

Renee Collins, Luminant

David Mitchell, Luminant

Eric Chavers, Luminant

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Figure 1: Constituent Trends

Figure 2: PHAST Fluid Head Calibration

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Figure 4: Geochemical Modeling Results for pH

Figure 5: Geochemical Modeling Results for Redox

**APPENDICES**

**APPENDIX A**
Laboratory Analytical Reports

**APPENDIX B**
Groundwater Modeling

**APPENDIX C**
Geochemical Modeling Saturation Indices

# 1.0 OVERVIEW

Oak Grove Management Company LLC (Luminant) operates the FGD-A-Pond, FGD-B-Pond, and FGD-C Pond (collectively referred to as the "FGD Ponds"), approximately 0.25 miles northeast of the Oak Grove Steam Electric Station (OGSES), in Robertson County, Texas. Luminant manages Coal Combustion Residuals (CCR) generated from the OGSES in the FGD Ponds per the applicable requirements of 40 Code of Federal Regulations (CFR) Part 257 Subpart D as amended (CCR Final Rule). A map of the FGD Ponds is provided on Exhibit 1.

Statistically significant levels (SSLs) of cobalt and lithium above groundwater protection standards (GWPS) were detected in the uppermost aquifer downgradient of the FGD Ponds during 2018 assessment monitoring. In response to the 2018 cobalt and lithium SSLs, an Assessment of Corrective Measures (ACM) report was completed for the FGD Ponds in September 2019 as required by 40 CFR § 257.96 (Golder 2019a). The ACM evaluated various source control and groundwater response technologies to address the cobalt and lithium SSLs. However, an Alternate Source Demonstration (ASD) completed in accordance with 40 CFR § 257.95(g)(3)(ii) in October 2020 (Golder 2020) indicated that a source other than the FGD Ponds caused the lithium SSL and lithium has therefore been eliminated as a constituent of concern at the FGD Ponds. The ACM was updated in May 2021 (Golder 2021) to remove lithium from the list of constituents evaluated in the ACM. In addition, updated statistical analyses for cobalt incorporating 2019 and 2020 assessment monitoring data indicate that cobalt is also no longer present at SSLs above the GWPS downgradient of the FGD Ponds; however, for the purposes of the ACM, Luminant continues to evaluate potential groundwater remedies for cobalt based on the 2018 SSL.

The ACM identified monitored natural attenuation (MNA) as a potential groundwater response technology for cobalt downgradient of the FGD Ponds. To supplement the findings of the ACM, Golder was retained by Luminant to further evaluate the overall feasibility of MNA as a groundwater remedial alternative for the FGD Ponds in accordance with 40 CFR §257.97. Golder based the MNA feasibility evaluation on United States Environmental Protection Agency (USEPA) guidance for using MNA as a remedial strategy (USEPA 2007a, b) and best practices in the Interstate Technology Regulatory Council (ITRC) document: "A Decision Framework for Applying Monitored Natural Attenuation Processes to Metals and Radionuclides in Groundwater" (ITRC 2010).

USEPA guidance recommends that the overall feasibility of MNA as a groundwater response technology be evaluated based on the following multi-tier approach (USEPA 2007a, b):

1) Demonstrate active constituent removal from groundwater and dissolved plume stability (Tier I).

2) Determine the mechanisms and rates of the operative attenuation processes (Tier II).

3) Determine the long-term capacity for attenuation and the stability of immobilized constituents (Tier III).

A Tier I MNA Evaluation for the FGD Ponds was completed in December 2019 (Golder 2019b). The Tier I Evaluation concluded that sufficient evidence was present to satisfy the Tier I criteria for successful MNA implementation to address the cobalt SSL. Further geochemical evaluation (i.e., Tier II and Tier III Evaluation) of MNA was recommended in the Tier I report. This memorandum presents the findings of the Tier II and Tier III MNA Evaluation for the FGD Ponds area.

The results of the Tier II and III Evaluation will be used to further assess the performance and reliability of MNA as a potential remedial alternative as required by 40 CFR §257.97. Following completion of this multi-tier evaluation, the fourth and final tier of an MNA program, which involves the design of a performance monitoring program and the development of a contingency plan, will be completed.

## 2.0 TIER II AND TIER III EVALUATION APPROACH

In 2019, Golder collected samples of overburden, groundwater, and porewater as part of a Nature and Extent Evaluation and Tier I Evaluation in accordance with the CCR Final Rule. Groundwater data collection and analysis at the FGD Ponds continued throughout and after the completion of the Tier I Evaluation, and the water quality results are used in the Tier II and III Site Evaluation presented herein. The additional groundwater data collection consisted of three sampling events (August 2019, May 2020, and September 2020). Data from those events are included in Appendix A. The general groundwater quality and trends for constituents with SSLs (previously including lithium) were described in detail in the Tier I report (Golder 2019b). No substantial changes in groundwater quality have occurred that would change the findings of the Tier I Evaluation.

The Tier II and III Evaluation expands upon the Tier I findings as follows:

- **Plume Stability:** Based on the water quality monitoring data presented in this assessment, groundwater concentrations of cobalt outside of the FGD Ponds at monitoring wells are relatively stable or decreasing (Figure 1). As of September 2020 (the most recent sampling event), the concentration of cobalt in groundwater in all but one downgradient monitoring well (FGD-6) was below the detection limit (<0.003 mg/L). At well FGD-3, where previously an SSL of cobalt was indicated, cobalt levels have not exceeded the GWPS since September 2018.
- **Magnitude of Exceedances**: Occasional exceedances of the cobalt GWPS in some wells do not amount to levels that would be considered an SSL per the CCR Rule (Golder 2019a). Cobalt is currently not at an SSL in groundwater based on a 95% confidence interval at any CCR monitoring well (Golder 2019a; Golder 2020). The highest level of cobalt in groundwater (since monitoring began) at the FGD Ponds was observed in well FGD-1 (0.0495 mg/L on May 11, 2020). During the next sampling round, cobalt in groundwater from FGD-1 was below the detection limit (<0.003 mg/L), thus not amounting to an SSL of cobalt. Although exceeding the GWPS, the measured cobalt concentration in May 2020 is considered an outlier due to field or laboratory error rather than the presence of a continuous cobalt source affecting FGD-1.
- **FGD Pond Porewater:** Historical records are not available for ash additions or porewater concentrations over the lifespan of the CCR units. However, based on 2019 and 2020 porewater data, cobalt is not present in the FGD Ponds at levels above its GWPS (0.016 mg/L). This suggests that the FGD Ponds may not be a current source of cobalt in groundwater.
- **Groundwater Chemistry:** The groundwater monitoring results and the findings of the geochemical modeling support the potential for natural attenuation of cobalt. Equilibrium of groundwater with the mineral phase ferrihydrite, capable of adsorbing cobalt, was indicated in all groundwater samples. Further, differences in relative abundance of the major ions in groundwater indicate that porewater is geochemically distinct from groundwater. Detailed findings are presented in the Golder Tier I Evaluation (Golder 2019b).
- **Confirmation of Attenuation/Immobilization:** Based on both mineralogical and chemical analysis, it is evident that attenuation of cobalt by aquifer materials is occurring. Iron, present in the form of (hydr)oxide or amorphous phases that facilitate metals attenuation (Dzombak and Morel 1990), was identified in all overburden samples, consistent with the inferred presence of ferrihydrite based on the geochemical modeling. The ubiquitous presence of aluminum, in the form of aluminum oxides and clay minerals, provides an additional well-studied attenuation reservoir (Karamalidis and Dzombak 2011; Uddin 2017). Thus, overburden samples from the FGD Ponds demonstrate sequestration of constituents of interest is occurring.

The Tier II and III Evaluation presented in this document builds upon the results of the Tier I Evaluation by undertaking the following:

- Evaluation of temporal and geographical trends in groundwater quality data to estimate site-wide attenuation rates.
- Geochemical modeling to determine the aqueous speciation of cobalt and evaluate saturation indices of minerals relevant to its attenuation.
- Determination of the capacity of different mechanisms to attenuate cobalt, including adsorption, precipitation and co-precipitation, and physical attenuation (dilution/dispersion).
- Geochemical modeling to assess the stability and reversibility of attenuation due to adsorption.

Additionally, the results from the following analyses described in the Tier I Evaluation for aquifer solids are utilized as part of the Tier II and III Evaluation:

- Mineralogical analysis of aquifer solids to identify and quantify the major mineral components.
- Chemical analysis and sequential extraction procedure (SEP) of aquifer solids to quantify the total metal content and identify the environmentally available fractions of metals.

The approach to and results of the Tier II and Tier III Evaluation are presented in the next sections to establish a basis for the likely success of MNA at the FGD Ponds area.

# 3.0 MODELING APPROACH

## 3.1 General Approach

### 3.1.1 Estimation of Attenuation Rates

To evaluate the attenuation of cobalt in groundwater at the FGD Ponds and to assess the rate of attenuation, the point decay method (Newell et al. 2009) was applied. The point decay method is used to determine the rate at which a constituent's concentrations are increasing or decreasing in groundwater at a single well between sampling events. This method can thus be used to predict when the constituent's concentrations will fall back below regulatory limits.

Equation 1 describes first-order decay for a constituent:

$$Ln(C_t) = kt + Ln(C_0) \quad \text{(Equation 1)}$$

where $C_0$ is the initial constituent concentration, $C_t$ is the constituent concentration at time t, t is the amount of time in years that has passed since the initial measurement, and k is the first-order decay rate constant.

Equation 2 shows Equation 1 reorganized to solve for the decay rate constant:

$$k = (Ln(C_t) - Ln(C_0))/t \quad \text{(Equation 2)}$$

Groundwater quality data from the upgradient and downgradient wells collected from November 2015 to September 2020 were used to determine the mean first-order decay rate for each constituent of interest. Due to variable detection limits, results that were reported as below detection were not used in the point decay analysis. Equation 1 and the mean first-order decay rate were used to calculate the number of years required for cobalt concentrations greater than the GWPS to decrease below the threshold.

### 3.1.2 Geochemical Speciation Modeling

Baseline geochemical modeling was conducted to evaluate general groundwater and porewater quality, determine the potential for precipitation of sorbent media, evaluate the potential for mineral precipitation or adsorption in the aquifer, and determine the speciation of cobalt. The geochemical computer code PHREEQC, developed by the United States Geological Survey (USGS), was used for these simulations (Parkhurst and Appelo 2013). PHREEQC version 3.4 is a general-purpose geochemical modeling code used to simulate reactions in water and between water and solid mineral phases (e.g., rocks and sediments). Reactions include aqueous equilibria, mineral dissolution and precipitation, ion exchange, surface complexation, solid solutions, gas-water equilibrium, and kinetic biogeochemical reactions. The widely accepted thermodynamic database Minteq.v4, 2017 edition, was used as a basis for the thermodynamic constants required for modeling (Allison et al. 1991).

### 3.1.3 Groundwater Modeling

Golder developed a three-dimensional numerical groundwater model based on the MODFLOW groundwater-flow source code created by the USGS (McDonald and Harbaugh 1988) using Visual MODFLOW (Version 4.6). The groundwater model simulates steady state groundwater flow conditions in the FGD Ponds. The results of the groundwater model were incorporated into the reactive transport geochemical model discussed in Section 3.1.4. The groundwater model was developed based on:

- Natural hydrologic boundaries, wherever possible.
- Ground surface topography and pond geometry.
- Geologic layers with representative structural properties based on boring logs.
- Hydraulic properties of geologic layers based on historical aquifer tests conducted at the site.
- Historical groundwater elevation measurements.

Details on key parameters used to develop the groundwater model are presented in Appendix B.

### 3.1.4 Reactive Transport Modeling

Additional geochemical modeling was performed to assess viable attenuation mechanisms and predict the quantity and stability of the attenuated constituents of interest. To do so, Golder used PHAST, a three-dimensional reactive transport modeling computer program developed by the USGS that simulates multicomponent reactive solute transport in a three-dimensional saturated groundwater flow system (Parkhurst et al. 2010). PHAST is a versatile groundwater flow and solute-transport simulator with capabilities to model a wide range of equilibrium and kinetic geochemical reactions. The flow and transport calculations are based on a modified version of HST3D that is restricted to constant fluid density and constant temperature. PHAST can be used to simulate both confined and unconfined flow using both a steady state and transient flow solution. The geochemical reactions are simulated with the geochemical model PHREEQC-RM (based on PHREEQC version 3.4), which is embedded in PHAST, resulting in a full three-dimensional reactive transport model. In the application used here, parameters from the site groundwater flow model developed in MODFLOW (i.e. hydraulic conductivities of layers, model layering, model architecture, water balance, groundwater velocities, and fluid head calculations) were directly used as initial and target model values to ensure seamless model coordination with

MODFLOW, without the need to rebuild a groundwater flow model independently in another software package capable of simulating geochemical reactions.

### 3.1.5 Source Control Modeling

For the purposes of the ACM, it was assumed that some degree of source control will be considered for the FGD Ponds, since one of the listed objectives in §257.97(b) for the corrective measures is to control the source of releases of Appendix IV constituents to the environment from the CCR Unit. The OGSES FGD Ponds are an integral part of the CCR management system at the plant and potential source control technologies will be designed to keep the FGD Ponds in operation.

FGD-B and FGD-C are constructed with composite liner systems that comply with the requirements of §257.71(a)(1)(ii) of the CCR Rule and these ponds are considered lined surface impoundments under the Rule. Since the liner systems in these ponds comply with the CCR Rule, FGD-B and FGD-C provide an appropriate level of source control as currently constructed and no modifications are necessary to these ponds.

FGD-A is constructed with a clay liner and the pond is considered an unlined surface impoundment as defined in § 257.71(a)(1)(i). The pond is currently out of service. The FGD-A is being retrofitted with a new composite liner system that complies with the requirements of §257.71(a)(1)(ii) of the CCR Rule to improve the level of source control in the pond. The new liner system will be installed in general accordance with the following procedures:

- Water will be removed from the pond and transferred to FGD-B and FGD-C;
- Solids in the pond will be dewatered, removed and transported to the OGSES Ash Landfill 1;
- A minimum of 2 feet of the existing compacted clay liner will be retained at the base of the pond;
- A 60-mil HDPE geomembrane liner will be installed over the 2 feet of compacted clay liner
- A protective layer of soil or other material will be placed over the geomembrane liner.

Retrofitting FGD-A with a new composite liner system is assumed to serve as the source control component of the potential corrective measures for the FGD Ponds. It is estimated that the FGD-A liner retrofit will be completed in 2021.

### 3.1.6 Mineral Precipitation and Co-precipitation

The potential for mineral precipitation was assessed in PHAST by PHREEQC using a saturation index (SI) calculated according to Equation 3.

$$SI = \log (IAP/Ksp) \qquad \text{(Equation 3)}$$

The saturation index is the ratio of the ion activity product (IAP) of a mineral to the solubility product (Ksp). An SI value greater than zero indicates that the solution is supersaturated with respect to a particular mineral phase and, therefore, precipitation of this mineral may occur. An evaluation of precipitation kinetics is then required to determine whether the supersaturated mineral will indeed form. An SI value less than zero indicates the solution is undersaturated with respect to a particular mineral phase. An SI value close to zero indicates equilibrium conditions exist between the mineral and the solution. For the purpose of this evaluation, SI values between -0.5 and 0.5 were considered to represent ‘equilibrium’ to account for the uncertainties inherent in the analytical methods and geochemical modeling.

Co-precipitation was evaluated based on published literature and known association between minerals and the constituents of interest. For example, cobalt is known to co-precipitate with iron oxyhydroxides as well as adsorb to Hfo (Nordstrom and Alpers 1999). Therefore, minerals identified by PHAST/PHREEQC to be at equilibrium and supersaturated (SI > -0.5) were evaluated for their potential to host cobalt.

### 3.1.7 Adsorption Capacity and Attenuation

Adsorption is an important mechanism by which constituents in groundwater can be attenuated. The adsorptive partitioning between dissolved and solid phases was simulated during baseline modeling using PHREEQC and for predictive modeling using PHAST with a two-layer surface complexation model (SCM). The SCM approach is described in Davis and Kent (1990), with additional parameterization based on Dzombak and Morel (1990) and Karamalidis and Dzombak (2011), utilizing iron (hydrous ferric oxide [Hfo]) as ferrihydrite [$Fe(OH)_{3(am)}$], and aluminum (hydrous aluminum oxide [Hao]) as gibbsite [$Al(OH)_{3(am)}$], as adsorbing surfaces.

The amount of Hfo and Hao available at the site for attenuation was based on the iron and aluminum concentrations measured in the amorphous and metal hydroxide phase of the SEP as described in the Tier I Evaluation (Golder 2019b). The minimum, mean, and maximum iron and aluminum concentrations in aquifer solids samples were used in the adsorption models to capture the range of expected site concentrations. The Hfo and Hao surface properties (i.e. surface area, site density, and types of surface sites) from Dzombak and Morel (1990) and Karamalidis and Dzombak (2011) were used to quantify the iron and aluminum adsorption sites per mole of mineral.

The calculation methodology of Appelo and Postma (2010) was used to determine the specific quantity of sites on each mineral surface type as a function of the amount of mineral available to participate in these reactions. The methodology assumes the number of surface sites (sites) equals the product of the moles of iron [Fe] and the moles of sites per mole of iron ([sites]/[Fe]= 0.2 moles of sites per mole of iron). To determine the amount of ferrihydrite available for sorption, the Appelo and Postma methodology further assumes the mass of ferrihydrite ($M_{HFO}$) in grams (g) available equals the product of the [Fe] and the molecular weight of ferrihydrite ($MW_{HFO}$ = 88.85 g/mole). The same approach was used to calculate the number of sites from gibbsite, assuming the [sites]/[Al] is 0.41 moles of sites per mole of aluminum and the molecular weight of gibbsite is 78.003 g/mole. The range of Hfo and Hao in soils at the FGD Ponds with associated calculations is presented in Table 1.

The thermodynamic database Minteq V.4, described in Section 3.1.1, was modified for adsorption modeling because new and updated thermodynamic data have been released in the scientific literature. These new data are important to include as they allow further refinement of potential reactions, or for correction of previous data that may have been less accurate or more broadly defined. For the geochemical modeling of the FGD Ponds, numerous updates to the database were made, including the addition of data relating to partitioning coefficients for metals on gibbsite, developed by Karamalidis and Dzombak (2011).

**Table 1: Calculations of ferrihydrite and gibbsite surface parameters for predictive modeling**

| Parameter | Units | Ferrihydrite | | | Gibbsite | | |
|---|---|---|---|---|---|---|---|
| | | Minimum | Mean | Maximum | Minimum | Mean | Maximum |
| Geometric Mean of Aquifer Solids Composition | mg/kg X | 1458 | 2131 | 3461 | 623 | 1030 | 1862 |
| | mmol X | 26.11 | 38.16 | 61.98 | 23.09 | 38.17 | 69.01 |
| | mol X | 2.61E-02 | 3.82E-02 | 6.20E-02 | 2.31E-02 | 3.82E-02 | 6.90E-02 |
| Surface Site Concentration | mol weak sites / mol X | 0.2 | 0.2 | 0.2 | 0.41 | 0.41 | 0.41 |
| | mol strong sites / mol X | 0.005 | 0.005 | 0.005 | --- | | |
| Surface Sites | mol weak | 5.2E-03 | 7.6E-03 | 1.2E-02 | 9.5E-03 | 1.6E-02 | 2.8E-02 |
| | mol strong | 1.3E-04 | 1.9E-04 | 3.1E-04 | --- | | |
| Mass of Ferrihydrite or Gibbsite | grams | 2.32 | 3.39 | 5.51 | 2.05 | 3.39 | 6.13 |

**Notes:**
X = Fe or Al depending on the mineral
Gibbsite only has one site 'type'

## 3.2 Model Calibration

Calibration of the unconfined flow reactive transport model involved adjusting the flux from the FGD Ponds, the concentration of the constituents of interest (cobalt), and the starting date for ash placement in the ponds. This calibration process simulated the gradual addition of ash to the ponds and was generally based on records of pond construction and certification (PBW 2017). The preliminary hydraulic head for PHAST targeted the steady state solution imported from MODFLOW and achieved a coefficient of determination ($R^2$) value of 0.9999 between the PHAST and MODFLOW results based on 75 sample point locations (Figure 2).

A hypothetical source solution was developed to represent the initial water quality in the FGD Ponds. Cobalt concentrations in the hypothetical source solution were increased relative to actual reported concentrations to achieve reasonable calibration with measured values in downgradient wells. Cobalt was measured at 0.00625 mg/L or less in porewater samples during the May 2020 sampling event, but that concentration required an increase to 0.044 mg/L to achieve model calibration.

To achieve calibration of cobalt sorption to aquifer solids, the surface site densities for Hfo and Hao were adjusted within the range of the measured minimum and maximum aluminum and iron concentrations in overburden. Background water quality was based on water quality results from background monitoring well FGD-8 and FGD-11 and was set to equilibrium with adsorptive surfaces. Calibration results for cobalt demonstrated good agreement in downgradient monitoring wells (Table 2), despite likely historical variability in source composition and ash placement in the FGD Ponds area. Compositional heterogeneity in terms of aquifer characteristics is likely to be present along the groundwater flow pathway but was not captured within the model. Use of the minimum surface site concentrations of Hfo and Hao calculated in Table 1 showed the best agreement with the target cobalt concentrations presented in Table 2.

**Table 2: Calibration of parameters in PHAST for predictive modeling as compared to the target values measured in 2020 in downgradient wells**

| Downgradient Monitoring Well | Units | Cobalt | |
|---|---|---|---|
| | | Target Value | Modeled |
| FGD-1 | mg/L | 0.003 | 0.003 |
| FGD-2 | mg/L | 0.003 | 0.003 |
| FGD-3 | mg/L | 0.004 | 0.003 |
| FGD-4 | mg/L | 0.003 | 0.003 |
| FGD-5 | mg/L | 0.003 | 0.003 |
| FGD-6 | mg/L | 0.005 | 0.003 |
| FGD-12 | mg/L | 0.003 | 0.003 |

The Peclet and Courant numbers included in the reactive transport modeling were used to evaluate model validity and control numerical dispersion. These values are calculated based on the cell size, time step, dispersivity, and average velocity of groundwater in the model. Equation 4 was used to control numerical dispersion using an upstream-in-space and backwards-in-time differencing solution based on a derivation of the Peclet and Courant numbers:

$$\frac{\Delta X}{2} + \frac{V_x \Delta t}{2} \ll \alpha \qquad \text{(Equation 4)}$$

Where:

$\Delta X$= Cell size (50ft)

$V_x$= Average Velocity (4 feet/year)

$\Delta t$ = Timestep (1 year)

$\alpha$= Longitudinal dispersivity (50 ft)

## 3.3 Long-Term Stability of Attenuated Constituents

The long-term stability of constituent attenuation and potential for re-mobilization was evaluated using the results of a 50-year simulation period. Specifically, the responses of the constituents of interest to modeled changes in pH and redox of groundwater at downgradient wells were evaluated. Variations in pH and redox are the most likely changes in groundwater chemistry that will occur in an aquifer over time, affecting the stability of the non-conservative constituents of interest, such as cobalt (ITRC 2010). For example, if the pH or redox should decrease substantially over time, causing the dissolution of ferrihydrite, re-mobilization of adsorbed cobalt would

be likely. In contrast, if pH were to increase substantially (>8), cobalt precipitation as cobalt carbonate may enhance the long-term stability of cobalt attenuation, possibly maintaining low levels of cobalt in groundwater (Nordstrom and Alpers 1999; Smith 1999). The long-term stability and reversibility of attenuation were also evaluated for scenarios involving complete source control (i.e., the capping of the ponds, reducing any flux from the ponds).

## 3.4 Data Handling and Geochemical Modeling Assumptions

Assumptions related to data handling practices and geochemical modeling were as follows:

- **Groundwater continuity:** Groundwater and porewater quality data from sampling events conducted from May 2019 to September 2020 were evaluated. These sampling events were selected because all wells related to the FGD Ponds were sampled and analyzed for the full suite of parameters described in the Tier I Evaluation (Golder 2019b); the resulting data are assumed to provide a comprehensive overview of Site conditions. Temporal trend analysis of pH and cobalt in groundwater made use of all available sampling events from a well (14 samples in total), dating back to November 2015.
- **Background groundwater chemistry:** Groundwater samples collected from FGD-8 and FGD-11 were assumed to represent natural background conditions for the purpose of geochemical and predictive modeling.
- **Porewater chemistry:** The porewater samples collected from the FGD-A and FGD-B ponds were assumed to be representative of porewater found in the FGD Ponds at the OGSES FGD Pond area.
- **Redox values:** Oxidation-reduction potential (ORP) values measured in the field were converted to redox potential (Eh) by adding 200 millivolts (mV) to the field-measured values as per YSI (2015).
- **Non-detect values:** Constituents with concentrations less than their respective method detection limits were assumed to have a concentration equal to the reporting limit in model simulations.
- **Total recoverable concentrations:** Total recoverable fraction results were used for geochemical modeling.
- **Charge balance:** Groundwater compositions with charge balance errors less than 10% were considered valid. Compositions with charge balance errors greater than 10% were included in the assessment but would be considered less reliable.

# 4.0 MODELING RESULTS

## 4.1 Hydrogeology

Based on soil borings completed at the site, the geology near the FGD Ponds generally consists of an upper zone of relatively thick, interbedded sand and clay strata, which is underlain by a lower zone of interbedded silty to clayey sand and well sorted sand (PBW 2017). The uppermost groundwater-bearing unit (GWBU) occurs under unconfined conditions within the shallow sand units at the site. Groundwater elevations are generally highest near the western side of the OGSES Ash Landfill I, which is located southeast of the FGD Ponds at the site and relatively flat in the vicinity of the FGD Ponds. Since CCR monitoring began in 2015, the inferred groundwater flow direction at the site has been to the east-northeast toward Twin Oak Reservoir.

The groundwater model consisted of three layers representing the three geological zones identified at the site. The model incorporated site-specific characteristics such as ground surface topography, groundwater elevation measurements, average elevations and thicknesses of the geological zones, geometry of the ponds, and hydraulic characteristics based on aquifer tests conducted as part of the CCR groundwater monitoring system certification (PBW 2017). Groundwater potentiometric heads in the model were calibrated based on groundwater elevations and inferred flow conditions observed at the site; specifically, to conditions observed during the May 2019 CCR groundwater monitoring event. Consistent with observations during the May 2019 and other historical groundwater monitoring events, groundwater was modeled to generally flow to the east northeast toward Twin Oaks Reservoir, with an average groundwater flow velocity of approximately 0.012 feet per day, or 4.4 feet per year. Additional groundwater model details are provided in Appendix B.

## 4.2 Capacity of Attenuation Mechanisms

### 4.2.1 Adsorption to Iron and Aluminum Oxyhydroxides

The Hfo and Hao surface area and sorption site calculations for the minimum, mean, and maximum iron and aluminum concentrations in aquifer solids are presented in Table 1. Adsorption modeling in PHAST revealed adequate capacity to attenuate cobalt based on current levels measured in downgradient monitoring wells. The term “adequate”, as used in this document, refers to the capacity needed to attenuate constituents in groundwater to a level that meets the site-specific GWPS (ITRC 2010). Figure 3 shows the modeled concentrations over time for cobalt for the seven downgradient compliance monitoring wells, accounting for adsorption to iron and aluminum oxyhydroxides and dilution/dispersion.

Cobalt attenuation measured by SEP was highly variable, ranging from 1.8 to 70 mg/kg and, therefore, was not used to evaluate modeled surface attenuation. As can be seen in Figure 3, the combination of attenuation by aluminum and iron oxyhydroxides and dilution/dispersion results in concentrations of cobalt below the GWPS from 5 years after closure. Further, the cobalt concentrations in porewater below the GWPS support the conclusion that adequate attenuation capacity exists downgradient of the CCR Units.

Modeling of mineral precipitation also identified consistent equilibrium of groundwater with ferrihydrite in all downgradient wells from May and June 2019 and May 2020 (events where iron was measured in groundwater). Thus, if the concentrations of cobalt in porewater at the FGD Ponds remain below the GWPS, the downgradient capacity to attenuate these constituents by iron and/or aluminum oxyhydroxides will not be exceeded under the current and simulated future groundwater pH and redox conditions, presented in Figures 4 and 5, respectively.

### 4.2.2 Co-precipitation

In addition to adsorption, co-precipitation, or the direct incorporation of trace metals such as cobalt into precipitated iron oxide-oxyhydroxides, has been well studied (e.g., Butt et al. 2000; Dzombak and Morel 1990; Smith 1999; Hem 1992). Predicted cobalt concentrations from the adsorption modeling fell within the range of cobalt for the aquifer solids analyzed by sequential extraction in the combined amorphous and metal hydroxide phases described in the Tier I Evaluation (Golder 2019b). This suggests that cobalt may also be attenuated during the formation of ferrihydrite as opposed to following its formation as crystalline mineral phase (Butt et al. 2000; Tebo et al. 2004).

### 4.2.3 Physical Attenuation

Figures 3 through 5 present the predicted cobalt concentration and pH and redox conditions over time at downgradient monitoring wells, accounting for physical attenuation (i.e., dilution and dispersion) in addition to

chemical attenuation downgradient of the CCR Units using PHAST. Boron, a well-known conservative tracer for CCRs, was selected for evaluation of physical attenuation. The observed boron levels in groundwater at downgradient wells in 2020 (<0.7 mg/L) and the range of boron concentrations in porewater (84.4 to 104 mg/L) suggest a decrease in CCR constituents of at least two orders of magnitude at downgradient wells due to dilution and dispersion alone.

### 4.2.4 Attenuation Rates

The results of the point decay analysis for groundwater at background and downgradient wells between November 2015 and September 2020 (the CCR groundwater monitoring period) are provided in Table 3, as average site attenuation rates. This evaluation indicates that cobalt concentrations in downgradient wells display decreasing (i.e. negative point decay constants) trends over time. Of note, this point decay trend does not account for any source control or mitigation options (which are currently not being implemented). Therefore, the identified decreasing trend of cobalt in downgradient wells should further benefit from source control and mitigation efforts.

Since the maximum cobalt concentration in monitoring wells has decreased below the cobalt GWPS (as of September 2020), cobalt concentrations in these wells are considered compliant. Additionally, it is considered unlikely that cobalt concentrations will continue to exceed the GWPS since predictive modeling in PHAST indicates that cobalt concentrations will reach the GWPS after source control is complete at the FGD Ponds.

**Table 3: Average Point Decay Trend Constants for Cobalt at the FGD Ponds**

| Constituents | Background Wells ($yr^{-1}$) | Downgradient Wells ($yr^{-1}$) | GWPS (mg/L) | Maximum Most Recent Value (mg/L) | Time to Achieve Compliance (years) |
|---|---|---|---|---|---|
| Cobalt | 0.03 | -0.03 | 0.016 | 0.00615 | Compliant |

Predictive modeling in PHAST used a more conservative approach to estimate the time to compliance by taking into account source control and increased source concentrations needed to achieve model calibration as previously described (Table 2). Based on this approach, considering source control, the estimated time to attenuation to a concentration below the GWPS increased to 5 years for cobalt. This is due to the elevated hypothetical source values for cobalt (0.044 mg/L) required to achieve model calibration. The simulated source value used was 7 times higher than the actual measured porewater values. Therefore, PHAST modeling presents the most conservative approach to determining the rate of attenuation. The actual time in which significant attenuation can likely be achieved falls between the two approaches used (i.e., the point decay method – concentrations currently below the GWPS - and the PHAST method – concentrations below the GWPS after 5 years).

## 4.3 Long-Term Stability of Attenuated Constituents

The expected trends over time for pH and Eh are presented in Figures 4 and 5, respectively. Variations in pH and Eh are arguably the most important factors, other than physical attenuation, controlling the long-term stability of cobalt.

Predictive modeling in PHAST indicates that the pH and Eh in the FGD Ponds will remain stable. The pH, initially ranging from approximately 6.7 to 6.8 is simulated to remain constant (<0.15 change in pH from year 0 to year 50). The Eh, initially ranging from approximately 480 to 500 mV, will also remain stable, with a slight increase in the overall range over time (from approximately 475 to 505 mV). At these predicted pH and Eh ranges,

ferrihydrite, the mineral phase primarily responsible for attenuation of cobalt, is modeled to remain stable across the FGD Ponds.

The long-term stability of cobalt can thus be summarized as follows:

- Attenuated cobalt should remain stable or decrease based on the range of pH and Eh values predicted at the site in the 50 years after closure and source control (Figures 4 and 5, respectively). It is not anticipated that attenuated cobalt will mobilize and exceed the GWPS in the future once compliance is achieved. For the anticipated pH range of the FGD Ponds area, Stenge and Peterson (1989) list a partitioning coefficient of 1.9 to 200 L/kg for cobalt while Hfo and Hao will remain stable. Additionally, the stability of ferrihydrite will also ensure any co-precipitated cobalt will remain sequestered. Thus, with source control and stable pH and Eh, long-term stability of cobalt is anticipated.

# 5.0 TIER II EVALUATION

The purpose of the Tier II Evaluation is to "Identify mechanisms and rates of the operative attenuation process" (USEPA 2007a). Based on this definition, the following modeling results and observations support MNA as a viable corrective measure for the FGD Ponds CCR Units:

- **Adsorption Capacity Modeling:** PHAST modeling results show that adsorption is likely attenuating cobalt downgradient of the CCR Unit. This is concluded based on equilibration of site-specific groundwater compositions with the range of Hfo and Hao concentrations observed in SEP results of FGD Ponds aquifer solids. Predictive modeling also demonstrates the future aquifer's capacity to adsorb constituents from the CCR Units is significant and adequate when source control has been implemented. In addition to metal oxyhydroxides, clay minerals and/or particulate organics can also act as a substrate for attenuation (Uddin 2017), but this mechanism was not included in the current evaluation. The presence of cobalt in the amorphous and metal oxyhydroxide fractions of soils indicates that adsorption is occurring across the monitored area downgradient of the CCR Unit.

- **Co-precipitation:** In addition to adsorption, co-precipitation or the direct incorporation of trace metals into precipitated iron oxide-oxyhydroxides is a well-documented process. Cobalt concentrations indicated by adsorption modeling fall within the range of cobalt for the aquifer solids analyzed by sequential extraction in the combined amorphous and metal hydroxide phases described in the Tier I Evaluation (Golder 2019b).

- **Attenuation Rates:** Cobalt concentrations in downgradient monitoring wells are already below the GWPS based upon the most recent September 2020 sampling event. Ongoing source control activities should support continued long-term attenuation. Therefore, the rate of attenuation is "adequate", as defined in USEPA guidance.

- **Dilution/Dispersion (Physical Attenuation) Modeling:** While not directly modeled, boron concentrations in porewater and in downgradient wells can be used to infer dilution and dispersion. In 2020, boron levels in porewater were 84.4 to 104 mg/L and < 0.7 mg/L in downgradient wells. Therefore, it is likely that physical attenuation accounts for a decrease in concentration of at least two orders of magnitude between porewater and groundwater at downgradient wells.

Based on these findings, cobalt is considered to be a candidate for an MNA remedy application and deemed to meet the criteria for Tier II MNA in accordance with USEPA guidance (USEPA 2007a and 2007b).

## 6.0 TIER III EVALUATION

According to USEPA (USEPA 2007a), the purpose of the Tier III Evaluation is to eliminate sites for an MNA remedy where (1) "Capacity of the aquifer is insufficient to attenuate the COC mass to regulatory standards" and/or (2) "Stability of the immobilized COC is insufficient to prevent remobilization due to future changes in groundwater chemistry". Based on this definition, the following observations support MNA as a viable corrective measure for the FGD Ponds:

- **Adsorption Capacity Modeling:** Predictive modeling has demonstrated that porewater concentrations of cobalt could increase to 0.044 mg/L and yet result in concentrations at downgradient monitoring wells below its GWPS in a reasonable time frame. The time frame is defined here as "reasonable" when it is comparable to time frames associated with other active remediation options described in an assessment of corrective measures (Golder 2019a; ITRC 2010). However, cobalt concentrations in porewater samples from the FGD Ponds only reached detectable levels once (0.00625 mg/L) and always remained below the GWPS (0.016 mg/L). Therefore, based on the current concentrations in the FGD Ponds, the current concentrations observed in downgradient monitoring wells, and the anticipated source control activities, it is concluded that the combined long-term attenuation from sorption, dilution, and dispersion is sufficient to attenuate the cobalt mass in the FGD Ponds to concentrations below the GWPS. In addition to aluminum and iron oxyhydroxides, cobalt is known to be attenuated by other sorbents (e.g., manganese (hydr)oxides, clay minerals, and particulate organic matter) not included in the modeling, providing additional sorption capacity at the FGD Ponds.
- **Stability of Constituents:** Reactive transport modeling indicates that the pH and Eh (i.e. the factors controlling adsorption, which is the primary attenuation mechanism) will remain stable over time. As such, both the sorption effectiveness as well as the stability of the ferrihydrite adsorptive surfaces will remain constant. The stability of gibbsite, another adsorptive surface considered in the modeling, is less dependent on pH and Eh and will remain constant within the expected range of groundwater conditions. The total aluminum and iron contents in aquifer solids, based on the Tier I Evaluation (Golder 2019b), range from 30,000 to 42,000 mg/kg and 5,000 to 9,000 mg/kg, respectively (by SEP Total), indicating a significant reservoir potentially available for attenuation, and a reservoir that is resilient to changes in pH and Eh. It should be noted that there is no historical basis to expect large future deviations in groundwater pH and/or redox conditions.

## 7.0 CONCLUSION

This report presents the results of a Tier II and III Evaluation conducted to determine the feasibility of using MNA as a remedial strategy for cobalt at the FGD Ponds. This evaluation has been completed in accordance with guidance and best practices promulgated by the USEPA (USEPA 2007a and 2007b) and the ITRC (ITRC 2010). Based on the results of this evaluation, the following is concluded regarding cobalt:

- Physical and chemical attenuation of cobalt is occurring. Cobalt levels are stable, and the aquifer has adequate capacity to attenuate cobalt in a reasonable timeframe. Modeling indicates that cobalt attenuation will be efficient and stable in the long term. Cobalt in porewater is well below the level that is observed in groundwater, including when a periodic exceedance occurs in downgradient groundwater. Therefore, cobalt is considered a candidate for MNA at the FGD Ponds.

It is recommended that a Tier IV Evaluation be completed to design a long-term MNA monitoring plan in the event that MNA is selected as the final remedy for cobalt at the FGD Ponds.

# Signature Page

**Golder Associates Inc.**

PJ Nolan, PhD
*Senior Project Geochemist*

Patrick J. Behling, PE
*Principal Engineer*

William F. Vienne
*Senior Hydrogeologist*

PJN/PJB/sb

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https://golderassociates.sharepoint.com/sites/127388/project files/5 technical work/1000-oak grove fgd ponds/tier 2 report/final ogses tier ii&iii eval.docx

# 8.0 REFERENCES


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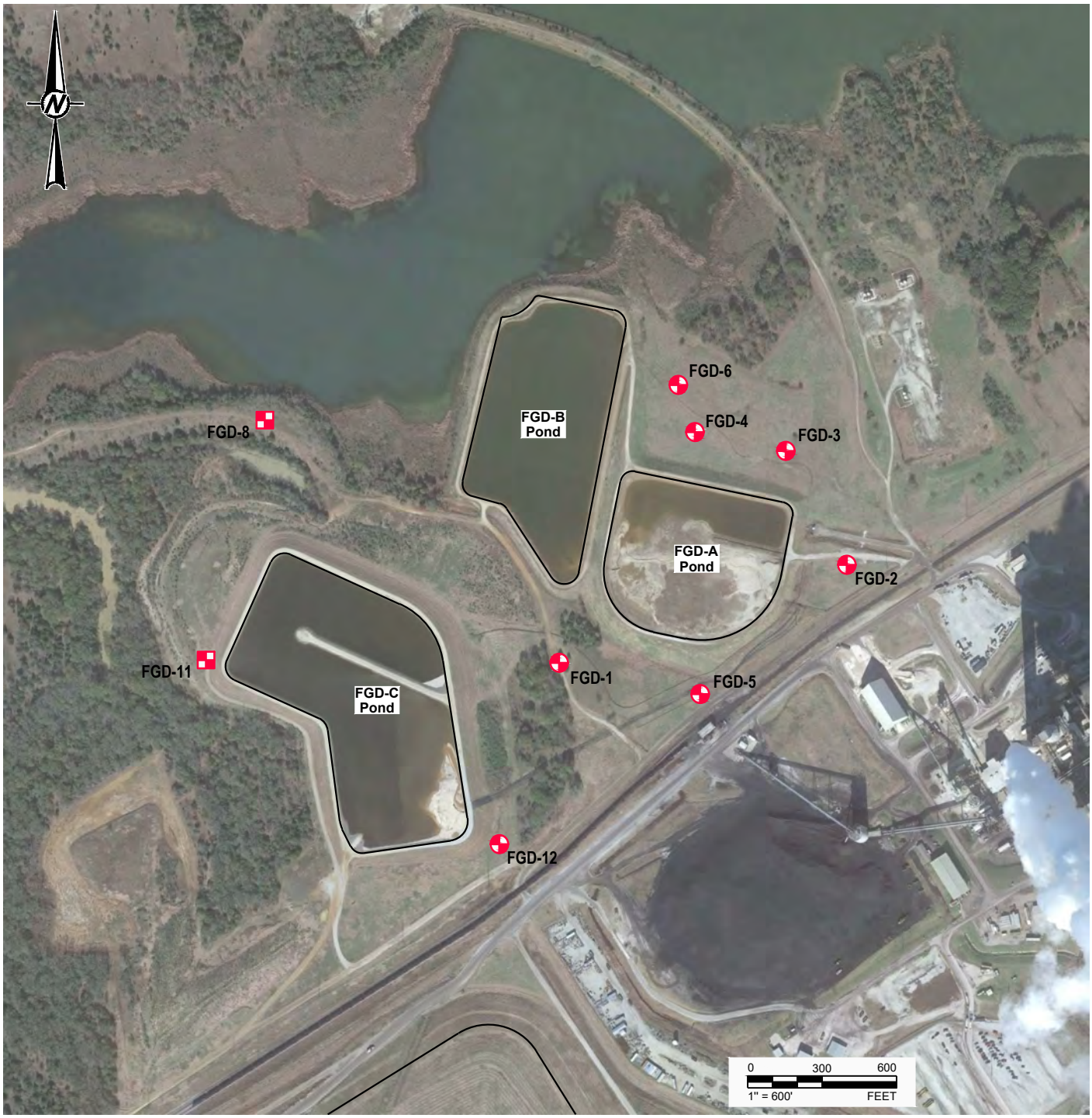
# Figures




**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

CLIENT
LUMINANT
OAK GROVE SES
FGD PONDS AREA

PROJECT
TIER II AND TIER III MNA GEOCHEMICAL EVALUATION

TITLE
**SITE LOCATION MAP**

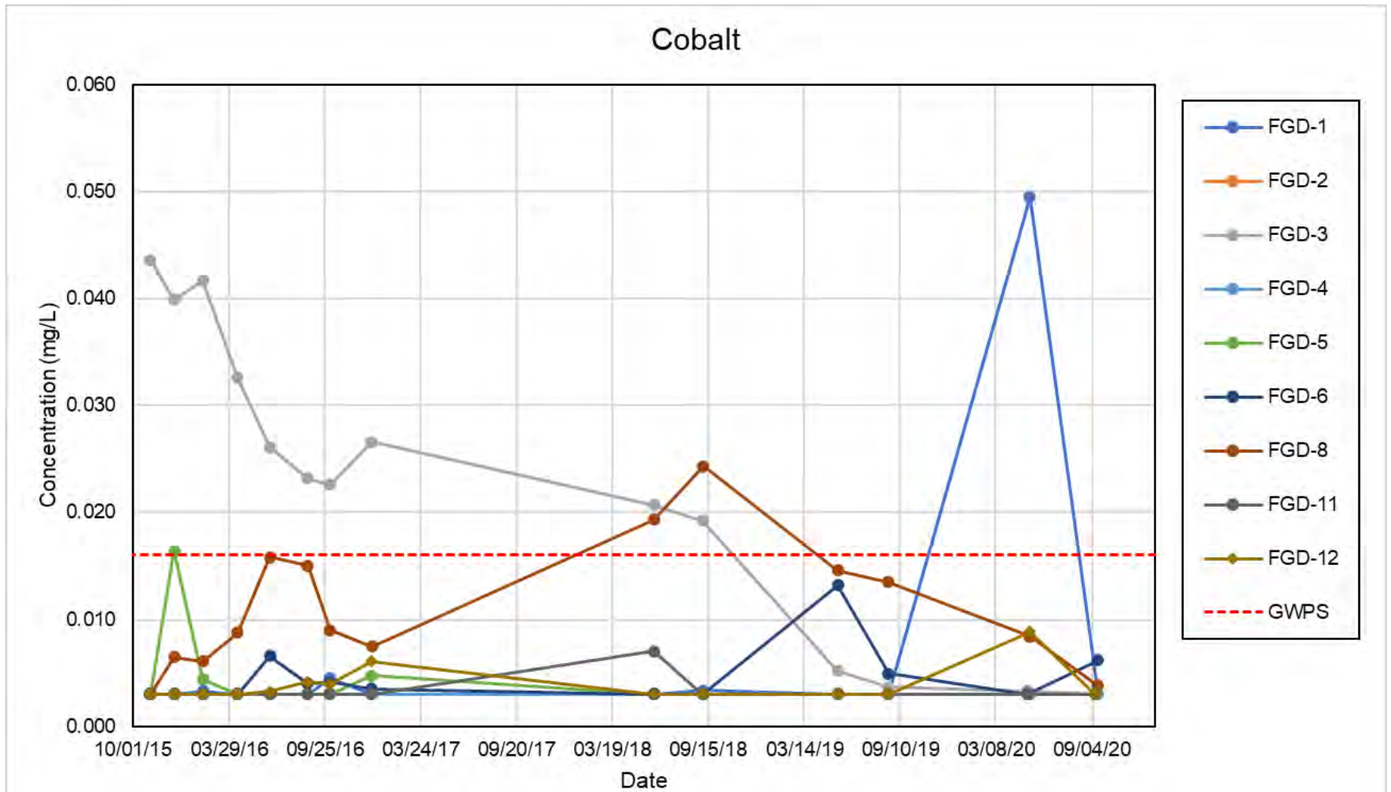
CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

PROJECT NO. 19134019 | REV. 0 | EXHIBIT 1



Last Edited By: adiamond Date: 2020-01-23 Time:9:34:07 AM | Printed By: adiamond Date: 2020-01-23 Time:9:34:57 AM
Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (FGD Pond Area).dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A




CLIENT
**LUMINANT**
**OAK GROVE SES**
**FGD PONDS AREA**

CONSULTANT
GOLDER

PROJECT
**TIER II AND TIER III MNA GEOCHEMICAL EVALUATION**

TITLE
**CONSTITUENT TRENDS**

| PROJECT NO. | PHASE | REV. | FIGURE |
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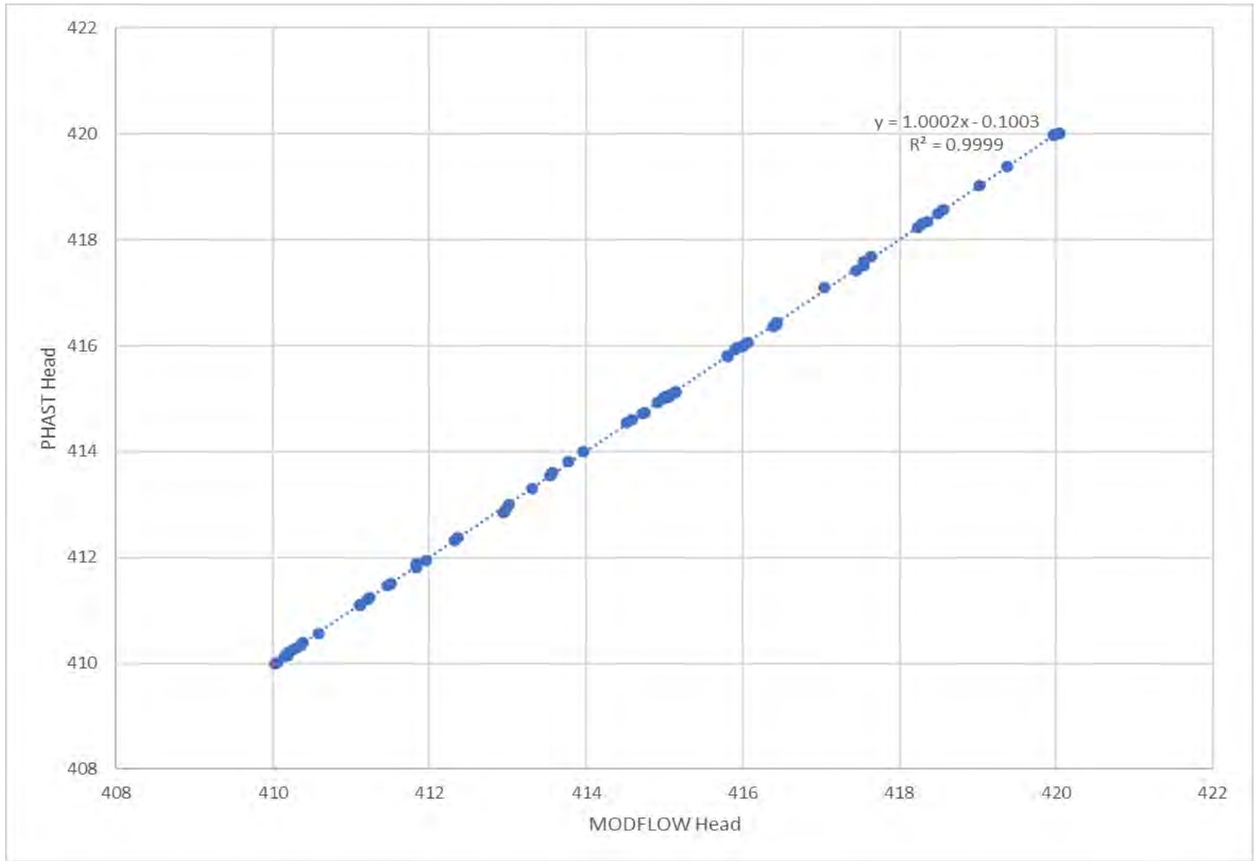


CLIENT
**LUMINANT**
**OAK GROVE SES**
**FGD PONDS AREA**

CONSULTANT

GOLDER

PROJECT
**TIER II AND TIER III MNA GEOCHEMICAL EVALUATION**

TITLE
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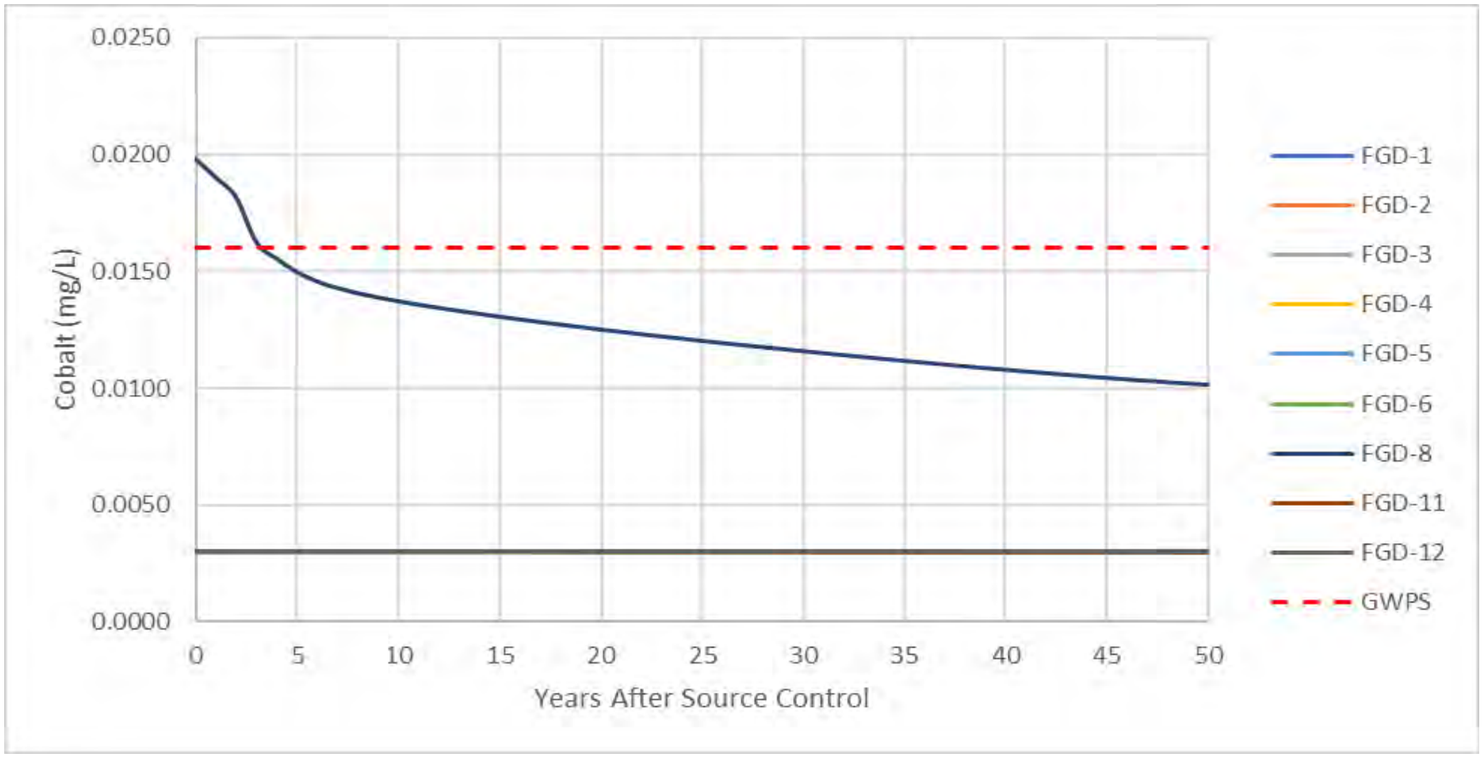



CLIENT
**LUMINANT**
**OAK GROVE SES**
**FGD PONDS AREA**

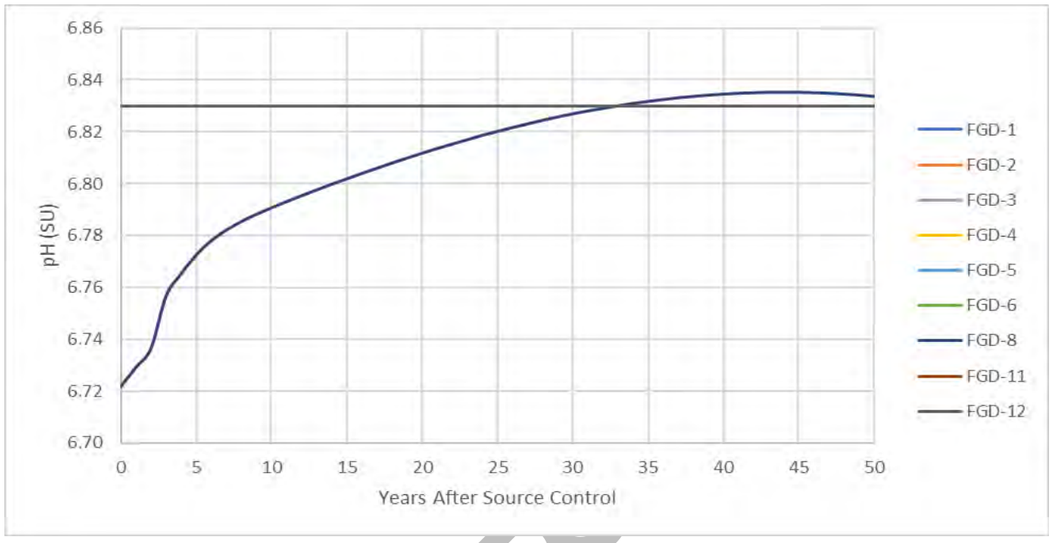
CONSULTANT
GOLDER

PROJECT
**TIER II AND TIER III MNA GEOCHEMICAL EVALUATION**

TITLE
**GEOCHEMICAL MODELING RESULTS FOR COBALT**

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19134019 | 2000 | | 3 |

**(4)**

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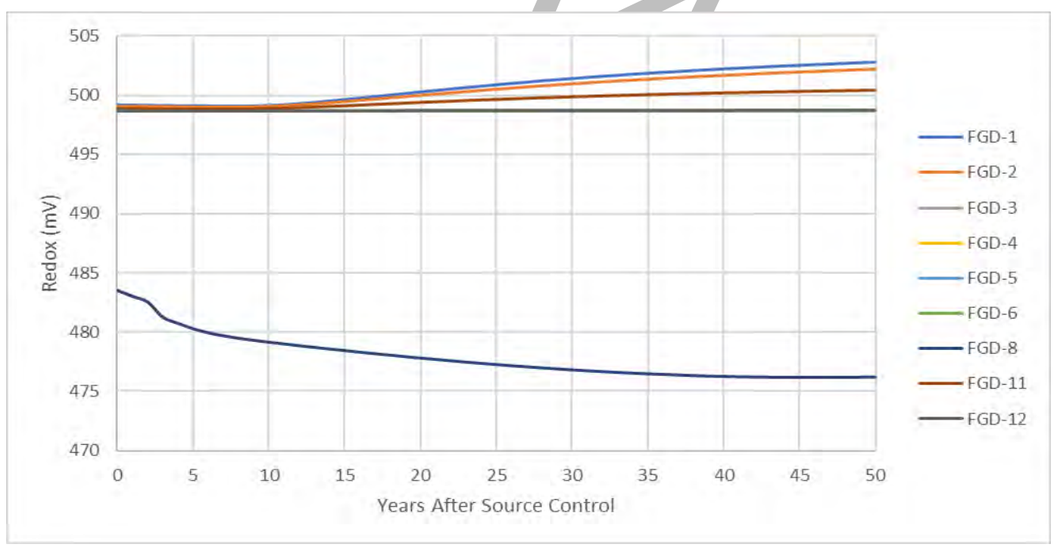


CLIENT
**LUMINANT**
**OAK GROVE SES**
**FGD PONDS AREA**

CONSULTANT
GOLDER

PROJECT
**TIER II AND TIER III MNA GEOCHEMICAL EVALUATION**

TITLE
**GEOCHEMICAL MODELING RESULTS FOR (4) pH AND (5) REDOX**

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19134019 | 2000 | | 4&5 |

**APPENDIX A**

# Laboratory Analytical Reports

September 25, 2019

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1908215

RE: Luminant-OGSES FGD Ponds

Dear Will Vienne:

DHL Analytical, Inc. received 12 sample(s) on 8/21/2019 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-19-24

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 85731

# CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 8-20-19 PAGE 1 OF 1
PO #: 19122262-F DHL WORK ORDER #: 1908215
PROJECT LOCATION OR NAME: LUMINANT - OGSES FGD PONDS
CLENT PROJECT #: 19122262-F COLLECTOR: J BEAUTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] | TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ | GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ | VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ | SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ | 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ | 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ | 8321 HERB ☐ T PHOS, AMMONIA ☐ | METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ ☐ | RCRA ☐ TX11 ☐ ☐ | PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ | CHLORIDE ☐ ANIONS ☐ | TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ | TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ | RCI ☐ FLASHPOINT ☐ DGAS ☐ | TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐ | APPENDIX III & IV

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ☐ NaOH ☐ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 01 | 8-19-19 | 0735 | W | P | 4 | | | | | | X | |
| FGD-3 | 02 | | 0825 | W | P | 4 | | | | | | X | |
| FGD-2 | 03 | | 0915 | W | P | 4 | | | | | | X | |
| FGD-5 | 04 | | 1000 | W | P | 4 | | | | | | X | |
| DUP-1 | 05 | | 1000 | W | P | 4 | | | | | | X | |
| FGD-8 | 06 | | 1100 | W | P | 4 | | | | | | X | |
| FGD-1 | 07 | | 1205 | W | P | 4 | | | | | | X | |
| FGD-14 | 08 | | 1315 | W | P | 4 | | | | | | X | |
| FGD-4 | 09 | | 1415 | W | P | 4 | | | | | | X | |
| FGD-11 | 10 | | 1520 | W | P | 4 | | | | | | X | |
| FGD-12 | 11 | | 1625 | W | P | 4 | | | | | | X | |
| FGD-15 | 12 | | 1730 | W | P | 4 | | | | | | X | |

RELINQUISHED BY: (Signature) DATE/TIME 8-20-19 1945 RECEIVED BY: (Signature) FEDEX
RELINQUISHED BY: (Signature) FEDEX DATE/TIME 8/21/19 9:19 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

☐ DHL DISPOSAL @ $5.00 each ☐ Return

**TURN AROUND TIME**
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ _____

**LABORATORY USE ONLY:**
RECEIVING TEMP: 2.2/1.0/3.2.C THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

ORIGIN ID:OKCA (512) 671-3434
J BRAYTON
GOLDER
2201 DOUBLE CREEK DR STE 4004
ROUND ROCK, TX 78664
UNITED STATES US
SHIP DATE: 20AUG19
ACTWGT: 60.00 LB
CAD: 006994696/SSFE2010
DIMS: 29x15x12 IN
BILL THIRD PARTY
TO DHL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664
(512) 388-8222
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DEPT:
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1 of 3
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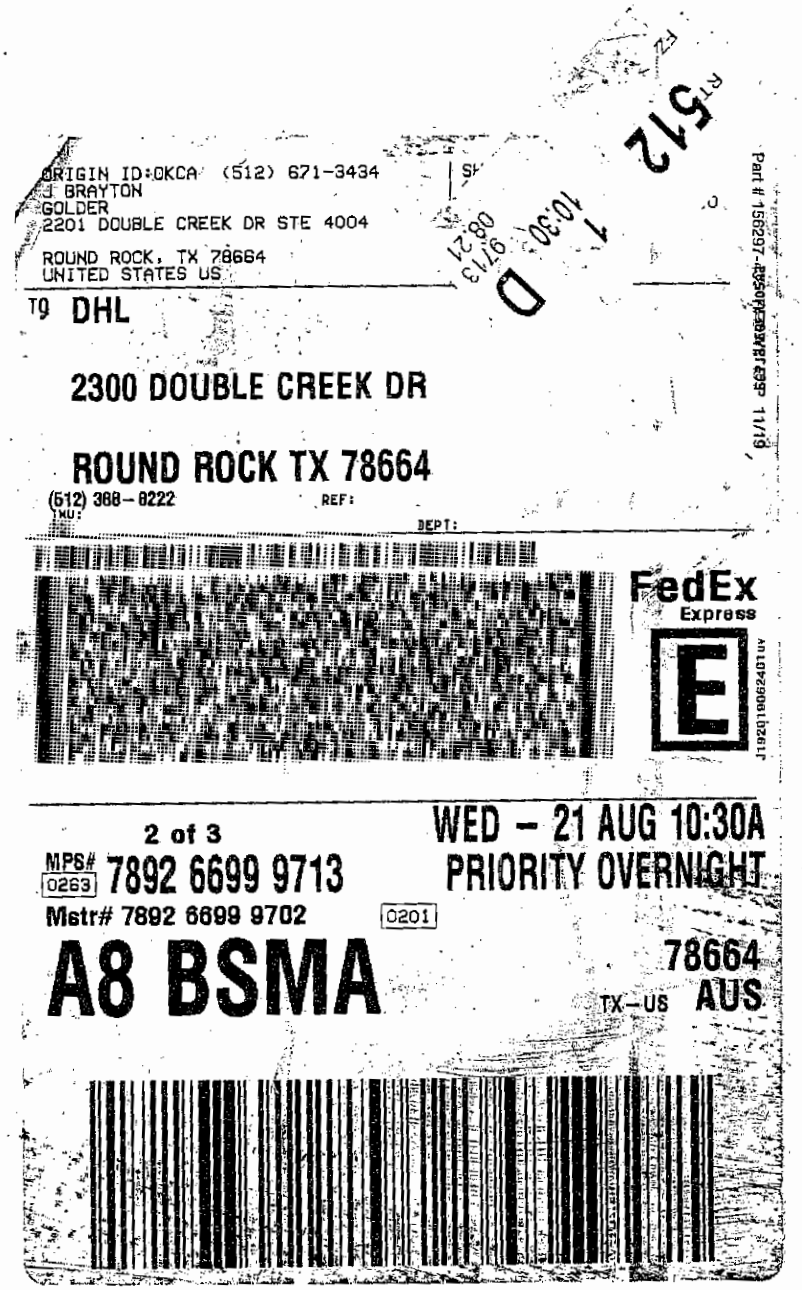
TX-US AUS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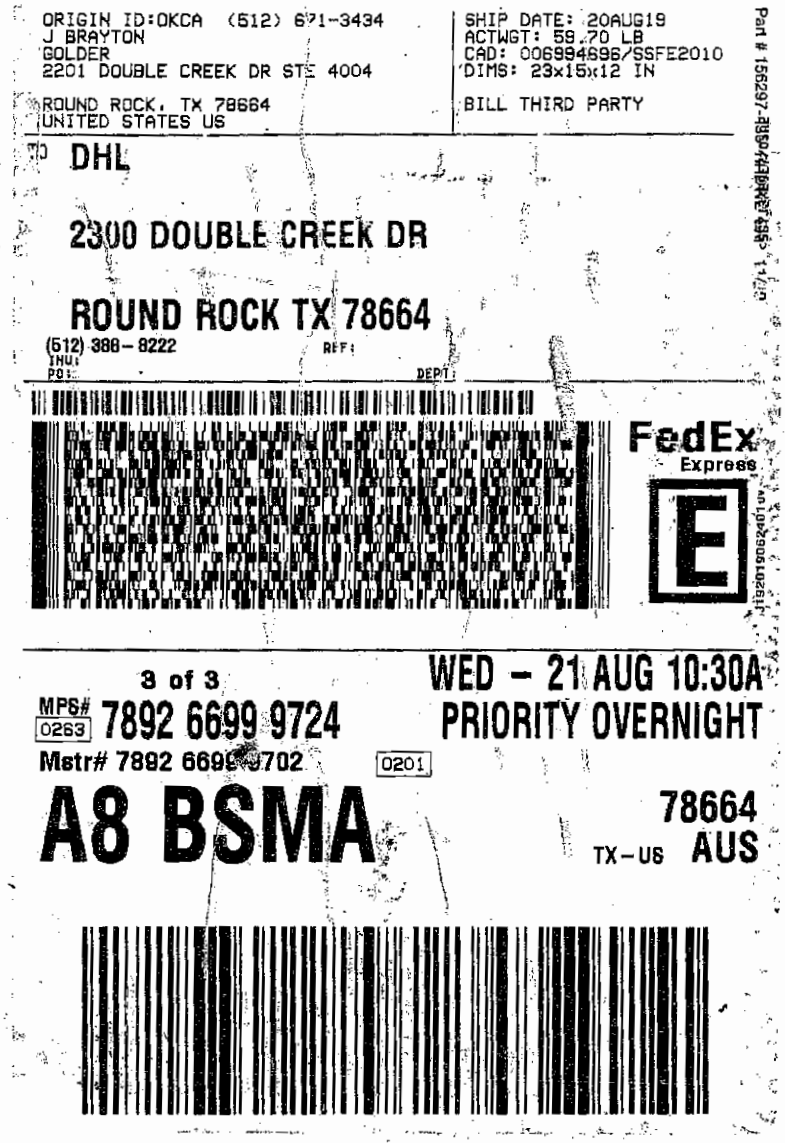
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78664
TX-US AUS

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name Golder | Date Received: 8/21/2019

Work Order Number 1908215 | Received by JW

Checklist completed by: _____ (Signature) 8/21/2019 (Date) | Reviewed by PL (Initials) 8/21/2019 (Date)

Carrier name FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 2.2 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? no | | Checked by CC |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

## Laboratory Name: DHL Analytical, Inc.

## Laboratory Review Checklist: Reportable Data

| | |
|---|---|
| **Project Name:** Luminant-OGSES FGD Ponds | **LRC Date:** 9/25/19 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 1908215 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | **X** | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | **X** | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | **X** | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | **X** | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | **X** | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | **X** | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | **X** | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | **X** | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | **X** | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | **X** | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | **X** | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | **X** | | |
| | | **9)** If required for the project, TICs reported? | | | **X** | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | **X** | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | **X** | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | **X** | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | **X** | | | | |
| | | **4)** Were blank concentrations < MDL? | **X** | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | **X** | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | **X** | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | **X** | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | **X** | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | **X** | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | **X** | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | **X** | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | **X** | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | **X** | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | | | **X** | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | | | **X** | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | | | **X** | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | **X** | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | **X** | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | **X** | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | **X** | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | **X** | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | **X** | | | | |

## Laboratory Name: DHL Analytical, Inc.

## Laboratory Review Checklist (continued): Supporting Data

| | |
|---|---|
| **Project Name:** Luminant-OGSES FGD Ponds | **LRC Date:** 9/25/19 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 1908215 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | **X** | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | **X** | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | **X** | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | **X** | | | | |
| | | **5)** Are ICAL data available for all instruments used? | **X** | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | **X** | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | **X** | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | **X** | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | **X** | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | **X** | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | **X** | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | **X** | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | **X** | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | **X** | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | **X** | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | **X** | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | **X** | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | **X** | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | **X** | | | **S9-01** |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | **X** | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | **X** | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | **X** | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | **X** | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | **X** | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | **X** | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | **X** | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | **X** | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | **X** | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

09/25/19

Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *25-Sep-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD Ponds
**Lab Order:** 1908215

# CASE NARRATIVE

Samples were analyzed using the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis

Exception Report R1-01

The samples were received and log-in performed on 8/21/19. A total of 12 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Metals analysis performed on 8/27/19 the matrix spike and matrix spike duplicate recoveries were out of control limits for Calcium. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

For Anions analysis performed on 8/23/19 (batch 92504) the matrix spike and matrix spike duplicate recoveries (1908250-05 MS/MSD) were slightly below control limits for Chloride. These are flagged accordingly. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

Exception Report S9-01

For Metals analysis performed on 8/27/19 the RPD of the serial dilution was above control limits for Boron. This is flagged accordingly in the QC summary report. The PDS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *25-Sep-19*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD Ponds
**Lab Order:** 1908215

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 1908215-01 | FGD-6 | | 08/19/19 07:35 AM | 8/21/2019 |
| 1908215-02 | FGD-3 | | 08/19/19 08:25 AM | 8/21/2019 |
| 1908215-03 | FGD-2 | | 08/19/19 09:15 AM | 8/21/2019 |
| 1908215-04 | FGD-5 | | 08/19/19 10:00 AM | 8/21/2019 |
| 1908215-05 | DUP-1 | | 08/19/19 10:00 AM | 8/21/2019 |
| 1908215-06 | FGD-8 | | 08/19/19 11:00 AM | 8/21/2019 |
| 1908215-07 | FGD-1 | | 08/19/19 12:05 PM | 8/21/2019 |
| 1908215-08 | FGD-14 | | 08/19/19 01:15 PM | 8/21/2019 |
| 1908215-09 | FGD-4 | | 08/19/19 02:15 PM | 8/21/2019 |
| 1908215-10 | FGD-11 | | 08/19/19 03:20 PM | 8/21/2019 |
| 1908215-11 | FGD-12 | | 08/19/19 04:25 PM | 8/21/2019 |
| 1908215-12 | FGD-15 | | 08/19/19 05:30 PM | 8/21/2019 |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1908215-01A | FGD-6 | 08/19/19 07:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-6 | 08/19/19 07:35 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-01B | FGD-6 | 08/19/19 07:35 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-6 | 08/19/19 07:35 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-6 | 08/19/19 07:35 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-02A | FGD-3 | 08/19/19 08:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-3 | 08/19/19 08:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-3 | 08/19/19 08:25 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-02B | FGD-3 | 08/19/19 08:25 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-3 | 08/19/19 08:25 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-3 | 08/19/19 08:25 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-03A | FGD-2 | 08/19/19 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-2 | 08/19/19 09:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-2 | 08/19/19 09:15 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-03B | FGD-2 | 08/19/19 09:15 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-2 | 08/19/19 09:15 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-2 | 08/19/19 09:15 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-2 | 08/19/19 09:15 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-04A | FGD-5 | 08/19/19 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-5 | 08/19/19 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-5 | 08/19/19 10:00 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-04B | FGD-5 | 08/19/19 10:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-5 | 08/19/19 10:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-5 | 08/19/19 10:00 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-05A | DUP-1 | 08/19/19 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | DUP-1 | 08/19/19 10:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | DUP-1 | 08/19/19 10:00 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-05B | DUP-1 | 08/19/19 10:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1908215-05B | DUP-1 | 08/19/19 10:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | DUP-1 | 08/19/19 10:00 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-06A | FGD-8 | 08/19/19 11:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-8 | 08/19/19 11:00 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-8 | 08/19/19 11:00 AM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-06B | FGD-8 | 08/19/19 11:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-8 | 08/19/19 11:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-8 | 08/19/19 11:00 AM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-8 | 08/19/19 11:00 AM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-07A | FGD-1 | 08/19/19 12:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-1 | 08/19/19 12:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-1 | 08/19/19 12:05 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-07B | FGD-1 | 08/19/19 12:05 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-1 | 08/19/19 12:05 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-1 | 08/19/19 12:05 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-08A | FGD-14 | 08/19/19 01:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-14 | 08/19/19 01:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-14 | 08/19/19 01:15 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-08B | FGD-14 | 08/19/19 01:15 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-14 | 08/19/19 01:15 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-14 | 08/19/19 01:15 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-09A | FGD-4 | 08/19/19 02:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-4 | 08/19/19 02:15 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-4 | 08/19/19 02:15 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-09B | FGD-4 | 08/19/19 02:15 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-4 | 08/19/19 02:15 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-4 | 08/19/19 02:15 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-10A | FGD-11 | 08/19/19 03:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 1908215-10A | FGD-11 | 08/19/19 03:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-11 | 08/19/19 03:20 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-10B | FGD-11 | 08/19/19 03:20 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-11 | 08/19/19 03:20 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-11 | 08/19/19 03:20 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-11 | 08/19/19 03:20 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-11A | FGD-12 | 08/19/19 04:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-12 | 08/19/19 04:25 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-11B | FGD-12 | 08/19/19 04:25 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-12 | 08/19/19 04:25 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-12 | 08/19/19 04:25 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |
| 1908215-12A | FGD-15 | 08/19/19 05:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-15 | 08/19/19 05:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 08/26/19 08:34 AM | 92519 |
| | FGD-15 | 08/19/19 05:30 PM | Aqueous | SW7470A | Mercury Aq Prep | 08/22/19 11:17 AM | 92489 |
| 1908215-12B | FGD-15 | 08/19/19 05:30 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-15 | 08/19/19 05:30 PM | Aqueous | E300 | Anion Preparation | 08/22/19 09:48 AM | 92485 |
| | FGD-15 | 08/19/19 05:30 PM | Aqueous | E300 | Anion Preparation | 08/23/19 09:53 AM | 92504 |
| | FGD-15 | 08/19/19 05:30 PM | Aqueous | M2540C | TDS Preparation | 08/22/19 01:31 PM | 92494 |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1908215-01A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:05 AM | CETAC2_HG_190823A |
| | FGD-6 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 10:55 AM | ICP-MS4_190827B |
| 1908215-01B | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 11:55 AM | IC4_190822A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 05:42 PM | IC4_190822A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-02A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:07 AM | CETAC2_HG_190823A |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 10:57 AM | ICP-MS4_190827B |
| | FGD-3 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:09 PM | ICP-MS4_190827B |
| 1908215-02B | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 12:11 PM | IC4_190822A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 05:58 PM | IC4_190822A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-03A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:09 AM | CETAC2_HG_190823A |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 10:59 AM | ICP-MS4_190827B |
| | FGD-2 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:11 PM | ICP-MS4_190827B |
| 1908215-03B | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 12:27 PM | IC4_190822A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 92485 | 100 | 08/22/19 04:06 PM | IC4_190822A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 06:14 PM | IC4_190822A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-04A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:11 AM | CETAC2_HG_190823A |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 10:51 AM | ICP-MS4_190827B |
| | FGD-5 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:05 PM | ICP-MS4_190827B |
| 1908215-04B | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 12:43 PM | IC4_190822A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 06:30 PM | IC4_190822A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-05A | DUP-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:14 AM | CETAC2_HG_190823A |
| | DUP-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:13 PM | ICP-MS4_190827B |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1908215-05A | DUP-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:01 AM | ICP-MS4_190827B |
| 1908215-05B | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 12:59 PM | IC4_190822A |
| | DUP-1 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 09:10 PM | IC4_190822A |
| | DUP-1 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-06A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:16 AM | CETAC2_HG_190823A |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:03 AM | ICP-MS4_190827B |
| | FGD-8 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 50 | 08/27/19 12:15 PM | ICP-MS4_190827B |
| 1908215-06B | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 01:15 PM | IC4_190822A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 92485 | 100 | 08/22/19 04:22 PM | IC4_190822A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 09:26 PM | IC4_190822A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-07A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:23 AM | CETAC2_HG_190823A |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:05 AM | ICP-MS4_190827B |
| | FGD-1 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 5 | 08/27/19 12:17 PM | ICP-MS4_190827B |
| 1908215-07B | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 01:31 PM | IC4_190822A |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 09:42 PM | IC4_190822A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-08A | FGD-14 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:25 AM | CETAC2_HG_190823A |
| | FGD-14 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:19 PM | ICP-MS4_190827B |
| | FGD-14 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:07 AM | ICP-MS4_190827B |
| 1908215-08B | FGD-14 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 01:47 PM | IC4_190822A |
| | FGD-14 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 09:58 PM | IC4_190822A |
| | FGD-14 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-09A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:27 AM | CETAC2_HG_190823A |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:09 AM | ICP-MS4_190827B |
| | FGD-4 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:21 PM | ICP-MS4_190827B |

**Lab Order:** 1908215
**Client:** Golder
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 1908215-09B | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 02:03 PM | IC4_190822A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 10:14 PM | IC4_190822A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-10A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:30 AM | CETAC2_HG_190823A |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:11 AM | ICP-MS4_190827B |
| | FGD-11 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 10 | 08/27/19 12:23 PM | ICP-MS4_190827B |
| 1908215-10B | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 02:19 PM | IC4_190822A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 92485 | 100 | 08/22/19 04:38 PM | IC4_190822A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 10:30 PM | IC4_190822A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-11A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:32 AM | CETAC2_HG_190823A |
| | FGD-12 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:32 AM | ICP-MS4_190827B |
| 1908215-11B | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 04:54 PM | IC4_190822A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 10:46 PM | IC4_190822A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |
| 1908215-12A | FGD-15 | Aqueous | SW7470A | Mercury Total: Aqueous | 92489 | 1 | 08/23/19 11:34 AM | CETAC2_HG_190823A |
| | FGD-15 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 1 | 08/27/19 11:34 AM | ICP-MS4_190827B |
| | FGD-15 | Aqueous | SW6020A | Trace Metals: ICP-MS - Water | 92519 | 50 | 08/27/19 12:25 PM | ICP-MS4_190827B |
| 1908215-12B | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 92485 | 10 | 08/22/19 05:10 PM | IC4_190822A |
| | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 92485 | 1 | 08/22/19 11:02 PM | IC4_190822A |
| | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 92504 | 100 | 08/23/19 05:00 PM | IC4_190823A |
| | FGD-15 | Aqueous | M2540C | Total Dissolved Solids | 92494 | 1 | 08/22/19 03:40 PM | WC_190822A |

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-01 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 07:35 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 10:55 AM |
| Arsenic | 0.0146 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:55 AM |
| Barium | 0.0903 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 10:55 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:55 AM |
| Boron | 0.102 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 10:55 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:55 AM |
| Calcium | 23.6 | 0.100 | 0.300 | | mg/L | 1 | 08/27/19 10:55 AM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:55 AM |
| Cobalt | 0.00493 | 0.00300 | 0.00500 | J | mg/L | 1 | 08/27/19 10:55 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:55 AM |
| Lithium | 0.00820 | 0.00500 | 0.0100 | J | mg/L | 1 | 08/27/19 10:55 AM |
| Molybdenum | 0.00332 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 10:55 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:55 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 10:55 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:05 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 158 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 11:55 AM |
| Fluoride | 0.741 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 05:42 PM |
| Sulfate | 60.3 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 05:42 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 754 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-02 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 08:25 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 10:57 AM |
| Arsenic | 0.00248 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 10:57 AM |
| Barium | 0.0365 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 10:57 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:57 AM |
| Boron | 0.134 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 10:57 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:57 AM |
| Calcium | 51.1 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:09 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:57 AM |
| Cobalt | 0.00364 | 0.00300 | 0.00500 | J | mg/L | 1 | 08/27/19 10:57 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:57 AM |
| Lithium | 0.0546 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 10:57 AM |
| Molybdenum | 0.00231 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 10:57 AM |
| Selenium | 0.0245 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:57 AM |
| Thallium | 0.000588 | 0.000500 | 0.00150 | J | mg/L | 1 | 08/27/19 10:57 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:07 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 84.9 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 12:11 PM |
| Fluoride | 0.874 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 05:58 PM |
| Sulfate | 150 | 10.0 | 30.0 | | mg/L | 10 | 08/22/19 12:11 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 882 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-03 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 09:15 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 10:59 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:59 AM |
| Barium | 0.181 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 10:59 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:59 AM |
| Boron | 0.192 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 10:59 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:59 AM |
| Calcium | 167 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:11 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:59 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 10:59 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:59 AM |
| Lithium | 0.0257 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 10:59 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:59 AM |
| Selenium | 0.0249 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:59 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 10:59 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:09 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 863 | 30.0 | 100 | | mg/L | 100 | 08/22/19 04:06 PM |
| Fluoride | 0.413 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 06:14 PM |
| Sulfate | 218 | 10.0 | 30.0 | | mg/L | 10 | 08/22/19 12:27 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1890 | 50.0 | 50.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-04 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 10:00 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 10:51 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:51 AM |
| Barium | 0.106 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 10:51 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:51 AM |
| Boron | 0.114 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 10:51 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:51 AM |
| Calcium | 90.7 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:05 PM |
| Chromium | 0.0103 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:51 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 10:51 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 10:51 AM |
| Lithium | 0.152 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 10:51 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:51 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 10:51 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 10:51 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:11 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 283 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 12:43 PM |
| Fluoride | 0.863 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 06:30 PM |
| Sulfate | 70.7 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 06:30 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 816 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | DUP-1 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-05 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 10:00 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:01 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:01 AM |
| Barium | 0.0972 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:01 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:01 AM |
| Boron | 0.112 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:01 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:01 AM |
| Calcium | 91.0 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:13 PM |
| Chromium | 0.0115 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:01 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:01 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:01 AM |
| Lithium | 0.151 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:01 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:01 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:01 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:01 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:14 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 283 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 12:59 PM |
| Fluoride | 0.915 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 09:10 PM |
| Sulfate | 70.1 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 09:10 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 816 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-06 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 11:00 AM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:03 AM |
| Arsenic | 0.00645 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:03 AM |
| Barium | 0.608 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:03 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:03 AM |
| Boron | 0.0756 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:03 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:03 AM |
| Calcium | 427 | 5.00 | 15.0 | | mg/L | 50 | 08/27/19 12:15 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:03 AM |
| Cobalt | 0.0135 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:03 AM |
| Lead | 0.00134 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:03 AM |
| Lithium | 0.0144 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:03 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:03 AM |
| Selenium | 0.00252 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 11:03 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:03 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:16 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 2260 | 30.0 | 100 | | mg/L | 100 | 08/22/19 04:22 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 09:26 PM |
| Sulfate | 452 | 10.0 | 30.0 | | mg/L | 10 | 08/22/19 01:15 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 4600 | 50.0 | 50.0 | | mg/L | 1 | 08/22/19 03:40 PM |

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DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-07 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 12:05 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:05 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:05 AM |
| Barium | 0.0538 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:05 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:05 AM |
| Boron | 0.0864 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:05 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:05 AM |
| Calcium | 26.1 | 0.500 | 1.50 | | mg/L | 5 | 08/27/19 12:17 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:05 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:05 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:05 AM |
| Lithium | 0.0441 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:05 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:05 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:05 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:05 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:23 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 69.3 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 01:31 PM |
| Fluoride | 0.486 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 09:42 PM |
| Sulfate | 80.9 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 09:42 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 328 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

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- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

See Final Page of Report for MQLs and MDLs

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-14 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-08 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 01:15 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:07 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:07 AM |
| Barium | 0.426 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:07 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:07 AM |
| Boron | 0.0714 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:07 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:07 AM |
| Calcium | 84.4 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:19 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:07 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:07 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:07 AM |
| Lithium | 0.00542 | 0.00500 | 0.0100 | J | mg/L | 1 | 08/27/19 11:07 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:07 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:07 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:07 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:25 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 387 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 01:47 PM |
| Fluoride | 0.318 | 0.100 | 0.400 | J | mg/L | 1 | 08/22/19 09:58 PM |
| Sulfate | 33.2 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 09:58 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 925 | 50.0 | 50.0 | | mg/L | 1 | 08/22/19 03:40 PM |

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- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-09 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 02:15 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:09 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:09 AM |
| Barium | 0.100 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:09 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:09 AM |
| Boron | 0.0850 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:09 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:09 AM |
| Calcium | 42.5 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:21 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:09 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:09 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:09 AM |
| Lithium | 0.0190 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:09 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:09 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:09 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:09 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:27 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 188 | 3.00 | 10.0 | | mg/L | 10 | 08/22/19 02:03 PM |
| Fluoride | 0.670 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 10:14 PM |
| Sulfate | 55.4 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 10:14 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 681 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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- DF- Dilution Factor
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- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
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- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-10 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 03:20 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:11 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:11 AM |
| Barium | 0.310 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:11 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:11 AM |
| Boron | 0.120 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:11 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:11 AM |
| Calcium | 92.5 | 1.00 | 3.00 | | mg/L | 10 | 08/27/19 12:23 PM |
| Chromium | 0.00391 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 11:11 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:11 AM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:11 AM |
| Lithium | 0.0136 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:11 AM |
| Molybdenum | 0.00238 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 11:11 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:11 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:11 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:30 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 535 | 30.0 | 100 | | mg/L | 100 | 08/22/19 04:38 PM |
| Fluoride | 0.630 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 10:30 PM |
| Sulfate | 44.7 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 10:30 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1430 | 50.0 | 50.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

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- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-11 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 04:25 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:32 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:32 AM |
| Barium | 0.0631 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:32 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:32 AM |
| Boron | 0.0794 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:32 AM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:32 AM |
| Calcium | 10.5 | 0.100 | 0.300 | | mg/L | 1 | 08/27/19 11:32 AM |
| Chromium | 0.00218 | 0.00200 | 0.00500 | J | mg/L | 1 | 08/27/19 11:32 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:32 AM |
| Lead | 0.00139 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:32 AM |
| Lithium | 0.0251 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:32 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:32 AM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:32 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:32 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:32 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 16.1 | 0.300 | 1.00 | | mg/L | 1 | 08/22/19 10:46 PM |
| Fluoride | 0.145 | 0.100 | 0.400 | J | mg/L | 1 | 08/22/19 10:46 PM |
| Sulfate | 17.1 | 1.00 | 3.00 | | mg/L | 1 | 08/22/19 10:46 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 209 | 10.0 | 10.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *25-Sep-19*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-15 |
| **Project:** | Luminant-OGSES FGD Ponds | **Lab ID:** | 1908215-12 |
| **Project No:** | 19122262-F | **Collection Date:** | 08/19/19 05:30 PM |
| **Lab Order:** | 1908215 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020A** | | | | | Analyst: **SP** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 08/27/19 11:34 AM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:34 AM |
| Barium | 0.0236 | 0.00300 | 0.0100 | | mg/L | 1 | 08/27/19 11:34 AM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 08/27/19 11:34 AM |
| Boron | 0.631 | 0.0100 | 0.0300 | | mg/L | 1 | 08/27/19 11:34 AM |
| Cadmium | 0.000838 | 0.000300 | 0.00100 | J | mg/L | 1 | 08/27/19 11:34 AM |
| Calcium | 335 | 5.00 | 15.0 | | mg/L | 50 | 08/27/19 12:25 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:34 AM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 08/27/19 11:34 AM |
| Lead | 0.000934 | 0.000300 | 0.00100 | J | mg/L | 1 | 08/27/19 11:34 AM |
| Lithium | 0.0823 | 0.00500 | 0.0100 | | mg/L | 1 | 08/27/19 11:34 AM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:34 AM |
| Selenium | 0.0221 | 0.00200 | 0.00500 | | mg/L | 1 | 08/27/19 11:34 AM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 08/27/19 11:34 AM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 08/23/19 11:34 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 1030 | 30.0 | 100 | | mg/L | 100 | 08/23/19 05:00 PM |
| Fluoride | 0.483 | 0.100 | 0.400 | | mg/L | 1 | 08/22/19 11:02 PM |
| Sulfate | 985 | 10.0 | 30.0 | | mg/L | 10 | 08/22/19 05:10 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 3180 | 50.0 | 50.0 | | mg/L | 1 | 08/22/19 03:40 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190611B**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID **DCS-91284** | Batch ID: **91284** | TestNo: **SW7470A** | Units: **mg/L** |
| SampType: **DCS** | Run ID: **CETAC2_HG_190611** | Analysis Date: **6/11/2019 5:01:26 PM** | Prep Date: **6/11/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.000206 | 0.000200 | 0.000200 | 0 | 103 | 82 | 119 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190823A**

The QC data in batch 92489 applies to the following samples: 1908215-01A, 1908215-02A, 1908215-03A, 1908215-04A, 1908215-05A, 1908215-06A, 1908215-07A, 1908215-08A, 1908215-09A, 1908215-10A, 1908215-11A, 1908215-12A

| Sample ID | **MB-92489** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:37:58 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID | **LCS-92489** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:42:30 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00188 | 0.000200 | 0.00200 | 0 | 94.0 | 85 | 115 | | | |

| Sample ID | **LCSD-92489** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:44:46 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00186 | 0.000200 | 0.00200 | 0 | 93.0 | 85 | 115 | 1.07 | 15 | |

| Sample ID | **1908173-01B MS** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:49:18 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00940 | 0.00100 | 0.0100 | 0 | 94.0 | 80 | 120 | | | |

| Sample ID | **1908173-01B MSD** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:51:33 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00915 | 0.00100 | 0.0100 | 0 | 91.5 | 80 | 120 | 2.70 | 15 | |

| Sample ID | **1908173-01B SD** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **SD** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:53:49 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.00200 | 0.00500 | 0 | 0 | | | | 0 | 10 | |

| Sample ID | **1908173-01B PDS** | Batch ID: | **92489** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **PDS** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:56:05 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0116 | 0.00100 | 0.0125 | 0 | 92.8 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_190823A**

| Sample ID | **ICV-190823** | Batch ID: | **R106002** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **ICV** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 10:33:24 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00384 | 0.000200 | 0.00400 | 0 | 96.0 | 90 | 110 | | | |

| Sample ID | **CCV1-190823** | Batch ID: | **R106002** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 11:18:47 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 90 | 110 | | | |

| Sample ID | **CCV2-190823** | Batch ID: | **R106002** | TestNo: | **SW7470A** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **CCV** | Run ID: | **CETAC2_HG_190823A** | Analysis Date: | **8/23/2019 11:39:17 AM** | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00199 | 0.000200 | 0.00200 | 0 | 99.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190621B**

| Sample ID **DCS2-91398** | Batch ID: **91398** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS4_190621B** | Analysis Date: **6/21/2019 1:24:00 PM** | Prep Date: **6/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.321 | 0.300 | 0.300 | 0 | 107 | 70 | 130 | 0 | 0 | |

| Sample ID **DCS3-91398** | Batch ID: **91398** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS4_190621B** | Analysis Date: **6/21/2019 1:27:00 PM** | Prep Date: **6/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | 0 | 0 | |
| Barium | 0.00479 | 0.0100 | 0.00500 | 0 | 95.8 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00523 | 0.00500 | 0.00500 | 0 | 105 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00564 | 0.00500 | 0.00500 | 0 | 113 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00602 | 0.0100 | 0.00500 | 0 | 120 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00480 | 0.00500 | 0.00500 | 0 | 95.9 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00569 | 0.00500 | 0.00500 | 0 | 114 | 70 | 130 | 0 | 0 | |

| Sample ID **DCS4-91398** | Batch ID: **91398** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS4_190621B** | Analysis Date: **6/21/2019 1:30:00 PM** | Prep Date: **6/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0311 | 0.0300 | 0.0300 | 0 | 104 | 70 | 130 | 0 | 0 | |

| Sample ID **DCS1-91398** | Batch ID: **91398** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS4_190621B** | Analysis Date: **6/21/2019 1:34:00 PM** | Prep Date: **6/20/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.000904 | 0.00250 | 0.00100 | 0 | 90.4 | 70 | 130 | 0 | 0 | |
| Beryllium | 0.000493 | 0.00100 | 0.000500 | 0 | 98.6 | 70 | 130 | 0 | 0 | |
| Cadmium | 0.000516 | 0.00100 | 0.000500 | 0 | 103 | 70 | 130 | 0 | 0 | |
| Lead | 0.000475 | 0.00100 | 0.000500 | 0 | 95.0 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000471 | 0.00150 | 0.000500 | 0 | 94.2 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

The QC data in batch 92519 applies to the following samples: 1908215-01A, 1908215-02A, 1908215-03A, 1908215-04A, 1908215-05A, 1908215-06A, 1908215-07A, 1908215-08A, 1908215-09A, 1908215-10A, 1908215-11A, 1908215-12A

Sample ID **MB-92519** Batch ID: **92519** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS4_190827B** Analysis Date: **8/27/2019 10:43:00 AM** Prep Date: **8/26/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID **LCS-92519** Batch ID: **92519** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS4_190827B** Analysis Date: **8/27/2019 10:45:00 AM** Prep Date: **8/26/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.1 | 80 | 120 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Boron | 0.215 | 0.0300 | 0.200 | 0 | 107 | 80 | 120 | | | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Calcium | 4.93 | 0.300 | 5.00 | 0 | 98.7 | 80 | 120 | | | |
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 99.0 | 80 | 120 | | | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Selenium | 0.195 | 0.00500 | 0.200 | 0 | 97.7 | 80 | 120 | | | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.6 | 80 | 120 | | | |

Sample ID **LCSD-92519** Batch ID: **92519** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS4_190827B** Analysis Date: **8/27/2019 10:47:00 AM** Prep Date: **8/26/2019**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | 0.325 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

| Sample ID **LCSD-92519** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 10:47:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.372 | 15 | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.6 | 80 | 120 | 0.515 | 15 | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.5 | 80 | 120 | 1.57 | 15 | |
| Boron | 0.202 | 0.0300 | 0.200 | 0 | 101 | 80 | 120 | 5.99 | 15 | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 80 | 120 | 0.663 | 15 | |
| Calcium | 4.91 | 0.300 | 5.00 | 0 | 98.2 | 80 | 120 | 0.485 | 15 | |
| Chromium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.986 | 15 | |
| Cobalt | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | 1.01 | 15 | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 98.8 | 80 | 120 | 0.219 | 15 | |
| Lithium | 0.199 | 0.0100 | 0.200 | 0 | 99.3 | 80 | 120 | 2.71 | 15 | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.275 | 15 | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 4.26 | 15 | |
| Thallium | 0.195 | 0.00150 | 0.200 | 0 | 97.7 | 80 | 120 | 0.896 | 15 | |

| Sample ID **1908215-04A SD** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 10:53:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 10 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Barium | 0.108 | 0.0500 | 0 | 0.106 | | | | 2.23 | 10 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Boron | 0.157 | 0.150 | 0 | 0.114 | | | | 32.1 | 10 | R |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Chromium | 0.0107 | 0.0250 | 0 | 0.0103 | | | | 4.05 | 10 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 10 | |
| Lithium | 0.160 | 0.0500 | 0 | 0.152 | | | | 4.97 | 10 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 10 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 10 | |

| Sample ID **1908215-04A PDS** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:13:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.211 | 0.00250 | 0.200 | 0 | 106 | 80 | 120 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Barium | 0.301 | 0.0100 | 0.200 | 0.106 | 97.6 | 80 | 120 | | | |
| Beryllium | 0.192 | 0.00100 | 0.200 | 0 | 96.1 | 80 | 120 | | | |
| Boron | 0.301 | 0.0300 | 0.200 | 0.114 | 93.4 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

| Sample ID **1908215-04A PDS** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:13:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.4 | 80 | 120 | | | |
| Chromium | 0.216 | 0.00500 | 0.200 | 0.0103 | 103 | 80 | 120 | | | |
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lead | 0.205 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lithium | 0.329 | 0.0100 | 0.200 | 0.152 | 88.5 | 80 | 120 | | | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Selenium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | | | |

| Sample ID **1908215-04A MS** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:15:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 80 | 120 | | | |
| Barium | 0.303 | 0.0100 | 0.200 | 0.106 | 98.4 | 80 | 120 | | | |
| Beryllium | 0.189 | 0.00100 | 0.200 | 0 | 94.5 | 80 | 120 | | | |
| Boron | 0.303 | 0.0300 | 0.200 | 0.114 | 94.9 | 80 | 120 | | | |
| Cadmium | 0.192 | 0.00100 | 0.200 | 0 | 96.0 | 80 | 120 | | | |
| Calcium | 90.5 | 0.300 | 5.00 | 86.7 | 75.4 | 80 | 120 | | | S |
| Chromium | 0.207 | 0.00500 | 0.200 | 0.0103 | 98.3 | 80 | 120 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.5 | 80 | 120 | | | |
| Lead | 0.201 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Lithium | 0.335 | 0.0100 | 0.200 | 0.152 | 91.6 | 80 | 120 | | | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Selenium | 0.203 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 99.8 | 80 | 120 | | | |

| Sample ID **1908215-04A MSD** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:17:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.208 | 0.00250 | 0.200 | 0 | 104 | 80 | 120 | 1.58 | 15 | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 1.95 | 15 | |
| Barium | 0.310 | 0.0100 | 0.200 | 0.106 | 102 | 80 | 120 | 2.30 | 15 | |
| Beryllium | 0.192 | 0.00100 | 0.200 | 0 | 96.1 | 80 | 120 | 1.61 | 15 | |
| Boron | 0.307 | 0.0300 | 0.200 | 0.114 | 96.9 | 80 | 120 | 1.27 | 15 | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 98.8 | 80 | 120 | 2.81 | 15 | |
| Calcium | 92.8 | 0.300 | 5.00 | 86.7 | 122 | 80 | 120 | 2.55 | 15 | S |
| Chromium | 0.212 | 0.00500 | 0.200 | 0.0103 | 101 | 80 | 120 | 2.58 | 15 | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 2.49 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

| Sample ID **1908215-04A MSD** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:17:00 AM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | 1.47 | 15 | |
| Lithium | 0.339 | 0.0100 | 0.200 | 0.152 | 93.6 | 80 | 120 | 1.18 | 15 | |
| Molybdenum | 0.212 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | 3.60 | 15 | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 1.84 | 15 | |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 80 | 120 | 1.20 | 15 | |

| Sample ID **1908215-04A SD** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 12:07:00 PM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 90.7 | 15.0 | 0 | 90.7 | | | | 0.035 | 10 | |

| Sample ID **1908215-04A PDS** | Batch ID: **92519** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 12:27:00 PM** | Prep Date: **8/26/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 141 | 3.00 | 50.0 | 90.7 | 101 | 80 | 120 | | | |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

| Sample ID **ICV-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 10:30:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.105 | 0.00250 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Arsenic | 0.0984 | 0.00500 | 0.100 | 0 | 98.4 | 90 | 110 | | | |
| Barium | 0.101 | 0.0100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Boron | 0.108 | 0.0300 | 0.100 | 0 | 108 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.61 | 0.300 | 2.50 | 0 | 105 | 90 | 110 | | | |
| Chromium | 0.108 | 0.00500 | 0.100 | 0 | 108 | 90 | 110 | | | |
| Cobalt | 0.105 | 0.00500 | 0.100 | 0 | 105 | 90 | 110 | | | |
| Lead | 0.101 | 0.00100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Lithium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Molybdenum | 0.0968 | 0.00500 | 0.100 | 0 | 96.8 | 90 | 110 | | | |
| Selenium | 0.100 | 0.00500 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Thallium | 0.102 | 0.00150 | 0.100 | 0 | 102 | 90 | 110 | | | |

| Sample ID **LCVL-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 10:36:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00217 | 0.00250 | 0.00200 | 0 | 108 | 70 | 130 | | | |
| Arsenic | 0.00534 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Barium | 0.00530 | 0.0100 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Beryllium | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 70 | 130 | | | |
| Boron | 0.0259 | 0.0300 | 0.0200 | 0 | 129 | 70 | 130 | | | |
| Cadmium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Calcium | 0.105 | 0.300 | 0.100 | 0 | 105 | 70 | 130 | | | |
| Chromium | 0.00547 | 0.00500 | 0.00500 | 0 | 109 | 70 | 130 | | | |
| Cobalt | 0.00550 | 0.00500 | 0.00500 | 0 | 110 | 70 | 130 | | | |
| Lead | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 70 | 130 | | | |
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |
| Molybdenum | 0.00536 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Selenium | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Thallium | 0.00103 | 0.00150 | 0.00100 | 0 | 103 | 70 | 130 | | | |

| Sample ID **CCV1-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:20:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

| Sample ID **CCV1-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:20:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Boron | 0.219 | 0.0300 | 0.200 | 0 | 110 | 90 | 110 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Calcium | 4.85 | 0.300 | 5.00 | 0 | 97.0 | 90 | 110 | | | |
| Chromium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.207 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 90 | 110 | | | |
| Lithium | 0.198 | 0.0100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Molybdenum | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Selenium | 0.205 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 101 | 90 | 110 | | | |

| Sample ID **LCVL1-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:27:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00209 | 0.00250 | 0.00200 | 0 | 104 | 70 | 130 | | | |
| Arsenic | 0.00508 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00528 | 0.0100 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Beryllium | 0.000921 | 0.00100 | 0.00100 | 0 | 92.1 | 70 | 130 | | | |
| Boron | 0.0236 | 0.0300 | 0.0200 | 0 | 118 | 70 | 130 | | | |
| Cadmium | 0.00107 | 0.00100 | 0.00100 | 0 | 107 | 70 | 130 | | | |
| Calcium | 0.111 | 0.300 | 0.100 | 0 | 111 | 70 | 130 | | | |
| Chromium | 0.00533 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Cobalt | 0.00534 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Lead | 0.000965 | 0.00100 | 0.00100 | 0 | 96.5 | 70 | 130 | | | |
| Lithium | 0.0103 | 0.0100 | 0.0100 | 0 | 103 | 70 | 130 | | | |
| Molybdenum | 0.00512 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Selenium | 0.00554 | 0.00500 | 0.00500 | 0 | 111 | 70 | 130 | | | |
| Thallium | 0.000957 | 0.00150 | 0.00100 | 0 | 95.7 | 70 | 130 | | | |

| Sample ID **CCV2-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:57:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.194 | 0.00500 | 0.200 | 0 | 97.2 | 90 | 110 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Boron | 0.205 | 0.0300 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS4_190827B**

| Sample ID **CCV2-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 11:57:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.88 | 0.300 | 5.00 | 0 | 97.5 | 90 | 110 | | | |
| Chromium | 0.207 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.194 | 0.00100 | 0.200 | 0 | 97.0 | 90 | 110 | | | |
| Lithium | 0.198 | 0.0100 | 0.200 | 0 | 99.0 | 90 | 110 | | | |
| Molybdenum | 0.198 | 0.00500 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Selenium | 0.196 | 0.00500 | 0.200 | 0 | 98.2 | 90 | 110 | | | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.4 | 90 | 110 | | | |

| Sample ID **LCVL2-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 12:01:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00211 | 0.00250 | 0.00200 | 0 | 106 | 70 | 130 | | | |
| Arsenic | 0.00509 | 0.00500 | 0.00500 | 0 | 102 | 70 | 130 | | | |
| Barium | 0.00507 | 0.0100 | 0.00500 | 0 | 101 | 70 | 130 | | | |
| Beryllium | 0.000874 | 0.00100 | 0.00100 | 0 | 87.4 | 70 | 130 | | | |
| Boron | 0.0232 | 0.0300 | 0.0200 | 0 | 116 | 70 | 130 | | | |
| Cadmium | 0.00108 | 0.00100 | 0.00100 | 0 | 108 | 70 | 130 | | | |
| Calcium | 0.104 | 0.300 | 0.100 | 0 | 104 | 70 | 130 | | | |
| Chromium | 0.00529 | 0.00500 | 0.00500 | 0 | 106 | 70 | 130 | | | |
| Cobalt | 0.00536 | 0.00500 | 0.00500 | 0 | 107 | 70 | 130 | | | |
| Lead | 0.000973 | 0.00100 | 0.00100 | 0 | 97.3 | 70 | 130 | | | |
| Lithium | 0.0106 | 0.0100 | 0.0100 | 0 | 106 | 70 | 130 | | | |
| Molybdenum | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 70 | 130 | | | |
| Selenium | 0.00513 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | | | |
| Thallium | 0.000980 | 0.00150 | 0.00100 | 0 | 98.0 | 70 | 130 | | | |

| Sample ID **CCV3-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 12:29:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 4.92 | 0.300 | 5.00 | 0 | 98.4 | 90 | 110 | | | |

| Sample ID **LCVL3-190827** | Batch ID: **R106089** | TestNo: **SW6020A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS4_190827B** | Analysis Date: **8/27/2019 12:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.109 | 0.300 | 0.100 | 0 | 109 | 70 | 130 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190815B**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID **DCS2-92363** | Batch ID: **92363** | TestNo: **E300** | | Units: **mg/L** | |
| SampType: **DCS2** | Run ID: **IC4_190815B** | Analysis Date: **8/15/2019 2:55:31 PM** | | Prep Date: **8/15/2019** | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.490 | 1.00 | 0.5000 | 0 | 98.0 | 65 | 135 | 0 | 0 | |
| Fluoride | 0.244 | 0.400 | 0.2000 | 0 | 122 | 65 | 135 | 0 | 0 | |
| Sulfate | 1.57 | 3.00 | 1.500 | 0 | 104 | 65 | 135 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190822A**

The QC data in batch 92485 applies to the following samples: 1908215-01B, 1908215-02B, 1908215-03B, 1908215-04B, 1908215-05B, 1908215-06B, 1908215-07B, 1908215-08B, 1908215-09B, 1908215-10B, 1908215-11B, 1908215-12B

| Sample ID | **MB-92485** | Batch ID: | **92485** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC4_190822A** | Analysis Date: | **8/22/2019 11:01:32 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-92485** | Batch ID: | **92485** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC4_190822A** | Analysis Date: | **8/22/2019 11:17:32 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.76 | 1.00 | 10.00 | 0 | 97.6 | 90 | 110 | | | |
| Fluoride | 4.13 | 0.400 | 4.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | | | |

| Sample ID | **LCSD-92485** | Batch ID: | **92485** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC4_190822A** | Analysis Date: | **8/22/2019 11:33:32 AM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.69 | 1.00 | 10.00 | 0 | 96.9 | 90 | 110 | 0.732 | 20 | |
| Fluoride | 4.03 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | 2.46 | 20 | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 98.0 | 90 | 110 | 0.517 | 20 | |

| Sample ID | **1908215-01BMS** | Batch ID: | **92485** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_190822A** | Analysis Date: | **8/22/2019 8:06:15 PM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 343 | 10.0 | 200.0 | 158.1 | 92.5 | 90 | 110 | | | |
| Fluoride | 212 | 4.00 | 200.0 | 1.743 | 105 | 90 | 110 | | | |
| Sulfate | 248 | 30.0 | 200.0 | 59.02 | 94.7 | 90 | 110 | | | |

| Sample ID | **1908215-01BMSD** | Batch ID: | **92485** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC4_190822A** | Analysis Date: | **8/22/2019 8:22:15 PM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 342 | 10.0 | 200.0 | 158.1 | 92.0 | 90 | 110 | 0.283 | 20 | |
| Fluoride | 212 | 4.00 | 200.0 | 1.743 | 105 | 90 | 110 | 0.201 | 20 | |
| Sulfate | 249 | 30.0 | 200.0 | 59.02 | 94.8 | 90 | 110 | 0.020 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190822A**

| Sample ID **1908215-02BMS** | Batch ID: **92485** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_190822A** | Analysis Date: **8/22/2019 8:38:15 PM** | Prep Date: **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 276 | 10.0 | 200.0 | 84.87 | 95.7 | 90 | 110 | | | |
| Fluoride | 214 | 4.00 | 200.0 | 1.927 | 106 | 90 | 110 | | | |
| Sulfate | 340 | 30.0 | 200.0 | 149.7 | 95.3 | 90 | 110 | | | |

| Sample ID **1908215-02BMSD** | Batch ID: **92485** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_190822A** | Analysis Date: **8/22/2019 8:54:15 PM** | Prep Date: **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 277 | 10.0 | 200.0 | 84.87 | 96.0 | 90 | 110 | 0.164 | 20 | |
| Fluoride | 216 | 4.00 | 200.0 | 1.927 | 107 | 90 | 110 | 0.814 | 20 | |
| Sulfate | 340 | 30.0 | 200.0 | 149.7 | 95.2 | 90 | 110 | 0.093 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190822A**

| Sample ID **ICV-190822** | Batch ID: **R105997** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_190822A** | Analysis Date: **8/22/2019 10:29:32 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.0 | 1.00 | 25.00 | 0 | 100 | 90 | 110 | | | |
| Fluoride | 10.4 | 0.400 | 10.00 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 75.7 | 3.00 | 75.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID **CCV1-190822** | Batch ID: **R105997** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190822A** | Analysis Date: **8/22/2019 3:23:51 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.66 | 1.00 | 10.00 | 0 | 96.6 | 90 | 110 | | | |
| Fluoride | 4.18 | 0.400 | 4.000 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 97.9 | 90 | 110 | | | |

| Sample ID **CCV2-190822** | Batch ID: **R105997** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190822A** | Analysis Date: **8/22/2019 7:34:15 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.74 | 1.00 | 10.00 | 0 | 97.4 | 90 | 110 | | | |
| Fluoride | 4.24 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 29.6 | 3.00 | 30.00 | 0 | 98.7 | 90 | 110 | | | |

| Sample ID **CCV3-190822** | Batch ID: **R105997** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190822A** | Analysis Date: **8/23/2019 12:22:15 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.66 | 1.00 | 10.00 | 0 | 96.6 | 90 | 110 | | | |
| Fluoride | 4.26 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 29.5 | 3.00 | 30.00 | 0 | 98.2 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190823A**

The QC data in batch 92504 applies to the following samples: 1908215-12B

| Sample ID | **MB-92504** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 11:05:54 AM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

| Sample ID | **LCS-92504** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 11:21:54 AM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.57 | 1.00 | 10.00 | 0 | 95.7 | 90 | 110 | | | |
| Fluoride | 4.12 | 0.400 | 4.000 | 0 | 103 | 90 | 110 | | | |
| Sulfate | 29.1 | 3.00 | 30.00 | 0 | 97.0 | 90 | 110 | | | |

| Sample ID | **LCSD-92504** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCSD** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 11:37:54 AM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.41 | 1.00 | 10.00 | 0 | 94.1 | 90 | 110 | 1.68 | 20 | |
| Fluoride | 4.06 | 0.400 | 4.000 | 0 | 101 | 90 | 110 | 1.56 | 20 | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | 0.598 | 20 | |

| Sample ID | **1908215-12BMS** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 5:16:48 PM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2950 | 100 | 2000 | 1032 | 96.1 | 90 | 110 | | | |
| Fluoride | 2150 | 40.0 | 2000 | 0 | 108 | 90 | 110 | | | |
| Sulfate | 2880 | 300 | 2000 | 977.6 | 95.0 | 90 | 110 | | | |

| Sample ID | **1908215-12BMSD** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MSD** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 5:32:48 PM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2930 | 100 | 2000 | 1032 | 95.0 | 90 | 110 | 0.718 | 20 | |
| Fluoride | 2130 | 40.0 | 2000 | 0 | 107 | 90 | 110 | 0.802 | 20 | |
| Sulfate | 2870 | 300 | 2000 | 977.6 | 94.4 | 90 | 110 | 0.414 | 20 | |

| Sample ID | **1908250-05EMS** | Batch ID: | **92504** | TestNo: | **E300** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MS** | Run ID: | **IC4_190823A** | Analysis Date: | **8/23/2019 5:48:48 PM** | Prep Date: | **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190823A**

| Sample ID **1908250-05EMS** | Batch ID: **92504** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_190823A** | Analysis Date: **8/23/2019 5:48:48 PM** | Prep Date: **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 50.8 | 1.00 | 20.00 | 34.64 | 80.6 | 90 | 110 | | | S |
| Fluoride | 23.5 | 0.400 | 20.00 | 2.518 | 105 | 90 | 110 | | | |
| Sulfate | 66.9 | 3.00 | 20.00 | 48.35 | 92.9 | 90 | 110 | | | |

| Sample ID **1908250-05EMSD** | Batch ID: **92504** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_190823A** | Analysis Date: **8/23/2019 6:04:48 PM** | Prep Date: **8/23/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 50.9 | 1.00 | 20.00 | 34.64 | 81.1 | 90 | 110 | 0.228 | 20 | S |
| Fluoride | 23.6 | 0.400 | 20.00 | 2.518 | 105 | 90 | 110 | 0.391 | 20 | |
| Sulfate | 66.8 | 3.00 | 20.00 | 48.35 | 92.4 | 90 | 110 | 0.148 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_190823A**

| Sample ID **ICV-190823** | Batch ID: **R106018** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_190823A** | Analysis Date: **8/23/2019 10:33:55 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.4 | 1.00 | 25.00 | 0 | 97.8 | 90 | 110 | | | |
| Fluoride | 10.2 | 0.400 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Sulfate | 75.3 | 3.00 | 75.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID **CCV1-190823** | Batch ID: **R106018** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190823A** | Analysis Date: **8/23/2019 3:24:19 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.61 | 1.00 | 10.00 | 0 | 96.1 | 90 | 110 | | | |
| Fluoride | 4.23 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.6 | 90 | 110 | | | |

| Sample ID **CCV2-190823** | Batch ID: **R106018** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_190823A** | Analysis Date: **8/23/2019 8:44:48 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.68 | 1.00 | 10.00 | 0 | 96.8 | 90 | 110 | | | |
| Fluoride | 4.26 | 0.400 | 4.000 | 0 | 106 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_190822A**

The QC data in batch 92494 applies to the following samples: 1908215-01B, 1908215-02B, 1908215-03B, 1908215-04B, 1908215-05B, 1908215-06B, 1908215-07B, 1908215-08B, 1908215-09B, 1908215-10B, 1908215-11B, 1908215-12B

| Sample ID | **MB-92944** | Batch ID: | **92494** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **MBLK** | Run ID: | **WC_190822A** | Analysis Date: | **8/22/2019 3:40:00 PM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID | **LCS-92494** | Batch ID: | **92494** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **LCS** | Run ID: | **WC_190822A** | Analysis Date: | **8/22/2019 3:40:00 PM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 737 | 10.0 | 745.6 | 0 | 98.8 | 90 | 113 | | | |

| Sample ID | **1908215-03B-DUP** | Batch ID: | **92494** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190822A** | Analysis Date: | **8/22/2019 3:40:00 PM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1880 | 50.0 | 0 | 1885 | | | | 0.532 | 5 | |

| Sample ID | **1908215-06B-DUP** | Batch ID: | **92494** | TestNo: | **M2540C** | Units: | **mg/L** |
|---|---|---|---|---|---|---|---|
| SampType: | **DUP** | Run ID: | **WC_190822A** | Analysis Date: | **8/22/2019 3:40:00 PM** | Prep Date: | **8/22/2019** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 4530 | 50.0 | 0 | 4595 | | | | 1.42 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 1908215
**Project:** Luminant-OGSES FGD Ponds

# MQL SUMMARY REPORT

| TestNo: E300 | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| TestNo: SW6020A | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Antimony | 0.000800 | 0.00250 |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Cadmium | 0.000300 | 0.00100 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Molybdenum | 0.00200 | 0.00500 |
| Selenium | 0.00200 | 0.00500 |
| Thallium | 0.000500 | 0.00150 |

| TestNo: SW7470A | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Mercury | 0.0000800 | 0.000200 |

| TestNo: M2540C | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

September 13, 2019

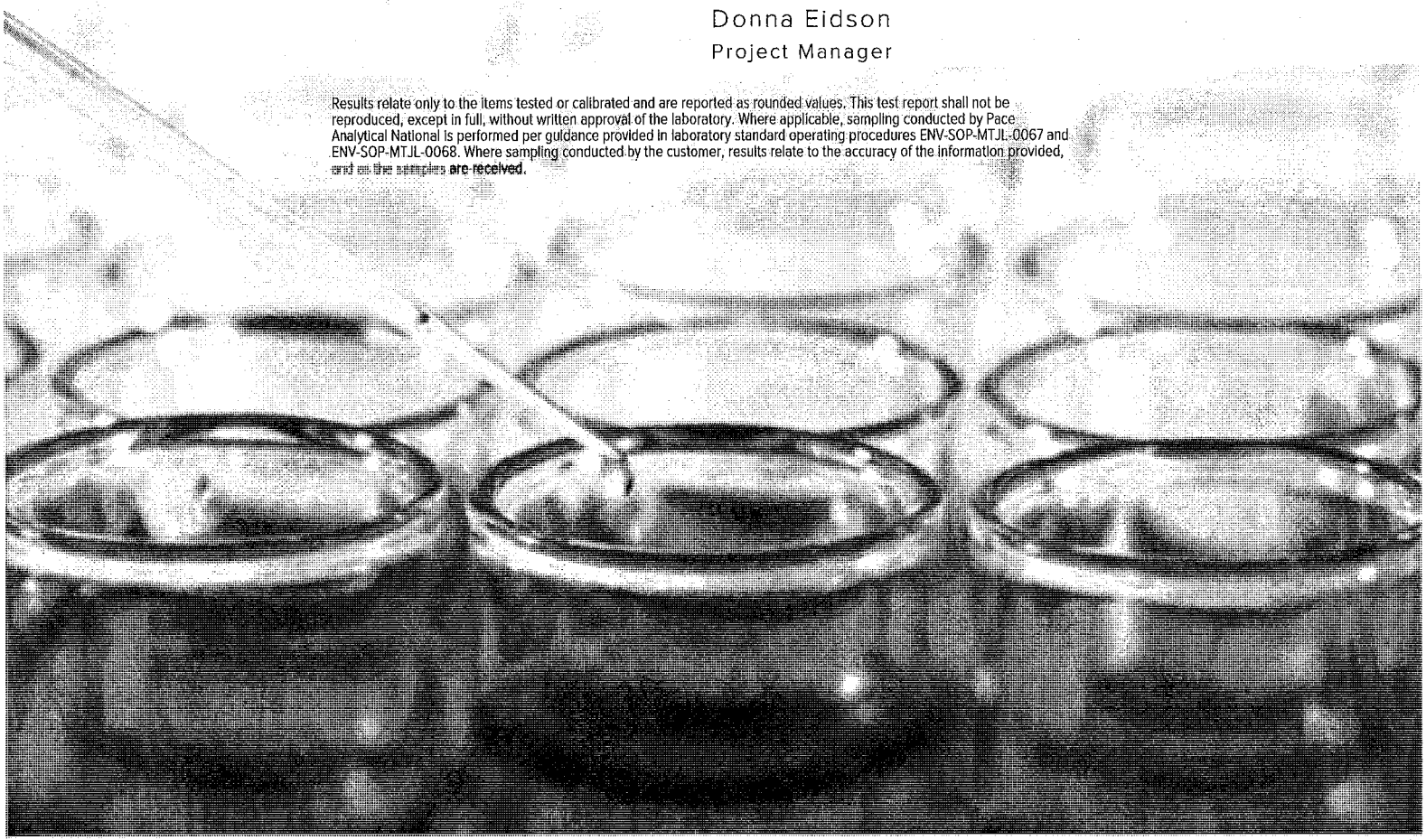
## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1133289 |
| Samples Received: | 08/27/2019 |
| Project Number: | 1908215 |
| Description: | |
| Report To: | John DuPont |
| | 2300 Double Creek Drive |
| | Round Rock, TX 78664 |

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and on the samples are received.



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## FGD-6 L1133289-01 Non-Potable Water

Collected by | Collected date/time 08/19/19 07:35 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-3 L1133289-02 Non-Potable Water

Collected by | Collected date/time 08/19/19 08:25 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-2 L1133289-03 Non-Potable Water

Collected by | Collected date/time 08/19/19 09:15 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-5 L1133289-04 Non-Potable Water

Collected by | Collected date/time 08/19/19 10:00 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## DUP-1 L1133289-05 Non-Potable Water

Collected by | Collected date/time 08/19/19 10:00 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-8 L1133289-06 Non-Potable Water

Collected by | Collected date/time 08/19/19 11:00 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 09/10/19 17:42 | RGT | Mt. Juliet, TN |

## FGD-1 L1133289-07 Non-Potable Water

Collected by | Collected date/time 08/19/19 12:05 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-14 L1133289-08 Non-Potable Water

Collected by | Collected date/time 08/19/19 13:15 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 11:06 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-4 L1133289-09 Non-Potable Water

Collected by | Collected date/time 08/19/19 14:15 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:54 | RGT | Mt. Juliet, TN |

## FGD-11 L1133289-10 Non-Potable Water

Collected by | Collected date/time 08/19/19 15:20 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 09/03/19 11:00 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 09/03/19 11:00 | 09/04/19 17:23 | RGT | Mt. Juliet, TN |

## FGD-12 L1133289-11 Non-Potable Water

Collected by | Collected date/time 08/19/19 16:25 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 08/29/19 13:56 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 08/29/19 13:56 | 08/30/19 14:55 | RGT | Mt. Juliet, TN |

## FGD-15 L1133289-12 Non-Potable Water

Collected by | Collected date/time 08/19/19 17:30 | Received date/time 08/27/19 08:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1340987 | 1 | 09/06/19 10:27 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1337055 | 1 | 09/04/19 12:00 | 09/11/19 15:45 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1337055 | 1 | 09/04/19 12:00 | 09/04/19 17:23 | RGT | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 2.55 | | 0.597 | 0.902 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *98.1* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *109* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 2.93 | | 0.844 | 1.12 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.385 | | 0.247 | 0.214 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *95.1* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.858 | | 0.443 | 0.782 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *83.7* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *97.4* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 1.38 | | 0.748 | 1.05 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.523 | | 0.305 | 0.266 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *71.0* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 2.80 | | 0.477 | 0.761 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *87.3* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *101* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 3.26 | | 1.07 | 1.6 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.456 | | 0.596 | 0.841 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *35.3* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.659 | | 0.360 | 0.677 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *93.6* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *103* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 1.21 | | 0.874 | 1.27 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.551 | | 0.514 | 0.591 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *33.9* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 0.251 | | 0.441 | 0.67 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *92.3* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *106* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 0.251 | | 0.815 | 1.36 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | -0.130 | | 0.374 | 0.693 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *46.9* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 6.82 | | 0.503 | 0.674 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *85.4* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 8.61 | | 1.17 | 1.14 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 1.79 | | 0.667 | 0.467 | 09/10/2019 17:42 | WG1337055 |
| *(T) Barium-133* | *19.5* | C2 | | *30.0-143* | *09/10/2019 17:42* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 1.09 | | 0.429 | 0.686 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *89.6* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *111* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 1.57 | | 0.712 | 0.877 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.489 | | 0.283 | 0.191 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *76.6* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 2.22 | | 0.444 | 0.775 | 09/11/2019 11:06 | WG1340987 |
| *(T) Barium* | *93.0* | | | *62.0-143* | *09/11/2019 11:06* | WG1340987 |
| *(T) Yttrium* | *109* | | | *79.0-136* | *09/11/2019 11:06* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 3.57 | | 0.893 | 1.01 | 09/11/2019 11:06 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty +/- | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 1.35 | | 0.449 | 0.232 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *90.4* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 1.58 | | 0.406 | 0.601 | 09/11/2019 15:45 | WG1340987 |
| *(T) Barium* | *103* | | | *62.0-143* | *09/11/2019 15:45* | WG1340987 |
| *(T) Yttrium* | *106* | | | *79.0-136* | *09/11/2019 15:45* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 1.97 | | 0.752 | 1.03 | 09/11/2019 15:45 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.390 | | 0.346 | 0.429 | 08/30/2019 14:54 | WG1337055 |
| *(T) Barium-133* | *79.3* | | | *30.0-143* | *08/30/2019 14:54* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 2.55 | | 0.409 | 0.552 | 09/11/2019 15:45 | WG1340987 |
| *(T) Barium* | *99.4* | | | *62.0-143* | *09/11/2019 15:45* | WG1340987 |
| *(T) Yttrium* | *113* | | | *79.0-136* | *09/11/2019 15:45* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 3.95 | | 0.861 | 0.802 | 09/11/2019 15:45 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 1.39 | | 0.452 | 0.25 | 09/04/2019 17:23 | WG1337055 |
| *(T) Barium-133* | *97.1* | | | *30.0-143* | *09/04/2019 17:23* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 3.52 | | 0.491 | 0.672 | 09/11/2019 15:45 | WG1340987 |
| *(T) Barium* | *105* | | | *62.0-143* | *09/11/2019 15:45* | WG1340987 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *09/11/2019 15:45* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 4.64 | | 0.940 | 0.947 | 09/11/2019 15:45 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 1.12 | | 0.449 | 0.275 | 08/30/2019 14:55 | WG1337055 |
| *(T) Barium-133* | *82.2* | | | *30.0-143* | *08/30/2019 14:55* | WG1337055 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-228 | 1.55 | | 0.414 | 0.707 | 09/11/2019 15:45 | WG1340987 |
| *(T) Barium* | *96.7* | | | *62.0-143* | *09/11/2019 15:45* | WG1340987 |
| *(T) Yttrium* | *111* | | | *79.0-136* | *09/11/2019 15:45* | WG1340987 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| Combined Radium | 2.15 | | 0.757 | 1.04 | 09/11/2019 15:45 | WG1337055 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | +/- | pCi/l | date / time | |
| RADIUM-226 | 0.604 | | 0.343 | 0.332 | 09/04/2019 17:23 | WG1337055 |
| *(T) Barium-133* | *82.4* | | | *30.0-143* | *09/04/2019 17:23* | WG1337055 |

## Method Blank (MB)

(MB) R3449949-1 09/11/19 11:06

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | 0.176 | | 0.453 |
| *(T) Barium* | *92.6* | | |
| *(T) Yttrium* | *114* | | |

## L1133289-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1133289-01 09/11/19 11:06 • (DUP) R3449949-5 09/11/19 11:06

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-228 | 2.55 | 3.06 | 1 | 18.2 | 0.553 | | 20 | 3 |
| *(T) Barium* | *98.1* | *95.8* | | | | | | |
| *(T) Yttrium* | *109* | *88.5* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3449949-2 09/11/19 11:06

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 5.46 | 109 | 80.0-120 | |
| *(T) Barium* | | | *99.0* | | |
| *(T) Yttrium* | | | *106* | | |

## L1133317-11 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1133317-11 09/11/19 15:45 • (MS) R3449949-3 09/11/19 11:06 • (MSD) R3449949-4 09/11/19 11:06

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 10.0 | 1.25 | 9.53 | 11.1 | 82.8 | 98.9 | 1 | 70.0-130 | | | 15.6 | | 20 |
| *(T) Barium* | | *102* | | | *95.7* | *111* | | | | | | | |
| *(T) Yttrium* | | *111* | | | *108* | *97.9* | | | | | | | |

## Method Blank (MB)

(MB) R3447929-1 08/30/19 14:54

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-226 | 0.000 | | 0.0661 |
| *(T) Barium-133* | *83.8* | | |

## L1133289-08 Original Sample (OS) • Duplicate (DUP)

(OS) L1133289-08 08/30/19 14:54 • (DUP) R3447929-5 08/30/19 14:54

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.35 | 1.14 | 1 | 16.5 | 0.296 | | 20 | 3 |
| *(T) Barium-133* | *90.4* | *63.2* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3447929-2 08/30/19 14:54

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 5.02 | 4.81 | 95.8 | 80.0-120 | |
| *(T) Barium-133* | | | *63.8* | | |

## L1134015-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1134015-01 08/30/19 14:55 • (MS) R3447929-3 08/30/19 14:54 • (MSD) R3447929-4 08/30/19 14:54

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 20.1 | 0.290 | 21.5 | 20.4 | 105 | 100 | 1 | 75.0-125 | | | 5.06 | | 20 |
| *(T) Barium-133* | | *25.5* | | | *75.8* | *66.2* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| C2 | Tracer recovery limits have been exceeded; values are outside lower control limits. |

# ACCREDITATIONS & LOCATIONS

ONE LAB. NATIONWIDE.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.



## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LA000356 |
| Kentucky [16] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [14] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

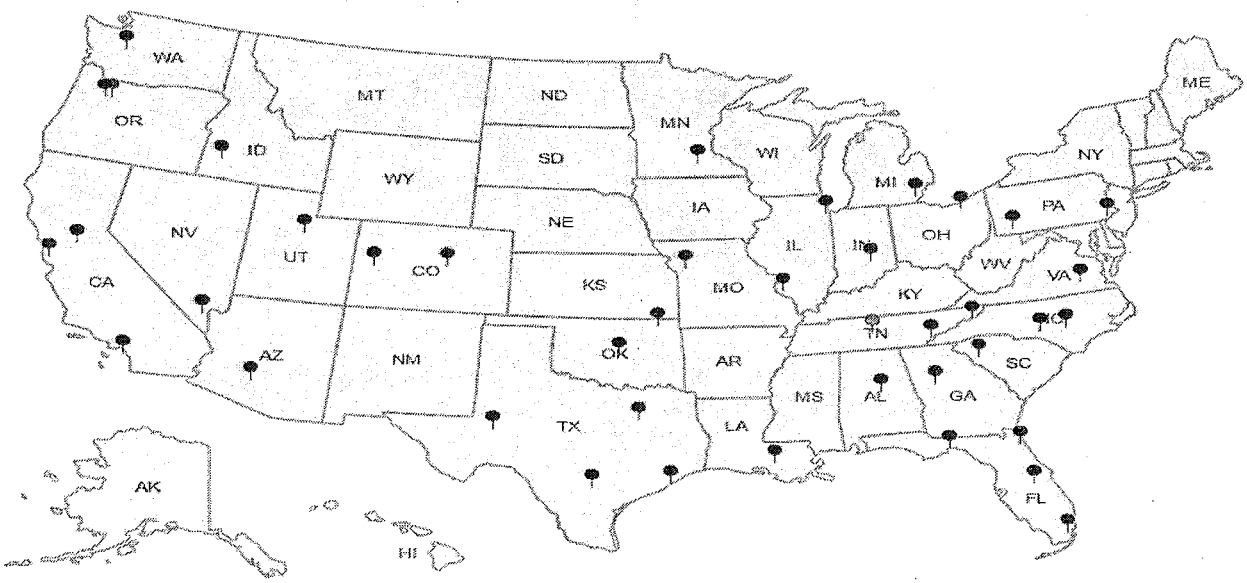
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



# Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | |
|---|---|---|
| Client: DHLRTX | SDG#: | 1135289 |
| Cooler Received/Opened On: 8/27/19 | Temperature: | Am5 |
| Received By: Lexxi Romero | | |
| Signature: | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | ✓ | | |
| COC Signed / Accurate? | | ✓ | |
| Bottles arrive intact? | | ✓ | |
| Correct bottles used? | | ✓ | |
| Sufficient volume sent? | | ✓ | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | | ✓ | |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



H008

Work Order: 1908215

Subcontractor:
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

11333289

21-Aug-19

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Ra 228 E904.0 | Ra 226 M7500 Ra B M | Requested Tests | |
|---|---|---|---|---|---|---|---|---|
| FGD-6 | Aqueous | -01C | 08/19/19 07:35 AM | 1LHDPEHNO3 | 1 | | | -01 |
| FGD-6 | Aqueous | -01D | 08/19/19 07:35 AM | 1LHDPEHNO3 | | 1 | | |
| FGD-3 | Aqueous | -02C | 08/19/19 08:25 AM | 1LHDPEHNO3 | 1 | | | 02 |
| FGD-3 | Aqueous | -02D | 08/19/19 08:25 AM | 1LHDPEHNO3 | | 1 | | |
| FGD-2 | Aqueous | -03C | 08/19/19 09:15 AM | 1LHDPEHNO3 | 1 | | | 03 |
| FGD-2 | Aqueous | -03D | 08/19/19 09:15 AM | 1LHDPEHNO3 | | 1 | | |
| FGD-5 | Aqueous | -04C | 08/19/19 10:00 AM | 1LHDPEHNO3 | 1 | | | 04 |
| FGD-5 | Aqueous | -04D | 08/19/19 10:00 AM | 1LHDPEHNO3 | | 1 | | |
| DUP-1 | Aqueous | -05C | 08/19/19 10:00 AM | 1LHDPEHNO3 | 1 | | | 05 |
| DUP-1 | Aqueous | -05D | 08/19/19 10:00 AM | 1LHDPEHNO3 | | 1 | | |
| FGD-8 | Aqueous | -06C | 08/19/19 11:00 AM | 1LHDPEHNO3 | 1 | | | 06 |
| FGD-8 | Aqueous | -06D | 08/19/19 11:00 AM | 1LHDPEHNO3 | | 1 | | |
| FGD-1 | Aqueous | -07C | 08/19/19 12:05 PM | 1LHDPEHNO3 | 1 | | | 07 |
| FGD-1 | Aqueous | -07D | 08/19/19 12:05 PM | 1LHDPEHNO3 | | 1 | | |
| FGD-14 | Aqueous | -08C | 08/19/19 01:15 PM | 1LHDPEHNO3 | 1 | | | 08 |
| FGD-14 | Aqueous | -08D | 08/19/19 01:15 PM | 1LHDPEHNO3 | | 1 | | |
| FGD-4 | Aqueous | -09C | 08/19/19 02:15 PM | 1LHDPEHNO3 | 1 | | | 09 |
| FGD-4 | Aqueous | -09D | 08/19/19 02:15 PM | 1LHDPEHNO3 | | 1 | | |

General Comments:
Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | Date/Time | | Date/Time |
|---|---|---|---|
| Relinquished by: | | Received by: | 8-21-19 10:30 |
| Relinquished by: | | Received by: | |

DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



Work Order: 1908215

Subcontractor:
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

1133289

21-Aug-19

| Sample Id | Matrix | DHL# | Date Collected | Bottle Type | Ra 228 E904.0 | Ra 226 M7500 Ra B M | Requested Tests | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-11 | Aqueous | -10C | 08/19/19 03:20 PM | 1LHDPEHNO3 | 1 | | | | | 10 |
| FGD-11 | Aqueous | -10D | 08/19/19 03:20 PM | 1LHDPEHNO3 | | 1 | | | | |
| FGD-12 | Aqueous | -11C | 08/19/19 04:25 PM | 1LHDPEHNO3 | 1 | | | | | 11 |
| FGD-12 | Aqueous | -11D | 08/19/19 04:25 PM | 1LHDPEHNO3 | | 1 | | | | |
| FGD-15 | Aqueous | -12C | 08/19/19 05:30 PM | 1LHDPEHNO3 | 1 | | | | | 12 |
| FGD-15 | Aqueous | -12D | 08/19/19 05:30 PM | 1LHDPEHNO3 | | 1 | | | | |

General Comments:
Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| Relinquished by: | | | Received by: | | 8-21-19 10:00 |
| Relinquished by: | | | Received by: | | |

July 10, 2020

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX: (512) 671-3446

Order No.: 2005038

RE: Luminant-OGSES-MNA

Dear Will Vienne:

DHL Analytical, Inc. received 5 sample(s) on 5/7/2020 for the analyses presented in the following report.

Revision Number 1 for Work Order 2005038: This revision consists of changing the target analyte list for 3 samples per the client's request. Please replace the original Data Report with this revision.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-20-25

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 68302

# CHAIN-OF-CUSTODY

CLIENT: GOLDER ASSOCIATES
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-6-20 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 2005038
PROJECT LOCATION OR NAME: LUMINANT - OGSES - MNA
CLENT PROJECT #: 19134019 COLLECTOR: JOHN BEAUTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT
P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ TPH 1005 ❑ TPH 1006 ❑ (METHOD 8021) HOLD 1006 ❑ GRO (METHOD 8015) ❑ DRO (METHOD 8105) ❑ VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ 8321 HERB ❑ T PHOS, AMMONIA ❑ METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ RCRA ❑ TX11 ❑ PH ❑ HEX CHROM ❑ ALKALINITY X ❑ COD ❑ CHLORIDE ❑ ANIONS ❑ TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ RCI ❑ FLASHPOINT ❑ DGAS ❑ TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ $NO_3$, $PO_4$, Na, Mg, K, Cl, F, $SO_4$, Ferrous Fe, Ferric Fe

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 01 | 5-6-20 | 1320 | W | | 5 | | X | | X | | X | |
| FGD-3 | 02 | " | 1420 | W | | 5 | | X | | X | | X | |
| FGD-14 | 03 | " | 1505 | W | | 5 | | X | | X | | X | Report Ca per Will V 7/8/20 |
| FGD-15 | 04 | " | 1545 | W | | 5 | | X | | X | | X | " JD |
| FGD-16 | 05 | " | 1630 | W | | 5 | | X | | X | | X | " |

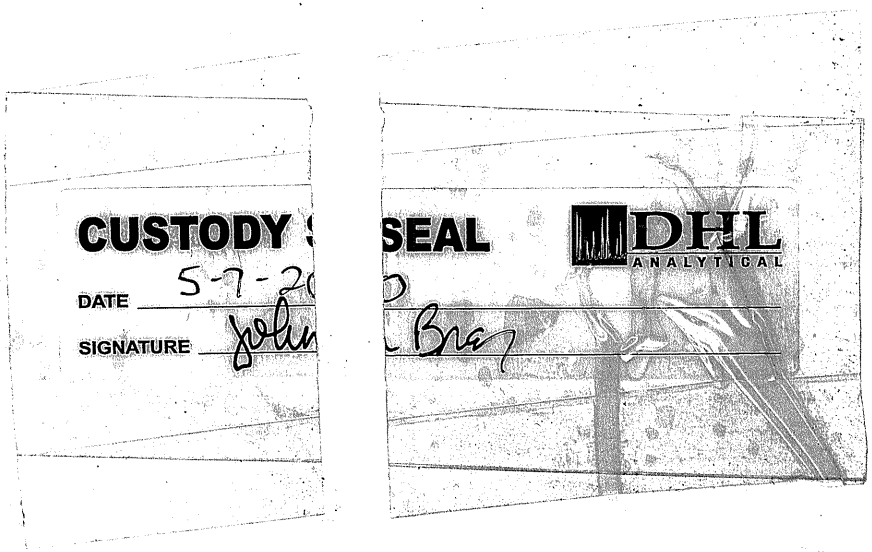
RELINQUISHED BY: (Signature) DATE/TIME 5-7-20/900 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME 5-7-20/1055 RECEIVED BY: (Signature)

❑ DHL DISPOSAL @ $5.00 each ❑ Return

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑

**LABORATORY USE ONLY:**
RECEIVING TEMP: 0.9°C THERM #: 78
CUSTODY SEALS: ❑ BROKEN ☒ INTACT ❑ NOT USED
CARRIER: ❑ LONE STAR ❑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
☒ HAND DELIVERED

DHL COC Rev 1 | FEB 2010


CUSTODY
SEAL
DHL
ANALYTICAL
DATE
SIGNATURE

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder** Date Received: **5/7/2020**

Work Order Number **2005038** Received by: **EL**

Checklist completed by: _____ 5/7/2020 Reviewed by (DL) 5/7/2020
Signature | Date | Initials | Date

Carrier name: Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **0.9** °C |
| Water - VOA vials have zero headspace? | Yes ☑ | No ☐ | No VOA vials submitted ☐ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? no | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? _____ | | Checked by _____ |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist: Reportable Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-MNA | **LRC Date:** 5/15/2020 |
| **Reviewer Name:** Angie O'Donnell | **Laboratory Work Order: 2005038** |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | **X** | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | **X** | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | **X** | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | **X** | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | **X** | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | **X** | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | **X** | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | **X** | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | **X** | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | **X** | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | **X** | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | **X** | | |
| | | **9)** If required for the project, TICs reported? | | | **X** | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | **X** | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | **X** | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | **X** | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | **X** | | | | |
| | | **4)** Were blank concentrations < MDL? | **X** | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | **X** | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | **X** | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | **X** | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | **X** | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | **X** | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | **X** | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | **X** | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | **X** | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | **X** | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | **X** | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | **X** | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | **X** | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | **X** | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | **X** | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | **X** | | | | **R10-01** |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | **X** | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | **X** | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-MNA | **LRC Date:** 5/15/2020 |
| **Reviewer Name:** Angie O'Donnell | **Laboratory Work Order: 2005038** |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | | X | | | **S2-04** |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | X | | | | |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28, 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

07/10/20
Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *15-May-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES-MNA
**Lab Order:** 2005038

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method E300 - Anions Analysis
Method M2320 B - Alkalinity Analysis
Method M3500-FE D - Ferrous Iron Analysis (This parameter is not NELAP Certified)
Method M3500-FE D - Ferrous Iron Analysis (Calculated) (This parameter is not NELAP Certified)
Method M4500-P E - Orthophosphate Analysis

Exception Report R1-01

The samples were received and log-in performed on 5/7/2020. A total of 5 samples were received and analyzed. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Metals Analysis, the recovery of Sodium for the Matrix Spike and Matrix Spike Duplicate (2005013-01 MS/MSD) was below the method control limits. This is flagged accordingly in the QC Summary Report. This analyte was within method control limits in the associated LCS. No further corrective action was taken.

For Ferrous Iron Analysis, the recovery of the Matrix Spike (2005038-01 MS) was above the method control limits. This is flagged accordingly in the QC Summary Report. The associated LCS/MSD was within method control limits. No further corrective action was taken.

Exception Report R10-01

The Ferric Iron is calculated as the Total Iron minus the Ferrous Iron.

Exception Report S2-04

For Metals Analysis, Sodium was detected below the reporting limit for the Continuing Calibration Blank (CCB3-200511). This analyte was reported in QC samples only, no field samples affected. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *15-May-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES-MNA
**Lab Order:** 2005038

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2005038-01 | FGD-6 | | 05/06/20 01:20 PM | 5/7/2020 |
| 2005038-02 | FGD-3 | | 05/06/20 02:20 PM | 5/7/2020 |
| 2005038-03 | FGD-14 | | 05/06/20 03:05 PM | 5/7/2020 |
| 2005038-04 | FGD-15 | | 05/06/20 03:45 PM | 5/7/2020 |
| 2005038-05 | FGD-16 | | 05/06/20 04:30 PM | 5/7/2020 |

**Lab Order:** 2005038
**Client:** Golder
**Project:** Luminant-OGSES-MNA

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005038-01A | FGD-6 | 05/06/20 01:20 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005038-01B | FGD-6 | 05/06/20 01:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| 2005038-01C | FGD-6 | 05/06/20 01:20 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/11/20 10:01 AM | 96290 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/07/20 02:01 PM | 96253 |
| 2005038-02A | FGD-3 | 05/06/20 02:20 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005038-02B | FGD-3 | 05/06/20 02:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| 2005038-02C | FGD-3 | 05/06/20 02:20 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/11/20 10:01 AM | 96290 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/07/20 02:01 PM | 96253 |
| 2005038-03A | FGD-14 | 05/06/20 03:05 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005038-03B | FGD-14 | 05/06/20 03:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-14 | 05/06/20 03:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| 2005038-03C | FGD-14 | 05/06/20 03:05 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/11/20 10:01 AM | 96290 |
| | FGD-14 | 05/06/20 03:05 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-14 | 05/06/20 03:05 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-14 | 05/06/20 03:05 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-14 | 05/06/20 03:05 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/07/20 02:01 PM | 96253 |
| 2005038-04A | FGD-15 | 05/06/20 03:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005038-04B | FGD-15 | 05/06/20 03:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-15 | 05/06/20 03:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| 2005038-04C | FGD-15 | 05/06/20 03:45 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/11/20 10:01 AM | 96290 |
| | FGD-15 | 05/06/20 03:45 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-15 | 05/06/20 03:45 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-15 | 05/06/20 03:45 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/07/20 02:01 PM | 96253 |
| 2005038-05A | FGD-16 | 05/06/20 04:30 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |

**Lab Order:** 2005038
**Client:** Golder
**Project:** Luminant-OGSES-MNA

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005038-05B | FGD-16 | 05/06/20 04:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-16 | 05/06/20 04:30 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| 2005038-05C | FGD-16 | 05/06/20 04:30 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/11/20 10:01 AM | 96290 |
| | FGD-16 | 05/06/20 04:30 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-16 | 05/06/20 04:30 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-16 | 05/06/20 04:30 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/07/20 02:01 PM | 96253 |

**Lab Order:** 2005038
**Client:** Golder
**Project:** Luminant-OGSES-MNA

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005038-01A | FGD-6 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110498 | 1 | 05/15/20 | UV/VIS_2_200515A |
| | FGD-6 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 10:49 AM | UV/VIS_2_200513B |
| 2005038-01B | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 1 | 05/11/20 01:59 PM | ICP-MS5_200511B |
| | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 20 | 05/11/20 03:56 PM | ICP-MS5_200511B |
| 2005038-01C | FGD-6 | Aqueous | M2320 B | Alkalinity | 96290 | 1 | 05/11/20 01:40 PM | TITRATOR_200511A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 96213 | 1 | 05/07/20 01:55 PM | IC4_200507A |
| | FGD-6 | Aqueous | M4500-P E | Orthophosphate | 96253 | 1 | 05/07/20 02:22 PM | UV/VIS_2_200507C |
| 2005038-02A | FGD-3 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110498 | 1 | 05/15/20 | UV/VIS_2_200515A |
| | FGD-3 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 10:49 AM | UV/VIS_2_200513B |
| 2005038-02B | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 1 | 05/11/20 02:01 PM | ICP-MS5_200511B |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 20 | 05/11/20 03:59 PM | ICP-MS5_200511B |
| 2005038-02C | FGD-3 | Aqueous | M2320 B | Alkalinity | 96290 | 1 | 05/11/20 02:00 PM | TITRATOR_200511A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 96213 | 1 | 05/07/20 02:11 PM | IC4_200507A |
| | FGD-3 | Aqueous | M4500-P E | Orthophosphate | 96253 | 1 | 05/07/20 02:23 PM | UV/VIS_2_200507C |
| 2005038-03A | FGD-14 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110498 | 1 | 05/15/20 | UV/VIS_2_200515A |
| | FGD-14 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 10:51 AM | UV/VIS_2_200513B |
| 2005038-03B | FGD-14 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 1 | 05/11/20 02:03 PM | ICP-MS5_200511B |
| | FGD-14 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 20 | 05/11/20 04:01 PM | ICP-MS5_200511B |
| 2005038-03C | FGD-14 | Aqueous | M2320 B | Alkalinity | 96290 | 1 | 05/11/20 02:08 PM | TITRATOR_200511A |
| | FGD-14 | Aqueous | E300 | Anions by IC method - Water | 96213 | 10 | 05/07/20 01:39 PM | IC4_200507A |
| | FGD-14 | Aqueous | E300 | Anions by IC method - Water | 96213 | 100 | 05/07/20 06:01 PM | IC4_200507A |
| | FGD-14 | Aqueous | E300 | Anions by IC method - Water | 96213 | 1 | 05/07/20 02:27 PM | IC4_200507A |
| | FGD-14 | Aqueous | M4500-P E | Orthophosphate | 96253 | 1 | 05/07/20 02:23 PM | UV/VIS_2_200507C |
| 2005038-04A | FGD-15 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110498 | 1 | 05/15/20 | UV/VIS_2_200515A |
| | FGD-15 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 10:51 AM | UV/VIS_2_200513B |
| 2005038-04B | FGD-15 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 1 | 05/11/20 02:05 PM | ICP-MS5_200511B |
| | FGD-15 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 50 | 05/11/20 04:03 PM | ICP-MS5_200511B |
| 2005038-04C | FGD-15 | Aqueous | M2320 B | Alkalinity | 96290 | 1 | 05/11/20 02:17 PM | TITRATOR_200511A |

**Lab Order:** 2005038
**Client:** Golder
**Project:** Luminant-OGSES-MNA

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005038-04C | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 96213 | 50 | 05/07/20 01:07 PM | IC4_200507A |
| | FGD-15 | Aqueous | E300 | Anions by IC method - Water | 96213 | 1 | 05/07/20 02:43 PM | IC4_200507A |
| | FGD-15 | Aqueous | M4500-P E | Orthophosphate | 96253 | 1 | 05/07/20 02:23 PM | UV/VIS_2_200507C |
| 2005038-05A | FGD-16 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110498 | 1 | 05/15/20 | UV/VIS_2_200515A |
| | FGD-16 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 10:53 AM | UV/VIS_2_200513B |
| 2005038-05B | FGD-16 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 1 | 05/11/20 02:08 PM | ICP-MS5_200511B |
| | FGD-16 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 10 | 05/11/20 04:05 PM | ICP-MS5_200511B |
| 2005038-05C | FGD-16 | Aqueous | M2320 B | Alkalinity | 96290 | 1 | 05/11/20 02:24 PM | TITRATOR_200511A |
| | FGD-16 | Aqueous | E300 | Anions by IC method - Water | 96213 | 1 | 05/07/20 02:59 PM | IC4_200507A |
| | FGD-16 | Aqueous | E300 | Anions by IC method - Water | 96213 | 10 | 05/07/20 07:21 PM | IC4_200507A |
| | FGD-16 | Aqueous | M4500-P E | Orthophosphate | 96253 | 1 | 05/07/20 02:24 PM | UV/VIS_2_200507C |

# DHL Analytical, Inc.

**Date:** *10-Jul-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES-MNA | **Lab ID:** | 2005038-01 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/06/20 01:20 PM |
| **Lab Order:** | 2005038 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Iron | 0.582 | 0.0300 | 0.100 | | mg/L | 1 | 05/11/20 01:59 PM |
| Magnesium | 7.17 | 0.100 | 0.300 | | mg/L | 1 | 05/11/20 01:59 PM |
| Potassium | 0.743 | 0.100 | 0.300 | | mg/L | 1 | 05/11/20 01:59 PM |
| Sodium | 235 | 2.00 | 6.00 | | mg/L | 20 | 05/11/20 03:56 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Nitrate-N | 0.129 | 0.100 | 0.500 | J | mg/L | 1 | 05/07/20 01:55 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 275 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/11/20 01:40 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/11/20 01:40 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/11/20 01:40 PM |
| Alkalinity, Total (As CaCO3) | 275 | 20.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/11/20 01:40 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | 0.582 | 0.0500 | 0.100 | N | mg/L | 1 | 05/15/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 10:49 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.0760 | 0.0300 | 0.100 | J | mg/L | 1 | 05/07/20 02:22 PM |

**Qualifiers:**

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J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *10-Jul-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES-MNA | **Lab ID:** | 2005038-02 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/06/20 02:20 PM |
| **Lab Order:** | 2005038 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Iron | 0.0395 | 0.0300 | 0.100 | J | mg/L | 1 | 05/11/20 02:01 PM |
| Magnesium | 23.5 | 0.100 | 0.300 | | mg/L | 1 | 05/11/20 02:01 PM |
| Potassium | 2.14 | 0.100 | 0.300 | | mg/L | 1 | 05/11/20 02:01 PM |
| Sodium | 230 | 2.00 | 6.00 | | mg/L | 20 | 05/11/20 03:59 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Nitrate-N | 0.535 | 0.100 | 0.500 | | mg/L | 1 | 05/07/20 02:11 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 434 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/11/20 02:00 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/11/20 02:00 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/11/20 02:00 PM |
| Alkalinity, Total (As CaCO3) | 434 | 20.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/11/20 02:00 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/15/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 10:49 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.0530 | 0.0300 | 0.100 | J | mg/L | 1 | 05/07/20 02:23 PM |

**Qualifiers:**

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- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *10-Jul-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-14 |
| **Project:** | Luminant-OGSES-MNA | **Lab ID:** | 2005038-03 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/06/20 03:05 PM |
| **Lab Order:** | 2005038 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Calcium | 121 | 2.00 | 6.00 | | mg/L | 20 | 05/11/20 04:01 PM |
| Iron | 0.0574 | 0.0300 | 0.100 | J | mg/L | 1 | 05/11/20 02:03 PM |
| Magnesium | 35.0 | 2.00 | 6.00 | | mg/L | 20 | 05/11/20 04:01 PM |
| Potassium | 8.91 | 0.100 | 0.300 | | mg/L | 1 | 05/11/20 02:03 PM |
| Sodium | 201 | 2.00 | 6.00 | | mg/L | 20 | 05/11/20 04:01 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 587 | 30.0 | 100 | | mg/L | 100 | 05/07/20 06:01 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/07/20 02:27 PM |
| Nitrate-N | 0.460 | 0.100 | 0.500 | J | mg/L | 1 | 05/07/20 02:27 PM |
| Sulfate | 28.7 | 1.00 | 3.00 | | mg/L | 1 | 05/07/20 02:27 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 104 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/11/20 02:08 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/11/20 02:08 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/11/20 02:08 PM |
| Alkalinity, Total (As CaCO3) | 104 | 20.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/11/20 02:08 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | 0.0574 | 0.0500 | 0.100 | JN | mg/L | 1 | 05/15/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 10:51 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 05/07/20 02:23 PM |

**Qualifiers:**

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J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
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S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *10-Jul-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-15 |
| **Project:** | Luminant-OGSES-MNA | **Lab ID:** | 2005038-04 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/06/20 03:45 PM |
| **Lab Order:** | 2005038 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Calcium | 399 | 5.00 | 15.0 | | mg/L | 50 | 05/11/20 04:03 PM |
| Iron | 0.0414 | 0.0300 | 0.100 | J | mg/L | 1 | 05/11/20 02:05 PM |
| Magnesium | 130 | 5.00 | 15.0 | | mg/L | 50 | 05/11/20 04:03 PM |
| Potassium | 4.37 | 0.100 | 0.300 | | mg/L | 1 | 05/11/20 02:05 PM |
| Sodium | 499 | 5.00 | 15.0 | | mg/L | 50 | 05/11/20 04:03 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 1060 | 15.0 | 50.0 | | mg/L | 50 | 05/07/20 01:07 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/07/20 02:43 PM |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/07/20 02:43 PM |
| Sulfate | 1020 | 50.0 | 150 | | mg/L | 50 | 05/07/20 01:07 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 119 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/11/20 02:17 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/11/20 02:17 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/11/20 02:17 PM |
| Alkalinity, Total (As CaCO3) | 119 | 20.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/11/20 02:17 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/15/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 10:51 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.0840 | 0.0300 | 0.100 | J | mg/L | 1 | 05/07/20 02:23 PM |

**Qualifiers:**

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N - Parameter not NELAP certified
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S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *10-Jul-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-16 |
| **Project:** | Luminant-OGSES-MNA | **Lab ID:** | 2005038-05 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/06/20 04:30 PM |
| **Lab Order:** | 2005038 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Calcium | 19.2 | 1.00 | 3.00 | | mg/L | 10 | 05/11/20 04:05 PM |
| Iron | 0.371 | 0.0300 | 0.100 | | mg/L | 1 | 05/11/20 02:08 PM |
| Magnesium | 4.09 | 0.100 | 0.300 | | mg/L | 1 | 05/11/20 02:08 PM |
| Potassium | 3.65 | 0.100 | 0.300 | | mg/L | 1 | 05/11/20 02:08 PM |
| Sodium | 75.7 | 1.00 | 3.00 | | mg/L | 10 | 05/11/20 04:05 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 85.7 | 3.00 | 10.0 | | mg/L | 10 | 05/07/20 07:21 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/07/20 02:59 PM |
| Nitrate-N | 0.974 | 0.100 | 0.500 | | mg/L | 1 | 05/07/20 02:59 PM |
| Sulfate | 15.5 | 1.00 | 3.00 | | mg/L | 1 | 05/07/20 02:59 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 99.2 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/11/20 02:24 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/11/20 02:24 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/11/20 02:24 PM |
| Alkalinity, Total (As CaCO3) | 99.2 | 20.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/11/20 02:24 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | 0.371 | 0.0500 | 0.100 | N | mg/L | 1 | 05/15/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 10:53 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 05/07/20 02:24 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
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S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200408C**

Sample ID: **DCS2-95814** Batch ID: **95814** TestNo: **SW6020B** Units: **mg/L**
SampType: **DCS2** Run ID: **ICP-MS5_200408C** Analysis Date: **4/8/2020 11:19:00 AM** Prep Date: **4/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.310 | 0.300 | 0.300 | 0 | 103 | 70 | 130 | 0 | 0 | |
| Iron | 0.0591 | 0.100 | 0.0500 | 0 | 118 | 70 | 130 | 0 | 0 | |
| Magnesium | 0.298 | 0.300 | 0.300 | 0 | 99.3 | 70 | 130 | 0 | 0 | |
| Potassium | 0.285 | 0.300 | 0.300 | 0 | 95.1 | 70 | 130 | 0 | 0 | |
| Sodium | 0.295 | 0.300 | 0.300 | 0 | 98.4 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

The QC data in batch 96270 applies to the following samples: 2005038-01B, 2005038-02B, 2005038-03B, 2005038-04B, 2005038-05B

Sample ID: **MB-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:41:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Iron | <0.0300 | 0.100 | | | | | | | | |
| Magnesium | <0.100 | 0.300 | | | | | | | | |
| Potassium | <0.100 | 0.300 | | | | | | | | |
| Sodium | <0.100 | 0.300 | | | | | | | | |

Sample ID: **LCS-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:43:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.10 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | | | |
| Iron | 5.19 | 0.100 | 5.00 | 0 | 104 | 80 | 120 | | | |
| Magnesium | 5.04 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | | | |
| Potassium | 5.04 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | | | |
| Sodium | 4.99 | 0.300 | 5.00 | 0 | 99.9 | 80 | 120 | | | |

Sample ID: **LCSD-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:45:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.05 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.928 | 15 | |
| Iron | 5.22 | 0.100 | 5.00 | 0 | 104 | 80 | 120 | 0.534 | 15 | |
| Magnesium | 5.09 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | 0.816 | 15 | |
| Potassium | 5.06 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.463 | 15 | |
| Sodium | 5.05 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 1.08 | 15 | |

Sample ID: **2005013-01B SD** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:52:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 3.98 | 1.50 | 0 | 4.00 | | | | 0.590 | 20 | |
| Iron | 0.238 | 0.500 | 0 | 0.237 | | | | 0.532 | 20 | |
| Magnesium | 0.884 | 1.50 | 0 | 0.892 | | | | 0.818 | 20 | |
| Potassium | 2.56 | 1.50 | 0 | 2.57 | | | | 0.207 | 20 | |

Sample ID: **2005013-01B PDS** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 2:23:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 8.99 | 0.300 | 5.00 | 4.00 | 99.7 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

| Sample ID: **2005013-01B PDS** | Batch ID: **96270** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 2:23:00 PM** | Prep Date: **5/8/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.38 | 0.100 | 5.00 | 0.237 | 103 | 75 | 125 | | | |
| Magnesium | 5.71 | 0.300 | 5.00 | 0.892 | 96.3 | 75 | 125 | | | |
| Potassium | 7.36 | 0.300 | 5.00 | 2.57 | 95.9 | 75 | 125 | | | |

| Sample ID: **2005013-01B MS** | Batch ID: **96270** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 2:26:00 PM** | Prep Date: **5/8/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 9.22 | 0.300 | 5.00 | 4.00 | 104 | 75 | 125 | | | |
| Iron | 5.38 | 0.100 | 5.00 | 0.237 | 103 | 75 | 125 | | | |
| Magnesium | 5.95 | 0.300 | 5.00 | 0.892 | 101 | 75 | 125 | | | |
| Potassium | 7.60 | 0.300 | 5.00 | 2.57 | 101 | 75 | 125 | | | |
| Sodium | 154 | 0.300 | 5.00 | 151 | 58.1 | 75 | 125 | | | S |

| Sample ID: **2005013-01B MSD** | Batch ID: **96270** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 2:28:00 PM** | Prep Date: **5/8/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 9.09 | 0.300 | 5.00 | 4.00 | 102 | 75 | 125 | 1.39 | 15 | |
| Iron | 5.39 | 0.100 | 5.00 | 0.237 | 103 | 75 | 125 | 0.208 | 15 | |
| Magnesium | 5.94 | 0.300 | 5.00 | 0.892 | 101 | 75 | 125 | 0.189 | 15 | |
| Potassium | 7.60 | 0.300 | 5.00 | 2.57 | 101 | 75 | 125 | 0.114 | 15 | |
| Sodium | 154 | 0.300 | 5.00 | 151 | 61.1 | 75 | 125 | 0.096 | 15 | S |

| Sample ID: **2005013-01B SD** | Batch ID: **96270** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 3:52:00 PM** | Prep Date: **5/8/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sodium | 149 | 15.0 | 0 | 155 | | | | 4.28 | 20 | |

| Sample ID: **2005013-01B PDS** | Batch ID: **96270** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 4:14:00 PM** | Prep Date: **5/8/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sodium | 207 | 3.00 | 50.0 | 155 | 104 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

| Sample ID: **ICV-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 11:23:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 2.55 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |
| Iron | 2.56 | 0.100 | 2.50 | 0 | 103 | 90 | 110 | | | |
| Magnesium | 2.51 | 0.300 | 2.50 | 0 | 100 | 90 | 110 | | | |
| Potassium | 2.54 | 0.300 | 2.50 | 0 | 101 | 90 | 110 | | | |
| Sodium | 2.56 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **LCVL-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 11:33:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.112 | 0.300 | 0.100 | 0 | 112 | 80 | 120 | | | |
| Iron | 0.102 | 0.100 | 0.100 | 0 | 102 | 80 | 120 | | | |
| Magnesium | 0.100 | 0.300 | 0.100 | 0 | 100 | 80 | 120 | | | |
| Potassium | 0.0988 | 0.300 | 0.100 | 0 | 98.8 | 80 | 120 | | | |
| Sodium | 0.0998 | 0.300 | 0.100 | 0 | 99.8 | 80 | 120 | | | |

| Sample ID: **CCV2-200409** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 1:33:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.08 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Iron | 5.11 | 0.100 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 5.08 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Potassium | 5.02 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |
| Sodium | 5.03 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **CCV3-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 2:39:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.20 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Iron | 5.25 | 0.100 | 5.00 | 0 | 105 | 90 | 110 | | | |
| Magnesium | 5.12 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Potassium | 5.12 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Sodium | 5.07 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **CCV5-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 3:41:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.18 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

| Sample ID: **CCV5-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 3:41:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Magnesium | 5.12 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Sodium | 5.06 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **CCV6-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 4:17:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.23 | 0.300 | 5.00 | 0 | 105 | 90 | 110 | | | |
| Magnesium | 5.16 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Sodium | 5.10 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200430A**

Sample ID: **DCS2-96153** Batch ID: **96153** TestNo: **E300** Units: **mg/L**
SampType: **DCS2** Run ID: **IC4_200430A** Analysis Date: **4/30/2020 11:31:49 AM** Prep Date: **4/30/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.473 | 1.00 | 0.5000 | 0 | 94.7 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.191 | 0.400 | 0.2000 | 0 | 95.6 | 70 | 130 | 0 | 0 | |
| Nitrate-N | 0.243 | 0.0500 | 0.2500 | 0 | 97.0 | 70 | 130 | 0 | 0 | |
| Sulfate | 1.34 | 3.00 | 1.500 | 0 | 89.6 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200507A**

The QC data in batch 96213 applies to the following samples: 2005038-01C, 2005038-02C, 2005038-03C, 2005038-04C, 2005038-05C

Sample ID: **MB-96213** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 10:26:10 AM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Nitrate-N | <0.100 | 0.500 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-96213** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 10:42:10 AM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.97 | 1.00 | 10.00 | 0 | 99.7 | 90 | 110 | | | |
| Fluoride | 3.70 | 0.400 | 4.000 | 0 | 92.6 | 90 | 110 | | | |
| Nitrate-N | 4.99 | 0.500 | 5.000 | 0 | 99.9 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | | | |

Sample ID: **LCSD-96213** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 10:58:10 AM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.95 | 1.00 | 10.00 | 0 | 99.5 | 90 | 110 | 0.142 | 20 | |
| Fluoride | 3.69 | 0.400 | 4.000 | 0 | 92.3 | 90 | 110 | 0.300 | 20 | |
| Nitrate-N | 5.43 | 0.500 | 5.000 | 0 | 109 | 90 | 110 | 8.45 | 20 | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.7 | 90 | 110 | 0.199 | 20 | |

Sample ID: **2005032-01CMS** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 6:17:07 PM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2090 | 100 | 2000 | 152.7 | 97.0 | 90 | 110 | | | |
| Fluoride | 1990 | 40.0 | 2000 | 0 | 99.4 | 90 | 110 | | | |
| Nitrate-N | 435 | 50.0 | 451.6 | 0 | 96.3 | 90 | 110 | | | |
| Sulfate | 2060 | 300 | 2000 | 104.8 | 97.7 | 90 | 110 | | | |

Sample ID: **2005032-01CMSD** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 6:33:07 PM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2100 | 100 | 2000 | 152.7 | 97.2 | 90 | 110 | 0.222 | 20 | |
| Fluoride | 2000 | 40.0 | 2000 | 0 | 100 | 90 | 110 | 0.595 | 20 | |
| Nitrate-N | 437 | 50.0 | 451.6 | 0 | 96.7 | 90 | 110 | 0.417 | 20 | |
| Sulfate | 2050 | 300 | 2000 | 104.8 | 97.4 | 90 | 110 | 0.233 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200507A**

| Sample ID: **2005022-01BMS** | Batch ID: **96213** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 6:49:07 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 243 | 10.0 | 200.0 | 46.49 | 98.2 | 90 | 110 | | | |
| Fluoride | 223 | 4.00 | 200.0 | 21.81 | 101 | 90 | 110 | | | |
| Nitrate-N | 45.7 | 5.00 | 45.16 | 1.937 | 97.0 | 90 | 110 | | | |
| Sulfate | 458 | 30.0 | 200.0 | 267.4 | 95.5 | 90 | 110 | | | |

| Sample ID: **2005022-01BMSD** | Batch ID: **96213** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 7:05:07 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 240 | 10.0 | 200.0 | 46.49 | 97.0 | 90 | 110 | 0.970 | 20 | |
| Fluoride | 223 | 4.00 | 200.0 | 21.81 | 100 | 90 | 110 | 0.247 | 20 | |
| Nitrate-N | 45.5 | 5.00 | 45.16 | 1.937 | 96.6 | 90 | 110 | 0.456 | 20 | |
| Sulfate | 458 | 30.0 | 200.0 | 267.4 | 95.1 | 90 | 110 | 0.187 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200507A**

| Sample ID: **ICV-200507** | Batch ID: **R110392** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 9:54:10 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.7 | 1.00 | 25.00 | 0 | 98.9 | 90 | 110 | | | |
| Fluoride | 9.55 | 0.400 | 10.00 | 0 | 95.5 | 90 | 110 | | | |
| Nitrate-N | 12.2 | 0.500 | 12.50 | 0 | 97.4 | 90 | 110 | | | |
| Sulfate | 74.8 | 3.00 | 75.00 | 0 | 99.7 | 90 | 110 | | | |

| Sample ID: **CCV1-200507** | Batch ID: **R110392** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 5:29:07 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.94 | 1.00 | 10.00 | 0 | 99.4 | 90 | 110 | | | |
| Fluoride | 3.75 | 0.400 | 4.000 | 0 | 93.6 | 90 | 110 | | | |
| Nitrate-N | 4.95 | 0.500 | 5.000 | 0 | 98.9 | 90 | 110 | | | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID: **CCV2-200507** | Batch ID: **R110392** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 10:33:07 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.0 | 1.00 | 10.00 | 0 | 100 | 90 | 110 | | | |
| Fluoride | 3.81 | 0.400 | 4.000 | 0 | 95.3 | 90 | 110 | | | |
| Nitrate-N | 4.97 | 0.500 | 5.000 | 0 | 99.4 | 90 | 110 | | | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 98.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_200511A**

The QC data in batch 96290 applies to the following samples: 2005038-01C, 2005038-02C, 2005038-03C, 2005038-04C, 2005038-05C

Sample ID: **MB-96290** Batch ID: **96290** TestNo: **M2320 B** Units: **mg/L @ pH 4.43**
SampType: **MBLK** Run ID: **TITRATOR_200511A** Analysis Date: **5/11/2020 11:32:00 AM** Prep Date: **5/11/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Total (As CaCO3) | <20.0 | 20.0 | | | | | | | | |

Sample ID: **LCS-96290** Batch ID: **96290** TestNo: **M2320 B** Units: **mg/L @ pH 4.23**
SampType: **LCS** Run ID: **TITRATOR_200511A** Analysis Date: **5/11/2020 11:36:00 AM** Prep Date: **5/11/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 53.4 | 20.0 | 50.00 | 0 | 107 | 74 | 129 | | | |

Sample ID: **2005013-01G-DUP** Batch ID: **96290** TestNo: **M2320 B** Units: **mg/L @ pH 4.52**
SampType: **DUP** Run ID: **TITRATOR_200511A** Analysis Date: **5/11/2020 1:18:00 PM** Prep Date: **5/11/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 242 | 20.0 | 0 | 243.0 | | | | 0.578 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 242 | 20.0 | 0 | 243.0 | | | | 0.578 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_200511A**

| Sample ID: **ICV-200511** | Batch ID: **R110433** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.33** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **TITRATOR_200511A** | Analysis Date: **5/11/2020 11:30:00 AM** | Prep Date: **5/11/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 29.4 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 69.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.1 | 20.0 | 100.0 | 0 | 99.1 | 98 | 102 | | | |

| Sample ID: **CCV1-200511** | Batch ID: **R110433** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.26** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_200511A** | Analysis Date: **5/11/2020 2:29:00 PM** | Prep Date: **5/11/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 39.6 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 59.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 98.8 | 20.0 | 100.0 | 0 | 98.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200323B**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS-95613** | Batch ID: **95613** | TestNo: **M3500-Fe D** | Units: **mg/L** | | |
| SampType: **DCS** | Run ID: **UV/VIS_2_200323B** | Analysis Date: **3/23/2020 1:30:00 PM** | Prep Date: **3/23/2020** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.0580 | 0.100 | 0.05000 | 0 | 116 | 65 | 135 | 0 | 0 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200507C**

The QC data in batch 96253 applies to the following samples: 2005038-01C, 2005038-02C, 2005038-03C, 2005038-04C, 2005038-05C

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **MB-96253** | Batch ID: **96253** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MBLK** | Run ID: **UV/VIS_2_200507C** | | | Analysis Date: **5/7/2020 2:21:00 PM** | | | | Prep Date: **5/7/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Phosphorus, Total Orthophosphate (As | <0.0300 | 0.100 | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **LCS-96253** | Batch ID: **96253** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **LCS** | Run ID: **UV/VIS_2_200507C** | | | Analysis Date: **5/7/2020 2:21:00 PM** | | | | Prep Date: **5/7/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Phosphorus, Total Orthophosphate (As | 0.499 | 0.100 | 0.5000 | 0 | 99.8 | 80 | 120 | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **LCSD-96253** | Batch ID: **96253** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **LCSD** | Run ID: **UV/VIS_2_200507C** | | | Analysis Date: **5/7/2020 2:21:00 PM** | | | | Prep Date: **5/7/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Phosphorus, Total Orthophosphate (As | 0.498 | 0.100 | 0.5000 | 0 | 99.6 | 80 | 120 | 0.201 | 15 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **DCS-96253** | Batch ID: **96253** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **DCS** | Run ID: **UV/VIS_2_200507C** | | | Analysis Date: **5/7/2020 2:22:00 PM** | | | | Prep Date: **5/7/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Phosphorus, Total Orthophosphate (As | 0.0480 | 0.100 | 0.05000 | 0 | 96.0 | 50 | 200 | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **2005038-01CMS** | Batch ID: **96253** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MS** | Run ID: **UV/VIS_2_200507C** | | | Analysis Date: **5/7/2020 2:22:00 PM** | | | | Prep Date: **5/7/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Phosphorus, Total Orthophosphate (As | 0.582 | 0.100 | 0.5000 | 0.07600 | 101 | 80 | 120 | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **2005038-01CMSD** | Batch ID: **96253** | | | TestNo: **M4500-P E** | | | | Units: **mg/L** | | | |
| SampType: **MSD** | Run ID: **UV/VIS_2_200507C** | | | Analysis Date: **5/7/2020 2:22:00 PM** | | | | Prep Date: **5/7/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Phosphorus, Total Orthophosphate (As | 0.583 | 0.100 | 0.5000 | 0.07600 | 101 | 80 | 120 | 0.172 | 15 | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **UV/VIS_2_200507C**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID: **ICV-200507** | Batch ID: **R110386** | TestNo: **M4500-P E** | | | | Units: **mg/L** | |
| SampType: **ICV** | Run ID: **UV/VIS_2_200507C** | Analysis Date: **5/7/2020 2:20:00 PM** | | | | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.198 | 0.100 | 0.2000 | 0 | 99.0 | 85 | 115 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample ID: **CCV1-200507** | Batch ID: **R110386** | TestNo: **M4500-P E** | | | | Units: **mg/L** | |
| SampType: **CCV** | Run ID: **UV/VIS_2_200507C** | Analysis Date: **5/7/2020 2:24:00 PM** | | | | Prep Date: | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.506 | 0.100 | 0.5000 | 0 | 101 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200513B**

The QC data in batch 96316 applies to the following samples: 2005038-01A, 2005038-02A, 2005038-03A, 2005038-04A, 2005038-05A

| Sample ID: **MB-96316** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:41:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | <0.0500 | 0.100 | | | | | | | | N |

| Sample ID: **LCS-96316** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:41:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.106 | 0.100 | 0.1000 | 0 | 106 | 85 | 115 | | | N |

| Sample ID: **LCSD-96316** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:42:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.105 | 0.100 | 0.1000 | 0 | 105 | 85 | 115 | 0.720 | 15 | N |

| Sample ID: **2005038-01AMS** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:29:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.120 | 0.100 | 0.1000 | 0 | 120 | 85 | 115 | | | SN |

| Sample ID: **2005038-01AMSD** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:29:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.109 | 0.100 | 0.1000 | 0 | 109 | 85 | 115 | 8.97 | 15 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200513B**

| Sample ID: **ICV-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:40:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.112 | 0.100 | 0.1000 | 0 | 112 | 85 | 115 | | | N |

| Sample ID: **CCV1-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:02:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.192 | 0.100 | 0.2000 | 0 | 96.2 | 85 | 115 | | | N |

| Sample ID: **CCV2-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:15:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.187 | 0.100 | 0.2000 | 0 | 93.5 | 85 | 115 | | | N |

| Sample ID: **CCV3-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:31:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.205 | 0.100 | 0.2000 | 0 | 103 | 85 | 115 | | | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005038
**Project:** Luminant-OGSES-MNA

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Nitrate-N | 0.100 | 0.500 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Calcium | 0.100 | 0.300 |
| Iron | 0.0300 | 0.100 |
| Magnesium | 0.100 | 0.300 |
| Potassium | 0.100 | 0.300 |
| Sodium | 0.100 | 0.300 |

| **TestNo: M2320 B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **ıg/L @ pH 4.4** | **g/L @ pH 4.4** |
| Alkalinity, Bicarbonate (As CaCO3) | 10.0 | 20.0 |
| Alkalinity, Carbonate (As CaCO3) | 10.0 | 20.0 |
| Alkalinity, Hydroxide (As CaCO3) | 10.0 | 20.0 |
| Alkalinity, Total (As CaCO3) | 20.0 | 20.0 |

| **TestNo: M3500-Fe D** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Iron, Ferrous | 0.0500 | 0.100 |

| **TestNo: M4500-P E** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Phosphorus, Total Orthophosphate ( | 0.0300 | 0.100 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

June 10, 2020

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2005040

RE: Luminant-OGSES-CCR

Dear Will Vienne:

DHL Analytical, Inc. received 2 sample(s) on 5/7/2020 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-20-25

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 68301

# CHAIN-OF-CUSTODY

CLIENT: GOLDER ASSOCIATES
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-6-20 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 2005040
PROJECT LOCATION OR NAME: LUMINANT - DGSES - CCR
CLENT PROJECT #: 19122262 COLLECTOR:

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT
P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS ❑ | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | APPENDIX III & IV

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | 01 | 5-6-20 | 1320 | W | | 4 | | X | | X | | X | |
| FGD-3 | 02 | 5-6-20 | 1420 | W | | 4 | | X | | X | | X | |

RELINQUISHED BY: (Signature) DATE/TIME 5-7-20/900 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME 5-7-20/1655 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

❑ DHL DISPOSAL @ $5.00 each ❑ Return

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☒
OTHER ❑

**LABORATORY USE ONLY:**
RECEIVING TEMP: 0.9°C THERM #: 78
CUSTODY SEALS: ❑ BROKEN ☒ INTACT ❑ NOT USED
CARRIER: ❑ LONE STAR ❑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
☑ HAND DELIVERED

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

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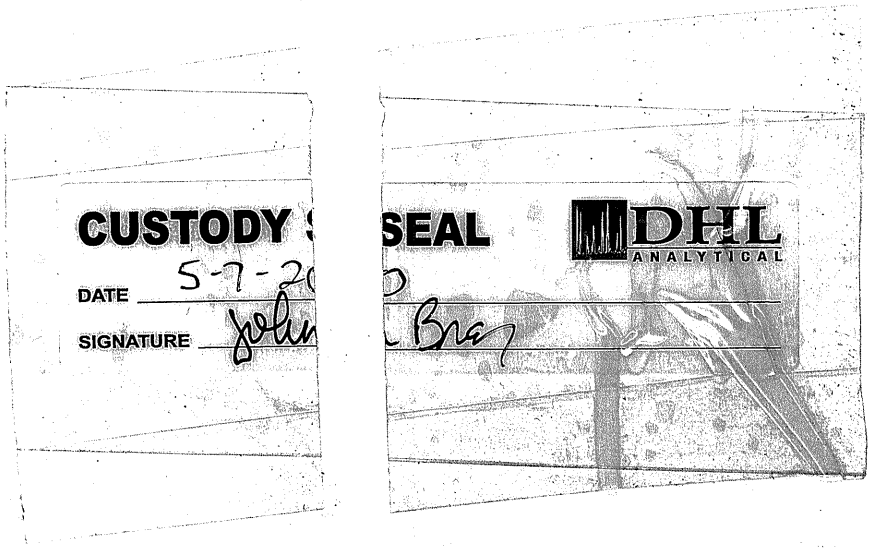
**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis


CUSTODY
SEAL
DHL
ANALYTICAL
DATE
5-7-2
SIGNATURE

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder** Date Received: **5/7/2020**

Work Order Number **2005040** Received by: **EL**

Checklist completed by: _____ 5/7/2020 Reviewed by DL 5/7/2020
Signature | Date | Initials | Date

Carrier name: Hand Delivered

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **0.9** °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? no | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? _____ | | Checked by _____ |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

## Laboratory Name: DHL Analytical, Inc.

## Laboratory Review Checklist: Reportable Data

| | |
|---|---|
| **Project Name:** Luminant-OGSES-CCR | **LRC Date:** 6/10/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2005040 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | **X** | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | **X** | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | **X** | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | **X** | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | **X** | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | **X** | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | **X** | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | **X** | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | **X** | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | **X** | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | **X** | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | **X** | | |
| | | **9)** If required for the project, TICs reported? | | | **X** | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | **X** | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | **X** | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | **X** | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | **X** | | | | |
| | | **4)** Were blank concentrations < MDL? | **X** | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | **X** | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | **X** | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | **X** | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | **X** | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | **X** | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | **X** | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | **X** | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | **X** | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | **X** | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | **X** | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | **X** | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | **X** | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | **X** | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | **X** | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | **X** | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | **X** | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-CCR | **LRC Date:** 6/10/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2005040 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | X | | | S9-01 |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

06/10/20

Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *10-Jun-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES-CCR
**Lab Order:** 2005040

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis

Exception Report R1-01

The samples were received and log-in performed on 5/7/20. A total of 2 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report S9-01

For Metals analysis performed on 5/11/20 the RPD for the serial dilution was slightly above control limits for Boron. This is flagged accordingly in the QC summary report. The PDS was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *10-Jun-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES-CCR
**Lab Order:** 2005040

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2005040-01 | FGD-6 | | 05/06/20 01:20 PM | 5/7/2020 |
| 2005040-02 | FGD-3 | | 05/06/20 02:20 PM | 5/7/2020 |

**Lab Order:** 2005040
**Client:** Golder
**Project:** Luminant-OGSES-CCR

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005040-01A | FGD-6 | 05/06/20 01:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/12/20 01:39 PM | 96317 |
| 2005040-01B | FGD-6 | 05/06/20 01:20 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-6 | 05/06/20 01:20 PM | Aqueous | M2540C | TDS Preparation | 05/07/20 01:32 PM | 96250 |
| 2005040-02A | FGD-3 | 05/06/20 02:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/08/20 10:34 AM | 96270 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/12/20 01:39 PM | 96317 |
| 2005040-02B | FGD-3 | 05/06/20 02:20 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | E300 | Anion Preparation | 05/07/20 08:41 AM | 96213 |
| | FGD-3 | 05/06/20 02:20 PM | Aqueous | M2540C | TDS Preparation | 05/07/20 01:32 PM | 96250 |

**Lab Order:** 2005040
**Client:** Golder
**Project:** Luminant-OGSES-CCR

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005040-01A | FGD-6 | Aqueous | SW7470A | Mercury Total: Aqueous | 96317 | 1 | 05/13/20 12:19 PM | CETAC2_HG_200513 A |
| | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 5 | 05/11/20 04:08 PM | ICP-MS5_200511B |
| | FGD-6 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 1 | 05/11/20 02:50 PM | ICP-MS5_200511B |
| 2005040-01B | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 96213 | 1 | 05/07/20 08:25 PM | IC4_200507A |
| | FGD-6 | Aqueous | E300 | Anions by IC method - Water | 96213 | 10 | 05/07/20 07:53 PM | IC4_200507A |
| | FGD-6 | Aqueous | M2540C | Total Dissolved Solids | 96250 | 1 | 05/07/20 04:50 PM | WC_200507D |
| 2005040-02A | FGD-3 | Aqueous | SW7470A | Mercury Total: Aqueous | 96317 | 1 | 05/13/20 12:21 PM | CETAC2_HG_200513 A |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 5 | 05/11/20 04:10 PM | ICP-MS5_200511B |
| | FGD-3 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96270 | 1 | 05/11/20 02:52 PM | ICP-MS5_200511B |
| 2005040-02B | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 96213 | 1 | 05/07/20 08:41 PM | IC4_200507A |
| | FGD-3 | Aqueous | E300 | Anions by IC method - Water | 96213 | 10 | 05/07/20 08:09 PM | IC4_200507A |
| | FGD-3 | Aqueous | M2540C | Total Dissolved Solids | 96250 | 1 | 05/07/20 04:50 PM | WC_200507D |

# DHL Analytical, Inc.

**Date:** *10-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-6 |
| **Project:** | Luminant-OGSES-CCR | **Lab ID:** | 2005040-01 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/06/20 01:20 PM |
| **Lab Order:** | 2005040 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/11/20 02:50 PM |
| Arsenic | 0.00286 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/11/20 02:50 PM |
| Barium | 0.0814 | 0.00300 | 0.0100 | | mg/L | 1 | 05/11/20 02:50 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:50 PM |
| Boron | 0.109 | 0.0100 | 0.0300 | | mg/L | 1 | 05/11/20 02:50 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:50 PM |
| Calcium | 27.4 | 0.500 | 1.50 | | mg/L | 5 | 05/11/20 04:08 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/11/20 02:50 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/11/20 02:50 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:50 PM |
| Lithium | 0.00877 | 0.00500 | 0.0100 | J | mg/L | 1 | 05/11/20 02:50 PM |
| Molybdenum | 0.00205 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/11/20 02:50 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/11/20 02:50 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/11/20 02:50 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/13/20 12:19 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 189 | 3.00 | 10.0 | | mg/L | 10 | 05/07/20 07:53 PM |
| Fluoride | 0.292 | 0.100 | 0.400 | J | mg/L | 1 | 05/07/20 08:25 PM |
| Sulfate | 70.7 | 1.00 | 3.00 | | mg/L | 1 | 05/07/20 08:25 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 746 | 10.0 | 10.0 | | mg/L | 1 | 05/07/20 04:50 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *10-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-3 |
| **Project:** | Luminant-OGSES-CCR | **Lab ID:** | 2005040-02 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/06/20 02:20 PM |
| **Lab Order:** | 2005040 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/11/20 02:52 PM |
| Arsenic | 0.00209 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/11/20 02:52 PM |
| Barium | 0.0353 | 0.00300 | 0.0100 | | mg/L | 1 | 05/11/20 02:52 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:52 PM |
| Boron | 0.152 | 0.0100 | 0.0300 | | mg/L | 1 | 05/11/20 02:52 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:52 PM |
| Calcium | 42.3 | 0.500 | 1.50 | | mg/L | 5 | 05/11/20 04:10 PM |
| Chromium | 0.0117 | 0.00200 | 0.00500 | | mg/L | 1 | 05/11/20 02:52 PM |
| Cobalt | 0.00332 | 0.00300 | 0.00500 | J | mg/L | 1 | 05/11/20 02:52 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/11/20 02:52 PM |
| Lithium | 0.0498 | 0.00500 | 0.0100 | | mg/L | 1 | 05/11/20 02:52 PM |
| Molybdenum | 0.00284 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/11/20 02:52 PM |
| Selenium | 0.00993 | 0.00200 | 0.00500 | | mg/L | 1 | 05/11/20 02:52 PM |
| Thallium | 0.000556 | 0.000500 | 0.00150 | J | mg/L | 1 | 05/11/20 02:52 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/13/20 12:21 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 70.2 | 3.00 | 10.0 | | mg/L | 10 | 05/07/20 08:09 PM |
| Fluoride | 0.800 | 0.100 | 0.400 | | mg/L | 1 | 05/07/20 08:41 PM |
| Sulfate | 129 | 1.00 | 3.00 | | mg/L | 1 | 05/07/20 08:41 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 777 | 10.0 | 10.0 | | mg/L | 1 | 05/07/20 04:50 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200304C**

Sample ID: **DCS-95289** Batch ID: **95289** TestNo: **SW7470A** Units: **mg/L**
SampType: **DCS** Run ID: **CETAC2_HG_200304C** Analysis Date: **3/4/2020 12:11:09 PM** Prep Date: **3/4/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.000175 | 0.000200 | 0.000200 | 0 | 87.5 | 82 | 119 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200513A**

The QC data in batch 96317 applies to the following samples: 2005040-01A, 2005040-02A

| Sample ID: **MB-96317** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:09:44 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

| Sample ID: **LCS-96317** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:14:44 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00195 | 0.000200 | 0.00200 | 0 | 97.5 | 85 | 115 | | | |

| Sample ID: **LCSD-96317** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:17:01 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00206 | 0.000200 | 0.00200 | 0 | 103 | 85 | 115 | 5.49 | 15 | |

| Sample ID: **2005048-02A MS** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:28:20 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0104 | 0.00100 | 0.0100 | 0 | 104 | 80 | 120 | | | |

| Sample ID: **2005048-02A MSD** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:30:36 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0105 | 0.00100 | 0.0100 | 0 | 104 | 80 | 120 | 0.480 | 15 | |

| Sample ID: **2005048-02A SD** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:32:52 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.00200 | 0.00500 | 0 | 0 | | | | 0 | 10 | |

| Sample ID: **2005048-02A PDS** | Batch ID: **96317** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 12:35:07 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.0124 | 0.00100 | 0.0125 | 0 | 99.2 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200513A**

| Sample ID: **ICV-200513** | Batch ID: **R110466** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 10:49:14 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00383 | 0.000200 | 0.00400 | 0 | 95.8 | 90 | 110 | | | |

| Sample ID: **CCV1-200513** | Batch ID: **R110466** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_200513A** | Analysis Date: **5/13/2020 1:06:55 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00202 | 0.000200 | 0.00200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200408C**

| Sample ID: **DCS1-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:16:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.000932 | 0.00250 | 0.00100 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Beryllium | 0.000472 | 0.00100 | 0.000500 | 0 | 94.4 | 70 | 130 | 0 | 0 | |
| Cadmium | 0.000492 | 0.00100 | 0.000500 | 0 | 98.4 | 70 | 130 | 0 | 0 | |
| Lead | 0.000496 | 0.00100 | 0.000500 | 0 | 99.2 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000468 | 0.00150 | 0.000500 | 0 | 93.6 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS2-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:19:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.310 | 0.300 | 0.300 | 0 | 103 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS3-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:21:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00466 | 0.00500 | 0.00500 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Barium | 0.00478 | 0.0100 | 0.00500 | 0 | 95.6 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00600 | 0.00500 | 0.00500 | 0 | 120 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00473 | 0.00500 | 0.00500 | 0 | 94.6 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00473 | 0.0100 | 0.00500 | 0 | 94.6 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00466 | 0.00500 | 0.00500 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:28:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0286 | 0.0300 | 0.0300 | 0 | 95.2 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS5_200511B**

The QC data in batch 96270 applies to the following samples: 2005040-01A, 2005040-02A

Sample ID: **MB-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:41:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Boron | <0.0100 | 0.0300 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID: **LCS-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:43:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Barium | 0.198 | 0.0100 | 0.200 | 0 | 99.0 | 80 | 120 | | | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 80 | 120 | | | |
| Boron | 0.191 | 0.0300 | 0.200 | 0 | 95.7 | 80 | 120 | | | |
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Calcium | 5.10 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 80 | 120 | | | |
| Cobalt | 0.199 | 0.00500 | 0.200 | 0 | 99.6 | 80 | 120 | | | |
| Lead | 0.191 | 0.00100 | 0.200 | 0 | 95.6 | 80 | 120 | | | |
| Lithium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Thallium | 0.190 | 0.00150 | 0.200 | 0 | 95.0 | 80 | 120 | | | |

Sample ID: **LCSD-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:45:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | 0.748 | 15 | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | 0.625 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

Sample ID: **LCSD-96270** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:45:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.3 | 80 | 120 | 0.306 | 15 | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | 0.891 | 15 | |
| Boron | 0.207 | 0.0300 | 0.200 | 0 | 104 | 80 | 120 | 7.99 | 15 | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.817 | 15 | |
| Calcium | 5.05 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | 0.928 | 15 | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.855 | 15 | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.747 | 15 | |
| Lead | 0.190 | 0.00100 | 0.200 | 0 | 95.2 | 80 | 120 | 0.416 | 15 | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | 1.37 | 15 | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.702 | 15 | |
| Selenium | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.402 | 15 | |
| Thallium | 0.189 | 0.00150 | 0.200 | 0 | 94.6 | 80 | 120 | 0.385 | 15 | |

Sample ID: **2005013-01B SD** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:52:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 20 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Barium | 0.0953 | 0.0500 | 0 | 0.0961 | | | | 0.857 | 20 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Boron | 0.287 | 0.150 | 0 | 0.221 | | | | 26.1 | 20 | R |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Calcium | 3.98 | 1.50 | 0 | 4.00 | | | | 0.590 | 20 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Lithium | 0.0284 | 0.0500 | 0 | 0.0274 | | | | 3.58 | 20 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 20 | |

Sample ID: **2005013-01B PDS** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 2:23:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.198 | 0.00250 | 0.200 | 0 | 99.1 | 75 | 125 | | | |
| Arsenic | 0.193 | 0.00500 | 0.200 | 0 | 96.4 | 75 | 125 | | | |
| Barium | 0.292 | 0.0100 | 0.200 | 0.0961 | 97.9 | 75 | 125 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 99.8 | 75 | 125 | | | |
| Boron | 0.409 | 0.0300 | 0.200 | 0.221 | 94.2 | 75 | 125 | | | |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

Sample ID: **2005013-01B PDS** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 2:23:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 0.203 | 0.00100 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Calcium | 8.99 | 0.300 | 5.00 | 4.00 | 99.7 | 75 | 125 | | | |
| Chromium | 0.203 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Cobalt | 0.192 | 0.00500 | 0.200 | 0 | 96.2 | 75 | 125 | | | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.3 | 75 | 125 | | | |
| Lithium | 0.231 | 0.0100 | 0.200 | 0.0274 | 102 | 75 | 125 | | | |
| Molybdenum | 0.200 | 0.00500 | 0.200 | 0 | 99.8 | 75 | 125 | | | |
| Selenium | 0.190 | 0.00500 | 0.200 | 0 | 95.0 | 75 | 125 | | | |
| Thallium | 0.192 | 0.00150 | 0.200 | 0 | 95.9 | 75 | 125 | | | |

Sample ID: **2005013-01B MS** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 2:26:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Arsenic | 0.193 | 0.00500 | 0.200 | 0 | 96.6 | 75 | 125 | | | |
| Barium | 0.294 | 0.0100 | 0.200 | 0.0961 | 99.0 | 75 | 125 | | | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 75 | 125 | | | |
| Boron | 0.442 | 0.0300 | 0.200 | 0.221 | 111 | 75 | 125 | | | |
| Cadmium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 75 | 125 | | | |
| Calcium | 9.22 | 0.300 | 5.00 | 4.00 | 104 | 75 | 125 | | | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 98.0 | 75 | 125 | | | |
| Cobalt | 0.188 | 0.00500 | 0.200 | 0 | 94.1 | 75 | 125 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.5 | 75 | 125 | | | |
| Lithium | 0.235 | 0.0100 | 0.200 | 0.0274 | 104 | 75 | 125 | | | |
| Molybdenum | 0.203 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Selenium | 0.193 | 0.00500 | 0.200 | 0 | 96.5 | 75 | 125 | | | |
| Thallium | 0.191 | 0.00150 | 0.200 | 0 | 95.3 | 75 | 125 | | | |

Sample ID: **2005013-01B MSD** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 2:28:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 102 | 75 | 125 | 0.105 | 15 | |
| Arsenic | 0.194 | 0.00500 | 0.200 | 0 | 97.2 | 75 | 125 | 0.685 | 15 | |
| Barium | 0.296 | 0.0100 | 0.200 | 0.0961 | 100 | 75 | 125 | 0.795 | 15 | |
| Beryllium | 0.197 | 0.00100 | 0.200 | 0 | 98.7 | 75 | 125 | 0.818 | 15 | |
| Boron | 0.441 | 0.0300 | 0.200 | 0.221 | 110 | 75 | 125 | 0.181 | 15 | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 75 | 125 | 0.312 | 15 | |
| Calcium | 9.09 | 0.300 | 5.00 | 4.00 | 102 | 75 | 125 | 1.39 | 15 | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 97.9 | 75 | 125 | 0.093 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

Sample ID: **2005013-01B MSD** Batch ID: **96270** TestNo: **SW6020B** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 2:28:00 PM** Prep Date: **5/8/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 0.190 | 0.00500 | 0.200 | 0 | 95.2 | 75 | 125 | 1.15 | 15 | |
| Lead | 0.195 | 0.00100 | 0.200 | 0 | 97.3 | 75 | 125 | 0.844 | 15 | |
| Lithium | 0.236 | 0.0100 | 0.200 | 0.0274 | 104 | 75 | 125 | 0.311 | 15 | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 102 | 75 | 125 | 0.717 | 15 | |
| Selenium | 0.190 | 0.00500 | 0.200 | 0 | 95.2 | 75 | 125 | 1.42 | 15 | |
| Thallium | 0.193 | 0.00150 | 0.200 | 0 | 96.3 | 75 | 125 | 1.03 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

Sample ID: **ICV-200511** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **ICV** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 11:23:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.103 | 0.00250 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.0999 | 0.00500 | 0.100 | 0 | 99.9 | 90 | 110 | | | |
| Barium | 0.0995 | 0.0100 | 0.100 | 0 | 99.5 | 90 | 110 | | | |
| Beryllium | 0.0992 | 0.00100 | 0.100 | 0 | 99.2 | 90 | 110 | | | |
| Boron | 0.0999 | 0.0300 | 0.100 | 0 | 99.9 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.55 | 0.300 | 2.50 | 0 | 102 | 90 | 110 | | | |
| Chromium | 0.103 | 0.00500 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Cobalt | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.0990 | 0.00100 | 0.100 | 0 | 99.0 | 90 | 110 | | | |
| Lithium | 0.0991 | 0.0100 | 0.100 | 0 | 99.1 | 90 | 110 | | | |
| Molybdenum | 0.0981 | 0.00500 | 0.100 | 0 | 98.1 | 90 | 110 | | | |
| Selenium | 0.106 | 0.00500 | 0.100 | 0 | 106 | 90 | 110 | | | |
| Thallium | 0.0964 | 0.00150 | 0.100 | 0 | 96.4 | 90 | 110 | | | |

Sample ID: **LCVL-200511** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 11:33:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00204 | 0.00250 | 0.00200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.00519 | 0.00500 | 0.00500 | 0 | 104 | 80 | 120 | | | |
| Barium | 0.00522 | 0.0100 | 0.00500 | 0 | 104 | 80 | 120 | | | |
| Beryllium | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 80 | 120 | | | |
| Boron | 0.0205 | 0.0300 | 0.0200 | 0 | 103 | 80 | 120 | | | |
| Cadmium | 0.000999 | 0.00100 | 0.00100 | 0 | 99.9 | 80 | 120 | | | |
| Calcium | 0.112 | 0.300 | 0.100 | 0 | 112 | 80 | 120 | | | |
| Chromium | 0.00504 | 0.00500 | 0.00500 | 0 | 101 | 80 | 120 | | | |
| Cobalt | 0.00505 | 0.00500 | 0.00500 | 0 | 101 | 80 | 120 | | | |
| Lead | 0.000980 | 0.00100 | 0.00100 | 0 | 98.0 | 80 | 120 | | | |
| Lithium | 0.00989 | 0.0100 | 0.0100 | 0 | 98.9 | 80 | 120 | | | |
| Molybdenum | 0.00502 | 0.00500 | 0.00500 | 0 | 100 | 80 | 120 | | | |
| Selenium | 0.00584 | 0.00500 | 0.00500 | 0 | 117 | 80 | 120 | | | |
| Thallium | 0.000967 | 0.00150 | 0.00100 | 0 | 96.7 | 80 | 120 | | | |

Sample ID: **CCV2-200409** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:33:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.199 | 0.00500 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Barium | 0.196 | 0.0100 | 0.200 | 0 | 97.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

Sample ID: **CCV2-200409** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 1:33:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 90 | 110 | | | |
| Boron | 0.197 | 0.0300 | 0.200 | 0 | 98.5 | 90 | 110 | | | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 90 | 110 | | | |
| Calcium | 5.08 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Chromium | 0.196 | 0.00500 | 0.200 | 0 | 98.1 | 90 | 110 | | | |
| Cobalt | 0.195 | 0.00500 | 0.200 | 0 | 97.7 | 90 | 110 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 95.8 | 90 | 110 | | | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.5 | 90 | 110 | | | |
| Thallium | 0.190 | 0.00150 | 0.200 | 0 | 94.8 | 90 | 110 | | | |

Sample ID: **CCV3-200511** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 2:39:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.199 | 0.0100 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.6 | 90 | 110 | | | |
| Boron | 0.196 | 0.0300 | 0.200 | 0 | 98.1 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 5.20 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Cobalt | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 90 | 110 | | | |
| Lead | 0.193 | 0.00100 | 0.200 | 0 | 96.6 | 90 | 110 | | | |
| Lithium | 0.205 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Selenium | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Thallium | 0.192 | 0.00150 | 0.200 | 0 | 95.8 | 90 | 110 | | | |

Sample ID: **CCV4-200511** Batch ID: **R110424** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200511B** Analysis Date: **5/11/2020 3:08:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Arsenic | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.200 | 0.00100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Boron | 0.199 | 0.0300 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Cadmium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200511B**

| Sample ID: **CCV4-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 3:08:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.4 | 90 | 110 | | | |
| Cobalt | 0.201 | 0.00500 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Lead | 0.192 | 0.00100 | 0.200 | 0 | 96.2 | 90 | 110 | | | |
| Lithium | 0.208 | 0.0100 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.190 | 0.00150 | 0.200 | 0 | 95.1 | 90 | 110 | | | |

| Sample ID: **CCV5-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 3:41:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.18 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |

| Sample ID: **CCV6-200511** | Batch ID: **R110424** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200511B** | Analysis Date: **5/11/2020 4:17:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.23 | 0.300 | 5.00 | 0 | 105 | 90 | 110 | | | |

**Qualifiers:**

| | |
|---|---|
| B | Analyte detected in the associated Method Blank |
| J | Analyte detected between MDL and RL |
| ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit |
| J | Analyte detected between SDL and RL |
| DF | Dilution Factor |
| MDL | Method Detection Limit |
| R | RPD outside accepted control limits |
| S | Spike Recovery outside control limits |
| N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200430A**

Sample ID: **DCS2-96153** Batch ID: **96153** TestNo: **E300** Units: **mg/L**
SampType: **DCS2** Run ID: **IC4_200430A** Analysis Date: **4/30/2020 11:31:49 AM** Prep Date: **4/30/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.473 | 1.00 | 0.5000 | 0 | 94.7 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.191 | 0.400 | 0.2000 | 0 | 95.6 | 70 | 130 | 0 | 0 | |
| Sulfate | 1.34 | 3.00 | 1.500 | 0 | 89.6 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200507A**

The QC data in batch 96213 applies to the following samples: 2005040-01B, 2005040-02B

Sample ID: **MB-96213** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 10:26:10 AM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-96213** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 10:42:10 AM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.97 | 1.00 | 10.00 | 0 | 99.7 | 90 | 110 | | | |
| Fluoride | 3.70 | 0.400 | 4.000 | 0 | 92.6 | 90 | 110 | | | |
| Sulfate | 29.2 | 3.00 | 30.00 | 0 | 97.5 | 90 | 110 | | | |

Sample ID: **LCSD-96213** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 10:58:10 AM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.95 | 1.00 | 10.00 | 0 | 99.5 | 90 | 110 | 0.142 | 20 | |
| Fluoride | 3.69 | 0.400 | 4.000 | 0 | 92.3 | 90 | 110 | 0.300 | 20 | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.7 | 90 | 110 | 0.199 | 20 | |

Sample ID: **2005032-01CMS** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 6:17:07 PM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2090 | 100 | 2000 | 152.7 | 97.0 | 90 | 110 | | | |
| Fluoride | 1990 | 40.0 | 2000 | 0 | 99.4 | 90 | 110 | | | |
| Sulfate | 2060 | 300 | 2000 | 104.8 | 97.7 | 90 | 110 | | | |

Sample ID: **2005032-01CMSD** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 6:33:07 PM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2100 | 100 | 2000 | 152.7 | 97.2 | 90 | 110 | 0.222 | 20 | |
| Fluoride | 2000 | 40.0 | 2000 | 0 | 100 | 90 | 110 | 0.595 | 20 | |
| Sulfate | 2050 | 300 | 2000 | 104.8 | 97.4 | 90 | 110 | 0.233 | 20 | |

Sample ID: **2005022-01BMS** Batch ID: **96213** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC4_200507A** Analysis Date: **5/7/2020 6:49:07 PM** Prep Date: **5/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200507A**

| Sample ID: **2005022-01BMS** | Batch ID: **96213** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 6:49:07 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 243 | 10.0 | 200.0 | 46.49 | 98.2 | 90 | 110 | | | |
| Fluoride | 223 | 4.00 | 200.0 | 21.81 | 101 | 90 | 110 | | | |
| Sulfate | 458 | 30.0 | 200.0 | 267.4 | 95.5 | 90 | 110 | | | |

| Sample ID: **2005022-01BMSD** | Batch ID: **96213** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 7:05:07 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 240 | 10.0 | 200.0 | 46.49 | 97.0 | 90 | 110 | 0.970 | 20 | |
| Fluoride | 223 | 4.00 | 200.0 | 21.81 | 100 | 90 | 110 | 0.247 | 20 | |
| Sulfate | 458 | 30.0 | 200.0 | 267.4 | 95.1 | 90 | 110 | 0.187 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC4_200507A**

| Sample ID: **ICV-200507** | Batch ID: **R110392** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 9:54:10 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 24.7 | 1.00 | 25.00 | 0 | 98.9 | 90 | 110 | | | |
| Fluoride | 9.55 | 0.400 | 10.00 | 0 | 95.5 | 90 | 110 | | | |
| Sulfate | 74.8 | 3.00 | 75.00 | 0 | 99.7 | 90 | 110 | | | |

| Sample ID: **CCV1-200507** | Batch ID: **R110392** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 5:29:07 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.94 | 1.00 | 10.00 | 0 | 99.4 | 90 | 110 | | | |
| Fluoride | 3.75 | 0.400 | 4.000 | 0 | 93.6 | 90 | 110 | | | |
| Sulfate | 29.3 | 3.00 | 30.00 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID: **CCV2-200507** | Batch ID: **R110392** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC4_200507A** | Analysis Date: **5/7/2020 10:33:07 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.0 | 1.00 | 10.00 | 0 | 100 | 90 | 110 | | | |
| Fluoride | 3.81 | 0.400 | 4.000 | 0 | 95.3 | 90 | 110 | | | |
| Sulfate | 29.4 | 3.00 | 30.00 | 0 | 98.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_200507D**

The QC data in batch 96250 applies to the following samples: 2005040-01B, 2005040-02B

| Sample ID: **MB-96250** | Batch ID: **96250** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_200507D** | Analysis Date: **5/7/2020 4:50:00 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-96250** | Batch ID: **96250** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_200507D** | Analysis Date: **5/7/2020 4:50:00 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 746 | 10.0 | 745.6 | 0 | 100 | 90 | 113 | | | |

| Sample ID: **2005023-01A-DUP** | Batch ID: **96250** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_200507D** | Analysis Date: **5/7/2020 4:50:00 PM** | Prep Date: **5/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1040 | 50.0 | 0 | 1055 | | | | 1.43 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005040
**Project:** Luminant-OGSES-CCR

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Antimony | 0.000800 | 0.00250 |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Cadmium | 0.000300 | 0.00100 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Molybdenum | 0.00200 | 0.00500 |
| Selenium | 0.00200 | 0.00500 |
| Thallium | 0.000500 | 0.00150 |

| **TestNo: SW7470A** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Mercury | 0.0000800 | 0.000200 |

| **TestNo: M2540C** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

June 10, 2020



## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1217407 |
| Samples Received: | 05/12/2020 |
| Project Number: | 2005040 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

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Tc: Table of Contents 2

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Cn: Case Narrative 4

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## FGD-6 L1217407-01 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time | |
|---|---|---|---|---|---|---|
| | | | | 05/06/20 13:20 | 05/12/20 10:30 | |
| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
| Radiochemistry by Method 904 | WG1475267 | 1 | 05/18/20 12:10 | 05/28/20 10:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1483326 | 1 | 05/28/20 11:33 | 06/04/20 13:38 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1483326 | 1 | 05/28/20 11:33 | 06/04/20 13:38 | RGT | Mt. Juliet, TN |

## FGD-3 L1217407-02 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time | |
|---|---|---|---|---|---|---|
| | | | | 05/06/20 14:20 | 05/12/20 10:30 | |
| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
| Radiochemistry by Method 904 | WG1475267 | 1 | 05/18/20 12:10 | 05/28/20 10:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1483326 | 1 | 05/28/20 11:33 | 05/29/20 15:55 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1483326 | 1 | 05/28/20 11:33 | 05/29/20 15:55 | RGT | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.845 | | 0.520 | 0.976 | 05/28/2020 10:30 | WG1475267 |
| *(T) Barium* | *87.4* | | | *62.0-143* | *05/28/2020 10:30* | WG1475267 |
| *(T) Yttrium* | *115* | | | *79.0-136* | *05/28/2020 10:30* | WG1475267 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.36 | | 0.765 | 1.13 | 06/04/2020 13:38 | WG1483326 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.513 | | 0.245 | 0.154 | 06/04/2020 13:38 | WG1483326 |
| *(T) Barium-133* | *120* | | | *30.0-143* | *06/04/2020 13:38* | WG1483326 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.463 | | 0.606 | 1.07 | 05/28/2020 10:30 | WG1475267 |
| *(T) Barium* | *90.5* | | | *62.0-143* | *05/28/2020 10:30* | WG1475267 |
| *(T) Yttrium* | *117* | | | *79.0-136* | *05/28/2020 10:30* | WG1475267 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 0.857 | | 0.859 | 1.31 | 05/29/2020 15:55 | WG1483326 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.394 | | 0.253 | 0.237 | 05/29/2020 15:55 | WG1483326 |
| *(T) Barium-133* | *116* | | | *30.0-143* | *05/29/2020 15:55* | WG1483326 |

## Method Blank (MB)

(MB) R3530968-1 05/22/20 10:30

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | 0.194 | | 0.455 |
| *(T) Barium* | *90.0* | | |
| *(T) Yttrium* | *108* | | |

## Laboratory Control Sample (LCS)

(LCS) R3530968-2 05/22/20 10:30

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 4.86 | 97.2 | 80.0-120 | |
| *(T) Barium* | | | *82.1* | | |
| *(T) Yttrium* | | | *106* | | |

## Method Blank (MB)

(MB) R3535339-1 06/03/20 14:24

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-226 | 0.000 | | 0.0602 |
| *(T) Barium-133* | *98.2* | | |

## Laboratory Control Sample (LCS)

(LCS) R3535339-2 06/03/20 14:24

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 5.02 | 5.19 | 103 | 80.0-120 | |
| *(T) Barium-133* | | | *102* | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|
| | The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG. |

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LAO00356 |
| Kentucky [1 6] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

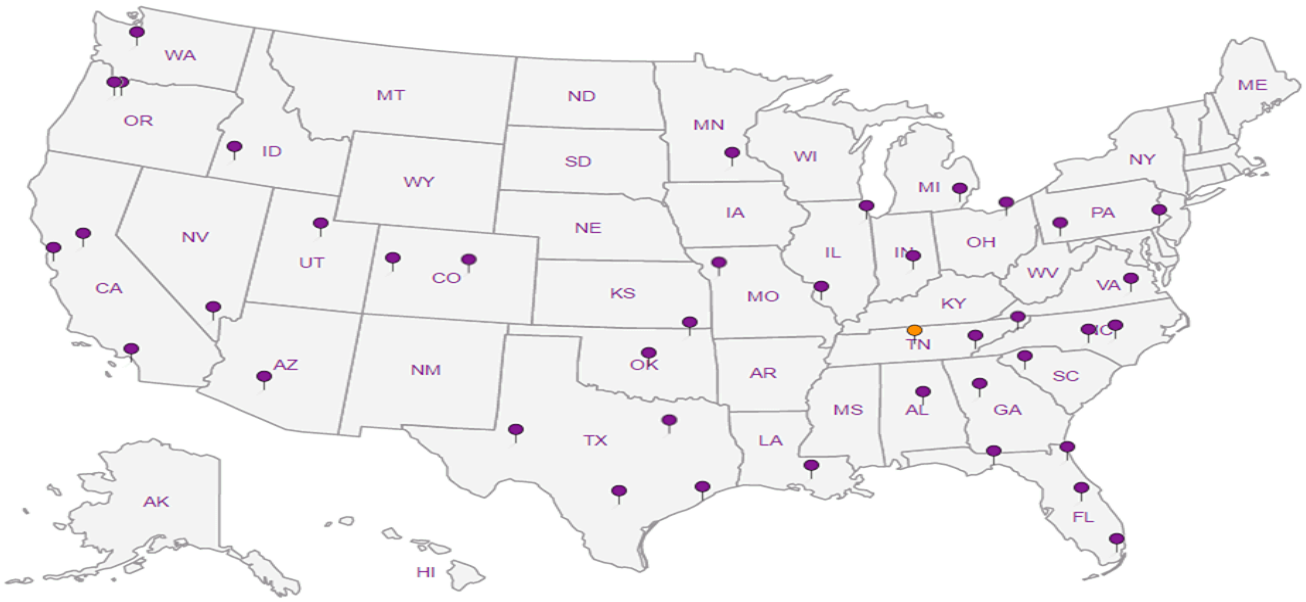
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



G138

Work Order: 2005040

1217467

07-May-20

**Subcontractor:**
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests: Ra-228 E904.0 (12) | Ra-226 M7500 Ra B M (12) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| FGD-6 | Aqueous | 01C | 05/06/20 01:20 PM | 1LHDPEHNO3 | 1 | | | | | -01 |
| FGD-6 | Aqueous | 01D | 05/06/20 01:20 PM | 1LHDPEHNO3 | | 1 | | | | 1 |
| FGD-3 | Aqueous | 02C | 05/06/20 02:20 PM | 1LHDPEHNO3 | 1 | | | | | 02 |
| FGD-3 | Aqueous | 02D | 05/06/20 02:20 PM | 1LHDPEHNO3 | | 1 | | | | 1 |

General Comments:
Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| Relinquished by: | [signature] | 5/8/20 1700 | Received by: | Carol Kemp | 5/11/20 10:30 |
| Relinquished by: | | | Received by: | | |

Amb

# Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | |
|---|---|---|
| Client: DHLRRTX | 1217407 | |
| Cooler Received/Opened On: 5/12/20 Temperature: | Amb | |
| Received By: Carol Kemp | | |
| Signature: Carol Kemp | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | | | |
| COC Signed / Accurate? | | ✓ | |
| Bottles arrive intact? | | ✓ | |
| Correct bottles used? | | ✓ | |
| Sufficient volume sent? | | ✓ | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | ✓ | | |

June 12, 2020

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2005076

RE: Luminant-OGSES-FGD Ponds

Dear Will Vienne:

DHL Analytical, Inc. received 2 sample(s) on 5/12/2020 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-20-25

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

№ 68287

# CHAIN-OF-CUSTODY

CLIENT: GOLDER ASSOCIATES
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-11-20 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 2005076
PROJECT LOCATION OR NAME: LUMINANT - OGSES - FGD PONDS
CLENT PROJECT #: 1912 COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT
P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ | CHLORIDE ❑ ANIONS | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | APPENDIX III & IV | FERROUS Fe | FERRIC Fe | $NO_3$, $PO_4$, $Na$, Cl, K

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | NaOH | ICE | UNPRESERVED | | | | | | | | | | | | | | | | | | | | | | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-A-PDND | 01 | 5-11-20 | 1405 | W | P | 9 | | X | | X | | | | | | | | | | | | | X | | | | | X | X | X | | | |
| FGD-B-PDND | 02 | 5-11-20 | 1425 | W | P | 9 | | X | | X | | | | | | | | | | | | | X | | | | | X | X | X | | | |

RELINQUISHED BY: (Signature) DATE/TIME 5-11-20 1730 RECEIVED BY: (Signature) FedEx
RELINQUISHED BY: (Signature) FedEx 5.12.2020 0915 DATE/TIME RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

❑ DHL DISPOSAL @ $5.00 each ❑ Return

TURN AROUND TIME
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☑
OTHER ❑

LABORATORY USE ONLY:
RECEIVING TEMP: 1.5, 1.8, 3.3, 1.3 THERM #: 78
CUSTODY SEALS: ❑ BROKEN ☒ INTACT ❑ NOT USED
CARRIER: ❑ LONE STAR ☒ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

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**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder** Date Received: **5/12/2020**

Work Order Number **2005076** Received by: **JH**

Checklist completed by: _____ 5/12/2020 Reviewed by DH 5/12/2020
Signature | Date | Initials | Date

Carrier name: FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **1.5** °C |
| Water - VOA vials have zero headspace? | Yes ☑ | No ☐ | No VOA vials submitted ☐ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? NO | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist: Reportable Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-FGD Ponds | **LRC Date:** 6/12/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2005076 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | X | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | X | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | X | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | X | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | X | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | X | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | X | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | X | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | X | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | X | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | X | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | X | | |
| | | **9)** If required for the project, TICs reported? | | | X | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | X | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | X | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | X | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | X | | | | |
| | | **4)** Were blank concentrations < MDL? | X | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | X | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | X | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | X | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | X | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | X | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | X | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | X | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | X | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | X | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | X | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | X | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | X | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | X | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | X | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | X | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | X | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | X | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | X | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-FGD Ponds | **LRC Date:** 6/12/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2005076 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | X | | | **S9-09** |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

06/12/20
Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *12-Jun-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES-FGD Ponds
**Lab Order:** 2005076

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2320 B - Alkalinity Analysis
Method M3500-Fe D - Ferrous Iron Analysis (this parameter is not NELAP certified)
Method M3500-Fe D - Ferric Iron (calculation) (this calculation is not NELAP certified)
Method M4500-P E - Orthophosphate Analysis
Method M2540C - TDS Analysis

Exception Report R1-01

The samples were received and log-in performed on 5/12/20. A total of 2 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Anions analysis performed on 5/12/20 the matrix spike and matrix spike duplicate recoveries (2005076-01 MS/MSD) were slightly below control limits for Chloride. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

For Metals analysis performed on 5/14/20 and 5/15/20 the matrix spike and/or matrix spike duplicate recoveries were out of control limits for a total of three analytes. These are flagged accordingly. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

For Ferrous Iron analysis performed on 5/13/20 the matrix spike recovery was slightly above control limits. This was due to matrix effect. This is flagged accordingly. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits. No further corrective actions were taken.

Exception Report S9-01

For Metals analysis performed on 5/14/20 the PDS recovery was out of control limits for a total of three analytes. These are flagged accordingly in the QC summary report. The serial dilution was within control limits for these analytes. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *12-Jun-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES-FGD Ponds
**Lab Order:** 2005076

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2005076-01 | FGD-A-POND | | 05/11/20 02:05 PM | 5/12/2020 |
| 2005076-02 | FGD-B-POND | | 05/11/20 02:25 PM | 5/12/2020 |

**Lab Order:** 2005076
**Client:** Golder
**Project:** Luminant-OGSES-FGD Ponds

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005076-01A | FGD-A-POND | 05/11/20 02:05 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005076-01B | FGD-A-POND | 05/11/20 02:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/13/20 09:48 AM | 96330 |
| | FGD-A-POND | 05/11/20 02:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/13/20 09:48 AM | 96330 |
| | FGD-A-POND | 05/11/20 02:05 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/13/20 09:48 AM | 96330 |
| | FGD-A-POND | 05/11/20 02:05 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005076-01C | FGD-A-POND | 05/11/20 02:05 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/14/20 09:44 AM | 96346 |
| | FGD-A-POND | 05/11/20 02:05 PM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-A-POND | 05/11/20 02:05 PM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-A-POND | 05/11/20 02:05 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/12/20 11:20 AM | 96315 |
| | FGD-A-POND | 05/11/20 02:05 PM | Aqueous | M2540C | TDS Preparation | 05/12/20 03:13 PM | 96320 |
| 2005076-02A | FGD-B-POND | 05/11/20 02:25 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005076-02B | FGD-B-POND | 05/11/20 02:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/13/20 09:48 AM | 96330 |
| | FGD-B-POND | 05/11/20 02:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/13/20 09:48 AM | 96330 |
| | FGD-B-POND | 05/11/20 02:25 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/13/20 09:48 AM | 96330 |
| | FGD-B-POND | 05/11/20 02:25 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005076-02C | FGD-B-POND | 05/11/20 02:25 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/14/20 09:44 AM | 96346 |
| | FGD-B-POND | 05/11/20 02:25 PM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-B-POND | 05/11/20 02:25 PM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-B-POND | 05/11/20 02:25 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/12/20 11:20 AM | 96315 |
| | FGD-B-POND | 05/11/20 02:25 PM | Aqueous | M2540C | TDS Preparation | 05/12/20 03:13 PM | 96320 |

**Lab Order:** 2005076
**Client:** Golder
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005076-01A | FGD-A-POND | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 96316 | 1 | 05/13/20 08:05 AM | UV/VIS_2_200513C |
| | FGD-A-POND | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 10:53 AM | UV/VIS_2_200513B |
| 2005076-01B | FGD-A-POND | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 11:54 AM | CETAC2_HG_200519B |
| | FGD-A-POND | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96330 | 1 | 05/14/20 02:46 PM | ICP-MS5_200514A |
| | FGD-A-POND | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96330 | 500 | 05/15/20 12:18 PM | ICP-MS5_200515B |
| | FGD-A-POND | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96330 | 100 | 05/15/20 12:20 PM | ICP-MS5_200515B |
| 2005076-01C | FGD-A-POND | Aqueous | M2320 B | Alkalinity | 96346 | 1 | 05/14/20 11:41 AM | TITRATOR_200514B |
| | FGD-A-POND | Aqueous | E300 | Anions by IC method - Water | 96308 | 2 | 05/12/20 12:56 PM | IC2_200512A |
| | FGD-A-POND | Aqueous | E300 | Anions by IC method - Water | 96308 | 100 | 05/12/20 06:00 PM | IC2_200512A |
| | FGD-A-POND | Aqueous | M4500-P E | Orthophosphate | 96315 | 1 | 05/12/20 04:05 PM | UV/VIS_2_200512D |
| | FGD-A-POND | Aqueous | M2540C | Total Dissolved Solids | 96320 | 1 | 05/12/20 05:00 PM | WC_200512D |
| 2005076-02A | FGD-B-POND | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | 96316 | 1 | 05/13/20 08:05 AM | UV/VIS_2_200513C |
| | FGD-B-POND | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 10:55 AM | UV/VIS_2_200513B |
| 2005076-02B | FGD-B-POND | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 11:56 AM | CETAC2_HG_200519B |
| | FGD-B-POND | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96330 | 1 | 05/14/20 02:48 PM | ICP-MS5_200514A |
| | FGD-B-POND | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96330 | 200 | 05/15/20 12:29 PM | ICP-MS5_200515B |
| | FGD-B-POND | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96330 | 100 | 05/15/20 12:32 PM | ICP-MS5_200515B |
| 2005076-02C | FGD-B-POND | Aqueous | M2320 B | Alkalinity | 96346 | 1 | 05/14/20 11:49 AM | TITRATOR_200514B |
| | FGD-B-POND | Aqueous | E300 | Anions by IC method - Water | 96308 | 2 | 05/12/20 01:12 PM | IC2_200512A |
| | FGD-B-POND | Aqueous | E300 | Anions by IC method - Water | 96308 | 100 | 05/12/20 06:48 PM | IC2_200512A |
| | FGD-B-POND | Aqueous | M4500-P E | Orthophosphate | 96315 | 1 | 05/12/20 04:05 PM | UV/VIS_2_200512D |
| | FGD-B-POND | Aqueous | M2540C | Total Dissolved Solids | 96320 | 1 | 05/12/20 05:00 PM | WC_200512D |

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-A-POND |
| **Project:** | Luminant-OGSES-FGD Ponds | **Lab ID:** | 2005076-01 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 02:05 PM |
| **Lab Order:** | 2005076 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | 0.00548 | 0.000800 | 0.00250 | | mg/L | 1 | 05/14/20 02:46 PM |
| Arsenic | 0.00420 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/14/20 02:46 PM |
| Barium | 0.278 | 0.00300 | 0.0100 | | mg/L | 1 | 05/14/20 02:46 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/14/20 02:46 PM |
| Boron | 104 | 5.00 | 15.0 | | mg/L | 500 | 05/15/20 12:18 PM |
| Cadmium | 0.00132 | 0.000300 | 0.00100 | | mg/L | 1 | 05/14/20 02:46 PM |
| Calcium | 895 | 10.0 | 30.0 | | mg/L | 100 | 05/15/20 12:20 PM |
| Chromium | 0.00244 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/14/20 02:46 PM |
| Cobalt | 0.00625 | 0.00300 | 0.00500 | | mg/L | 1 | 05/14/20 02:46 PM |
| Iron | 0.150 | 0.0300 | 0.100 | | mg/L | 1 | 05/14/20 02:46 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/14/20 02:46 PM |
| Lithium | 0.422 | 0.00500 | 0.0100 | | mg/L | 1 | 05/14/20 02:46 PM |
| Magnesium | 1490 | 10.0 | 30.0 | | mg/L | 100 | 05/15/20 12:20 PM |
| Molybdenum | 0.216 | 0.00200 | 0.00500 | | mg/L | 1 | 05/14/20 02:46 PM |
| Potassium | 195 | 10.0 | 30.0 | | mg/L | 100 | 05/15/20 12:20 PM |
| Selenium | 4.71 | 0.200 | 0.500 | | mg/L | 100 | 05/15/20 12:20 PM |
| Sodium | 563 | 10.0 | 30.0 | | mg/L | 100 | 05/15/20 12:20 PM |
| Thallium | 0.00326 | 0.000500 | 0.00150 | | mg/L | 1 | 05/14/20 02:46 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | 0.000672 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 11:54 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 3440 | 30.0 | 100 | | mg/L | 100 | 05/12/20 06:00 PM |
| Fluoride | 20.6 | 0.200 | 0.800 | | mg/L | 2 | 05/12/20 12:56 PM |
| Nitrate-N | 6.27 | 0.200 | 1.00 | | mg/L | 2 | 05/12/20 12:56 PM |
| Sulfate | 4680 | 100 | 300 | | mg/L | 100 | 05/12/20 06:00 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 134 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/14/20 11:41 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/14/20 11:41 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/14/20 11:41 AM |
| Alkalinity, Total (As CaCO3) | 134 | 20.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/14/20 11:41 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.150 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 08:05 AM |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 10:53 AM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-A-POND |
| **Project:** | Luminant-OGSES-FGD Ponds | **Lab ID:** | 2005076-01 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 02:05 PM |
| **Lab Order:** | 2005076 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 05/12/20 04:05 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 13200 | 200 | 200 | | mg/L | 1 | 05/12/20 05:00 PM |

**Qualifiers:**

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- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-B-POND |
| **Project:** | Luminant-OGSES-FGD Ponds | **Lab ID:** | 2005076-02 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 02:25 PM |
| **Lab Order:** | 2005076 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/14/20 02:48 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/14/20 02:48 PM |
| Barium | 0.0583 | 0.00300 | 0.0100 | | mg/L | 1 | 05/14/20 02:48 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/14/20 02:48 PM |
| Boron | 84.4 | 2.00 | 6.00 | | mg/L | 200 | 05/15/20 12:29 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/14/20 02:48 PM |
| Calcium | 696 | 10.0 | 30.0 | | mg/L | 100 | 05/15/20 12:32 PM |
| Chromium | 0.00246 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/14/20 02:48 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/14/20 02:48 PM |
| Iron | 0.170 | 0.0300 | 0.100 | | mg/L | 1 | 05/14/20 02:48 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/14/20 02:48 PM |
| Lithium | 0.182 | 0.00500 | 0.0100 | | mg/L | 1 | 05/14/20 02:48 PM |
| Magnesium | 1020 | 10.0 | 30.0 | | mg/L | 100 | 05/15/20 12:32 PM |
| Molybdenum | 0.244 | 0.00200 | 0.00500 | | mg/L | 1 | 05/14/20 02:48 PM |
| Potassium | 106 | 10.0 | 30.0 | | mg/L | 100 | 05/15/20 12:32 PM |
| Selenium | 0.681 | 0.00200 | 0.00500 | | mg/L | 1 | 05/14/20 02:48 PM |
| Sodium | 351 | 10.0 | 30.0 | | mg/L | 100 | 05/15/20 12:32 PM |
| Thallium | 0.000818 | 0.000500 | 0.00150 | J | mg/L | 1 | 05/14/20 02:48 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | 0.000545 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 11:56 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 1940 | 30.0 | 100 | | mg/L | 100 | 05/12/20 06:48 PM |
| Fluoride | 15.6 | 0.200 | 0.800 | | mg/L | 2 | 05/12/20 01:12 PM |
| Nitrate-N | 2.23 | 0.200 | 1.00 | | mg/L | 2 | 05/12/20 01:12 PM |
| Sulfate | 3930 | 100 | 300 | | mg/L | 100 | 05/12/20 06:48 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 68.8 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/14/20 11:49 AM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/14/20 11:49 AM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/14/20 11:49 AM |
| Alkalinity, Total (As CaCO3) | 68.8 | 20.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/14/20 11:49 AM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **CAC** |
| Iron, Ferric | 0.170 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 08:05 AM |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 10:55 AM |

**Qualifiers:**

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B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-B-POND |
| **Project:** | Luminant-OGSES-FGD Ponds | **Lab ID:** | 2005076-02 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 02:25 PM |
| **Lab Order:** | 2005076 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 05/12/20 04:05 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 8890 | 50.0 | 50.0 | | mg/L | 1 | 05/12/20 05:00 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200304C**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS-95289** | Batch ID: **95289** | TestNo: **SW7470A** | Units: **mg/L** | | |
| SampType: **DCS** | Run ID: **CETAC2_HG_200304C** | Analysis Date: **3/4/2020 12:11:09 PM** | Prep Date: **3/4/2020** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.000175 | 0.000200 | 0.000200 | 0 | 87.5 | 82 | 119 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200519B**

The QC data in batch 96370 applies to the following samples: 2005076-01B, 2005076-02B

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **MB-96370** | Batch ID: **96370** | | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | |
| SampType: **MBLK** | Run ID: **CETAC2_HG_200519B** | | | Analysis Date: **5/19/2020 11:47:54 AM** | | | | Prep Date: **5/17/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | <0.0000800 | 0.000200 | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **LCS-96370** | Batch ID: **96370** | | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | |
| SampType: **LCS** | Run ID: **CETAC2_HG_200519B** | | | Analysis Date: **5/19/2020 11:50:10 AM** | | | | Prep Date: **5/17/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | 0.00205 | 0.000200 | 0.00200 | 0 | 103 | 85 | 115 | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **LCSD-96370** | Batch ID: **96370** | | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | |
| SampType: **LCSD** | Run ID: **CETAC2_HG_200519B** | | | Analysis Date: **5/19/2020 11:52:26 AM** | | | | Prep Date: **5/17/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | 0.00194 | 0.000200 | 0.00200 | 0 | 97.0 | 85 | 115 | 5.51 | 15 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **2005079-01A MS** | Batch ID: **96370** | | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | |
| SampType: **MS** | Run ID: **CETAC2_HG_200519B** | | | Analysis Date: **5/19/2020 12:01:30 PM** | | | | Prep Date: **5/17/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | 0.00191 | 0.000200 | 0.00200 | 0 | 95.5 | 80 | 120 | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **2005079-01A MSD** | Batch ID: **96370** | | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | |
| SampType: **MSD** | Run ID: **CETAC2_HG_200519B** | | | Analysis Date: **5/19/2020 12:03:46 PM** | | | | Prep Date: **5/17/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | 0.00209 | 0.000200 | 0.00200 | 0 | 104 | 80 | 120 | 9.00 | 15 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **2005079-01A SD** | Batch ID: **96370** | | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | |
| SampType: **SD** | Run ID: **CETAC2_HG_200519B** | | | Analysis Date: **5/19/2020 12:06:02 PM** | | | | Prep Date: **5/17/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: **2005079-01A PDS** | Batch ID: **96370** | | | TestNo: **SW7470A** | | | | Units: **mg/L** | | | |
| SampType: **PDS** | Run ID: **CETAC2_HG_200519B** | | | Analysis Date: **5/19/2020 12:08:18 PM** | | | | Prep Date: **5/17/2020** | | | |
| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual | |
| Mercury | 0.00226 | 0.000200 | 0.00250 | 0 | 90.4 | 85 | 115 | | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200519B**

| Sample ID: **ICV-200519** | Batch ID: **R110550** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_200519B** | Analysis Date: **5/19/2020 10:31:55 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00391 | 0.000200 | 0.00400 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID: **CCV2-200519** | Batch ID: **R110550** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_200519B** | Analysis Date: **5/19/2020 11:42:21 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00213 | 0.000200 | 0.00200 | 0 | 106 | 90 | 110 | | | |

| Sample ID: **CCV3-200519** | Batch ID: **R110550** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_200519B** | Analysis Date: **5/19/2020 12:26:27 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00214 | 0.000200 | 0.00200 | 0 | 107 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200408C**

| Sample ID: **DCS1-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:16:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.000932 | 0.00250 | 0.00100 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Beryllium | 0.000472 | 0.00100 | 0.000500 | 0 | 94.4 | 70 | 130 | 0 | 0 | |
| Cadmium | 0.000492 | 0.00100 | 0.000500 | 0 | 98.4 | 70 | 130 | 0 | 0 | |
| Lead | 0.000496 | 0.00100 | 0.000500 | 0 | 99.2 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000468 | 0.00150 | 0.000500 | 0 | 93.6 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS2-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:19:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.310 | 0.300 | 0.300 | 0 | 103 | 70 | 130 | 0 | 0 | |
| Iron | 0.0591 | 0.100 | 0.0500 | 0 | 118 | 70 | 130 | 0 | 0 | |
| Magnesium | 0.298 | 0.300 | 0.300 | 0 | 99.3 | 70 | 130 | 0 | 0 | |
| Potassium | 0.285 | 0.300 | 0.300 | 0 | 95.1 | 70 | 130 | 0 | 0 | |
| Sodium | 0.295 | 0.300 | 0.300 | 0 | 98.4 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS3-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:21:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00466 | 0.00500 | 0.00500 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Barium | 0.00478 | 0.0100 | 0.00500 | 0 | 95.6 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00600 | 0.00500 | 0.00500 | 0 | 120 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00473 | 0.00500 | 0.00500 | 0 | 94.6 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00473 | 0.0100 | 0.00500 | 0 | 94.6 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00466 | 0.00500 | 0.00500 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:28:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0286 | 0.0300 | 0.0300 | 0 | 95.2 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS5_200514A**

The QC data in batch 96330 applies to the following samples: 2005076-01B, 2005076-02B

Sample ID: **MB-96330** Batch ID: **96330** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_200514A** Analysis Date: **5/14/2020 1:24:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Iron | <0.0300 | 0.100 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Magnesium | <0.100 | 0.300 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Potassium | <0.100 | 0.300 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Sodium | <0.100 | 0.300 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID: **LCS-96330** Batch ID: **96330** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_200514A** Analysis Date: **5/14/2020 1:26:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.203 | 0.00250 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Barium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Beryllium | 0.205 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Calcium | 5.22 | 0.300 | 5.00 | 0 | 104 | 80 | 120 | | | |
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Iron | 5.10 | 0.100 | 5.00 | 0 | 102 | 80 | 120 | | | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 99.9 | 80 | 120 | | | |
| Lithium | 0.207 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Magnesium | 5.13 | 0.300 | 5.00 | 0 | 103 | 80 | 120 | | | |
| Molybdenum | 0.201 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Potassium | 5.11 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | | | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Sodium | 5.14 | 0.300 | 5.00 | 0 | 103 | 80 | 120 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.5 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200514A**

Sample ID: **LCSD-96330** Batch ID: **96330** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200514A** Analysis Date: **5/14/2020 1:28:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.206 | 0.00250 | 0.200 | 0 | 103 | 80 | 120 | 1.84 | 15 | |
| Arsenic | 0.205 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 1.10 | 15 | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | 0.481 | 15 | |
| Beryllium | 0.206 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | 0.883 | 15 | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 80 | 120 | 0.123 | 15 | |
| Calcium | 5.17 | 0.300 | 5.00 | 0 | 103 | 80 | 120 | 1.01 | 15 | |
| Chromium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.421 | 15 | |
| Cobalt | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.015 | 15 | |
| Iron | 5.12 | 0.100 | 5.00 | 0 | 102 | 80 | 120 | 0.297 | 15 | |
| Lead | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.968 | 15 | |
| Lithium | 0.207 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 0.103 | 15 | |
| Magnesium | 5.19 | 0.300 | 5.00 | 0 | 104 | 80 | 120 | 1.09 | 15 | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.287 | 15 | |
| Potassium | 5.10 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | 0.208 | 15 | |
| Selenium | 0.202 | 0.00500 | 0.200 | 0 | 101 | 80 | 120 | 0.151 | 15 | |
| Sodium | 5.15 | 0.300 | 5.00 | 0 | 103 | 80 | 120 | 0.222 | 15 | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 100 | 80 | 120 | 0.933 | 15 | |

Sample ID: **2005081-01A SD** Batch ID: **96330** TestNo: **SW6020B** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS5_200514A** Analysis Date: **5/14/2020 1:35:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00688 | 0.0125 | 0 | 0.00692 | | | | 0.580 | 20 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Barium | 0.0797 | 0.0500 | 0 | 0.0823 | | | | 3.25 | 20 | |
| Beryllium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0.000566 | | | | 0 | 20 | |
| Calcium | 112 | 1.50 | 0 | 111 | | | | 0.280 | 20 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0.00535 | | | | 0 | 20 | |
| Cobalt | <0.0150 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Iron | <0.150 | 0.500 | 0 | 0 | | | | 0 | 20 | |
| Lead | <0.00150 | 0.00500 | 0 | 0.000354 | | | | 0 | 20 | |
| Lithium | 0.369 | 0.0500 | 0 | 0.364 | | | | 1.16 | 20 | |
| Magnesium | 4.91 | 1.50 | 0 | 4.87 | | | | 0.868 | 20 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0.00457 | | | | 0 | 20 | |
| Potassium | 37.7 | 1.50 | 0 | 37.5 | | | | 0.705 | 20 | |
| Selenium | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Sodium | 165 | 1.50 | 0 | 163 | | | | 1.61 | 20 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200514A**

Sample ID: **2005081-01A PDS** Batch ID: **96330** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS5_200514A** Analysis Date: **5/14/2020 2:02:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.205 | 0.00250 | 0.200 | 0.00692 | 98.8 | 75 | 125 | | | |
| Arsenic | 0.193 | 0.00500 | 0.200 | 0 | 96.3 | 75 | 125 | | | |
| Barium | 0.282 | 0.0100 | 0.200 | 0.0823 | 100 | 75 | 125 | | | |
| Beryllium | 0.198 | 0.00100 | 0.200 | 0 | 99.2 | 75 | 125 | | | |
| Cadmium | 0.201 | 0.00100 | 0.200 | 0.000566 | 100 | 75 | 125 | | | |
| Calcium | 110 | 0.300 | 5.00 | 111 | -23.2 | 75 | 125 | | | S |
| Chromium | 0.214 | 0.00500 | 0.200 | 0.00535 | 104 | 75 | 125 | | | |
| Cobalt | 0.193 | 0.00500 | 0.200 | 0 | 96.6 | 75 | 125 | | | |
| Iron | 5.07 | 0.100 | 5.00 | 0 | 101 | 75 | 125 | | | |
| Lead | 0.204 | 0.00100 | 0.200 | 0.000354 | 102 | 75 | 125 | | | |
| Lithium | 0.538 | 0.0100 | 0.200 | 0.364 | 86.8 | 75 | 125 | | | |
| Magnesium | 9.54 | 0.300 | 5.00 | 4.87 | 93.4 | 75 | 125 | | | |
| Molybdenum | 0.202 | 0.00500 | 0.200 | 0.00457 | 98.5 | 75 | 125 | | | |
| Potassium | 40.5 | 0.300 | 5.00 | 37.5 | 61.4 | 75 | 125 | | | S |
| Selenium | 0.197 | 0.00500 | 0.200 | 0 | 98.4 | 75 | 125 | | | |
| Sodium | 159 | 0.300 | 5.00 | 163 | -74.0 | 75 | 125 | | | S |
| Thallium | 0.202 | 0.00150 | 0.200 | 0 | 101 | 75 | 125 | | | |

Sample ID: **2005081-01A MS** Batch ID: **96330** TestNo: **SW6020B** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS5_200514A** Analysis Date: **5/14/2020 2:04:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.212 | 0.00250 | 0.200 | 0.00692 | 102 | 75 | 125 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 75 | 125 | | | |
| Barium | 0.286 | 0.0100 | 0.200 | 0.0823 | 102 | 75 | 125 | | | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.7 | 75 | 125 | | | |
| Cadmium | 0.200 | 0.00100 | 0.200 | 0.000566 | 99.9 | 75 | 125 | | | |
| Calcium | 118 | 0.300 | 5.00 | 111 | 129 | 75 | 125 | | | S |
| Chromium | 0.209 | 0.00500 | 0.200 | 0.00535 | 102 | 75 | 125 | | | |
| Cobalt | 0.192 | 0.00500 | 0.200 | 0 | 96.2 | 75 | 125 | | | |
| Iron | 5.13 | 0.100 | 5.00 | 0 | 103 | 75 | 125 | | | |
| Lead | 0.200 | 0.00100 | 0.200 | 0.000354 | 99.9 | 75 | 125 | | | |
| Lithium | 0.561 | 0.0100 | 0.200 | 0.364 | 98.2 | 75 | 125 | | | |
| Magnesium | 9.98 | 0.300 | 5.00 | 4.87 | 102 | 75 | 125 | | | |
| Molybdenum | 0.208 | 0.00500 | 0.200 | 0.00457 | 102 | 75 | 125 | | | |
| Potassium | 43.2 | 0.300 | 5.00 | 37.5 | 114 | 75 | 125 | | | |
| Selenium | 0.190 | 0.00500 | 0.200 | 0 | 94.8 | 75 | 125 | | | |
| Sodium | 169 | 0.300 | 5.00 | 163 | 129 | 75 | 125 | | | S |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200514A**

Sample ID: **2005081-01A MSD** Batch ID: **96330** TestNo: **SW6020B** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS5_200514A** Analysis Date: **5/14/2020 2:07:00 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.210 | 0.00250 | 0.200 | 0.00692 | 102 | 75 | 125 | 0.899 | 15 | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0 | 99.9 | 75 | 125 | 0.042 | 15 | |
| Barium | 0.279 | 0.0100 | 0.200 | 0.0823 | 98.1 | 75 | 125 | 2.57 | 15 | |
| Beryllium | 0.199 | 0.00100 | 0.200 | 0 | 99.3 | 75 | 125 | 0.406 | 15 | |
| Cadmium | 0.199 | 0.00100 | 0.200 | 0.000566 | 99.2 | 75 | 125 | 0.713 | 15 | |
| Calcium | 116 | 0.300 | 5.00 | 111 | 89.4 | 75 | 125 | 1.68 | 15 | |
| Chromium | 0.207 | 0.00500 | 0.200 | 0.00535 | 101 | 75 | 125 | 1.26 | 15 | |
| Cobalt | 0.191 | 0.00500 | 0.200 | 0 | 95.6 | 75 | 125 | 0.653 | 15 | |
| Iron | 5.00 | 0.100 | 5.00 | 0 | 99.9 | 75 | 125 | 2.68 | 15 | |
| Lead | 0.200 | 0.00100 | 0.200 | 0.000354 | 100 | 75 | 125 | 0.147 | 15 | |
| Lithium | 0.556 | 0.0100 | 0.200 | 0.364 | 95.6 | 75 | 125 | 0.928 | 15 | |
| Magnesium | 9.83 | 0.300 | 5.00 | 4.87 | 99.2 | 75 | 125 | 1.45 | 15 | |
| Molybdenum | 0.206 | 0.00500 | 0.200 | 0.00457 | 101 | 75 | 125 | 0.965 | 15 | |
| Potassium | 42.5 | 0.300 | 5.00 | 37.5 | 100 | 75 | 125 | 1.60 | 15 | |
| Selenium | 0.187 | 0.00500 | 0.200 | 0 | 93.4 | 75 | 125 | 1.53 | 15 | |
| Sodium | 166 | 0.300 | 5.00 | 163 | 71.3 | 75 | 125 | 1.71 | 15 | S |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 100 | 75 | 125 | 0.031 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200514A**

| Sample ID: **ICV-200514** | Batch ID: **R110496** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_200514A** | Analysis Date: **5/14/2020 11:28:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.101 | 0.00250 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Barium | 0.101 | 0.0100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.101 | 0.00100 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.103 | 0.00100 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Calcium | 2.62 | 0.300 | 2.50 | 0 | 105 | 90 | 110 | | | |
| Chromium | 0.103 | 0.00500 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Cobalt | 0.102 | 0.00500 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Iron | 2.44 | 0.100 | 2.50 | 0 | 97.4 | 90 | 110 | | | |
| Lead | 0.0999 | 0.00100 | 0.100 | 0 | 99.9 | 90 | 110 | | | |
| Lithium | 0.0987 | 0.0100 | 0.100 | 0 | 98.7 | 90 | 110 | | | |
| Magnesium | 2.41 | 0.300 | 2.50 | 0 | 96.2 | 90 | 110 | | | |
| Molybdenum | 0.0956 | 0.00500 | 0.100 | 0 | 95.6 | 90 | 110 | | | |
| Potassium | 2.47 | 0.300 | 2.50 | 0 | 98.7 | 90 | 110 | | | |
| Selenium | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Sodium | 2.47 | 0.300 | 2.50 | 0 | 98.8 | 90 | 110 | | | |
| Thallium | 0.0980 | 0.00150 | 0.100 | 0 | 98.0 | 90 | 110 | | | |

| Sample ID: **LCVL-200514** | Batch ID: **R110496** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_200514A** | Analysis Date: **5/14/2020 11:38:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00214 | 0.00250 | 0.00200 | 0 | 107 | 80 | 120 | | | |
| Arsenic | 0.00532 | 0.00500 | 0.00500 | 0 | 106 | 80 | 120 | | | |
| Barium | 0.00521 | 0.0100 | 0.00500 | 0 | 104 | 80 | 120 | | | |
| Beryllium | 0.00110 | 0.00100 | 0.00100 | 0 | 110 | 80 | 120 | | | |
| Cadmium | 0.00105 | 0.00100 | 0.00100 | 0 | 105 | 80 | 120 | | | |
| Calcium | 0.105 | 0.300 | 0.100 | 0 | 105 | 80 | 120 | | | |
| Chromium | 0.00522 | 0.00500 | 0.00500 | 0 | 104 | 80 | 120 | | | |
| Cobalt | 0.00512 | 0.00500 | 0.00500 | 0 | 102 | 80 | 120 | | | |
| Iron | 0.0998 | 0.100 | 0.100 | 0 | 99.8 | 80 | 120 | | | |
| Lead | 0.00104 | 0.00100 | 0.00100 | 0 | 104 | 80 | 120 | | | |
| Lithium | 0.0102 | 0.0100 | 0.0100 | 0 | 102 | 80 | 120 | | | |
| Magnesium | 0.0929 | 0.300 | 0.100 | 0 | 92.9 | 80 | 120 | | | |
| Molybdenum | 0.00521 | 0.00500 | 0.00500 | 0 | 104 | 80 | 120 | | | |
| Potassium | 0.0946 | 0.300 | 0.100 | 0 | 94.6 | 80 | 120 | | | |
| Selenium | 0.00554 | 0.00500 | 0.00500 | 0 | 111 | 80 | 120 | | | |
| Sodium | 0.103 | 0.300 | 0.100 | 0 | 103 | 80 | 120 | | | |
| Thallium | 0.000989 | 0.00150 | 0.00100 | 0 | 98.9 | 80 | 120 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200514A**

| Sample ID: **CCV2-200514** | Batch ID: **R110496** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200514A** | Analysis Date: **5/14/2020 1:19:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Cadmium | 0.205 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Calcium | 5.15 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Chromium | 0.210 | 0.00500 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Iron | 5.07 | 0.100 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.5 | 90 | 110 | | | |
| Lithium | 0.207 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Magnesium | 5.08 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Molybdenum | 0.201 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Potassium | 5.08 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Selenium | 0.212 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Sodium | 5.07 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Thallium | 0.197 | 0.00150 | 0.200 | 0 | 98.7 | 90 | 110 | | | |

| Sample ID: **CCV3-200514** | Batch ID: **R110496** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200514A** | Analysis Date: **5/14/2020 2:22:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Barium | 0.203 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.205 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Cadmium | 0.206 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Calcium | 5.15 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Chromium | 0.211 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Cobalt | 0.203 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Iron | 5.15 | 0.100 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.7 | 90 | 110 | | | |
| Lithium | 0.207 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Magnesium | 5.13 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.201 | 0.00500 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Potassium | 5.07 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Selenium | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Sodium | 5.13 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 98.0 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200514A**

Sample ID: **CCV4-200514** Batch ID: **R110496** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200514A** Analysis Date: **5/14/2020 3:17:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Beryllium | 0.209 | 0.00100 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Cadmium | 0.210 | 0.00100 | 0.200 | 0 | 105 | 90 | 110 | | | |
| Chromium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Iron | 5.17 | 0.100 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Lithium | 0.207 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Selenium | 0.215 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.4 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200515B**

The QC data in batch 96330 applies to the following samples: 2005076-01B, 2005076-02B

| Sample ID: **MB-96330** | Batch ID: **96330** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 12:54:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

| Sample ID: **LCS-96330** | Batch ID: **96330** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 12:57:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.197 | 0.0300 | 0.200 | 0 | 98.3 | 80 | 120 | | | |

| Sample ID: **LCSD-96330** | Batch ID: **96330** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 12:59:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.213 | 0.0300 | 0.200 | 0 | 106 | 80 | 120 | 7.86 | 15 | |

| Sample ID: **2005081-01A SD** | Batch ID: **96330** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 1:10:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.963 | 0.750 | 0 | 0.908 | | | | 5.89 | 20 | |

| Sample ID: **2005081-01A PDS** | Batch ID: **96330** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 1:37:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 1.84 | 0.150 | 1.00 | 0.908 | 93.3 | 75 | 125 | | | |

| Sample ID: **2005081-01A MS** | Batch ID: **96330** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 1:39:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 1.17 | 0.150 | 0.200 | 0.908 | 133 | 75 | 125 | | | S |

| Sample ID: **2005081-01A MSD** | Batch ID: **96330** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 1:42:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 1.15 | 0.150 | 0.200 | 0.908 | 121 | 75 | 125 | 2.14 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200515B**

| Sample ID: **ICV-200515** | Batch ID: **R110514** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 10:34:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0999 | 0.0300 | 0.100 | 0 | 99.9 | 90 | 110 | | | |
| Calcium | 2.58 | 0.300 | 2.50 | 0 | 103 | 90 | 110 | | | |
| Magnesium | 2.45 | 0.300 | 2.50 | 0 | 98.0 | 90 | 110 | | | |
| Potassium | 2.50 | 0.300 | 2.50 | 0 | 100 | 90 | 110 | | | |
| Selenium | 0.104 | 0.00500 | 0.100 | 0 | 104 | 90 | 110 | | | |
| Sodium | 2.48 | 0.300 | 2.50 | 0 | 99.2 | 90 | 110 | | | |

| Sample ID: **LCVL-200515** | Batch ID: **R110514** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 10:48:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0221 | 0.0300 | 0.0200 | 0 | 111 | 80 | 120 | | | |
| Calcium | 0.114 | 0.300 | 0.100 | 0 | 114 | 80 | 120 | | | |
| Magnesium | 0.0979 | 0.300 | 0.100 | 0 | 97.9 | 80 | 120 | | | |
| Potassium | 0.102 | 0.300 | 0.100 | 0 | 102 | 80 | 120 | | | |
| Selenium | 0.00506 | 0.00500 | 0.00500 | 0 | 101 | 80 | 120 | | | |
| Sodium | 0.104 | 0.300 | 0.100 | 0 | 104 | 80 | 120 | | | |

| Sample ID: **CCV1-200515** | Batch ID: **R110514** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 11:31:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.201 | 0.0300 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Calcium | 5.18 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Magnesium | 5.10 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Potassium | 5.15 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Sodium | 5.01 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID: **CCV2-200515** | Batch ID: **R110514** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 12:45:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.197 | 0.0300 | 0.200 | 0 | 98.3 | 90 | 110 | | | |
| Calcium | 5.24 | 0.300 | 5.00 | 0 | 105 | 90 | 110 | | | |
| Magnesium | 5.15 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Potassium | 5.18 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Selenium | 0.212 | 0.00500 | 0.200 | 0 | 106 | 90 | 110 | | | |
| Sodium | 5.04 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200515B**

Sample ID: **CCV3-200515** Batch ID: **R110514** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200515B** Analysis Date: **5/15/2020 1:53:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.192 | 0.0300 | 0.200 | 0 | 95.9 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200421A**

Sample ID: **DCS2-96036** Batch ID: **96036** TestNo: **E300** Units: **mg/L**
SampType: **DCS2** Run ID: **IC2_200421A** Analysis Date: **4/21/2020 11:47:08 AM** Prep Date: **4/21/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.420 | 1.00 | 0.5000 | 0 | 84.1 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.154 | 0.400 | 0.2000 | 0 | 77.1 | 70 | 130 | 0 | 0 | |
| Nitrate-N | 0.246 | 0.0500 | 0.2500 | 0 | 98.5 | 70 | 130 | 0 | 0 | |
| Sulfate | 1.43 | 3.00 | 1.500 | 0 | 95.3 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200512A**

The QC data in batch 96308 applies to the following samples: 2005076-01C, 2005076-02C

Sample ID: **MB-96308** Batch ID: **96308** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_200512A** Analysis Date: **5/12/2020 10:34:16 AM** Prep Date: **5/12/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Nitrate-N | <0.100 | 0.500 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-96308** Batch ID: **96308** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_200512A** Analysis Date: **5/12/2020 10:50:15 AM** Prep Date: **5/12/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.96 | 1.00 | 10.00 | 0 | 99.6 | 90 | 110 | | | |
| Fluoride | 3.81 | 0.400 | 4.000 | 0 | 95.3 | 90 | 110 | | | |
| Nitrate-N | 4.95 | 0.500 | 5.000 | 0 | 98.9 | 90 | 110 | | | |
| Sulfate | 29.8 | 3.00 | 30.00 | 0 | 99.3 | 90 | 110 | | | |

Sample ID: **LCSD-96308** Batch ID: **96308** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_200512A** Analysis Date: **5/12/2020 11:06:15 AM** Prep Date: **5/12/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 9.87 | 1.00 | 10.00 | 0 | 98.7 | 90 | 110 | 0.924 | 20 | |
| Fluoride | 3.78 | 0.400 | 4.000 | 0 | 94.4 | 90 | 110 | 0.950 | 20 | |
| Nitrate-N | 4.91 | 0.500 | 5.000 | 0 | 98.2 | 90 | 110 | 0.758 | 20 | |
| Sulfate | 29.5 | 3.00 | 30.00 | 0 | 98.4 | 90 | 110 | 1.00 | 20 | |

Sample ID: **2005076-01CMS** Batch ID: **96308** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_200512A** Analysis Date: **5/12/2020 6:16:24 PM** Prep Date: **5/12/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 5090 | 100 | 2000 | 3444 | 82.5 | 90 | 110 | | | S |
| Fluoride | 2060 | 40.0 | 2000 | 21.91 | 102 | 90 | 110 | | | |
| Nitrate-N | 438 | 50.0 | 451.6 | 0 | 97.0 | 90 | 110 | | | |
| Sulfate | 6550 | 300 | 2000 | 4678 | 93.4 | 90 | 110 | | | |

Sample ID: **2005076-01CMSD** Batch ID: **96308** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_200512A** Analysis Date: **5/12/2020 6:32:24 PM** Prep Date: **5/12/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 5090 | 100 | 2000 | 3444 | 82.4 | 90 | 110 | 0.032 | 20 | S |
| Fluoride | 2070 | 40.0 | 2000 | 21.91 | 102 | 90 | 110 | 0.353 | 20 | |
| Nitrate-N | 439 | 50.0 | 451.6 | 0 | 97.2 | 90 | 110 | 0.161 | 20 | |
| Sulfate | 6540 | 300 | 2000 | 4678 | 93.0 | 90 | 110 | 0.142 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200512A**

| Sample ID: **2005076-02CMS** | Batch ID: **96308** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 7:04:24 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3880 | 100 | 2000 | 1944 | 96.7 | 90 | 110 | | | |
| Fluoride | 2130 | 40.0 | 2000 | 15.27 | 106 | 90 | 110 | | | |
| Nitrate-N | 455 | 50.0 | 451.6 | 0 | 101 | 90 | 110 | | | |
| Sulfate | 5870 | 300 | 2000 | 3932 | 96.8 | 90 | 110 | | | |

| Sample ID: **2005076-02CMSD** | Batch ID: **96308** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 7:20:24 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 3880 | 100 | 2000 | 1944 | 96.9 | 90 | 110 | 0.096 | 20 | |
| Fluoride | 2130 | 40.0 | 2000 | 15.27 | 106 | 90 | 110 | 0.174 | 20 | |
| Nitrate-N | 456 | 50.0 | 451.6 | 0 | 101 | 90 | 110 | 0.070 | 20 | |
| Sulfate | 5880 | 300 | 2000 | 3932 | 97.2 | 90 | 110 | 0.163 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200512A**

Sample ID: **ICV-200512** Batch ID: **R110449** TestNo: **E300** Units: **mg/L**
SampType: **ICV** Run ID: **IC2_200512A** Analysis Date: **5/12/2020 10:02:16 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 25.7 | 1.00 | 25.00 | 0 | 103 | 90 | 110 | | | |
| Fluoride | 9.97 | 0.400 | 10.00 | 0 | 99.7 | 90 | 110 | | | |
| Nitrate-N | 13.0 | 0.500 | 12.50 | 0 | 104 | 90 | 110 | | | |
| Sulfate | 77.8 | 3.00 | 75.00 | 0 | 104 | 90 | 110 | | | |

Sample ID: **CCV1-200512** Batch ID: **R110449** TestNo: **E300** Units: **mg/L**
SampType: **CCV** Run ID: **IC2_200512A** Analysis Date: **5/12/2020 4:08:23 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.81 | 0.400 | 4.000 | 0 | 95.2 | 90 | 110 | | | |
| Nitrate-N | 4.94 | 0.500 | 5.000 | 0 | 98.9 | 90 | 110 | | | |
| Sulfate | 29.8 | 3.00 | 30.00 | 0 | 99.2 | 90 | 110 | | | |

Sample ID: **CCV2-200512** Batch ID: **R110449** TestNo: **E300** Units: **mg/L**
SampType: **CCV** Run ID: **IC2_200512A** Analysis Date: **5/12/2020 10:16:24 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.1 | 1.00 | 10.00 | 0 | 101 | 90 | 110 | | | |
| Fluoride | 3.86 | 0.400 | 4.000 | 0 | 96.6 | 90 | 110 | | | |
| Nitrate-N | 4.99 | 0.500 | 5.000 | 0 | 99.8 | 90 | 110 | | | |
| Sulfate | 29.9 | 3.00 | 30.00 | 0 | 99.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **TITRATOR_200514B**

The QC data in batch 96346 applies to the following samples: 2005076-01C, 2005076-02C

Sample ID: **MB-96346** Batch ID: **96346** TestNo: **M2320 B** Units: **mg/L @ pH 4.23**
SampType: **MBLK** Run ID: **TITRATOR_200514B** Analysis Date: **5/14/2020 11:22:00 AM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Total (As CaCO3) | <20.0 | 20.0 | | | | | | | | |

Sample ID: **LCS-96346** Batch ID: **96346** TestNo: **M2320 B** Units: **mg/L @ pH 4.22**
SampType: **LCS** Run ID: **TITRATOR_200514B** Analysis Date: **5/14/2020 11:26:00 AM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 53.2 | 20.0 | 50.00 | 0 | 106 | 74 | 129 | | | |

Sample ID: **2005076-01C-DUP** Batch ID: **96346** TestNo: **M2320 B** Units: **mg/L @ pH 4.53**
SampType: **DUP** Run ID: **TITRATOR_200514B** Analysis Date: **5/14/2020 11:46:00 AM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 130 | 20.0 | 0 | 133.8 | | | | 3.11 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 130 | 20.0 | 0 | 133.8 | | | | 3.11 | 20 | |

Sample ID: **2005110-01C-DUP** Batch ID: **96346** TestNo: **M2320 B** Units: **mg/L @ pH 4.5**
SampType: **DUP** Run ID: **TITRATOR_200514B** Analysis Date: **5/14/2020 1:18:00 PM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 32.0 | 20.0 | 0 | 32.90 | | | | 2.77 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 32.0 | 20.0 | 0 | 32.90 | | | | 2.77 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_200514B**

| Sample ID: **ICV-200514** | Batch ID: **R110504** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.36** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **TITRATOR_200514B** | Analysis Date: **5/14/2020 11:20:00 AM** | Prep Date: **5/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 31.5 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 67.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.4 | 20.0 | 100.0 | 0 | 99.4 | 98 | 102 | | | |

| Sample ID: **CCV1-200514** | Batch ID: **R110504** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.33** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_200514B** | Analysis Date: **5/14/2020 1:10:00 PM** | Prep Date: **5/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 39.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 60.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.9 | 20.0 | 100.0 | 0 | 99.9 | 90 | 110 | | | |

| Sample ID: **CCV2-200514** | Batch ID: **R110504** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.32** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_200514B** | Analysis Date: **5/14/2020 2:01:00 PM** | Prep Date: **5/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 42.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 58.1 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 100 | 20.0 | 100.0 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200323B**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS-95613** | Batch ID: **95613** | TestNo: **M3500-Fe D** | Units: **mg/L** | | |
| SampType: **DCS** | Run ID: **UV/VIS_2_200323B** | Analysis Date: **3/23/2020 1:30:00 PM** | Prep Date: **3/23/2020** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.0580 | 0.100 | 0.05000 | 0 | 116 | 65 | 135 | 0 | 0 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200507C**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS-96253** | Batch ID: **96253** | TestNo: **M4500-P E** | Units: **mg/L** | | |
| SampType: **DCS** | Run ID: **UV/VIS_2_200507C** | Analysis Date: **5/7/2020 2:22:00 PM** | Prep Date: **5/7/2020** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.0480 | 0.100 | 0.05000 | 0 | 96.0 | 50 | 200 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200512D**

The QC data in batch 96315 applies to the following samples: 2005076-01C, 2005076-02C

| Sample ID: **MB-96315** | Batch ID: **96315** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:04:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | <0.0300 | 0.100 | | | | | | | | |

| Sample ID: **LCS-96315** | Batch ID: **96315** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:04:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.498 | 0.100 | 0.5000 | 0 | 99.6 | 80 | 120 | | | |

| Sample ID: **LCSD-96315** | Batch ID: **96315** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:04:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.499 | 0.100 | 0.5000 | 0 | 99.8 | 80 | 120 | 0.201 | 15 | |

| Sample ID: **2005076-02CMS** | Batch ID: **96315** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:08:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.495 | 0.100 | 0.5000 | 0 | 99.0 | 80 | 120 | | | |

| Sample ID: **2005076-02CMSD** | Batch ID: **96315** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:08:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.491 | 0.100 | 0.5000 | 0 | 98.2 | 80 | 120 | 0.811 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200512D**

| Sample ID: **ICV-200512** | Batch ID: **R110462** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:03:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.200 | 0.100 | 0.2000 | 0 | 100 | 85 | 115 | | | |

| Sample ID: **CCV1-200512** | Batch ID: **R110462** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:09:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.516 | 0.100 | 0.5000 | 0 | 103 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200513B**

The QC data in batch 96316 applies to the following samples: 2005076-01A, 2005076-02A

| Sample ID: **MB-96316** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:41:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | <0.0500 | 0.100 | | | | | | | | N |

| Sample ID: **LCS-96316** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:41:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.106 | 0.100 | 0.1000 | 0 | 106 | 85 | 115 | | | N |

| Sample ID: **LCSD-96316** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:42:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.105 | 0.100 | 0.1000 | 0 | 105 | 85 | 115 | 0.720 | 15 | N |

| Sample ID: **2005038-01AMS** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:29:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.120 | 0.100 | 0.1000 | 0 | 120 | 85 | 115 | | | SN |

| Sample ID: **2005038-01AMSD** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:29:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.109 | 0.100 | 0.1000 | 0 | 109 | 85 | 115 | 8.97 | 15 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200513B**

| Sample ID: **ICV-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:40:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.112 | 0.100 | 0.1000 | 0 | 112 | 85 | 115 | | | N |

| Sample ID: **CCV1-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:02:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.192 | 0.100 | 0.2000 | 0 | 96.2 | 85 | 115 | | | N |

| Sample ID: **CCV2-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:15:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.187 | 0.100 | 0.2000 | 0 | 93.5 | 85 | 115 | | | N |

| Sample ID: **CCV3-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:31:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.205 | 0.100 | 0.2000 | 0 | 103 | 85 | 115 | | | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_200512D**

The QC data in batch 96320 applies to the following samples: 2005076-01C, 2005076-02C

| Sample ID: **MB-96320** | Batch ID: **96320** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_200512D** | Analysis Date: **5/12/2020 5:00:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-96320** | Batch ID: **96320** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_200512D** | Analysis Date: **5/12/2020 5:00:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 761 | 10.0 | 745.6 | 0 | 102 | 90 | 113 | | | |

| Sample ID: **2005073-01D-DUP** | Batch ID: **96320** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_200512D** | Analysis Date: **5/12/2020 5:00:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 10600 | 200 | 0 | 10640 | | | | 0.377 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005076
**Project:** Luminant-OGSES-FGD Ponds

# MQL SUMMARY REPORT

| TestNo: E300 | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Nitrate-N | 0.100 | 0.500 |
| Sulfate | 1.00 | 3.00 |

| TestNo: SW6020B | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Antimony | 0.000800 | 0.00250 |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Cadmium | 0.000300 | 0.00100 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Iron | 0.0300 | 0.100 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Magnesium | 0.100 | 0.300 |
| Molybdenum | 0.00200 | 0.00500 |
| Potassium | 0.100 | 0.300 |
| Selenium | 0.00200 | 0.00500 |
| Sodium | 0.100 | 0.300 |
| Thallium | 0.000500 | 0.00150 |

| TestNo: M2320 B | MDL | MQL |
|---|---|---|
| **Analyte** | **ıg/L @ pH 4.2** | **g/L @ pH 4.2** |
| Alkalinity, Bicarbonate (As CaCO3) | 10.0 | 20.0 |
| Alkalinity, Carbonate (As CaCO3) | 10.0 | 20.0 |
| Alkalinity, Hydroxide (As CaCO3) | 10.0 | 20.0 |
| Alkalinity, Total (As CaCO3) | 20.0 | 20.0 |

| TestNo: M3500-Fe D | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Iron, Ferrous | 0.0500 | 0.100 |

| TestNo: SW7470A | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Mercury | 0.0000800 | 0.000200 |

| TestNo: M4500-P E | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Phosphorus, Total Orthophosphate | 0.0300 | 0.100 |

| TestNo: M2540C | MDL | MQL |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

June 12, 2020



## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1219697 |
| Samples Received: | 05/18/2020 |
| Project Number: | 2005076 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

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## FGD-A-POND L1219697-01 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time | |
|---|---|---|---|---|---|---|
| | | | | 05/11/20 14:05 | 05/18/20 09:45 | |
| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
| Radiochemistry by Method 904 | WG1478122 | 1 | 05/19/20 12:05 | 05/27/20 15:20 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1487018 | 1 | 06/04/20 15:41 | 06/05/20 15:02 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1487018 | 1 | 06/04/20 15:41 | 06/05/20 15:02 | RGT | Mt. Juliet, TN |

## FGD-B-POND L1219697-02 Non-Potable Water

| | | | Collected by | Collected date/time | Received date/time | |
|---|---|---|---|---|---|---|
| | | | | 05/11/20 14:25 | 05/18/20 09:45 | |
| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
| Radiochemistry by Method 904 | WG1478122 | 1 | 05/19/20 12:05 | 05/27/20 15:20 | JMR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1487018 | 1 | 06/04/20 15:41 | 06/05/20 15:02 | RGT | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1487018 | 1 | 06/04/20 15:41 | 06/05/20 15:02 | RGT | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | -0.709 | | 0.565 | 0.882 | 05/27/2020 15:20 | WG1478122 |
| *(T) Barium* | *119* | | | *62.0-143* | *05/27/2020 15:20* | WG1478122 |
| *(T) Yttrium* | *98.8* | | | *79.0-136* | *05/27/2020 15:20* | WG1478122 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 0.885 | | 0.950 | 1.22 | 06/05/2020 15:02 | WG1487018 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.885 | | 0.385 | 0.339 | 06/05/2020 15:02 | WG1487018 |
| *(T) Barium-133* | *93.3* | | | *30.0-143* | *06/05/2020 15:02* | WG1487018 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.104 | | 0.497 | 0.767 | 05/27/2020 15:20 | WG1478122 |
| *(T) Barium* | *141* | | | *62.0-143* | *05/27/2020 15:20* | WG1478122 |
| *(T) Yttrium* | *103* | | | *79.0-136* | *05/27/2020 15:20* | WG1478122 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 0.193 | | 0.718 | 1.13 | 06/05/2020 15:02 | WG1487018 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.0890 | | 0.221 | 0.365 | 06/05/2020 15:02 | WG1487018 |
| *(T) Barium-133* | *90.7* | | | *30.0-143* | *06/05/2020 15:02* | WG1487018 |

## Method Blank (MB)

(MB) R3532575-1 05/27/20 10:15

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | -0.0177 | | 0.386 |
| *(T) Barium* | *99.9* | | |
| *(T) Yttrium* | *114* | | |

## Original Sample (OS) • Duplicate (DUP)

(OS) • (DUP) R3532575-5 05/27/20 10:15

| Analyte | Original Result | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-228 | | 1.33 | 1 | 32.4 | 0.463 | | 20 | 3 |
| *(T) Barium* | | *106* | | | | | | |
| *(T) Yttrium* | | *104* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3532575-2 05/27/20 10:15

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 5.43 | 109 | 80.0-120 | |
| *(T) Barium* | | | *105* | | |
| *(T) Yttrium* | | | *104* | | |

## Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) • (MS) R3532575-3 05/27/20 10:15 • (MSD) R3532575-4 05/27/20 10:15

| Analyte | Spike Amount pCi/l | Original Result | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-228 | 10.0 | | 11.8 | 12.3 | 109 | 113 | 1 | 70.0-130 | | | 3.90 | | 20 |
| *(T) Barium* | | | | | *115* | *104* | | | | | | | |
| *(T) Yttrium* | | | | | *102* | *110* | | | | | | | |

## Method Blank (MB)

(MB) R3537395-1 06/05/20 15:02

| Analyte | MB Result | MB Qualifier | MB MDA |
|---|---|---|---|
| | pCi/l | | pCi/l |
| Radium-226 | -0.0212 | | 0.0760 |
| *(T) Barium-133* | *101* | | |

## L1224651-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1224651-01 06/05/20 15:02 • (DUP) R3537395-5 06/05/20 15:02

| Analyte | Original Result | DUP Result | Dilution | DUP RPD | DUP RER | DUP Qualifier | DUP RPD Limits | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| | pCi/l | pCi/l | | % | | | % | |
| Radium-226 | 0.289 | 0.269 | 1 | 7.21 | 0.0681 | | 20 | 3 |
| *(T) Barium-133* | *104* | *94.0* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3537395-2 06/05/20 15:02

| Analyte | Spike Amount | LCS Result | LCS Rec. | Rec. Limits | LCS Qualifier |
|---|---|---|---|---|---|
| | pCi/l | pCi/l | % | % | |
| Radium-226 | 5.02 | 4.75 | 94.5 | 80.0-120 | |
| *(T) Barium-133* | | | *99.4* | | |

## L1221007-13 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1221007-13 06/05/20 15:02 • (MS) R3537395-3 06/05/20 15:02 • (MSD) R3537395-4 06/05/20 15:02

| Analyte | Spike Amount | Original Result | MS Result | MSD Result | MS Rec. | MSD Rec. | Dilution | Rec. Limits | MS Qualifier | MSD Qualifier | RPD | MS RER | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pCi/l | pCi/l | pCi/l | pCi/l | % | % | | % | | | % | | % |
| Radium-226 | 20.1 | 0.201 | 19.7 | 23.7 | 96.9 | 117 | 1 | 75.0-125 | | | 18.4 | | 20 |
| *(T) Barium-133* | | *96.1* | | | *99.0* | *85.9* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.



## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LAO00356 |
| Kentucky [1 6] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

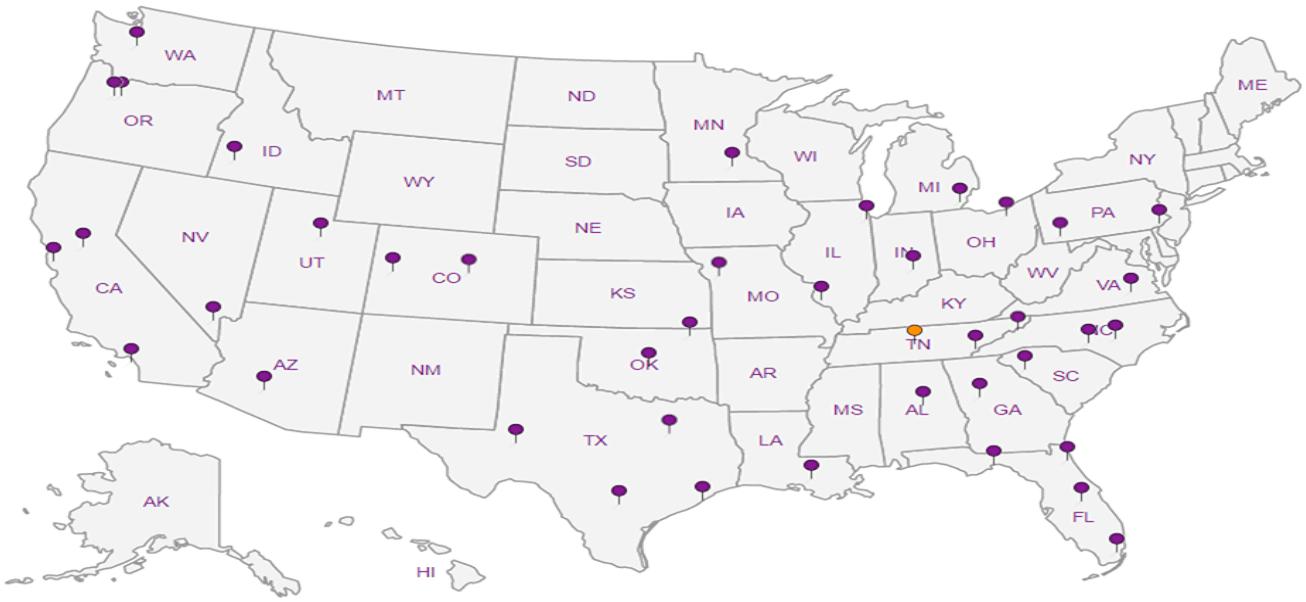
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



G109

Work Order: 2005076

**Subcontractor:**

Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

1219697

**14-May-20**

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ra-228 | Ra-226 | | | | | |
| | | | | | E904.0 | M7500 Ra B M | | | | | |
| FGD-A-POND | Aqueous | 01D | 05/11/20 02:05 PM | 1LHDPEHNO3 | | 1 | | | | | 01 |
| FGD-A-POND | Aqueous | 01E | 05/11/20 02:05 PM | 1LHDPEHNO3 | 1 | | | | | | 01 |
| FGD-B-POND | Aqueous | 02D | 05/11/20 02:25 PM | 1LHDPEHNO3 | | 1 | | | | | 02 |
| FGD-B-POND | Aqueous | 02E | 05/11/20 02:25 PM | 1LHDPEHNO3 | 1 | | | | | | 02 |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | Em | 5/14/20 1700 | **Received by:** | Carol Kemp | 5/18/20 9:45 |
| **Relinquished by:** | | | **Received by:** | | |



Amb

# Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | |
|---|---|---|
| Client: DHLRRT | 1219697 | |
| Cooler Received/Opened On: 5 /18 / 20 Temperature: | Amb | |
| Received By: Carol Kemp | | |
| Signature: Carol Kemp | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | ✓ | | |
| COC Signed / Accurate? | | ✓ | |
| Bottles arrive intact? | | ✓ | |
| Correct bottles used? | | ✓ | |
| Sufficient volume sent? | | ✓ | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | | ✓ | |

Pace Analytical®
National Center for Testing & Innovation

| Login #:1219697 | Client: DHLRRTX | Date:5/18/2020 | Evaluated by:Carol K |
|---|---|---|---|

**Non-Conformance (check applicable items)**

| | Sample Integrity | | Chain of Custody Clarification | | |
|---|---|---|---|---|---|
| | Parameter(s) past holding time | | Login Clarification Needed | | **If Broken Container:** |
| | Temperature not in range | | Chain of custody is incomplete | | Insufficient packing material around container |
| | Improper container type | | Please specify Metals requested. | | Insufficient packing material inside cooler |
| x | pH not in range. | | Please specify TCLP requested. | | Improper handling by carrier (FedEx / UPS / Couri |
| | Insufficient sample volume. | | Received additional samples not listed on coc. | | Sample was frozen |
| | Sample is biphasic. | | Sample ids on containers do not match ids on coc | | Container lid not intact |
| | Vials received with headspace. | | Trip Blank not received. | | **If no Chain of Custody:** |
| | Broken container | | Client did not "X" analysis. | | Received by: |
| | Broken container: | | Chain of Custody is missing | | Date/Time: |
| | Sufficient sample remains | | | | Temp./Cont. Rec./pH: |
| | | | | | Carrier: |
| | | | | | Tracking# |

**Login Comments: 3 of 4 bottles received at a ph of 8. Preserved in lab**

**HNO3 Lot # 19L04452**

| Client informed by: | | Call | | Email | | Voice Mail | | Date: | Time: |
|---|---|---|---|---|---|---|---|---|---|
| TSR Initials:DE 5/18/20 1500 | Client Contact: | | | | | | | | |

Login Instructions:

May 21, 2020

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX: (512) 671-3446

Order No.: 2005078

RE: Luminant-OGSES-FGD PONDS

Dear Will Vienne:

DHL Analytical, Inc. received 7 sample(s) on 5/12/2020 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-20-25

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# CHAIN-OF-CUSTODY

№ 68290

CLIENT: GOLDER ASSOCIATES
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-11-20 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 2005073
PROJECT LOCATION OR NAME: LUMINANT - OGSES - FGD PONDS
CLENT PROJECT #: 19134019 COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

PRESERVATION: HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC-8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ | PH ❑ HEX CHROM ❑ ALKALINITY X COD ❑ | CHLORIDE ❑ ANIONS | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | NO3, PO4, Na, Mg, K | Ferrous Fe | Ferric Fe

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | HCl | $HNO_3$ | NaOH | ICE | UNPRESERVED | | | | | | | | | | | | | | | | | | | | | | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-4 | 01 | 5-11-20 | 0745 | W | P | 5 | | X | | X | | | | | | | | | | | | | | X | | | | | | X | X | | |
| FGD-2 | 02 | " | 0835 | W | P | 5 | | X | | X | | | | | | | | | | | | | | X | | | | | | X | X | | |
| FGD-5 | 03 | " | 0925 | W | P | 5 | | X | | X | | | | | | | | | | | | | | X | | | | | | X | X | | |
| FGD-1 | 04 | " | 1015 | W | P | 5 | | X | | X | | | | | | | | | | | | | | X | | | | | | X | X | | |
| FGD-8 | 05 | " | 1110 | W | P | 5 | | X | | X | | | | | | | | | | | | | | X | | | | | | X | X | | |
| FGD-11 | 06 | " | 1245 | W | P | 5 | | X | | X | | | | | | | | | | | | | | X | | | | | | X | X | | |
| FGD-12 | 07 | " | 1345 | W | P | 5 | | X | | X | | | | | | | | | | | | | | X | | | | | | X | X | | |

RELINQUISHED BY: (Signature) DATE/TIME 5-11-20 1730 RECEIVED BY: (Signature) FedEx
RELINQUISHED BY: (Signature) FedEx DATE/TIME 5.12.2020 0915 RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

❑ DHL DISPOSAL @ $5.00 each ❑ Return

**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL X
OTHER ❑

**LABORATORY USE ONLY:**
RECEIVING TEMP: 1.5, 1.8, 3.3, 1.3 THERM #: 78
CUSTODY SEALS: ❑ BROKEN ☒ INTACT ❑ NOT USED
CARRIER: ❑ LONE STAR ☒ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED

DHL COC Rev 1 | FEB 2010

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder** Date Received: **5/12/2020**

Work Order Number **2005078** Received by: **JH**

Checklist completed by: _____ 5/12/2020 Reviewed by _____ 5/12/2020
Signature | Date | Initials | Date

Carrier name: FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **1.5** °C |
| Water - VOA vials have zero headspace? | Yes ☑ | No ☐ | No VOA vials submitted ☐ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? no | | Checked by EL |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? _____ | | Checked by _____ |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist: Reportable Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-FGD PONDS | **LRC Date:** 5/21/2020 |
| **Reviewer Name:** Angie O'Donnell | **Laboratory Work Order: 2005078** |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | **X** | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | **X** | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | **X** | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | **X** | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | **X** | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | **X** | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | **X** | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | **X** | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | **X** | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | **X** | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | **X** | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | **X** | | |
| | | **9)** If required for the project, TICs reported? | | | **X** | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | **X** | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | **X** | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | **X** | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | **X** | | | | |
| | | **4)** Were blank concentrations < MDL? | **X** | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | **X** | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | **X** | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | **X** | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | **X** | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | **X** | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | **X** | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | **X** | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | **X** | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | **X** | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | **X** | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | **X** | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | **X** | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | **X** | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | **X** | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | **X** | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | **X** | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | **X** | | | | **R10-01** |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | **X** | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | **X** | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES-FGD PONDS | **LRC Date:** 5/21/2020 |
| **Reviewer Name:** Angie O'Donnell | **Laboratory Work Order: 2005078** |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | X | | | **S9-01** |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28, 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

05/21/20

Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *21-May-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES-FGD PONDS
**Lab Order:** 2005078

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method E300 - Anions Analysis
Method M2320 B - Alkalinity Analysis
Method M3500-FE D - Ferrous Iron Analysis (This parameter is not NELAP Certified)
Method M3500-FE D - Ferrous Iron Analysis (Calculated) (This parameter is not NELAP Certified)
Method M4500-P E - Orthophosphate Analysis

Exception Report R1-01

The samples were received and log-in performed on 5/12/2020. A total of 7 samples were received and analyzed. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Ferrous Iron Analysis, the recovery of the Matrix Spike (2005038-01 MS) was above the method control limits. This is flagged accordingly in the QC Summary Report. The associated LCS/MSD was within method control limits. No further corrective action was taken.

Exception Report R10-01

The Ferric Iron is calculated as the Total Iron minus the Ferrous Iron.

Exception Report S9-01

For Metals Analysis, the recovery of Sodium for the Post Digestion Spike (2005077-05 PDS) was below the method control limits. This is fagged accordingly in the QC Summary Report. This analyte was within method control limits in the associated Serial Dilution. No further corrective action was taken.

## DHL Analytical, Inc.

**Date:** *21-May-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES-FGD PONDS
**Lab Order:** 2005078

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2005078-01 | FGD-4 | | 05/11/20 07:45 AM | 5/12/2020 |
| 2005078-02 | FGD-2 | | 05/11/20 08:35 AM | 5/12/2020 |
| 2005078-03 | FGD-5 | | 05/11/20 09:25 AM | 5/12/2020 |
| 2005078-04 | FGD-1 | | 05/11/20 10:15 AM | 5/12/2020 |
| 2005078-05 | FGD-8 | | 05/11/20 11:10 AM | 5/12/2020 |
| 2005078-06 | FGD-11 | | 05/11/20 12:45 PM | 5/12/2020 |
| 2005078-07 | FGD-12 | | 05/11/20 01:45 PM | 5/12/2020 |

**Lab Order:** 2005078
**Client:** Golder
**Project:** Luminant-OGSES-FGD PONDS

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005078-01A | FGD-4 | 05/11/20 07:45 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005078-01B | FGD-4 | 05/11/20 07:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| 2005078-01C | FGD-4 | 05/11/20 07:45 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/14/20 09:44 AM | 96346 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/12/20 11:20 AM | 96315 |
| 2005078-02A | FGD-2 | 05/11/20 08:35 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005078-02B | FGD-2 | 05/11/20 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| 2005078-02C | FGD-2 | 05/11/20 08:35 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/14/20 09:44 AM | 96346 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/12/20 11:20 AM | 96315 |
| 2005078-03A | FGD-5 | 05/11/20 09:25 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005078-03B | FGD-5 | 05/11/20 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| 2005078-03C | FGD-5 | 05/11/20 09:25 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/14/20 09:44 AM | 96346 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/12/20 11:20 AM | 96315 |
| 2005078-04A | FGD-1 | 05/11/20 10:15 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005078-04B | FGD-1 | 05/11/20 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| 2005078-04C | FGD-1 | 05/11/20 10:15 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/14/20 09:44 AM | 96346 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/12/20 11:20 AM | 96315 |
| 2005078-05A | FGD-8 | 05/11/20 11:10 AM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005078-05B | FGD-8 | 05/11/20 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| 2005078-05C | FGD-8 | 05/11/20 11:10 AM | Aqueous | M2320 B | Alkalinity Preparation | 05/14/20 09:44 AM | 96346 |

**Lab Order:** 2005078
**Client:** Golder
**Project:** Luminant-OGSES-FGD PONDS

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005078-05C | FGD-8 | 05/11/20 11:10 AM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | M4500-P E | Orthophosphate Prep | 05/12/20 11:20 AM | 96315 |
| 2005078-06A | FGD-11 | 05/11/20 12:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005078-06B | FGD-11 | 05/11/20 12:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| 2005078-06C | FGD-11 | 05/11/20 12:45 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/14/20 09:44 AM | 96346 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/12/20 11:20 AM | 96315 |
| 2005078-07A | FGD-12 | 05/11/20 01:45 PM | Aqueous | M3500-Fe | Ferrous Iron Prep Water | 05/13/20 08:00 AM | 96316 |
| 2005078-07B | FGD-12 | 05/11/20 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/14/20 09:57 AM | 96348 |
| 2005078-07C | FGD-12 | 05/11/20 01:45 PM | Aqueous | M2320 B | Alkalinity Preparation | 05/14/20 09:44 AM | 96346 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | E300 | Anion Preparation | 05/12/20 09:07 AM | 96308 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | M4500-P E | Orthophosphate Prep | 05/12/20 11:20 AM | 96315 |

**Lab Order:** 2005078
**Client:** Golder
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005078-01A | FGD-4 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110589 | 1 | 05/21/20 | UV/VIS_2_200521B |
| | FGD-4 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 10:56 AM | UV/VIS_2_200513B |
| 2005078-01B | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 1 | 05/15/20 03:14 PM | ICP-MS5_200515B |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 10 | 05/20/20 02:23 PM | ICP-MS5_200520B |
| 2005078-01C | FGD-4 | Aqueous | M2320 B | Alkalinity | 96346 | 1 | 05/14/20 12:02 PM | TITRATOR_200514B |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 96308 | 1 | 05/12/20 01:28 PM | IC2_200512A |
| | FGD-4 | Aqueous | M4500-P E | Orthophosphate | 96315 | 1 | 05/12/20 04:06 PM | UV/VIS_2_200512D |
| 2005078-02A | FGD-2 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110589 | 1 | 05/21/20 | UV/VIS_2_200521B |
| | FGD-2 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 11:00 AM | UV/VIS_2_200513B |
| 2005078-02B | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 1 | 05/15/20 02:07 PM | ICP-MS5_200515B |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 50 | 05/20/20 02:25 PM | ICP-MS5_200520B |
| 2005078-02C | FGD-2 | Aqueous | M2320 B | Alkalinity | 96346 | 1 | 05/14/20 12:10 PM | TITRATOR_200514B |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 96308 | 1 | 05/12/20 01:44 PM | IC2_200512A |
| | FGD-2 | Aqueous | M4500-P E | Orthophosphate | 96315 | 1 | 05/12/20 04:06 PM | UV/VIS_2_200512D |
| 2005078-03A | FGD-5 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110589 | 1 | 05/21/20 | UV/VIS_2_200521B |
| | FGD-5 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 11:00 AM | UV/VIS_2_200513B |
| 2005078-03B | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 1 | 05/15/20 02:09 PM | ICP-MS5_200515B |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 10 | 05/20/20 02:27 PM | ICP-MS5_200520B |
| 2005078-03C | FGD-5 | Aqueous | M2320 B | Alkalinity | 96346 | 1 | 05/14/20 12:21 PM | TITRATOR_200514B |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 96308 | 1 | 05/12/20 02:00 PM | IC2_200512A |
| | FGD-5 | Aqueous | M4500-P E | Orthophosphate | 96315 | 1 | 05/12/20 04:06 PM | UV/VIS_2_200512D |
| 2005078-04A | FGD-1 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110589 | 1 | 05/21/20 | UV/VIS_2_200521B |
| | FGD-1 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 11:04 AM | UV/VIS_2_200513B |
| 2005078-04B | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 10 | 05/20/20 02:29 PM | ICP-MS5_200520B |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 1 | 05/15/20 02:12 PM | ICP-MS5_200515B |
| 2005078-04C | FGD-1 | Aqueous | M2320 B | Alkalinity | 96346 | 1 | 05/14/20 12:26 PM | TITRATOR_200514B |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 96308 | 1 | 05/12/20 02:16 PM | IC2_200512A |
| | FGD-1 | Aqueous | M4500-P E | Orthophosphate | 96315 | 1 | 05/12/20 04:07 PM | UV/VIS_2_200512D |

**Lab Order:** 2005078
**Client:** Golder
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005078-05A | FGD-8 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110589 | 1 | 05/21/20 | UV/VIS_2_200521B |
| | FGD-8 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1000 | 05/13/20 11:14 AM | UV/VIS_2_200513B |
| 2005078-05B | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 1 | 05/15/20 02:14 PM | ICP-MS5_200515B |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 50 | 05/20/20 02:32 PM | ICP-MS5_200520B |
| 2005078-05C | FGD-8 | Aqueous | M2320 B | Alkalinity | 96346 | 1 | 05/14/20 12:49 PM | TITRATOR_200514B |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 96308 | 1 | 05/12/20 03:04 PM | IC2_200512A |
| | FGD-8 | Aqueous | M4500-P E | Orthophosphate | 96315 | 1 | 05/12/20 04:07 PM | UV/VIS_2_200512D |
| 2005078-06A | FGD-11 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110589 | 1 | 05/21/20 | UV/VIS_2_200521B |
| | FGD-11 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 11:05 AM | UV/VIS_2_200513B |
| 2005078-06B | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 50 | 05/20/20 02:34 PM | ICP-MS5_200520B |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 1 | 05/15/20 02:16 PM | ICP-MS5_200515B |
| 2005078-06C | FGD-11 | Aqueous | M2320 B | Alkalinity | 96346 | 1 | 05/14/20 01:01 PM | TITRATOR_200514B |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 96308 | 1 | 05/12/20 02:32 PM | IC2_200512A |
| | FGD-11 | Aqueous | M4500-P E | Orthophosphate | 96315 | 1 | 05/12/20 04:07 PM | UV/VIS_2_200512D |
| 2005078-07A | FGD-12 | Aqueous | M3500-Fe D | Ferric Iron (Calculated) | R110589 | 1 | 05/21/20 | UV/VIS_2_200521B |
| | FGD-12 | Aqueous | M3500-Fe D | Ferrous Iron | 96316 | 1 | 05/13/20 11:14 AM | UV/VIS_2_200513B |
| 2005078-07B | FGD-12 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 1 | 05/15/20 02:18 PM | ICP-MS5_200515B |
| | FGD-12 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96348 | 10 | 05/20/20 02:36 PM | ICP-MS5_200520B |
| 2005078-07C | FGD-12 | Aqueous | M2320 B | Alkalinity | 96346 | 1 | 05/14/20 01:05 PM | TITRATOR_200514B |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 96308 | 1 | 05/12/20 02:48 PM | IC2_200512A |
| | FGD-12 | Aqueous | M4500-P E | Orthophosphate | 96315 | 1 | 05/12/20 04:08 PM | UV/VIS_2_200512D |

# DHL Analytical, Inc.

**Date:** *21-May-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES-FGD PONDS | **Lab ID:** | 2005078-01 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/11/20 07:45 AM |
| **Lab Order:** | 2005078 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Iron | 0.120 | 0.0300 | 0.100 | | mg/L | 1 | 05/15/20 03:14 PM |
| Magnesium | 14.7 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 03:14 PM |
| Potassium | 1.53 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 03:14 PM |
| Sodium | 204 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 02:23 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/12/20 01:28 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 247 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/14/20 12:02 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/14/20 12:02 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/14/20 12:02 PM |
| Alkalinity, Total (As CaCO3) | 247 | 20.0 | 20.0 | | mg/L @ pH 4.53 | 1 | 05/14/20 12:02 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | 0.120 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 10:56 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.139 | 0.0300 | 0.100 | | mg/L | 1 | 05/12/20 04:06 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *21-May-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES-FGD PONDS | **Lab ID:** | 2005078-02 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/11/20 08:35 AM |
| **Lab Order:** | 2005078 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Iron | 0.0636 | 0.0300 | 0.100 | J | mg/L | 1 | 05/15/20 02:07 PM |
| Magnesium | 74.2 | 5.00 | 15.0 | | mg/L | 50 | 05/20/20 02:25 PM |
| Potassium | 5.73 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 02:07 PM |
| Sodium | 507 | 5.00 | 15.0 | | mg/L | 50 | 05/20/20 02:25 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Nitrate-N | 2.52 | 0.100 | 0.500 | | mg/L | 1 | 05/12/20 01:44 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 114 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/14/20 12:10 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/14/20 12:10 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/14/20 12:10 PM |
| Alkalinity, Total (As CaCO3) | 114 | 20.0 | 20.0 | | mg/L @ pH 4.51 | 1 | 05/14/20 12:10 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | 0.0636 | 0.0500 | 0.100 | JN | mg/L | 1 | 05/21/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 11:00 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.0520 | 0.0300 | 0.100 | J | mg/L | 1 | 05/12/20 04:06 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *21-May-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES-FGD PONDS | **Lab ID:** | 2005078-03 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/11/20 09:25 AM |
| **Lab Order:** | 2005078 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Iron | 0.0483 | 0.0300 | 0.100 | J | mg/L | 1 | 05/15/20 02:09 PM |
| Magnesium | 52.0 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 02:27 PM |
| Potassium | 3.64 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 02:09 PM |
| Sodium | 125 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 02:27 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Nitrate-N | 0.563 | 0.100 | 0.500 | | mg/L | 1 | 05/12/20 02:00 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 232 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/14/20 12:21 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/14/20 12:21 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/14/20 12:21 PM |
| Alkalinity, Total (As CaCO3) | 232 | 20.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/14/20 12:21 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 11:00 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 05/12/20 04:06 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *21-May-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES-FGD PONDS | **Lab ID:** | 2005078-04 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/11/20 10:15 AM |
| **Lab Order:** | 2005078 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Iron | 1.09 | 0.0300 | 0.100 | | mg/L | 1 | 05/15/20 02:12 PM |
| Magnesium | 17.1 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 02:12 PM |
| Potassium | 2.56 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 02:12 PM |
| Sodium | 82.0 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 02:29 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/12/20 02:16 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 67.6 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/14/20 12:26 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/14/20 12:26 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/14/20 12:26 PM |
| Alkalinity, Total (As CaCO3) | 67.6 | 20.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/14/20 12:26 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | 0.732 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | 0.358 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 11:04 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.370 | 0.0300 | 0.100 | | mg/L | 1 | 05/12/20 04:07 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *21-May-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES-FGD PONDS | **Lab ID:** | 2005078-05 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/11/20 11:10 AM |
| **Lab Order:** | 2005078 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Iron | 220 | 1.50 | 5.00 | | mg/L | 50 | 05/20/20 02:32 PM |
| Magnesium | 198 | 5.00 | 15.0 | | mg/L | 50 | 05/20/20 02:32 PM |
| Potassium | 19.9 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 02:14 PM |
| Sodium | 801 | 5.00 | 15.0 | | mg/L | 50 | 05/20/20 02:32 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Nitrate-N | 1.64 | 0.100 | 0.500 | | mg/L | 1 | 05/12/20 03:04 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 518 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/14/20 12:49 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/14/20 12:49 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/14/20 12:49 PM |
| Alkalinity, Total (As CaCO3) | 518 | 20.0 | 20.0 | | mg/L @ pH 4.54 | 1 | 05/14/20 12:49 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | 68.0 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | 152 | 50.0 | 100 | N | mg/L | 1000 | 05/13/20 11:14 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | <0.0300 | 0.0300 | 0.100 | | mg/L | 1 | 05/12/20 04:07 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *21-May-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES-FGD PONDS | **Lab ID:** | 2005078-06 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/11/20 12:45 PM |
| **Lab Order:** | 2005078 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Iron | 0.225 | 0.0300 | 0.100 | | mg/L | 1 | 05/15/20 02:16 PM |
| Magnesium | 28.5 | 5.00 | 15.0 | | mg/L | 50 | 05/20/20 02:34 PM |
| Potassium | 4.42 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 02:16 PM |
| Sodium | 306 | 5.00 | 15.0 | | mg/L | 50 | 05/20/20 02:34 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Nitrate-N | <0.100 | 0.100 | 0.500 | | mg/L | 1 | 05/12/20 02:32 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 230 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/14/20 01:01 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/14/20 01:01 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/14/20 01:01 PM |
| Alkalinity, Total (As CaCO3) | 230 | 20.0 | 20.0 | | mg/L @ pH 4.52 | 1 | 05/14/20 01:01 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | 0.225 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 11:05 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.0640 | 0.0300 | 0.100 | J | mg/L | 1 | 05/12/20 04:07 PM |

**Qualifiers:**

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *21-May-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES-FGD PONDS | **Lab ID:** | 2005078-07 |
| **Project No:** | 19134019-1000 | **Collection Date:** | 05/11/20 01:45 PM |
| **Lab Order:** | 2005078 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Iron | 32.5 | 0.300 | 1.00 | | mg/L | 10 | 05/20/20 02:36 PM |
| Magnesium | 8.03 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 02:18 PM |
| Potassium | 5.31 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 02:18 PM |
| Sodium | 22.1 | 0.100 | 0.300 | | mg/L | 1 | 05/15/20 02:18 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Nitrate-N | 1.22 | 0.100 | 0.500 | | mg/L | 1 | 05/12/20 02:48 PM |
| **ALKALINITY** | | **M2320 B** | | | | | Analyst: **BTJ** |
| Alkalinity, Bicarbonate (As CaCO3) | 34.6 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/14/20 01:05 PM |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/14/20 01:05 PM |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 10.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/14/20 01:05 PM |
| Alkalinity, Total (As CaCO3) | 34.6 | 20.0 | 20.0 | | mg/L @ pH 4.49 | 1 | 05/14/20 01:05 PM |
| **FERRIC IRON (CALCULATED)** | | **M3500-FE D** | | | | | Analyst: **AO** |
| Iron, Ferric | 32.5 | 0.0500 | 0.100 | N | mg/L | 1 | 05/21/20 |
| **FERROUS IRON** | | **M3500-FE D** | | | | | Analyst: **CC** |
| Iron, Ferrous | <0.0500 | 0.0500 | 0.100 | N | mg/L | 1 | 05/13/20 11:14 AM |
| **ORTHOPHOSPHATE** | | **M4500-P E** | | | | | Analyst: **BTJ** |
| Phosphorus, Total Orthophosphate (As P) | 0.0560 | 0.0300 | 0.100 | J | mg/L | 1 | 05/12/20 04:08 PM |

**Qualifiers:**

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200408C**

Sample ID: **DCS2-95814** Batch ID: **95814** TestNo: **SW6020B** Units: **mg/L**
SampType: **DCS2** Run ID: **ICP-MS5_200408C** Analysis Date: **4/8/2020 11:19:00 AM** Prep Date: **4/7/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.0591 | 0.100 | 0.0500 | 0 | 118 | 70 | 130 | 0 | 0 | |
| Magnesium | 0.298 | 0.300 | 0.300 | 0 | 99.3 | 70 | 130 | 0 | 0 | |
| Potassium | 0.285 | 0.300 | 0.300 | 0 | 95.1 | 70 | 130 | 0 | 0 | |
| Sodium | 0.295 | 0.300 | 0.300 | 0 | 98.4 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID:** **ICP-MS5_200515B**

The QC data in batch 96348 applies to the following samples: 2005078-01B, 2005078-02B, 2005078-03B, 2005078-04B, 2005078-05B, 2005078-06B, 2005078-07B

Sample ID: **MB-96348** Batch ID: **96348** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_200515B** Analysis Date: **5/15/2020 2:38:00 PM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | <0.0300 | 0.100 | | | | | | | | |
| Magnesium | <0.100 | 0.300 | | | | | | | | |
| Potassium | <0.100 | 0.300 | | | | | | | | |
| Sodium | <0.100 | 0.300 | | | | | | | | |

Sample ID: **LCS-96348** Batch ID: **96348** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_200515B** Analysis Date: **5/15/2020 2:41:00 PM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.18 | 0.100 | 5.00 | 0 | 104 | 80 | 120 | | | |
| Magnesium | 5.07 | 0.300 | 5.00 | 0 | 101 | 80 | 120 | | | |
| Potassium | 5.14 | 0.300 | 5.00 | 0 | 103 | 80 | 120 | | | |
| Sodium | 5.00 | 0.300 | 5.00 | 0 | 100 | 80 | 120 | | | |

Sample ID: **LCSD-96348** Batch ID: **96348** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200515B** Analysis Date: **5/15/2020 2:43:00 PM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.19 | 0.100 | 5.00 | 0 | 104 | 80 | 120 | 0.142 | 15 | |
| Magnesium | 5.18 | 0.300 | 5.00 | 0 | 104 | 80 | 120 | 2.28 | 15 | |
| Potassium | 5.24 | 0.300 | 5.00 | 0 | 105 | 80 | 120 | 2.03 | 15 | |
| Sodium | 5.09 | 0.300 | 5.00 | 0 | 102 | 80 | 120 | 1.86 | 15 | |

Sample ID: **2005077-05A SD** Batch ID: **96348** TestNo: **SW6020B** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS5_200515B** Analysis Date: **5/15/2020 2:54:00 PM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 1.18 | 0.500 | 0 | 1.16 | | | | 2.13 | 20 | |
| Magnesium | 16.9 | 1.50 | 0 | 16.7 | | | | 1.48 | 20 | |
| Potassium | 2.57 | 1.50 | 0 | 2.56 | | | | 0.542 | 20 | |
| Sodium | 83.2 | 1.50 | 0 | 79.6 | | | | 4.37 | 20 | |

Sample ID: **2005077-05A PDS** Batch ID: **96348** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS5_200515B** Analysis Date: **5/15/2020 3:21:00 PM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 6.28 | 0.100 | 5.00 | 1.15 | 103 | 75 | 125 | | | |
| Magnesium | 20.8 | 0.300 | 5.00 | 16.7 | 81.8 | 75 | 125 | | | |
| Potassium | 7.62 | 0.300 | 5.00 | 2.56 | 101 | 75 | 125 | | | |

**Qualifiers:**

| | |
|---|---|
| B | Analyte detected in the associated Method Blank |
| J | Analyte detected between MDL and RL |
| ND | Not Detected at the Method Detection Limit |
| RL | Reporting Limit |
| J | Analyte detected between SDL and RL |
| DF | Dilution Factor |
| MDL | Method Detection Limit |
| R | RPD outside accepted control limits |
| S | Spike Recovery outside control limits |
| N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200515B**

| Sample ID: **2005077-05A PDS** | Batch ID: **96348** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 3:21:00 PM** | Prep Date: **5/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Sodium | 80.8 | 0.300 | 5.00 | 79.6 | 24.4 | 75 | 125 | | | S |

| Sample ID: **2005077-05A MS** | Batch ID: **96348** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 3:23:00 PM** | Prep Date: **5/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 6.35 | 0.100 | 5.00 | 1.15 | 104 | 75 | 125 | | | |
| Magnesium | 21.9 | 0.300 | 5.00 | 16.7 | 105 | 75 | 125 | | | |
| Potassium | 7.83 | 0.300 | 5.00 | 2.56 | 105 | 75 | 125 | | | |
| Sodium | 84.9 | 0.300 | 5.00 | 79.6 | 105 | 75 | 125 | | | |

| Sample ID: **2005077-05A MSD** | Batch ID: **96348** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 3:25:00 PM** | Prep Date: **5/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 6.36 | 0.100 | 5.00 | 1.15 | 104 | 75 | 125 | 0.153 | 15 | |
| Magnesium | 21.8 | 0.300 | 5.00 | 16.7 | 103 | 75 | 125 | 0.476 | 15 | |
| Potassium | 7.73 | 0.300 | 5.00 | 2.56 | 103 | 75 | 125 | 1.21 | 15 | |
| Sodium | 85.6 | 0.300 | 5.00 | 79.6 | 118 | 75 | 125 | 0.796 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200515B**

| Sample ID: **ICV-200515** | Batch ID: **R110514** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 10:34:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 2.50 | 0.100 | 2.50 | 0 | 99.8 | 90 | 110 | | | |
| Magnesium | 2.45 | 0.300 | 2.50 | 0 | 98.0 | 90 | 110 | | | |
| Potassium | 2.50 | 0.300 | 2.50 | 0 | 100 | 90 | 110 | | | |
| Sodium | 2.48 | 0.300 | 2.50 | 0 | 99.2 | 90 | 110 | | | |

| Sample ID: **LCVL-200515** | Batch ID: **R110514** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 10:48:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.101 | 0.100 | 0.100 | 0 | 101 | 80 | 120 | | | |
| Magnesium | 0.0979 | 0.300 | 0.100 | 0 | 97.9 | 80 | 120 | | | |
| Potassium | 0.102 | 0.300 | 0.100 | 0 | 102 | 80 | 120 | | | |
| Sodium | 0.104 | 0.300 | 0.100 | 0 | 104 | 80 | 120 | | | |

| Sample ID: **CCV3-200515** | Batch ID: **R110514** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 1:53:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.31 | 0.100 | 5.00 | 0 | 106 | 90 | 110 | | | |
| Magnesium | 5.13 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |
| Potassium | 5.21 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Sodium | 5.04 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **CCV4-200515** | Batch ID: **R110514** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 2:30:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.30 | 0.100 | 5.00 | 0 | 106 | 90 | 110 | | | |
| Magnesium | 5.19 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Potassium | 5.23 | 0.300 | 5.00 | 0 | 105 | 90 | 110 | | | |
| Sodium | 5.15 | 0.300 | 5.00 | 0 | 103 | 90 | 110 | | | |

| Sample ID: **CCV5-200409** | Batch ID: **R110514** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200515B** | Analysis Date: **5/15/2020 3:36:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.20 | 0.100 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Magnesium | 5.08 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Potassium | 5.12 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Sodium | 5.01 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200520B**

| Sample ID: **ICV-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 10:52:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 2.54 | 0.100 | 2.50 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 2.47 | 0.300 | 2.50 | 0 | 98.6 | 90 | 110 | | | |
| Sodium | 2.50 | 0.300 | 2.50 | 0 | 99.9 | 90 | 110 | | | |

| Sample ID: **LCVL-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 11:04:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 0.0988 | 0.100 | 0.100 | 0 | 98.8 | 80 | 120 | | | |
| Magnesium | 0.0961 | 0.300 | 0.100 | 0 | 96.1 | 80 | 120 | | | |
| Sodium | 0.100 | 0.300 | 0.100 | 0 | 100 | 80 | 120 | | | |

| Sample ID: **CCV3-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 2:09:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.09 | 0.100 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 5.09 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Sodium | 5.01 | 0.300 | 5.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID: **CCV4-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 2:38:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron | 5.09 | 0.100 | 5.00 | 0 | 102 | 90 | 110 | | | |
| Magnesium | 5.03 | 0.300 | 5.00 | 0 | 101 | 90 | 110 | | | |
| Sodium | 4.96 | 0.300 | 5.00 | 0 | 99.2 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200421A**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS2-96036** | Batch ID: **96036** | TestNo: **E300** | | Units: | **mg/L** |
| SampType: **DCS2** | Run ID: **IC2_200421A** | Analysis Date: **4/21/2020 11:47:08 AM** | | Prep Date: | **4/21/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | 0.246 | 0.0500 | 0.2500 | 0 | 98.5 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200512A**

The QC data in batch 96308 applies to the following samples: 2005078-01C, 2005078-02C, 2005078-03C, 2005078-04C, 2005078-05C, 2005078-06C, 2005078-07C

| Sample ID: **MB-96308** | Batch ID: **96308** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 10:34:16 AM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | <0.100 | 0.500 | | | | | | | | |

| Sample ID: **LCS-96308** | Batch ID: **96308** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 10:50:15 AM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | 4.95 | 0.500 | 5.000 | 0 | 98.9 | 90 | 110 | | | |

| Sample ID: **LCSD-96308** | Batch ID: **96308** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 11:06:15 AM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | 4.91 | 0.500 | 5.000 | 0 | 98.2 | 90 | 110 | 0.758 | 20 | |

| Sample ID: **2005076-01CMS** | Batch ID: **96308** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 6:16:24 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | 438 | 50.0 | 451.6 | 0 | 97.0 | 90 | 110 | | | |

| Sample ID: **2005076-01CMSD** | Batch ID: **96308** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 6:32:24 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | 439 | 50.0 | 451.6 | 0 | 97.2 | 90 | 110 | 0.161 | 20 | |

| Sample ID: **2005076-02CMS** | Batch ID: **96308** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 7:04:24 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | 455 | 50.0 | 451.6 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **2005076-02CMSD** | Batch ID: **96308** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 7:20:24 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | 456 | 50.0 | 451.6 | 0 | 101 | 90 | 110 | 0.070 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200512A**

| Sample ID: **ICV-200512** | Batch ID: **R110449** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 10:02:16 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | 13.0 | 0.500 | 12.50 | 0 | 104 | 90 | 110 | | | |

| Sample ID: **CCV1-200512** | Batch ID: **R110449** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 4:08:23 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | 4.94 | 0.500 | 5.000 | 0 | 98.9 | 90 | 110 | | | |

| Sample ID: **CCV2-200512** | Batch ID: **R110449** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200512A** | Analysis Date: **5/12/2020 10:16:24 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrate-N | 4.99 | 0.500 | 5.000 | 0 | 99.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_200514B**

The QC data in batch 96346 applies to the following samples: 2005078-01C, 2005078-02C, 2005078-03C, 2005078-04C, 2005078-05C, 2005078-06C, 2005078-07C

Sample ID: **MB-96346** Batch ID: **96346** TestNo: **M2320 B** Units: **mg/L @ pH 4.23**
SampType: **MBLK** Run ID: **TITRATOR_200514B** Analysis Date: **5/14/2020 11:22:00 AM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | | | | | | | | |
| Alkalinity, Total (As CaCO3) | <20.0 | 20.0 | | | | | | | | |

Sample ID: **LCS-96346** Batch ID: **96346** TestNo: **M2320 B** Units: **mg/L @ pH 4.22**
SampType: **LCS** Run ID: **TITRATOR_200514B** Analysis Date: **5/14/2020 11:26:00 AM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Total (As CaCO3) | 53.2 | 20.0 | 50.00 | 0 | 106 | 74 | 129 | | | |

Sample ID: **2005076-01C-DUP** Batch ID: **96346** TestNo: **M2320 B** Units: **mg/L @ pH 4.53**
SampType: **DUP** Run ID: **TITRATOR_200514B** Analysis Date: **5/14/2020 11:46:00 AM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 130 | 20.0 | 0 | 133.8 | | | | 3.11 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 130 | 20.0 | 0 | 133.8 | | | | 3.11 | 20 | |

Sample ID: **2005110-01C-DUP** Batch ID: **96346** TestNo: **M2320 B** Units: **mg/L @ pH 4.5**
SampType: **DUP** Run ID: **TITRATOR_200514B** Analysis Date: **5/14/2020 1:18:00 PM** Prep Date: **5/14/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 32.0 | 20.0 | 0 | 32.90 | | | | 2.77 | 20 | |
| Alkalinity, Carbonate (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | 0 | | | | 0 | 20 | |
| Alkalinity, Total (As CaCO3) | 32.0 | 20.0 | 0 | 32.90 | | | | 2.77 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: TITRATOR_200514B**

| Sample ID: **ICV-200514** | Batch ID: **R110504** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.36** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **TITRATOR_200514B** | Analysis Date: **5/14/2020 11:20:00 AM** | Prep Date: **5/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 31.5 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 67.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.4 | 20.0 | 100.0 | 0 | 99.4 | 98 | 102 | | | |

| Sample ID: **CCV1-200514** | Batch ID: **R110504** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.33** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_200514B** | Analysis Date: **5/14/2020 1:10:00 PM** | Prep Date: **5/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 39.8 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 60.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 99.9 | 20.0 | 100.0 | 0 | 99.9 | 90 | 110 | | | |

| Sample ID: **CCV2-200514** | Batch ID: **R110504** | TestNo: **M2320 B** | Units: **mg/L @ pH 4.32** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **TITRATOR_200514B** | Analysis Date: **5/14/2020 2:01:00 PM** | Prep Date: **5/14/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity, Bicarbonate (As CaCO3) | 42.2 | 20.0 | 0 | | | | | | | |
| Alkalinity, Carbonate (As CaCO3) | 58.1 | 20.0 | 0 | | | | | | | |
| Alkalinity, Hydroxide (As CaCO3) | <10.0 | 20.0 | 0 | | | | | | | |
| Alkalinity, Total (As CaCO3) | 100 | 20.0 | 100.0 | 0 | 100 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200323B**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS-95613** | Batch ID: **95613** | TestNo: **M3500-Fe D** | Units: **mg/L** | | |
| SampType: **DCS** | Run ID: **UV/VIS_2_200323B** | Analysis Date: **3/23/2020 1:30:00 PM** | Prep Date: **3/23/2020** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.0580 | 0.100 | 0.05000 | 0 | 116 | 65 | 135 | 0 | 0 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200507C**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS-96253** | Batch ID: **96253** | TestNo: **M4500-P E** | Units: **mg/L** | | |
| SampType: **DCS** | Run ID: **UV/VIS_2_200507C** | Analysis Date: **5/7/2020 2:22:00 PM** | Prep Date: **5/7/2020** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.0480 | 0.100 | 0.05000 | 0 | 96.0 | 50 | 200 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200512D**

The QC data in batch 96315 applies to the following samples: 2005078-01C, 2005078-02C, 2005078-03C, 2005078-04C, 2005078-05C, 2005078-06C, 2005078-07C

| Sample ID: **MB-96315** | Batch ID: **96315** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:04:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | <0.0300 | 0.100 | | | | | | | | |

| Sample ID: **LCS-96315** | Batch ID: **96315** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:04:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.498 | 0.100 | 0.5000 | 0 | 99.6 | 80 | 120 | | | |

| Sample ID: **LCSD-96315** | Batch ID: **96315** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:04:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.499 | 0.100 | 0.5000 | 0 | 99.8 | 80 | 120 | 0.201 | 15 | |

| Sample ID: **2005076-02CMS** | Batch ID: **96315** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:08:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.495 | 0.100 | 0.5000 | 0 | 99.0 | 80 | 120 | | | |

| Sample ID: **2005076-02CMSD** | Batch ID: **96315** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:08:00 PM** | Prep Date: **5/12/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.491 | 0.100 | 0.5000 | 0 | 98.2 | 80 | 120 | 0.811 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200512D**

| Sample ID: **ICV-200512** | Batch ID: **R110462** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:03:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.200 | 0.100 | 0.2000 | 0 | 100 | 85 | 115 | | | |

| Sample ID: **CCV1-200512** | Batch ID: **R110462** | TestNo: **M4500-P E** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200512D** | Analysis Date: **5/12/2020 4:09:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus, Total Orthophosphate (As | 0.516 | 0.100 | 0.5000 | 0 | 103 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200513B**

The QC data in batch 96316 applies to the following samples: 2005078-01A, 2005078-02A, 2005078-03A, 2005078-04A, 2005078-05A, 2005078-06A, 2005078-07A

| Sample ID: **MB-96316** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:41:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | <0.0500 | 0.100 | | | | | | | | N |

| Sample ID: **LCS-96316** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:41:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.106 | 0.100 | 0.1000 | 0 | 106 | 85 | 115 | | | N |

| Sample ID: **LCSD-96316** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:42:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.105 | 0.100 | 0.1000 | 0 | 105 | 85 | 115 | 0.720 | 15 | N |

| Sample ID: **2005038-01AMS** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:29:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.120 | 0.100 | 0.1000 | 0 | 120 | 85 | 115 | | | SN |

| Sample ID: **2005038-01AMSD** | Batch ID: **96316** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:29:00 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.109 | 0.100 | 0.1000 | 0 | 109 | 85 | 115 | 8.97 | 15 | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: UV/VIS_2_200513B**

| Sample ID: **ICV-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 10:40:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.112 | 0.100 | 0.1000 | 0 | 112 | 85 | 115 | | | N |

| Sample ID: **CCV1-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:02:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.192 | 0.100 | 0.2000 | 0 | 96.2 | 85 | 115 | | | N |

| Sample ID: **CCV2-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:15:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.187 | 0.100 | 0.2000 | 0 | 93.5 | 85 | 115 | | | N |

| Sample ID: **CCV3-200513** | Batch ID: **R110472** | TestNo: **M3500-Fe D** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **UV/VIS_2_200513B** | Analysis Date: **5/13/2020 11:31:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Ferrous | 0.205 | 0.100 | 0.2000 | 0 | 103 | 85 | 115 | | | N |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005078
**Project:** Luminant-OGSES-FGD PONDS

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Nitrate-N | 0.100 | 0.500 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Iron | 0.0300 | 0.100 |
| Magnesium | 0.100 | 0.300 |
| Potassium | 0.100 | 0.300 |
| Sodium | 0.100 | 0.300 |

| **TestNo: M2320 B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **ıg/L @ pH 4.2** | **g/L @ pH 4.2** |
| Alkalinity, Bicarbonate (As CaCO3) | 10.0 | 20.0 |
| Alkalinity, Carbonate (As CaCO3) | 10.0 | 20.0 |
| Alkalinity, Hydroxide (As CaCO3) | 10.0 | 20.0 |
| Alkalinity, Total (As CaCO3) | 20.0 | 20.0 |

| **TestNo: M3500-Fe D** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Iron, Ferrous | 0.0500 | 0.100 |

| **TestNo: M4500-P E** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Phosphorus, Total Orthophosphate ( | 0.0300 | 0.100 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

June 12, 2020

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2005079

RE: Luminant-OGSES FGD PONDS

Dear Will Vienne:

DHL Analytical, Inc. received 7 sample(s) on 5/12/2020 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-20-25

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DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: www.dhlanalytical.com
E-Mail: login@dhlanalytical.com

# CHAIN-OF-CUSTODY

№ 68289

CLIENT: GOLDER ASSOCIATES
ADDRESS: 2201 DOUBLE CREEK DR ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL:
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-11-20 PAGE 1 OF 1
PO #: DHL WORK ORDER #: 2005079
PROJECT LOCATION OR NAME: LUMINANT - OGSES FGD PONDS
CLENT PROJECT #: 19122262 COLLECTOR: J. BEATON

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL W=WATER A=AIR L=LIQUID SE=SEDIMENT P=PAINT SL=SLUDGE O=OTHER SO=SOLID

| Field Sample I.D. | DHL Lab # | Date | Time | Matrix | Container Type | # of Containers | PRESERVATION HCl | $HNO_3$ | $H_2SO_4$ ❑ NaOH ❑ | ICE | UNPRESERVED | ANALYSES | FIELD NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGD-4 | 01 | 5-11-20 | 0745 | W | P | 4 | | X | | X | | X | |
| FGD-2 | 02 | | 0835 | W | P | 4 | | X | | X | | X | |
| FGD-5 | 03 | | 0925 | W | P | 4 | | X | | X | | X | |
| FGD-1 | 04 | | 1015 | W | P | 4 | | X | | X | | X | |
| FGD-8 | 05 | | 1110 | W | P | 4 | | X | | X | | X | |
| FGD-11 | 06 | | 1245 | W | P | 4 | | X | | X | | X | |
| FGD-12 | 07 | | 1345 | W | P | 4 | | X | | X | | X | |

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ❑ COD ❑ | CHLORIDE ❑ ANIONS | TCLP-SVOC ❑ VOC ❑ PEST ❑ HERB ❑ | TCLP-METALS ❑ RCRA 8 ❑ TX-11 ❑ Pb ❑ | RCI ❑ FLASHPOINT ❑ DGAS ❑ | TDS ❑ TSS ❑ % MOISTURE ❑ CYANIDE ❑ | APPENDIX III & IV

RELINQUISHED BY: (Signature) DATE/TIME 5-11-20 1730 RECEIVED BY: (Signature) FedEx
RELINQUISHED BY: (Signature) DATE/TIME 5.12.2020 0715 RECEIVED BY: (Signature)
FedEx
RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

~~APPENDIX F Revision 1 November 21, 2022~~
❑ DHL DISPOSAL @ $5.00 each ❑ Return



**TURN AROUND TIME**
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ❑
NORMAL ☑
OTHER ❑

**LABORATORY USE ONLY:**
RECEIVING TEMP: 1.5, 1.8, 3.3, 1.3 THERM #: 78
CUSTODY SEALS: ❑ BROKEN ☑ INTACT ❑ NOT USED
CARRIER: ❑ LONE STAR ☑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED

DHL COC Rev 1 | FEB 2010

## Eric Lau

**From:** John DuPont
**Sent:** Tuesday, May 28, 2019 11:35 AM
**To:** Eric Lau
**Subject:** FW: CCR Analysis

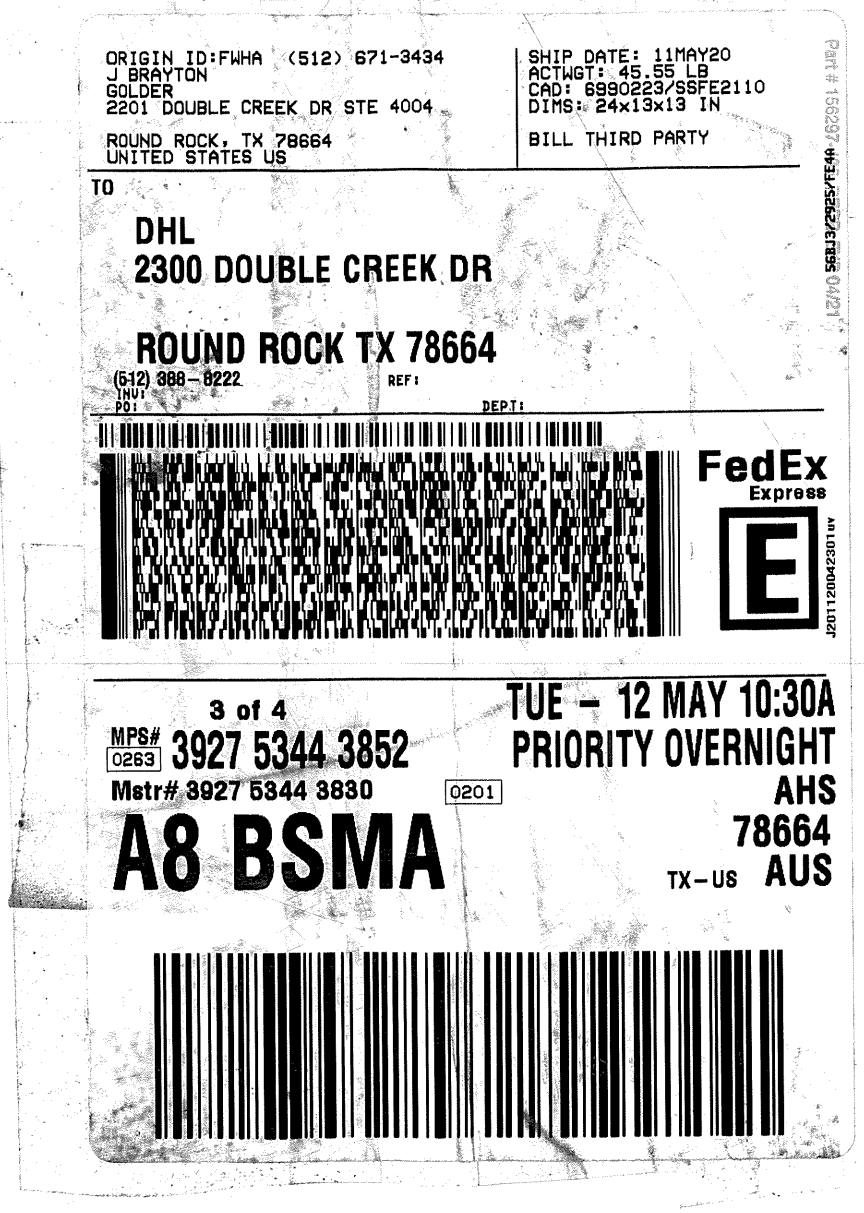
Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

---

**From:** Vienne, Will [mailto:William_Vienne@golder.com]
**Sent:** Tuesday, April 09, 2019 12:48 PM
**To:** John DuPont <dupont@dhlanalytical.com>
**Subject:** CCR Analysis



ORIGIN ID:FWHA (512) 671-3434
J BRAYTON
GOLDER
2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 11MAY20
ACTWGT: 45.55 LB
CAD: 6990223/SSFE2110
DIMS: 24x13x13 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx Express

J2D1120042301uv

3 of 4
MPS# 0263 3927 5344 3852
Mstr# 3927 5344 3830

0201

A8 BSMA

TUE - 12 MAY 10:30A
PRIORITY OVERNIGHT
AHS
78664
TX-US AUS

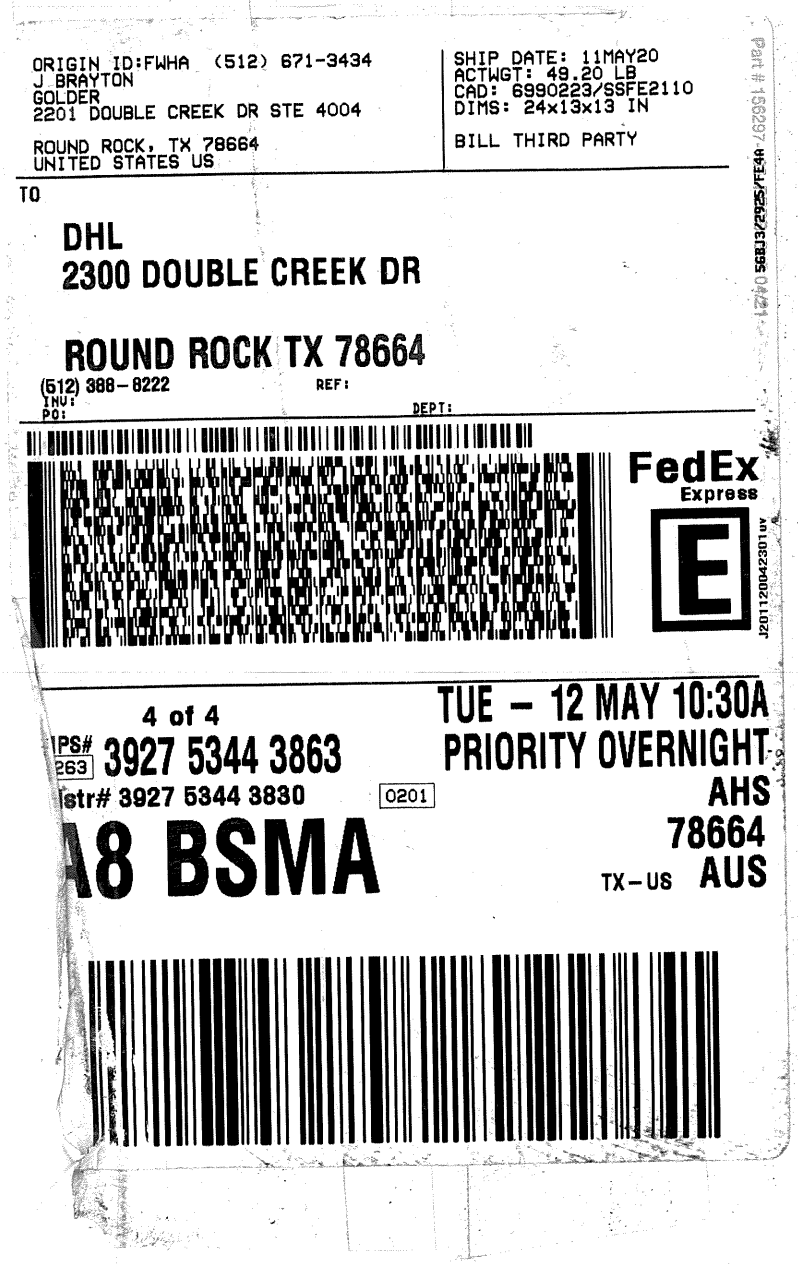
1.5
290

CUSTODY SEAL

DATE 5/11/20

SIGNATURE

DHL ANALYTICAL



ORIGIN ID:FWHA (512) 671-3434
J BRAYTON
GOLDER
2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 11MAY20
ACTWGT: 49.20 LB
CAD: 6990223/SSFE2110
DIMS: 24x13x13 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx Express

4 of 4
IPS# 3927 5344 3863
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str# 3927 5344 3830 0201

TUE - 12 MAY 10:30A
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TX-US AUS

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**CUSTODY SEAL**

DATE 5-11-20

SIGNATURE

DHL ANALYTICAL

ORIGIN ID:FWHA (512) 671-3434
J BRAYTON
GOLDER
2201 DOUBLE CREEK DR STE 4004

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 11MAY20
ACTWGT: 45.55 LB
CAD: 5990223/SSFE2110
DIMS: 24x13x13 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(512) 388-8222
INV:
PO:
REF:
DEPT:

FedEx Express

2 of 4
MPS# 0263 3927 5344 3841
Mstr# 3927 5344 3830

0201

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DHL ANALYTICAL

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CUSTODY S

EAL

DATE 5-14-21

SIGNATURE

DH

ANALY

DHL Analytical, Inc.

## Sample Receipt Checklist

Client Name **Golder**

Date Received: **5/12/2020**

Work Order Number **2005079**

Received by: **JH**

Checklist completed by: _____ 5/12/2020
Signature | Date

Reviewed by _____ 5/12/2020
Initials | Date

Carrier name: FedEx 1day

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shippping container/cooler? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | **1.5** °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH<2 acceptable upon receipt? | Yes ☑ | No ☐ | NA ☐ LOT # 13171 |
| | Adjusted? no | | Checked by Ec |
| Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt? | Yes ☐ | No ☐ | NA ☑ LOT # |
| | Adjusted? | | Checked by |

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist: Reportable Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES FGD PONDS | **LRC Date:** 6/12/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2005079 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| | | **Chain-of-Custody (C-O-C)** | | | | | |
| **R1** | OI | **1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | X | | | | **R1-01** |
| | | **2)** Were all departures from standard conditions described in an exception report? | | | X | | |
| **R2** | OI | **Sample and Quality Control (QC) Identification** | | | | | |
| | | **1)** Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | X | | | | |
| | | **2)** Are all laboratory ID numbers cross-referenced to the corresponding QC data? | X | | | | |
| **R3** | OI | **Test Reports** | | | | | |
| | | **1)** Were all samples prepared and analyzed within holding times? | X | | | | |
| | | **2)** Other than those results < MQL, were all other raw values bracketed by calibration standards? | X | | | | |
| | | **3)** Were calculations checked by a peer or supervisor? | X | | | | |
| | | **4)** Were all analyte identifications checked by a peer or supervisor? | X | | | | |
| | | **5)** Were sample detection limits reported for all analytes not detected? | X | | | | |
| | | **6)** Were all results for soil and sediment samples reported on a dry weight basis? | | | X | | |
| | | **7)** Were % moisture (or solids) reported for all soil and sediment samples? | | | X | | |
| | | **8)** Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035? | | | X | | |
| | | **9)** If required for the project, TICs reported? | | | X | | |
| **R4** | O | **Surrogate Recovery Data** | | | | | |
| | | **1)** Were surrogates added prior to extraction? | | | X | | |
| | | **2)** Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | X | | |
| **R5** | OI | **Test Reports/Summary Forms for Blank Samples** | | | | | |
| | | **1)** Were appropriate type(s) of blanks analyzed? | X | | | | |
| | | **2)** Were blanks analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | X | | | | |
| | | **4)** Were blank concentrations < MDL? | X | | | | |
| | | **5)** For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample? | | | X | | |
| **R6** | OI | **Laboratory Control Samples (LCS):** | | | | | |
| | | **1)** Were all COCs included in the LCS? | X | | | | |
| | | **2)** Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | X | | | | |
| | | **3)** Were LCSs analyzed at the required frequency? | X | | | | |
| | | **4)** Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | X | | | | |
| | | **5)** Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs? | X | | | | |
| | | **6)** Was the LCSD RPD within QC limits (if applicable)? | X | | | | |
| **R7** | OI | **Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data** | | | | | |
| | | **1)** Were the project/method specified analytes included in the MS and MSD? | X | | | | |
| | | **2)** Were MS/MSD analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | X | | | **R7-03** |
| | | **4)** Were MS/MSD RPDs within laboratory QC limits? | X | | | | |
| **R8** | OI | **Analytical Duplicate Data** | | | | | |
| | | **1)** Were appropriate analytical duplicates analyzed for each matrix? | X | | | | |
| | | **2)** Were analytical duplicates analyzed at the appropriate frequency? | X | | | | |
| | | **3)** Were RPDs or relative standard deviations within the laboratory QC limits? | X | | | | |
| **R9** | OI | **Method Quantitation Limits (MQLs):** | | | | | |
| | | **1)** Are the MQLs for each method analyte included in the laboratory data package? | X | | | | |
| | | **2)** Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | X | | | | |
| | | **3)** Are unadjusted MQLs and DCSs included in the laboratory data package? | X | | | | |
| **R10** | OI | **Other Problems/Anomalies** | | | | | |
| | | **1)** Are all known problems/anomalies/special conditions noted in this LRC and ER? | X | | | | |
| | | **2)** Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results? | X | | | | |
| | | **3)** Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package? | X | | | | |

**Laboratory Name: DHL Analytical, Inc.**

**Laboratory Review Checklist (continued): Supporting Data**

| | |
|---|---|
| **Project Name:** Luminant-OGSES FGD PONDS | **LRC Date:** 6/12/20 |
| **Reviewer Name:** Carlos Castro | **Laboratory Work Order:** 2005079 |
| **Prep Batch Number(s):** See Prep Dates Report | **Run Batch:** See Analytical Dates Report |

| #[1] | A[2] | Description | Yes | No | NA[3] | NR[4] | ER#[5] |
|---|---|---|---|---|---|---|---|
| **S1** | OI | **Initial Calibration (ICAL)** | | | | | |
| | | **1)** Were response factors and/or relative response factors for each analyte within QC limits? | X | | | | |
| | | **2)** Were percent RSDs or correlation coefficient criteria met? | X | | | | |
| | | **3)** Was the number of standards recommended in the method used for all analytes? | X | | | | |
| | | **4)** Were all points generated between the lowest and highest standard used to calculate the curve? | X | | | | |
| | | **5)** Are ICAL data available for all instruments used? | X | | | | |
| | | **6)** Has the initial calibration curve been verified using an appropriate second source standard? | X | | | | |
| **S2** | OI | **Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):** | | | | | |
| | | **1)** Was the CCV analyzed at the method-required frequency? | X | | | | |
| | | **2)** Were percent differences for each analyte within the method-required QC limits? | X | | | | |
| | | **3)** Was the ICAL curve verified for each analyte? | X | | | | |
| | | **4)** Was the absolute value of the analyte concentration in the inorganic CCB < MDL? | X | | | | |
| **S3** | O | **Mass Spectral Tuning:** | | | | | |
| | | **1)** Was the appropriate compound for the method used for tuning? | X | | | | |
| | | **2)** Were ion abundance data within the method-required QC limits? | X | | | | |
| **S4** | O | **Internal Standards (IS):** | | | | | |
| | | **1)** Were IS area counts and retention times within the method-required QC limits? | X | | | | |
| **S5** | OI | **Raw Data (NELAC Section 5.5.10)** | | | | | |
| | | **1)** Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | X | | | | |
| | | **2)** Were data associated with manual integrations flagged on the raw data? | X | | | | |
| **S6** | O | **Dual Column Confirmation** | | | | | |
| | | **1)** Did dual column confirmation results meet the method-required QC? | | | X | | |
| **S7** | O | **Tentatively Identified Compounds (TICs):** | | | | | |
| | | **1)** If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | X | | |
| **S8** | I | **Interference Check Sample (ICS) Results:** | | | | | |
| | | **1)** Were percent recoveries within method QC limits? | X | | | | |
| **S9** | I | **Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions** | | | | | |
| | | **1)** Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | X | | | **S9-09** |
| **S10** | OI | **Method Detection Limit (MDL) Studies** | | | | | |
| | | **1)** Was a MDL study performed for each reported analyte? | X | | | | |
| | | **2)** Is the MDL either adjusted or supported by the analysis of DCSs? | X | | | | |
| **S11** | OI | **Proficiency Test Reports:** | | | | | |
| | | **1)** Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies? | X | | | | |
| **S12** | OI | **Standards Documentation** | | | | | |
| | | **1)** Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | X | | | | |
| **S13** | OI | **Compound/Analyte Identification Procedures** | | | | | |
| | | **1)** Are the procedures for compound/analyte identification documented? | X | | | | |
| **S14** | OI | **Demonstration of Analyst Competency (DOC)** | | | | | |
| | | **1)** Was DOC conducted consistent with NELAC Chapter 5 – Appendix C? | X | | | | |
| | | **2)** Is documentation of the analyst's competency up-to-date and on file? | X | | | | |
| **S15** | OI | **Verification/Validation Documentation for Methods** (NELAC Chapter 5) | | | | | |
| | | **1)** Are all the methods used to generate the data documented, verified, and validated, where applicable? | X | | | | |
| **S16** | OI | **Laboratory Standard Operating Procedures (SOPs):** | | | | | |
| | | **1)** Are laboratory SOPs current and on file for each method performed? | X | | | | |

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.

2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).

3 NA = Not applicable.

4 NR = Not Reviewed.

5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

# Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

**Release Statement:** I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 25-28 2019. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

06/12/20
Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

**DHL Analytical, Inc.** **Date:** *12-Jun-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD PONDS
**Lab Order:** 2005079

# CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis

Exception Report R1-01

The samples were received and log-in performed on 5/12/20. A total of 7 samples were received. The samples arrived in good condition and were properly packaged.

Exception Report R7-03

For Anions analysis performed on 5/13/20 (batch 96331) the matrix spikes and matrix spike duplicates recoveries (2005007-01 MS/MSD & 2005077-02 MS/MSD) were out of control limits for Chloride and/or Sulfate. This was due to matrix effect. These are flagged accordingly in the QC summary report. The samples selected for the matrix spikes and matrix spike duplicates were not from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

For Metals analysis performed on 5/20/20 the matrix spike and matrix spike duplicate recoveries were above control limits for Boron. These are flagged accordingly. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for this analyte. No further corrective actions were taken.

Exception Report S9-01

For Metals analysis performed on 5/19/20 the PDS recovery was out of control limits for Calcium. This is flagged accordingly in the QC summary report. The serial dilution was within control limits for this analyte. No further corrective actions were taken.

## DHL Analytical, Inc.

**Date:** *12-Jun-20*

**CLIENT:** Golder
**Project:** Luminant-OGSES FGD PONDS
**Lab Order:** 2005079

# Work Order Sample Summary

| Lab Smp ID | Client Sample ID | Tag Number | Date Collected | Date Recved |
|---|---|---|---|---|
| 2005079-01 | FGD-4 | | 05/11/20 07:45 AM | 5/12/2020 |
| 2005079-02 | FGD-2 | | 05/11/20 08:35 AM | 5/12/2020 |
| 2005079-03 | FGD-5 | | 05/11/20 09:25 AM | 5/12/2020 |
| 2005079-04 | FGD-1 | | 05/11/20 10:15 AM | 5/12/2020 |
| 2005079-05 | FGD-8 | | 05/11/20 11:10 AM | 5/12/2020 |
| 2005079-06 | FGD-11 | | 05/11/20 12:45 PM | 5/12/2020 |
| 2005079-07 | FGD-12 | | 05/11/20 01:45 PM | 5/12/2020 |

**Lab Order:** 2005079
**Client:** Golder
**Project:** Luminant-OGSES FGD PONDS

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005079-01A | FGD-4 | 05/11/20 07:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-01B | FGD-4 | 05/11/20 07:45 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-4 | 05/11/20 07:45 AM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-02A | FGD-2 | 05/11/20 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-02B | FGD-2 | 05/11/20 08:35 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-2 | 05/11/20 08:35 AM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-03A | FGD-5 | 05/11/20 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-03B | FGD-5 | 05/11/20 09:25 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-5 | 05/11/20 09:25 AM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-04A | FGD-1 | 05/11/20 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-04B | FGD-1 | 05/11/20 10:15 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-1 | 05/11/20 10:15 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |

**Lab Order:** 2005079
**Client:** Golder
**Project:** Luminant-OGSES FGD PONDS

# PREP DATES REPORT

| Sample ID | Client Sample ID | Collection Date | Matrix | Test Number | Test Name | Prep Date | Batch ID |
|---|---|---|---|---|---|---|---|
| 2005079-04B | FGD-1 | 05/11/20 10:15 AM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-05A | FGD-8 | 05/11/20 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-05B | FGD-8 | 05/11/20 11:10 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-8 | 05/11/20 11:10 AM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-06A | FGD-11 | 05/11/20 12:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-06B | FGD-11 | 05/11/20 12:45 PM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | E300 | Anion Preparation | 05/15/20 10:09 AM | 96363 |
| | FGD-11 | 05/11/20 12:45 PM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |
| 2005079-07A | FGD-12 | 05/11/20 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | SW3005A | Aq Prep Metals : ICP-MS | 05/15/20 08:56 AM | 96359 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | SW7470A | Mercury Aq Prep | 05/17/20 12:32 PM | 96370 |
| 2005079-07B | FGD-12 | 05/11/20 01:45 PM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | E300 | Anion Preparation | 05/13/20 10:21 AM | 96331 |
| | FGD-12 | 05/11/20 01:45 PM | Aqueous | M2540C | TDS Preparation | 05/13/20 10:43 AM | 96333 |

**Lab Order:** 2005079
**Client:** Golder
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005079-01A | FGD-4 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 11:59 AM | CETAC2_HG_200519B |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 12:55 PM | ICP-MS5_200519B |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:27 PM | ICP-MS5_200520B |
| | FGD-4 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 10 | 05/20/20 01:28 PM | ICP-MS5_200520B |
| 2005079-01B | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 08:08 PM | IC2_200513A |
| | FGD-4 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/13/20 11:20 PM | IC2_200513A |
| | FGD-4 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-02A | FGD-2 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:10 PM | CETAC2_HG_200519B |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 12:57 PM | ICP-MS5_200519B |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:30 PM | ICP-MS5_200520B |
| | FGD-2 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 20 | 05/20/20 01:30 PM | ICP-MS5_200520B |
| 2005079-02B | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 96331 | 100 | 05/13/20 06:48 PM | IC2_200513A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 08:24 PM | IC2_200513A |
| | FGD-2 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/13/20 11:36 PM | IC2_200513A |
| | FGD-2 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-03A | FGD-5 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:12 PM | CETAC2_HG_200519B |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 01:00 PM | ICP-MS5_200519B |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:32 PM | ICP-MS5_200520B |
| | FGD-5 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 10 | 05/20/20 01:33 PM | ICP-MS5_200520B |
| 2005079-03B | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 08:40 PM | IC2_200513A |
| | FGD-5 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/13/20 11:52 PM | IC2_200513A |
| | FGD-5 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-04A | FGD-1 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:15 PM | CETAC2_HG_200519B |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 10 | 05/20/20 01:35 PM | ICP-MS5_200520B |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 01:02 PM | ICP-MS5_200519B |
| | FGD-1 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:34 PM | ICP-MS5_200520B |

**Lab Order:** 2005079
**Client:** Golder
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL DATES REPORT

| Sample ID | Client Sample ID | Matrix | Test Number | Test Name | Batch ID | Dilution | Analysis Date | Run ID |
|---|---|---|---|---|---|---|---|---|
| 2005079-04B | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/14/20 12:08 AM | IC2_200513A |
| | FGD-1 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 08:56 PM | IC2_200513A |
| | FGD-1 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-05A | FGD-8 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:17 PM | CETAC2_HG_200519B |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 01:04 PM | ICP-MS5_200519B |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:36 PM | ICP-MS5_200520B |
| | FGD-8 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 50 | 05/20/20 01:37 PM | ICP-MS5_200520B |
| 2005079-05B | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 96331 | 100 | 05/13/20 07:04 PM | IC2_200513A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 09:12 PM | IC2_200513A |
| | FGD-8 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/14/20 12:24 AM | IC2_200513A |
| | FGD-8 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-06A | FGD-11 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:19 PM | CETAC2_HG_200519B |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 10 | 05/20/20 01:39 PM | ICP-MS5_200520B |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 01:06 PM | ICP-MS5_200519B |
| | FGD-11 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:38 PM | ICP-MS5_200520B |
| 2005079-06B | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 10:48 PM | IC2_200513A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/14/20 12:40 AM | IC2_200513A |
| | FGD-11 | Aqueous | E300 | Anions by IC method - Water | 96363 | 100 | 05/15/20 03:28 PM | IC2_200515A |
| | FGD-11 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |
| 2005079-07A | FGD-12 | Aqueous | SW7470A | Mercury Total: Aqueous | 96370 | 1 | 05/19/20 12:21 PM | CETAC2_HG_200519B |
| | FGD-12 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/19/20 01:09 PM | ICP-MS5_200519B |
| | FGD-12 | Aqueous | SW6020B | Trace Metals: ICP-MS - Water | 96359 | 1 | 05/20/20 12:41 PM | ICP-MS5_200520B |
| 2005079-07B | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 96331 | 10 | 05/13/20 11:04 PM | IC2_200513A |
| | FGD-12 | Aqueous | E300 | Anions by IC method - Water | 96331 | 1 | 05/14/20 12:56 AM | IC2_200513A |
| | FGD-12 | Aqueous | M2540C | Total Dissolved Solids | 96333 | 1 | 05/13/20 05:00 PM | WC_200513A |

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-4 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-01 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 07:45 AM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 12:55 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:55 PM |
| Barium | 0.104 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 12:55 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:55 PM |
| Boron | 0.145 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:27 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:55 PM |
| Calcium | 40.6 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 01:28 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:55 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 12:55 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:55 PM |
| Lithium | 0.0166 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 12:55 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:55 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:55 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 12:55 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 11:59 AM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 198 | 3.00 | 10.0 | | mg/L | 10 | 05/13/20 08:08 PM |
| Fluoride | 0.300 | 0.100 | 0.400 | J | mg/L | 1 | 05/13/20 11:20 PM |
| Sulfate | 52.9 | 1.00 | 3.00 | | mg/L | 1 | 05/13/20 11:20 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 702 | 10.0 | 10.0 | | mg/L | 1 | 05/13/20 05:00 PM |

**Qualifiers:**

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- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-2 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-02 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 08:35 AM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 12:57 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:57 PM |
| Barium | 0.108 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 12:57 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:57 PM |
| Boron | 0.605 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:30 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:57 PM |
| Calcium | 217 | 2.00 | 6.00 | | mg/L | 20 | 05/20/20 01:30 PM |
| Chromium | 0.00234 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/19/20 12:57 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 12:57 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 12:57 PM |
| Lithium | 0.0280 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 12:57 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:57 PM |
| Selenium | 0.0208 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 12:57 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 12:57 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:10 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 1150 | 30.0 | 100 | | mg/L | 100 | 05/13/20 06:48 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/13/20 11:36 PM |
| Sulfate | 286 | 10.0 | 30.0 | | mg/L | 10 | 05/13/20 08:24 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 2300 | 50.0 | 50.0 | | mg/L | 1 | 05/13/20 05:00 PM |

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C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-5 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-03 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 09:25 AM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 01:00 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:00 PM |
| Barium | 0.0959 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 01:00 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:00 PM |
| Boron | 0.165 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:32 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:00 PM |
| Calcium | 100 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 01:33 PM |
| Chromium | 0.0374 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:00 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 01:00 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:00 PM |
| Lithium | 0.156 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 01:00 PM |
| Molybdenum | 0.00561 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:00 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:00 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 01:00 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:12 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 307 | 3.00 | 10.0 | | mg/L | 10 | 05/13/20 08:40 PM |
| Fluoride | 0.413 | 0.100 | 0.400 | | mg/L | 1 | 05/13/20 11:52 PM |
| Sulfate | 83.8 | 1.00 | 3.00 | | mg/L | 1 | 05/13/20 11:52 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 836 | 10.0 | 10.0 | | mg/L | 1 | 05/13/20 05:00 PM |

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S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-1 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-04 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 10:15 AM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 01:02 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:02 PM |
| Barium | 0.131 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 01:02 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:02 PM |
| Boron | 0.121 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:34 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:02 PM |
| Calcium | 37.8 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 01:35 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:02 PM |
| Cobalt | 0.0495 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 01:02 PM |
| Lead | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:02 PM |
| Lithium | 0.0548 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 01:02 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:02 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:02 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 01:02 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:15 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 146 | 3.00 | 10.0 | | mg/L | 10 | 05/13/20 08:56 PM |
| Fluoride | 0.231 | 0.100 | 0.400 | J | mg/L | 1 | 05/14/20 12:08 AM |
| Sulfate | 79.5 | 1.00 | 3.00 | | mg/L | 1 | 05/14/20 12:08 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 448 | 10.0 | 10.0 | | mg/L | 1 | 05/13/20 05:00 PM |

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SDL - Sample Detection Limit
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# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-8 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-05 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 11:10 AM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 01:04 PM |
| Arsenic | 0.00663 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:04 PM |
| Barium | 0.732 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 01:04 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:04 PM |
| Boron | 0.129 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:36 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:04 PM |
| Calcium | 381 | 5.00 | 15.0 | | mg/L | 50 | 05/20/20 01:37 PM |
| Chromium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:04 PM |
| Cobalt | 0.00840 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 01:04 PM |
| Lead | 0.000415 | 0.000300 | 0.00100 | J | mg/L | 1 | 05/19/20 01:04 PM |
| Lithium | 0.0152 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 01:04 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:04 PM |
| Selenium | 0.00210 | 0.00200 | 0.00500 | J | mg/L | 1 | 05/19/20 01:04 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 01:04 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:17 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 2240 | 30.0 | 100 | | mg/L | 100 | 05/13/20 07:04 PM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/14/20 12:24 AM |
| Sulfate | 188 | 10.0 | 30.0 | | mg/L | 10 | 05/13/20 09:12 PM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 4090 | 50.0 | 50.0 | | mg/L | 1 | 05/13/20 05:00 PM |

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C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-11 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-06 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 12:45 PM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 01:06 PM |
| Arsenic | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:06 PM |
| Barium | 0.347 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 01:06 PM |
| Beryllium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:06 PM |
| Boron | 0.166 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:38 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:06 PM |
| Calcium | 103 | 1.00 | 3.00 | | mg/L | 10 | 05/20/20 01:39 PM |
| Chromium | 0.0146 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:06 PM |
| Cobalt | <0.00300 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 01:06 PM |
| Lead | 0.000658 | 0.000300 | 0.00100 | J | mg/L | 1 | 05/19/20 01:06 PM |
| Lithium | 0.0132 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 01:06 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:06 PM |
| Selenium | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:06 PM |
| Thallium | <0.000500 | 0.000500 | 0.00150 | | mg/L | 1 | 05/19/20 01:06 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:19 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 560 | 30.0 | 100 | | mg/L | 100 | 05/15/20 03:28 PM |
| Fluoride | 0.365 | 0.100 | 0.400 | J | mg/L | 1 | 05/14/20 12:40 AM |
| Sulfate | 43.3 | 1.00 | 3.00 | | mg/L | 1 | 05/14/20 12:40 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 1300 | 50.0 | 50.0 | | mg/L | 1 | 05/13/20 05:00 PM |

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S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

# DHL Analytical, Inc.

**Date:** *12-Jun-20*

| | | | |
|---|---|---|---|
| **CLIENT:** | Golder | **Client Sample ID:** | FGD-12 |
| **Project:** | Luminant-OGSES FGD PONDS | **Lab ID:** | 2005079-07 |
| **Project No:** | 19122262-F2020 | **Collection Date:** | 05/11/20 01:45 PM |
| **Lab Order:** | 2005079 | **Matrix:** | AQUEOUS |

| Analyses | Result | SDL | RL | Qual | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **TRACE METALS: ICP-MS - WATER** | | **SW6020B** | | | | | Analyst: **RO** |
| Antimony | <0.000800 | 0.000800 | 0.00250 | | mg/L | 1 | 05/19/20 01:09 PM |
| Arsenic | 0.0116 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:09 PM |
| Barium | 0.230 | 0.00300 | 0.0100 | | mg/L | 1 | 05/19/20 01:09 PM |
| Beryllium | 0.00166 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:09 PM |
| Boron | 0.149 | 0.0100 | 0.0300 | | mg/L | 1 | 05/20/20 12:41 PM |
| Cadmium | <0.000300 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:09 PM |
| Calcium | 15.6 | 0.100 | 0.300 | | mg/L | 1 | 05/20/20 12:41 PM |
| Chromium | 0.0370 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:09 PM |
| Cobalt | 0.00883 | 0.00300 | 0.00500 | | mg/L | 1 | 05/19/20 01:09 PM |
| Lead | 0.0249 | 0.000300 | 0.00100 | | mg/L | 1 | 05/19/20 01:09 PM |
| Lithium | 0.0371 | 0.00500 | 0.0100 | | mg/L | 1 | 05/19/20 01:09 PM |
| Molybdenum | <0.00200 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:09 PM |
| Selenium | 0.00678 | 0.00200 | 0.00500 | | mg/L | 1 | 05/19/20 01:09 PM |
| Thallium | 0.000651 | 0.000500 | 0.00150 | J | mg/L | 1 | 05/19/20 01:09 PM |
| **MERCURY TOTAL: AQUEOUS** | | **SW7470A** | | | | | Analyst: **BM** |
| Mercury | <0.0000800 | 0.0000800 | 0.000200 | | mg/L | 1 | 05/19/20 12:21 PM |
| **ANIONS BY IC METHOD - WATER** | | **E300** | | | | | Analyst: **SNM** |
| Chloride | 19.3 | 0.300 | 1.00 | | mg/L | 1 | 05/14/20 12:56 AM |
| Fluoride | <0.100 | 0.100 | 0.400 | | mg/L | 1 | 05/14/20 12:56 AM |
| Sulfate | 19.9 | 1.00 | 3.00 | | mg/L | 1 | 05/14/20 12:56 AM |
| **TOTAL DISSOLVED SOLIDS** | | **M2540C** | | | | | Analyst: **JS** |
| Total Dissolved Solids (Residue, Filterable) | 198 | 10.0 | 10.0 | | mg/L | 1 | 05/13/20 05:00 PM |

**Qualifiers:**

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B - Analyte detected in the associated Method Blank
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RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200304C**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS-95289** | Batch ID: **95289** | TestNo: **SW7470A** | Units: **mg/L** | | |
| SampType: **DCS** | Run ID: **CETAC2_HG_200304C** | Analysis Date: **3/4/2020 12:11:09 PM** | Prep Date: **3/4/2020** | | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.000175 | 0.000200 | 0.000200 | 0 | 87.5 | 82 | 119 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200519B**

The QC data in batch 96370 applies to the following samples: 2005079-01A, 2005079-02A, 2005079-03A, 2005079-04A, 2005079-05A, 2005079-06A, 2005079-07A

Sample ID: **MB-96370** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **MBLK** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 11:47:54 AM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.0000800 | 0.000200 | | | | | | | | |

Sample ID: **LCS-96370** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **LCS** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 11:50:10 AM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00205 | 0.000200 | 0.00200 | 0 | 103 | 85 | 115 | | | |

Sample ID: **LCSD-96370** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **LCSD** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 11:52:26 AM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00194 | 0.000200 | 0.00200 | 0 | 97.0 | 85 | 115 | 5.51 | 15 | |

Sample ID: **2005079-01A MS** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **MS** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 12:01:30 PM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00191 | 0.000200 | 0.00200 | 0 | 95.5 | 80 | 120 | | | |

Sample ID: **2005079-01A MSD** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **MSD** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 12:03:46 PM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00209 | 0.000200 | 0.00200 | 0 | 104 | 80 | 120 | 9.00 | 15 | |

Sample ID: **2005079-01A SD** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **SD** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 12:06:02 PM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | <0.000400 | 0.00100 | 0 | 0 | | | | 0 | 10 | |

Sample ID: **2005079-01A PDS** Batch ID: **96370** TestNo: **SW7470A** Units: **mg/L**
SampType: **PDS** Run ID: **CETAC2_HG_200519B** Analysis Date: **5/19/2020 12:08:18 PM** Prep Date: **5/17/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00226 | 0.000200 | 0.00250 | 0 | 90.4 | 85 | 115 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: CETAC2_HG_200519B**

| Sample ID: **ICV-200519** | Batch ID: **R110550** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **CETAC2_HG_200519B** | Analysis Date: **5/19/2020 10:31:55 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00391 | 0.000200 | 0.00400 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID: **CCV2-200519** | Batch ID: **R110550** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_200519B** | Analysis Date: **5/19/2020 11:42:21 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00213 | 0.000200 | 0.00200 | 0 | 106 | 90 | 110 | | | |

| Sample ID: **CCV3-200519** | Batch ID: **R110550** | TestNo: **SW7470A** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **CETAC2_HG_200519B** | Analysis Date: **5/19/2020 12:26:27 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | 0.00214 | 0.000200 | 0.00200 | 0 | 107 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200408C**

| Sample ID: **DCS1-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:16:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.000932 | 0.00250 | 0.00100 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Beryllium | 0.000472 | 0.00100 | 0.000500 | 0 | 94.4 | 70 | 130 | 0 | 0 | |
| Cadmium | 0.000492 | 0.00100 | 0.000500 | 0 | 98.4 | 70 | 130 | 0 | 0 | |
| Lead | 0.000496 | 0.00100 | 0.000500 | 0 | 99.2 | 70 | 130 | 0 | 0 | |
| Thallium | 0.000468 | 0.00150 | 0.000500 | 0 | 93.6 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS2-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS2** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:19:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 0.310 | 0.300 | 0.300 | 0 | 103 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS3-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS3** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:21:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 0.00466 | 0.00500 | 0.00500 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Barium | 0.00478 | 0.0100 | 0.00500 | 0 | 95.6 | 70 | 130 | 0 | 0 | |
| Chromium | 0.00600 | 0.00500 | 0.00500 | 0 | 120 | 70 | 130 | 0 | 0 | |
| Cobalt | 0.00473 | 0.00500 | 0.00500 | 0 | 94.6 | 70 | 130 | 0 | 0 | |
| Lithium | 0.00473 | 0.0100 | 0.00500 | 0 | 94.6 | 70 | 130 | 0 | 0 | |
| Molybdenum | 0.00466 | 0.00500 | 0.00500 | 0 | 93.2 | 70 | 130 | 0 | 0 | |
| Selenium | 0.00517 | 0.00500 | 0.00500 | 0 | 103 | 70 | 130 | 0 | 0 | |

| Sample ID: **DCS4-95814** | Batch ID: **95814** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DCS4** | Run ID: **ICP-MS5_200408C** | Analysis Date: **4/8/2020 11:28:00 AM** | Prep Date: **4/7/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0286 | 0.0300 | 0.0300 | 0 | 95.2 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200519B**

The QC data in batch 96359 applies to the following samples: 2005079-01A, 2005079-02A, 2005079-03A, 2005079-04A, 2005079-05A, 2005079-06A, 2005079-07A

Sample ID: **MB-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 12:37:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.000800 | 0.00250 | | | | | | | | |
| Arsenic | <0.00200 | 0.00500 | | | | | | | | |
| Barium | <0.00300 | 0.0100 | | | | | | | | |
| Beryllium | <0.000300 | 0.00100 | | | | | | | | |
| Cadmium | <0.000300 | 0.00100 | | | | | | | | |
| Calcium | <0.100 | 0.300 | | | | | | | | |
| Chromium | <0.00200 | 0.00500 | | | | | | | | |
| Cobalt | <0.00300 | 0.00500 | | | | | | | | |
| Lead | <0.000300 | 0.00100 | | | | | | | | |
| Lithium | <0.00500 | 0.0100 | | | | | | | | |
| Molybdenum | <0.00200 | 0.00500 | | | | | | | | |
| Selenium | <0.00200 | 0.00500 | | | | | | | | |
| Thallium | <0.000500 | 0.00150 | | | | | | | | |

Sample ID: **LCS-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 12:40:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.208 | 0.00500 | 0.200 | 0 | 104 | 80 | 120 | | | |
| Barium | 0.202 | 0.0100 | 0.200 | 0 | 101 | 80 | 120 | | | |
| Beryllium | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Cadmium | 0.206 | 0.00100 | 0.200 | 0 | 103 | 80 | 120 | | | |
| Calcium | 5.42 | 0.300 | 5.00 | 0 | 108 | 80 | 120 | | | |
| Chromium | 0.200 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Cobalt | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Lead | 0.201 | 0.00100 | 0.200 | 0 | 100 | 80 | 120 | | | |
| Lithium | 0.204 | 0.0100 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 102 | 80 | 120 | | | |
| Selenium | 0.213 | 0.00500 | 0.200 | 0 | 107 | 80 | 120 | | | |
| Thallium | 0.200 | 0.00150 | 0.200 | 0 | 99.9 | 80 | 120 | | | |

Sample ID: **LCSD-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 12:42:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 80 | 120 | 0.135 | 15 | |
| Arsenic | 0.207 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.366 | 15 | |
| Barium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 80 | 120 | 1.84 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200519B**

| Sample ID: **LCSD-96359** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 12:42:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 80 | 120 | 0.541 | 15 | |
| Cadmium | 0.209 | 0.00100 | 0.200 | 0 | 104 | 80 | 120 | 1.41 | 15 | |
| Calcium | 5.32 | 0.300 | 5.00 | 0 | 106 | 80 | 120 | 2.00 | 15 | |
| Chromium | 0.201 | 0.00500 | 0.200 | 0 | 100 | 80 | 120 | 0.209 | 15 | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.548 | 15 | |
| Lead | 0.199 | 0.00100 | 0.200 | 0 | 99.6 | 80 | 120 | 0.766 | 15 | |
| Lithium | 0.201 | 0.0100 | 0.200 | 0 | 100 | 80 | 120 | 1.71 | 15 | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 103 | 80 | 120 | 0.262 | 15 | |
| Selenium | 0.212 | 0.00500 | 0.200 | 0 | 106 | 80 | 120 | 0.751 | 15 | |
| Thallium | 0.198 | 0.00150 | 0.200 | 0 | 99.2 | 80 | 120 | 0.704 | 15 | |

| Sample ID: **2005111-01B SD** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **SD** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 12:53:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | <0.00400 | 0.0125 | 0 | 0 | | | | 0 | 20 | |
| Arsenic | <0.0100 | 0.0250 | 0 | 0.00893 | | | | 0 | 20 | |
| Barium | 0.0171 | 0.0500 | 0 | 0.0170 | | | | 0.492 | 20 | |
| Beryllium | 0.0169 | 0.00500 | 0 | 0.0164 | | | | 3.12 | 20 | |
| Cadmium | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Calcium | 260 | 1.50 | 0 | 257 | | | | 0.815 | 20 | |
| Chromium | <0.0100 | 0.0250 | 0 | 0.00205 | | | | 0 | 20 | |
| Cobalt | 0.449 | 0.0250 | 0 | 0.439 | | | | 2.12 | 20 | |
| Lead | <0.00150 | 0.00500 | 0 | 0 | | | | 0 | 20 | |
| Lithium | 0.248 | 0.0500 | 0 | 0.249 | | | | 0.282 | 20 | |
| Molybdenum | <0.0100 | 0.0250 | 0 | 0 | | | | 0 | 20 | |
| Selenium | 0.0328 | 0.0250 | 0 | 0.0299 | | | | 9.36 | 20 | |
| Thallium | <0.00250 | 0.00750 | 0 | 0 | | | | 0 | 20 | |

| Sample ID: **2005111-01B PDS** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 1:20:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.204 | 0.00250 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Arsenic | 0.200 | 0.00500 | 0.200 | 0.00893 | 95.3 | 75 | 125 | | | |
| Barium | 0.225 | 0.0100 | 0.200 | 0.0170 | 104 | 75 | 125 | | | |
| Beryllium | 0.203 | 0.00100 | 0.200 | 0.0164 | 93.4 | 75 | 125 | | | |
| Cadmium | 0.195 | 0.00100 | 0.200 | 0 | 97.5 | 75 | 125 | | | |
| Calcium | 248 | 0.300 | 5.00 | 257 | -182 | 75 | 125 | | | S |
| Chromium | 0.202 | 0.00500 | 0.200 | 0.00205 | 99.7 | 75 | 125 | | | |
| Cobalt | 0.606 | 0.00500 | 0.200 | 0.439 | 83.3 | 75 | 125 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200519B**

| Sample ID: **2005111-01B PDS** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **PDS** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 1:20:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | 0.203 | 0.00100 | 0.200 | 0 | 102 | 75 | 125 | | | |
| Lithium | 0.417 | 0.0100 | 0.200 | 0.249 | 84.4 | 75 | 125 | | | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 103 | 75 | 125 | | | |
| Selenium | 0.217 | 0.00500 | 0.200 | 0.0299 | 93.6 | 75 | 125 | | | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 101 | 75 | 125 | | | |

| Sample ID: **2005111-01B MS** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 1:22:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.202 | 0.00250 | 0.200 | 0 | 101 | 75 | 125 | | | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0.00893 | 97.3 | 75 | 125 | | | |
| Barium | 0.223 | 0.0100 | 0.200 | 0.0170 | 103 | 75 | 125 | | | |
| Beryllium | 0.206 | 0.00100 | 0.200 | 0.0164 | 94.7 | 75 | 125 | | | |
| Cadmium | 0.194 | 0.00100 | 0.200 | 0 | 96.8 | 75 | 125 | | | |
| Calcium | 263 | 0.300 | 5.00 | 257 | 118 | 75 | 125 | | | |
| Chromium | 0.194 | 0.00500 | 0.200 | 0.00205 | 96.1 | 75 | 125 | | | |
| Cobalt | 0.633 | 0.00500 | 0.200 | 0.439 | 96.8 | 75 | 125 | | | |
| Lead | 0.198 | 0.00100 | 0.200 | 0 | 99.1 | 75 | 125 | | | |
| Lithium | 0.430 | 0.0100 | 0.200 | 0.249 | 90.6 | 75 | 125 | | | |
| Molybdenum | 0.211 | 0.00500 | 0.200 | 0 | 106 | 75 | 125 | | | |
| Selenium | 0.225 | 0.00500 | 0.200 | 0.0299 | 97.4 | 75 | 125 | | | |
| Thallium | 0.199 | 0.00150 | 0.200 | 0 | 99.4 | 75 | 125 | | | |

| Sample ID: **2005111-01B MSD** | Batch ID: **96359** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 1:24:00 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 100 | 75 | 125 | 0.929 | 15 | |
| Arsenic | 0.203 | 0.00500 | 0.200 | 0.00893 | 97.0 | 75 | 125 | 0.261 | 15 | |
| Barium | 0.219 | 0.0100 | 0.200 | 0.0170 | 101 | 75 | 125 | 2.08 | 15 | |
| Beryllium | 0.206 | 0.00100 | 0.200 | 0.0164 | 95.0 | 75 | 125 | 0.323 | 15 | |
| Cadmium | 0.193 | 0.00100 | 0.200 | 0 | 96.5 | 75 | 125 | 0.269 | 15 | |
| Calcium | 262 | 0.300 | 5.00 | 257 | 92.8 | 75 | 125 | 0.471 | 15 | |
| Chromium | 0.193 | 0.00500 | 0.200 | 0.00205 | 95.7 | 75 | 125 | 0.411 | 15 | |
| Cobalt | 0.632 | 0.00500 | 0.200 | 0.439 | 96.4 | 75 | 125 | 0.138 | 15 | |
| Lead | 0.200 | 0.00100 | 0.200 | 0 | 100 | 75 | 125 | 1.06 | 15 | |
| Lithium | 0.437 | 0.0100 | 0.200 | 0.249 | 94.3 | 75 | 125 | 1.66 | 15 | |
| Molybdenum | 0.208 | 0.00500 | 0.200 | 0 | 104 | 75 | 125 | 1.36 | 15 | |
| Selenium | 0.227 | 0.00500 | 0.200 | 0.0299 | 98.3 | 75 | 125 | 0.785 | 15 | |
| Thallium | 0.201 | 0.00150 | 0.200 | 0 | 100 | 75 | 125 | 0.951 | 15 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200519B**

Sample ID: **ICV-200519** Batch ID: **R110549** TestNo: **SW6020B** Units: **mg/L**
SampType: **ICV** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 10:48:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.101 | 0.00250 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.0990 | 0.00500 | 0.100 | 0 | 99.0 | 90 | 110 | | | |
| Barium | 0.102 | 0.0100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Beryllium | 0.0981 | 0.00100 | 0.100 | 0 | 98.1 | 90 | 110 | | | |
| Cadmium | 0.102 | 0.00100 | 0.100 | 0 | 102 | 90 | 110 | | | |
| Calcium | 2.60 | 0.300 | 2.50 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.101 | 0.00500 | 0.100 | 0 | 101 | 90 | 110 | | | |
| Cobalt | 0.100 | 0.00500 | 0.100 | 0 | 100 | 90 | 110 | | | |
| Lead | 0.0993 | 0.00100 | 0.100 | 0 | 99.3 | 90 | 110 | | | |
| Lithium | 0.0998 | 0.0100 | 0.100 | 0 | 99.8 | 90 | 110 | | | |
| Molybdenum | 0.0975 | 0.00500 | 0.100 | 0 | 97.5 | 90 | 110 | | | |
| Selenium | 0.103 | 0.00500 | 0.100 | 0 | 103 | 90 | 110 | | | |
| Thallium | 0.0973 | 0.00150 | 0.100 | 0 | 97.3 | 90 | 110 | | | |

Sample ID: **LCVL-200519** Batch ID: **R110549** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCVL** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 11:00:00 AM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.00203 | 0.00250 | 0.00200 | 0 | 102 | 80 | 120 | | | |
| Arsenic | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 80 | 120 | | | |
| Barium | 0.00527 | 0.0100 | 0.00500 | 0 | 105 | 80 | 120 | | | |
| Beryllium | 0.00109 | 0.00100 | 0.00100 | 0 | 109 | 80 | 120 | | | |
| Cadmium | 0.00102 | 0.00100 | 0.00100 | 0 | 102 | 80 | 120 | | | |
| Calcium | 0.115 | 0.300 | 0.100 | 0 | 115 | 80 | 120 | | | |
| Chromium | 0.00502 | 0.00500 | 0.00500 | 0 | 100 | 80 | 120 | | | |
| Cobalt | 0.00510 | 0.00500 | 0.00500 | 0 | 102 | 80 | 120 | | | |
| Lead | 0.00103 | 0.00100 | 0.00100 | 0 | 103 | 80 | 120 | | | |
| Lithium | 0.0100 | 0.0100 | 0.0100 | 0 | 100 | 80 | 120 | | | |
| Molybdenum | 0.00524 | 0.00500 | 0.00500 | 0 | 105 | 80 | 120 | | | |
| Selenium | 0.00565 | 0.00500 | 0.00500 | 0 | 113 | 80 | 120 | | | |
| Thallium | 0.000986 | 0.00150 | 0.00100 | 0 | 98.6 | 80 | 120 | | | |

Sample ID: **CCV2-200519** Batch ID: **R110549** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_200519B** Analysis Date: **5/19/2020 12:26:00 PM** Prep Date:

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.201 | 0.00250 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Arsenic | 0.207 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.200 | 0.0100 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.204 | 0.00100 | 0.200 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200519B**

| Sample ID: **CCV2-200519** | Batch ID: **R110549** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 12:26:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | 5.20 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.198 | 0.00500 | 0.200 | 0 | 99.1 | 90 | 110 | | | |
| Cobalt | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Lead | 0.197 | 0.00100 | 0.200 | 0 | 98.3 | 90 | 110 | | | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.204 | 0.00500 | 0.200 | 0 | 102 | 90 | 110 | | | |
| Selenium | 0.214 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 97.8 | 90 | 110 | | | |

| Sample ID: **CCV3-200519** | Batch ID: **R110549** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200519B** | Analysis Date: **5/19/2020 1:44:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.200 | 0.00250 | 0.200 | 0 | 99.8 | 90 | 110 | | | |
| Arsenic | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Barium | 0.201 | 0.0100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Beryllium | 0.202 | 0.00100 | 0.200 | 0 | 101 | 90 | 110 | | | |
| Cadmium | 0.206 | 0.00100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Calcium | 5.19 | 0.300 | 5.00 | 0 | 104 | 90 | 110 | | | |
| Chromium | 0.199 | 0.00500 | 0.200 | 0 | 99.3 | 90 | 110 | | | |
| Cobalt | 0.206 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Lead | 0.196 | 0.00100 | 0.200 | 0 | 98.0 | 90 | 110 | | | |
| Lithium | 0.206 | 0.0100 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Molybdenum | 0.205 | 0.00500 | 0.200 | 0 | 103 | 90 | 110 | | | |
| Selenium | 0.215 | 0.00500 | 0.200 | 0 | 107 | 90 | 110 | | | |
| Thallium | 0.196 | 0.00150 | 0.200 | 0 | 97.8 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200520B**

The QC data in batch 96359 applies to the following samples: 2005079-01A, 2005079-02A, 2005079-03A, 2005079-04A, 2005079-05A, 2005079-06A, 2005079-07A

Sample ID: **MB-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:10:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | <0.0100 | 0.0300 | | | | | | | | |

Sample ID: **LCS-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:13:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.193 | 0.0300 | 0.200 | 0 | 96.4 | 80 | 120 | | | |

Sample ID: **LCSD-96359** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:15:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.208 | 0.0300 | 0.200 | 0 | 104 | 80 | 120 | 7.81 | 15 | |

Sample ID: **2005111-01B SD** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:26:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 20.5 | 7.50 | 0 | 19.0 | | | | 7.43 | 20 | |

Sample ID: **2005111-01B PDS** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:53:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 28.5 | 1.50 | 10.0 | 19.0 | 95.5 | 75 | 125 | | | |

Sample ID: **2005111-01B MS** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:55:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 21.0 | 1.50 | 0.200 | 19.0 | 1020 | 75 | 125 | | | S |

Sample ID: **2005111-01B MSD** Batch ID: **96359** TestNo: **SW6020B** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS5_200520B** Analysis Date: **5/20/2020 1:57:00 PM** Prep Date: **5/15/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 21.3 | 1.50 | 0.200 | 19.0 | 1160 | 75 | 125 | 1.40 | 15 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: ICP-MS5_200520B**

| Sample ID: **ICV-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 10:52:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0987 | 0.0300 | 0.100 | 0 | 98.7 | 90 | 110 | | | |
| Calcium | 2.60 | 0.300 | 2.50 | 0 | 104 | 90 | 110 | | | |

| Sample ID: **LCVL-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCVL** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 11:04:00 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.0216 | 0.0300 | 0.0200 | 0 | 108 | 80 | 120 | | | |
| Calcium | 0.106 | 0.300 | 0.100 | 0 | 106 | 80 | 120 | | | |

| Sample ID: **CCV1-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 12:00:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.200 | 0.0300 | 0.200 | 0 | 100 | 90 | 110 | | | |
| Calcium | 4.94 | 0.300 | 5.00 | 0 | 98.9 | 90 | 110 | | | |

| Sample ID: **CCV2-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 12:52:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.195 | 0.0300 | 0.200 | 0 | 97.3 | 90 | 110 | | | |
| Calcium | 4.98 | 0.300 | 5.00 | 0 | 99.7 | 90 | 110 | | | |

| Sample ID: **CCV3-200520** | Batch ID: **R110581** | TestNo: **SW6020B** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **ICP-MS5_200520B** | Analysis Date: **5/20/2020 2:09:00 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Boron | 0.198 | 0.0300 | 0.200 | 0 | 98.9 | 90 | 110 | | | |
| Calcium | 5.09 | 0.300 | 5.00 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200421A**

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: **DCS2-96036** | Batch ID: **96036** | TestNo: **E300** | | Units: **mg/L** | |
| SampType: **DCS2** | Run ID: **IC2_200421A** | Analysis Date: **4/21/2020 11:47:08 AM** | | Prep Date: **4/21/2020** | |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 0.420 | 1.00 | 0.5000 | 0 | 84.1 | 70 | 130 | 0 | 0 | |
| Fluoride | 0.154 | 0.400 | 0.2000 | 0 | 77.1 | 70 | 130 | 0 | 0 | |
| Sulfate | 1.43 | 3.00 | 1.500 | 0 | 95.3 | 70 | 130 | 0 | 0 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200513A**

The QC data in batch 96331 applies to the following samples: 2005079-01B, 2005079-02B, 2005079-03B, 2005079-04B, 2005079-05B, 2005079-06B, 2005079-07B

Sample ID: **MB-96331** Batch ID: **96331** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_200513A** Analysis Date: **5/13/2020 12:03:31 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |
| Fluoride | <0.100 | 0.400 | | | | | | | | |
| Sulfate | <1.00 | 3.00 | | | | | | | | |

Sample ID: **LCS-96331** Batch ID: **96331** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_200513A** Analysis Date: **5/13/2020 12:19:31 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Fluoride | 3.73 | 0.400 | 4.000 | 0 | 93.2 | 90 | 110 | | | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

Sample ID: **LCSD-96331** Batch ID: **96331** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_200513A** Analysis Date: **5/13/2020 12:35:31 PM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | 0.114 | 20 | |
| Fluoride | 3.75 | 0.400 | 4.000 | 0 | 93.8 | 90 | 110 | 0.683 | 20 | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | 0.039 | 20 | |

Sample ID: **2005077-02BMS** Batch ID: **96331** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_200513A** Analysis Date: **5/14/2020 1:28:07 AM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 825 | 10.0 | 200.0 | 800.5 | 12.5 | 90 | 110 | | | S |
| Fluoride | 216 | 4.00 | 200.0 | 0 | 108 | 90 | 110 | | | |
| Sulfate | 494 | 30.0 | 200.0 | 288.5 | 103 | 90 | 110 | | | |

Sample ID: **2005077-02BMSD** Batch ID: **96331** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_200513A** Analysis Date: **5/14/2020 1:44:07 AM** Prep Date: **5/13/2020**

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 822 | 10.0 | 200.0 | 800.5 | 10.6 | 90 | 110 | 0.450 | 20 | S |
| Fluoride | 217 | 4.00 | 200.0 | 0 | 108 | 90 | 110 | 0.480 | 20 | |
| Sulfate | 494 | 30.0 | 200.0 | 288.5 | 103 | 90 | 110 | 0.008 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200513A**

| Sample ID: **2005077-01BMS** | Batch ID: **96331** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_200513A** | Analysis Date: **5/14/2020 2:00:07 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 105 | 1.00 | 20.00 | 108.6 | -16.4 | 90 | 110 | | | S |
| Fluoride | 19.4 | 0.400 | 20.00 | 0.2859 | 95.7 | 90 | 110 | | | |
| Sulfate | 70.1 | 3.00 | 20.00 | 52.44 | 88.2 | 90 | 110 | | | S |

| Sample ID: **2005077-01BMSD** | Batch ID: **96331** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_200513A** | Analysis Date: **5/14/2020 2:16:07 AM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | 20.00 | 108.6 | -543 | 90 | 110 | 0 | 20 | S |
| Fluoride | 19.4 | 0.400 | 20.00 | 0.2859 | 95.7 | 90 | 110 | 0.065 | 20 | |
| Sulfate | 70.1 | 3.00 | 20.00 | 52.44 | 88.5 | 90 | 110 | 0.074 | 20 | S |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200513A**

| Sample ID: **ICV-200513** | Batch ID: **R110479** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_200513A** | Analysis Date: **5/13/2020 11:31:31 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 26.2 | 1.00 | 25.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 9.86 | 0.400 | 10.00 | 0 | 98.6 | 90 | 110 | | | |
| Sulfate | 78.8 | 3.00 | 75.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID: **CCV1-200513** | Batch ID: **R110479** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200513A** | Analysis Date: **5/13/2020 6:16:07 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | | | |
| Fluoride | 3.88 | 0.400 | 4.000 | 0 | 97.0 | 90 | 110 | | | |
| Sulfate | 30.2 | 3.00 | 30.00 | 0 | 101 | 90 | 110 | | | |

| Sample ID: **CCV2-200513** | Batch ID: **R110479** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200513A** | Analysis Date: **5/13/2020 10:16:07 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |
| Fluoride | 3.87 | 0.400 | 4.000 | 0 | 96.8 | 90 | 110 | | | |
| Sulfate | 30.1 | 3.00 | 30.00 | 0 | 100 | 90 | 110 | | | |

| Sample ID: **CCV3-200513** | Batch ID: **R110479** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200513A** | Analysis Date: **5/14/2020 3:20:07 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.5 | 1.00 | 10.00 | 0 | 105 | 90 | 110 | | | |
| Fluoride | 3.96 | 0.400 | 4.000 | 0 | 99.0 | 90 | 110 | | | |
| Sulfate | 30.6 | 3.00 | 30.00 | 0 | 102 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200515A**

The QC data in batch 96363 applies to the following samples: 2005079-06B

| Sample ID: **MB-96363** | Batch ID: **96363** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 11:51:21 AM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.300 | 1.00 | | | | | | | | |

| Sample ID: **LCS-96363** | Batch ID: **96363** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 12:07:21 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | | | |

| Sample ID: **LCSD-96363** | Batch ID: **96363** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCSD** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 12:23:21 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.2 | 1.00 | 10.00 | 0 | 102 | 90 | 110 | 0.117 | 20 | |

| Sample ID: **2005112-01BMS** | Batch ID: **96363** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MS** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 4:00:25 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2220 | 100 | 2000 | 206.2 | 101 | 90 | 110 | | | |

| Sample ID: **2005112-01BMSD** | Batch ID: **96363** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MSD** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 4:16:25 PM** | Prep Date: **5/15/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 2230 | 100 | 2000 | 206.2 | 101 | 90 | 110 | 0.373 | 20 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: IC2_200515A**

| Sample ID: **ICV-200515** | Batch ID: **R110519** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **ICV** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 11:19:21 AM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 26.2 | 1.00 | 25.00 | 0 | 105 | 90 | 110 | | | |

| Sample ID: **CCV1-200515** | Batch ID: **R110519** | TestNo: **E300** | Units: **mg/L** |
|---|---|---|---|
| SampType: **CCV** | Run ID: **IC2_200515A** | Analysis Date: **5/15/2020 7:12:25 PM** | Prep Date: |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 10.3 | 1.00 | 10.00 | 0 | 103 | 90 | 110 | | | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# ANALYTICAL QC SUMMARY REPORT

**RunID: WC_200513A**

The QC data in batch 96333 applies to the following samples: 2005079-01B, 2005079-02B, 2005079-03B, 2005079-04B, 2005079-05B, 2005079-06B, 2005079-07B

| Sample ID: **MB-96333** | Batch ID: **96333** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **MBLK** | Run ID: **WC_200513A** | Analysis Date: **5/13/2020 5:00:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | <10.0 | 10.0 | | | | | | | | |

| Sample ID: **LCS-96333** | Batch ID: **96333** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **LCS** | Run ID: **WC_200513A** | Analysis Date: **5/13/2020 5:00:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 756 | 10.0 | 745.6 | 0 | 101 | 90 | 113 | | | |

| Sample ID: **2005079-05B-DUP** | Batch ID: **96333** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_200513A** | Analysis Date: **5/13/2020 5:00:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 4120 | 50.0 | 0 | 4090 | | | | 0.609 | 5 | |

| Sample ID: **2005079-06B-DUP** | Batch ID: **96333** | TestNo: **M2540C** | Units: **mg/L** |
|---|---|---|---|
| SampType: **DUP** | Run ID: **WC_200513A** | Analysis Date: **5/13/2020 5:00:00 PM** | Prep Date: **5/13/2020** |

| Analyte | Result | RL | SPK value | Ref Val | %REC | LowLimit | HighLimit | %RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Dissolved Solids (Residue, Filtera | 1250 | 50.0 | 0 | 1295 | | | | 3.94 | 5 | |

**Qualifiers:**

| | | | |
|---|---|---|---|
| B | Analyte detected in the associated Method Blank | DF | Dilution Factor |
| J | Analyte detected between MDL and RL | MDL | Method Detection Limit |
| ND | Not Detected at the Method Detection Limit | R | RPD outside accepted control limits |
| RL | Reporting Limit | S | Spike Recovery outside control limits |
| J | Analyte detected between SDL and RL | N | Parameter not NELAP certified |

**CLIENT:** Golder
**Work Order:** 2005079
**Project:** Luminant-OGSES FGD PONDS

# MQL SUMMARY REPORT

| **TestNo: E300** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Chloride | 0.300 | 1.00 |
| Fluoride | 0.100 | 0.400 |
| Sulfate | 1.00 | 3.00 |

| **TestNo: SW6020B** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Antimony | 0.000800 | 0.00250 |
| Arsenic | 0.00200 | 0.00500 |
| Barium | 0.00300 | 0.0100 |
| Beryllium | 0.000300 | 0.00100 |
| Boron | 0.0100 | 0.0300 |
| Cadmium | 0.000300 | 0.00100 |
| Calcium | 0.100 | 0.300 |
| Chromium | 0.00200 | 0.00500 |
| Cobalt | 0.00300 | 0.00500 |
| Lead | 0.000300 | 0.00100 |
| Lithium | 0.00500 | 0.0100 |
| Molybdenum | 0.00200 | 0.00500 |
| Selenium | 0.00200 | 0.00500 |
| Thallium | 0.000500 | 0.00150 |

| **TestNo: SW7470A** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Mercury | 0.0000800 | 0.000200 |

| **TestNo: M2540C** | **MDL** | **MQL** |
|---|---|---|
| **Analyte** | **mg/L** | **mg/L** |
| Total Dissolved Solids (Residue, Filt | 10.0 | 10.0 |

**Qualifiers:** MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

Pace Analytical®
National Center for Testing & Innovation

# ANALYTICAL REPORT

June 10, 2020



## DHL Analytical, Inc.

| | |
|---|---|
| Sample Delivery Group: | L1219695 |
| Samples Received: | 05/18/2020 |
| Project Number: | 2005079 |
| Description: | |

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

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## FGD-4 L1219695-01 Non-Potable Water

Collected by | Collected date/time 05/11/20 07:45 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/27/20 16:43 | RGT | Mt. Juliet, TN |

## FGD-2 L1219695-02 Non-Potable Water

Collected by | Collected date/time 05/11/20 08:35 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/04/20 10:10 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/04/20 10:10 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/27/20 16:43 | RGT | Mt. Juliet, TN |

## FGD-5 L1219695-03 Non-Potable Water

Collected by | Collected date/time 05/11/20 09:25 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/27/20 16:43 | RGT | Mt. Juliet, TN |

## FGD-1 L1219695-04 Non-Potable Water

Collected by | Collected date/time 05/11/20 10:15 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/28/20 13:43 | RGT | Mt. Juliet, TN |

## FGD-8 L1219695-05 Non-Potable Water

Collected by | Collected date/time 05/11/20 11:10 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/28/20 13:43 | RGT | Mt. Juliet, TN |

## FGD-11 L1219695-06 Non-Potable Water

Collected by | Collected date/time 05/11/20 12:45 | Received date/time 05/18/20 09:45

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/28/20 13:43 | RGT | Mt. Juliet, TN |

| | Collected by | Collected date/time | Received date/time |
|---|---|---|---|
| FGD-12 L1219695-07 Non-Potable Water | | 05/11/20 13:45 | 05/18/20 09:45 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Radiochemistry by Method 904 | WG1479430 | 1 | 05/21/20 14:37 | 06/05/20 13:30 | SNR | Mt. Juliet, TN |
| Radiochemistry by Method Calculation | WG1480228 | 1 | 05/26/20 11:14 | 06/05/20 13:30 | RRE | Mt. Juliet, TN |
| Radiochemistry by Method SM7500Ra B M | WG1480228 | 1 | 05/26/20 11:14 | 05/28/20 13:43 | RGT | Mt. Juliet, TN |

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 1.20 | | 0.681 | 1.49 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *70.1* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *104* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.35 | | 1.14 | 2.17 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 0.150 | | 0.462 | 0.679 | 05/27/2020 16:43 | WG1480228 |
| *(T) Barium-133* | *91.9* | | | *30.0-143* | *05/27/2020 16:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 2.08 | | 0.643 | 1.34 | 06/04/2020 10:10 | WG1479430 |
| *(T) Barium* | *78.1* | | | *62.0-143* | *06/04/2020 10:10* | WG1479430 |
| *(T) Yttrium* | *112* | | | *79.0-136* | *06/04/2020 10:10* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 2.76 | | 0.993 | 1.55 | 06/04/2020 10:10 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.677 | | 0.350 | 0.211 | 05/27/2020 16:43 | WG1480228 |
| *(T) Barium-133* | *89.7* | | | *30.0-143* | *05/27/2020 16:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-228 | 5.18 | | 0.667 | 1.35 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *73.7* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *110* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| Combined Radium | 5.28 | | 0.860 | 1.67 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result pCi/l | Qualifier | Uncertainty + / - | MDA pCi/l | Analysis Date date / time | Batch |
|---|---|---|---|---|---|---|
| RADIUM-226 | 0.0983 | | 0.193 | 0.324 | 05/27/2020 16:43 | WG1480228 |
| *(T) Barium-133* | *83.4* | | | *30.0-143* | *05/27/2020 16:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 0.808 | | 0.616 | 1.03 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *83.8* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 1.89 | | 1.03 | 1.29 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 1.08 | | 0.415 | 0.256 | 05/28/2020 13:43 | WG1480228 |
| *(T) Barium-133* | *91.4* | | | *30.0-143* | *05/28/2020 13:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 6.58 | | 0.683 | 1.25 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *68.3* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *105* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 8.65 | | 1.18 | 1.57 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 2.07 | | 0.499 | 0.323 | 05/28/2020 13:43 | WG1480228 |
| *(T) Barium-133* | *96.8* | | | *30.0-143* | *05/28/2020 13:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 4.00 | | 0.583 | 0.835 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *87.2* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *107* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 6.40 | | 1.17 | 1.08 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 2.39 | | 0.591 | 0.243 | 05/28/2020 13:43 | WG1480228 |
| *(T) Barium-133* | *89.3* | | | *30.0-143* | *05/28/2020 13:43* | WG1480228 |

## Radiochemistry by Method 904

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-228 | 10.7 | | 0.708 | 1.03 | 06/05/2020 13:30 | WG1479430 |
| *(T) Barium* | *81.0* | | | *62.0-143* | *06/05/2020 13:30* | WG1479430 |
| *(T) Yttrium* | *110* | | | *79.0-136* | *06/05/2020 13:30* | WG1479430 |

## Radiochemistry by Method Calculation

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| Combined Radium | 16.6 | | 1.65 | 1.27 | 06/05/2020 13:30 | WG1480228 |

## Radiochemistry by Method SM7500Ra B M

| Analyte | Result | Qualifier | Uncertainty | MDA | Analysis Date | Batch |
|---|---|---|---|---|---|---|
| | pCi/l | | + / - | pCi/l | date / time | |
| RADIUM-226 | 5.96 | | 0.946 | 0.241 | 05/28/2020 13:43 | WG1480228 |
| *(T) Barium-133* | *84.7* | | | *30.0-143* | *05/28/2020 13:43* | WG1480228 |

## Method Blank (MB)

(MB) R3534480-6 06/04/20 10:10

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-228 | -0.637 | | 0.528 |
| *(T) Barium* | *89.8* | | |
| *(T) Yttrium* | *105* | | |

## L1219695-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1219695-02 06/04/20 10:10 • (DUP) R3534480-10 06/04/20 10:10

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-228 | 2.08 | 1.67 | 1 | 22.0 | 0.453 | | 20 | 3 |
| *(T) Barium* | *78.1* | *83.8* | | | | | | |
| *(T) Yttrium* | *112* | *110* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3534480-7 06/04/20 10:10

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-228 | 5.00 | 5.60 | 112 | 80.0-120 | |
| *(T) Barium* | | | *84.5* | | |
| *(T) Yttrium* | | | *110* | | |

## Method Blank (MB)

(MB) R3533718-5 05/28/20 17:55

| Analyte | MB Result pCi/l | MB Qualifier | MB MDA pCi/l |
|---|---|---|---|
| Radium-226 | 0.0282 | | 0.0620 |
| *(T) Barium-133* | *95.4* | | |

## L1219695-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1219695-01 05/27/20 16:43 • (DUP) R3533718-1 05/27/20 16:45

| Analyte | Original Result pCi/l | DUP Result pCi/l | Dilution | DUP RPD % | DUP RER | DUP Qualifier | DUP RPD Limits % | DUP RER Limit |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.150 | 0.477 | 1 | 104 | 0.622 | | 20 | 3 |
| *(T) Barium-133* | *91.9* | *89.3* | | | | | | |

## Laboratory Control Sample (LCS)

(LCS) R3533718-2 05/28/20 13:53

| Analyte | Spike Amount pCi/l | LCS Result pCi/l | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Radium-226 | 5.02 | 5.42 | 108 | 80.0-120 | |
| *(T) Barium-133* | | | *92.9* | | |

## L1219695-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1219695-04 05/28/20 13:43 • (MS) R3533718-3 05/28/20 13:53 • (MSD) R3533718-4 05/28/20 13:53

| Analyte | Spike Amount pCi/l | Original Result pCi/l | MS Result pCi/l | MSD Result pCi/l | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | MS RER | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 20.1 | 1.08 | 22.8 | 23.6 | 108 | 112 | 1 | 75.0-125 | | | 3.32 | | 20 |
| *(T) Barium-133* | | *91.4* | | | *84.6* | *87.2* | | | | | | | |

## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

## Abbreviations and Definitions

| | |
|---|---|
| MDA | Minimum Detectable Activity. |
| Rec. | Recovery. |
| RER | Replicate Error Ratio. |
| RPD | Relative Percent Difference. |
| SDG | Sample Delivery Group. |
| (T) | Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation. |
| Analyte | The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported. |
| Dilution | If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor. |
| Limits | These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges. |
| Original Sample | The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG. |
| Qualifier | This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable. |
| Result | The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte. |
| Uncertainty (Radiochemistry) | Confidence level of 2 sigma. |
| Case Narrative (Cn) | A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report. |
| Quality Control Summary (Qc) | This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material. |
| Sample Chain of Custody (Sc) | This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis. |
| Sample Results (Sr) | This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported. |
| Sample Summary (Ss) | This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis. |

| Qualifier | Description |
|---|---|

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.



## State Accreditations

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN-03-2002-34 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | n/a |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LAO00356 |
| Kentucky [1 6] | 90010 | South Carolina | 84004 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana [1] | LA180010 | Texas | T104704245-18-15 |
| Maine | TN0002 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN00003 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 460132 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 9980939910 |
| Montana | CERT0086 | Wyoming | A2LA |

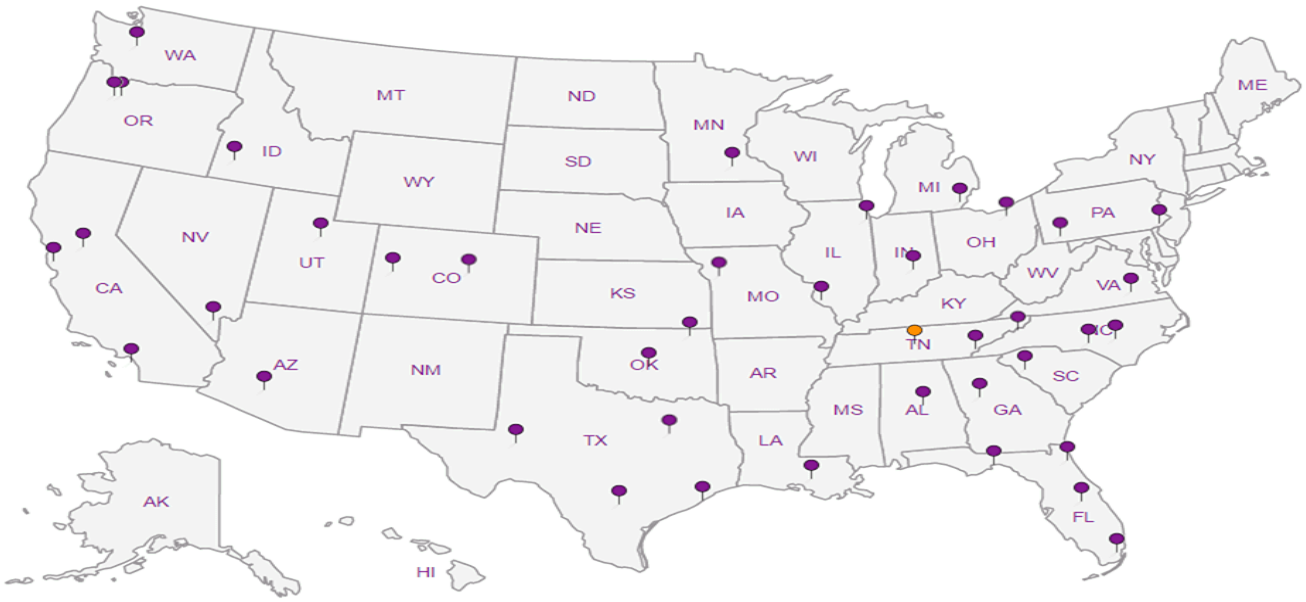
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



DHL Analytical, Inc.
*2300 Double Creek Drive*
*Round Rock, TX 78664*
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

# CHAIN-OF-CUSTODY RECORD



G108

Work Order: 2005079

**Subcontractor:**

Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

12/1968

**12-May-20**

| Sample ID | Matrix | DHL# | Date Collected | Bottle Type | Requested Tests | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ra-228 | Ra-226 | | | | |
| | | | | | E904.0 | M7500 Ra B M | | | | |
| FGD-4 | Aqueous | 01C | 05/11/20 07:45 AM | 1LHDPEHNO3 | 1 | | | | | 01 |
| FGD-4 | Aqueous | 01D | 05/11/20 07:45 AM | 1LHDPEHNO3 | | 1 | | | | 01 |
| FGD-2 | Aqueous | 02C | 05/11/20 08:35 AM | 1LHDPEHNO3 | 1 | | | | | 02 |
| FGD-2 | Aqueous | 02D | 05/11/20 08:35 AM | 1LHDPEHNO3 | | 1 | | | | 02 |
| FGD-5 | Aqueous | 03C | 05/11/20 09:25 AM | 1LHDPEHNO3 | 1 | | | | | 03 |
| FGD-5 | Aqueous | 03D | 05/11/20 09:25 AM | 1LHDPEHNO3 | | 1 | | | | 03 |
| FGD-1 | Aqueous | 04C | 05/11/20 10:15 AM | 1LHDPEHNO3 | 1 | | | | | 04 |
| FGD-1 | Aqueous | 04D | 05/11/20 10:15 AM | 1LHDPEHNO3 | | 1 | | | | 04 |
| FGD-8 | Aqueous | 05C | 05/11/20 11:10 AM | 1LHDPEHNO3 | 1 | | | | | 05 |
| FGD-8 | Aqueous | 05D | 05/11/20 11:10 AM | 1LHDPEHNO3 | | 1 | | | | 05 |
| FGD-11 | Aqueous | 06C | 05/11/20 12:45 PM | 1LHDPEHNO3 | 1 | | | | | 06 |
| FGD-11 | Aqueous | 06D | 05/11/20 12:45 PM | 1LHDPEHNO3 | | 1 | | | | 06 |
| FGD-12 | Aqueous | 07C | 05/11/20 01:45 PM | 1LHDPEHNO3 | 1 | | | | | 07 |
| FGD-12 | Aqueous | 07D | 05/11/20 01:45 PM | 1LHDPEHNO3 | | 1 | | | | 07 |

General Comments:

Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

| | | Date/Time | | | Date/Time |
|---|---|---|---|---|---|
| **Relinquished by:** | [signature] | 5/14/20 1700 | **Received by:** | Carol Kemp | 5/18/20 9:45 |
| **Relinquished by:** | | | **Received by:** | | |

# Pace Analytical National Center for Testing & Innovation
## Cooler Receipt Form

| | | |
|---|---|---|
| Client: PHLRRZ | 1219695 | |
| Cooler Received/Opened On: 5 / 18 / 20 Temperature: | Amb | |
| Received By: Carol Kemp | | |
| Signature: Carol Kemp | | |

| Receipt Check List | NP | Yes | No |
|---|---|---|---|
| COC Seal Present / Intact? | ✓ | | |
| COC Signed / Accurate? | | ✓ | |
| Bottles arrive intact? | | ✓ | |
| Correct bottles used? | | ✓ | |
| Sufficient volume sent? | | ✓ | |
| If Applicable | | | |
| VOA Zero headspace? | | | |
| Preservation Correct / Checked? | | ✓ | |

**APPENDIX B**

# Groundwater Modeling Notes

## APPENDIX B: OAK GROVE GROUNDWATER MODELING NOTES

**By**: William Vienne, Golder
**Date**: March 2021

**Objective:** Create a groundwater model using Visual Modflow to setup steady-state hydrogeological conditions for use in PHREEQC geochemical model.

**Units**

| | | | |
|---|---|---|---|
| length: | feet | pumping rate: | gal/min |
| time: | day | recharge: | in/year |
| concentration: | mg/L | mass: | kg |
| conductivity: | cm/s | | |

**Default Parameters**

| | | | | | |
|---|---|---|---|---|---|
| Kx: | 9E-4 cm/s | | Sy: | 0.22 | (value for sand in Heath 1983) |
| Ky: | 9E-4 cm/s | | eff. Porosity: | 0.25 | (typical of sand aquifer) |
| Kz: | 9E-5 cm/s | | tot. porosity: | 0.40 | (typical of sand aquifer) |
| (K based on 2015 slug tests in wells FGD-5 and FGD-12 (PBW 2017)) | | | SS simulation time : | 1 day | |
| Ss: | 2.3E-4 $ft^{-1}$ | (value for sand in Dominico and Mifflin 1965) | No recharge or evapotranspiration | | |

**Base Map**

Base map: May 2019 groundwater potentiometric surface map

Two-point georeference:

| Model Coordinates | Georeferenced Coordinates |
|---|---|
| Model origin (0, 0 ft) | N11321403/E2419094 |
| MW-8R | N11326288/E2423313 |

**Model Setup**

3 layers:

1. Upper sandy silt/clay: Ground surface to 405 feet amsl (thickness varies with ground elevation -- generally ~20 feet thick)
 - Kxy = 1E-4 cm/s; Kz = 1E-5 cm/s
 - All other hydro parameters set to default values
 - All ponds are completed in Layer 1
2. Middle sand (uppermost GWBU): 405 feet amsl to 370 feet amsl
 - All monitoring wells are completed in Layer 2
 - All hydro parameters set to default values, including conductivity
 - Kxy = 9E-4 cm/s; Kz = 9E-5 cm/s
3. Lower confining clay: 370 feet amsl to 360 feet amsl
 - Kxy = 1E-5 cm/s; Kz = 1E-6 cm/s
 - All other hydro parameters set to default values

Model extent: 9000 ft x 9000 ft

| Columns | Rows | |
|---|---|---|
| 90 | 90 | (100-ft grid cells) |

- Refined cells to 50 ft in FGD Area
- Generated ground surface elevation grid using well ground surface elevations
 - Imported excel file with model coordinates and elevations. Used Natural Neigbor function for interpolation.
 - Adjusted ground elevation of single cells in Layer 1 around FGD Ponds to reflect berm heights on engineer drawings (Pond-A = 450', Pond-B = 430', Pond-C = 455').
 - Set interior pond areas to the berm elevations (allows use of Lake package for ponds)

**Boundary Conditions**

- Constant head boundary or 420 feet set in Layer 2 along western edge of Ash Landfill 1 based on water elevations in wells in that area.

- Constant head boundary of 410 feet set in Layer 2 for Twin Oak Reservoir. Did not use Lake package because primary concern is leakage from ponds, not the reservoir. Normal level of lake is 401 feet, but 410 feet matched better with May 2019 groundwater elevation contours.
- Constant head boundaries created gw gradient similar to the one shown on May 2019 pot map, with groundwater flowing toward reservoir.
- Lake Package used for ponds FGD-A, B, and C. Assumed constant water levels of 10 feet above bottom of ponds. Pond bottoms based on engineering drawings. Lake Package parameters:

| Pond ID | Start | Stop (days) | Lake Stage (ft amsl) | Bottom (ft amsl) | Precip | Runoff | Evap | Lake Bed (ft) | K of Lake Bed (cm/s) |
|---|---|---|---|---|---|---|---|---|---|
| A | 0 | 10950 | 432 | 422 | 0 | 0 | 0 | 3 | 1E-06 |
| B | 0 | 10950 | 428 | 418 | 0 | 0 | 0 | 3 | 1E-06 |
| C | 0 | 10950 | 449 | 439 | 0 | 0 | 0 | 3 | 1E-06 |

**Calibration**

Model vs.Observed Head in CCR wells (May 2019):
Residual Mean: 0.135 ft
Standard Error of the Estimate: 0.367 ft
Correlation Coefficient: 0.873

**Deliverables for PHREEQC Model**

1. VMOD head files (x, y, z, and head)
2. Surface elevation grid
3. Shapefile showing pond outlines

**References**

Pastor, Behling & Wheeler, LLC (PBW), 2017. Coal Combustion Residual Rule Groundwater Monitoring System Certification, Oak Grove Steam Electric Station.

**APPENDIX C**

# Geochemical Modeling Saturation Indices

**APPENDIX C**
**GEOCHEMICAL MODELING**
**RELEVANT MINERAL PHASES - Saturation Indices**
**OAK GROVE SES FGD PONDS AREA**

| MINERAL PHASES - Saturation Indices | | FGD-1 05-2019 | FGD-2 05-2019 | FGD-3 05-2019 | FGD-4 05-2019 | FGD-5 05-2019 | FGD-6 05-2019 | FGD-8 05-2019 | FGD-11 05-2019 | FGD-12 05-2019 | FGD-15 06-2019 | FGD-16 06-2019 | FGD-A-POND 06-2019 | FGD-B-POND 06-2019 | FGD-1 05-2020 | FGD-2 05-2020 | FGD-3 05-2020 | FGD-4 05-2020 | FGD-5 05-2020 | FGD-6 05-2020 | FGD-8 05-2020 | FGD-11 05-2020 | FGD-12 05-2020 | FGD-A-POND 05-2020 | FGD-B-POND 05-2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Otavite | $CdCO_3$ | -3.52 | -3.00 | -2.59 | -3.13 | -3.25 | -2.72 | -3.36 | -3.00 | -3.65 | | | -4.45 | -4.38 | -3.18 | -3.82 | -2.72 | -3.00 | -2.93 | -2.82 | -3.38 | -3.13 | -3.66 | -3.79 | -4.44 |
| Ferrihydrite | $Fe(OH)_3$ | **2.50** | **2.34** | **2.41** | **2.18** | **1.75** | **4.12** | **4.99** | **3.50** | **2.77** | **1.88** | **2.03** | **1.75** | **0.73** | **3.39** | **1.97** | **1.90** | **2.29** | **2.09** | **3.10** | **5.06** | **2.66** | **4.71** | **2.27** | **2.39** |
| Siderite | $FeCO_3$ | -2.73 | -2.12 | -1.82 | -2.28 | -2.37 | -1.89 | **1.37** | -2.02 | -2.88 | -2.64 | -2.12 | -3.58 | -3.45 | -1.49 | -2.76 | -1.96 | -2.15 | -2.04 | -1.98 | **1.25** | -2.16 | -2.88 | -3.40 | -3.49 |
| Melanterite | $FeSO_4$ $7H_2O$ | -7.31 | -7.52 | -7.25 | -7.72 | -7.64 | -7.62 | -4.24 | -7.82 | -7.86 | -6.91 | -8.03 | -6.87 | -6.88 | -6.54 | -7.34 | -7.32 | -7.64 | -7.57 | -7.50 | -4.35 | -7.89 | -7.80 | -7.05 | -6.92 |
| Anglesite | $PbSO_4$ | -4.82 | -5.32 | -5.34 | -5.51 | -5.41 | -5.59 | -4.87 | -5.43 | -5.31 | | | -4.23 | -4.26 | -5.03 | -4.89 | -5.33 | -5.49 | -5.44 | -5.44 | -5.52 | -5.38 | -3.33 | -4.42 | -4.27 |
| Gypsum | $CaSO_4:2H_2O$ | -2.16 | -2.05 | -1.60 | -2.23 | -1.86 | -2.44 | -1.32 | -1.99 | -3.17 | -0.57 | -2.95 | **-0.13** | **-0.17** | -1.94 | -1.05 | -1.82 | -2.16 | -1.69 | -2.19 | -1.22 | -1.98 | -2.75 | **0.11** | **0.03** |
| Jarosite-H | $(H_3O)Fe_3(SO_4)_2(OH)_6$ | -3.88 | -5.55 | -4.12 | -5.33 | -5.91 | **-0.40** | **3.24** | -2.40 | -3.92 | -4.18 | -7.19 | -3.50 | -6.81 | -2.59 | -4.86 | -5.41 | -4.99 | -6.16 | -2.80 | **3.42** | -4.72 | **1.80** | -2.16 | -2.01 |
| Jarosite-K | $KFe_3(SO_4)_2(OH)_6$ | **1.15** | **-0.23** | **1.05** | **-0.50** | -0.86 | **4.36** | **9.20** | **3.09** | **0.87** | **1.16** | -1.90 | **2.91** | **-0.33** | **2.84** | **0.52** | **-0.41** | **-0.13** | -0.73 | **1.88** | **9.41** | **0.71** | **7.19** | **4.68** | **4.62** |
| Jarosite-Na | $NaFe_3(SO_4)_2(OH)_6$ | -0.85 | -1.71 | **-0.28** | -1.87 | -2.68 | **3.49** | **7.45** | **1.62** | -1.38 | **-0.25** | -3.84 | **0.06** | -3.17 | **0.97** | -0.90 | -1.75 | -1.38 | -2.57 | **1.01** | **7.64** | -0.82 | **4.44** | **1.77** | **1.78** |
| Calcite | $CaCO_3$ | -1.73 | -0.81 | **-0.32** | -0.95 | -0.76 | -0.87 | **0.12** | **-0.36** | -2.36 | **-0.46** | -1.21 | -1.00 | -0.90 | -1.06 | -0.64 | -0.63 | -0.83 | **-0.32** | -0.84 | **0.22** | **-0.41** | -2.00 | **-0.41** | -0.71 |
| Magnesite | $MgCO_3$ | -2.77 | -1.97 | -1.35 | -2.09 | -1.75 | -2.15 | -0.85 | -1.59 | -3.52 | -1.65 | -2.70 | -1.56 | -1.44 | -2.19 | -1.90 | -1.66 | -2.06 | -1.39 | -2.20 | -0.86 | -1.76 | -3.09 | -0.97 | -1.32 |
| Barite | $BaSO_4$ | **0.12** | **0.22** | **0.23** | **0.08** | **0.08** | **0.15** | **0.98** | **0.48** | **-0.48** | | | **1.10** | **1.10** | **0.47** | **0.53** | **-0.01** | **0.12** | **0.16** | **0.15** | **0.93** | **0.40** | **0.26** | **1.61** | **0.97** |
| Witherite | $BaCO_3$ | -4.74 | -3.82 | -3.77 | -3.92 | -4.10 | -3.56 | -2.85 | -3.17 | -4.95 | | | -5.06 | -4.91 | -3.93 | -4.35 | -4.09 | -3.84 | -3.75 | -3.77 | -2.91 | -3.31 | -4.26 | -4.19 | -5.05 |
| Fluorite | $CaF_2$ | -2.54 | -2.30 | -1.63 | -2.39 | -1.74 | -2.06 | -3.11 | -2.08 | -3.98 | -1.47 | -3.26 | **1.04** | **1.04** | -2.70 | -3.02 | -1.69 | -2.49 | -1.94 | -2.67 | -3.03 | -2.02 | -3.67 | **1.14** | **0.99** |
| CoCO3 | $CoCO_3$ | -4.24 | -3.67 | -3.20 | -3.84 | -3.95 | -2.83 | -3.14 | -3.60 | -4.40 | | | -5.08 | -4.96 | -2.65 | -4.30 | -3.53 | -3.73 | -3.61 | -3.57 | -3.38 | -3.73 | -3.93 | -4.60 | -4.99 |
| Cerrusite | $PbCO_3$ | -2.93 | -2.61 | -2.59 | -2.76 | -2.84 | -2.55 | -1.95 | -2.32 | -3.03 | | | -3.64 | -3.52 | -2.68 | -3.02 | -2.66 | -2.70 | -2.61 | -2.61 | -2.62 | -2.33 | -1.10 | -3.48 | -3.54 |
| Carbon Dioxide | pCO2(g) [b] | -1.83 | -1.60 | -0.95 | -1.20 | -1.04 | -1.37 | -0.98 | -1.38 | -1.86 | -1.36 | -1.45 | -1.81 | -1.80 | -2.05 | -1.54 | -0.93 | -1.17 | -1.41 | -1.25 | -1.01 | -1.34 | -1.98 | -1.58 | -1.89 |

**Notes:**

Saturation indices > -0.5 identified by bold type and grey shading

[b] pCO2(g) values presented at 10^value atm

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# APPENDIX C

## Tier IV Monitored Natural Attenuation Performance Monitoring Plan

**REPORT**

# Tier IV MNA Performance Monitoring Plan

*Oak Grove Steam Electric Station - FGD Ponds*

*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

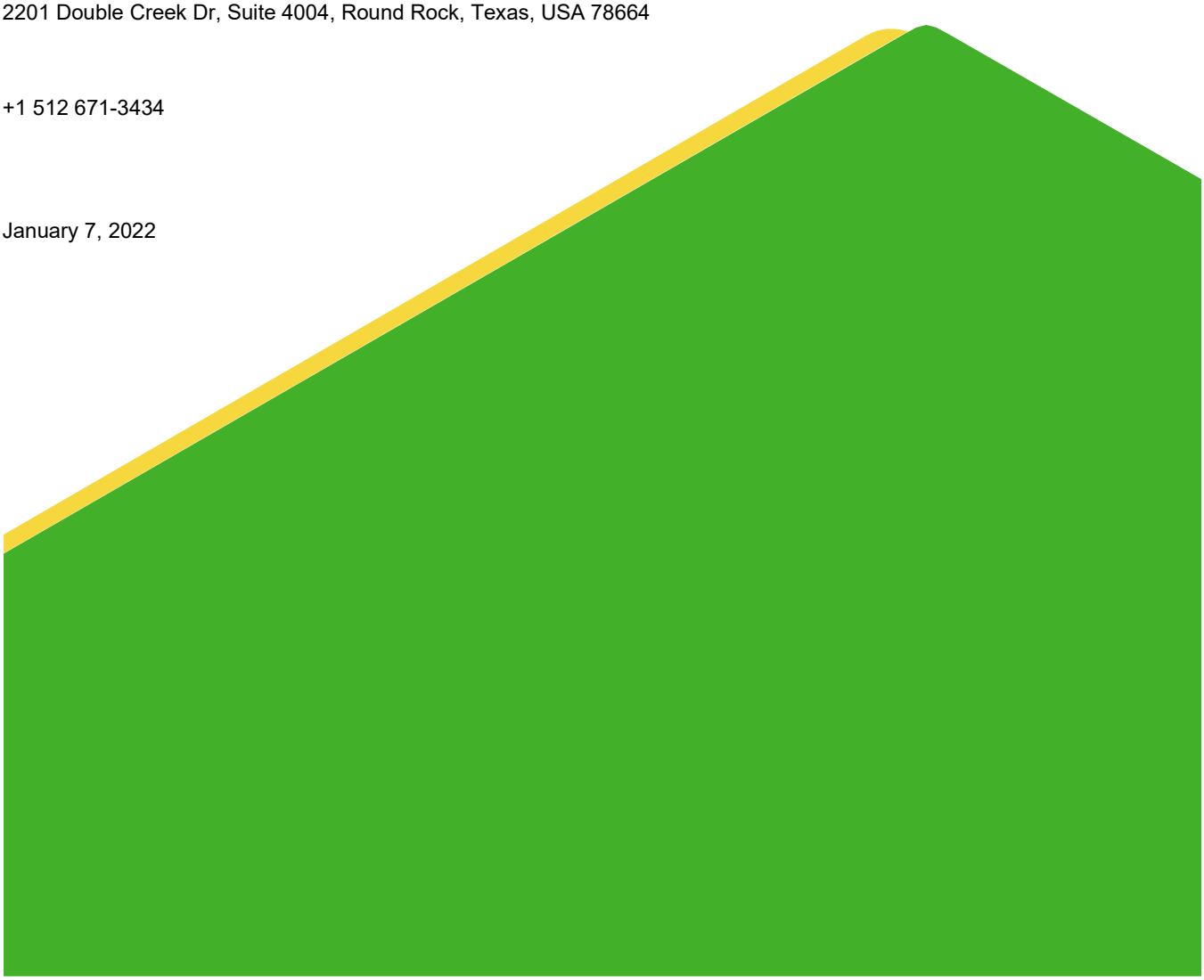
Submitted by:

**Golder Associates Inc.**

2201 Double Creek Dr, Suite 4004, Round Rock, Texas, USA 78664

+1 512 671-3434

January 7, 2022



# Distribution List

Renee Collins, Luminant

David Mitchell, Luminant

Eric Chavers, Luminant

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Figure 1 Detailed Site Plan

# 1.0 INTRODUCTION

On behalf of Oak Grove Management Company (Luminant), Golder Associates, Inc. (Golder), Member of WSP, has prepared this Tier IV Monitored Natural Attenuation (MNA) Performance Monitoring Plan for the FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the "FGD Ponds") located at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas (hereafter, the "Site"). Luminant manages coal combustion residuals (CCR) in the FGD Ponds, which are subject to applicable requirements of 40 Code of Federal Regulations (CFR) Part 257 Subpart D as amended (CCR Final Rule).

Statistically significant levels (SSLs) of cobalt and lithium above groundwater protection standards (GWPSs) were detected in the uppermost aquifer hydraulically downgradient of the FGD Ponds during 2018 assessment monitoring. In response to the 2018 cobalt and lithium SSLs, an Assessment of Corrective Measures (ACM) report was completed for the FGD Ponds in September 2019 as required by 40 CFR § 257.96 (Golder 2019). The ACM demonstrated that groundwater concentrations of cobalt and lithium were stable or decreasing at all wells and the extent of cobalt and lithium SSLs was delineated on-site (i.e., no offsite migration was indicated). An Alternate Source Demonstration (ASD) was completed in accordance with 40 CFR § 257.95(g)(3)(ii) in October 2020 (Golder 2020), which indicated that a source other than the FGD Ponds caused the lithium SSL. Lithium has therefore been eliminated as a constituent of concern at the FGD Ponds. The ACM was updated in May 2021 (Golder 2021a) to remove lithium from the list of constituents evaluated in the ACM.

As documented in the Remedy Selection Report for the FGD Ponds (Golder 2021b), MNA in conjunction with source control measures (i.e., retrofitting the liner in FGD-A Pond) was selected as the remedy to address cobalt SSLs at the Site. MNA refers to the reliance on natural attenuation processes (within the context of a carefully controlled and monitored approach) to achieve site-specific groundwater remediation objectives. MNA relies on a range of natural processes, including sorption, (co)precipitation, radioactive decay, dispersion, dilution, and abiotic degradation/transformation to achieve remediation objectives. A Tier I MNA evaluation report was completed in December 2019 (Golder 2019b) and a Tier II/III MNA evaluation report was completed in June 2021 (Golder 2021c). Based on the results of these MNA evaluations, the following was concluded regarding cobalt:

- Physical and chemical attenuation of cobalt is occurring at the Site. Cobalt levels are stable and the aquifer has adequate capacity to attenuate cobalt in a reasonable timeframe. Modeling indicates that cobalt attenuation will be efficient and stable in the long term. Cobalt in the CCR unit porewater is well below the level that is observed in groundwater, including when a periodic exceedance occurs in downgradient groundwater. Therefore, MNA would be effective in remediating cobalt in groundwater beneath and downgradient of the FGD Ponds.

The purpose of this Tier IV MNA Performance and Monitoring Plan is to describe the groundwater monitoring network, sampling and analysis methods, procedures for assessing long-term MNA effectiveness, and reporting for the MNA monitoring program.

# 2.0 SITE SETTING

The OGSES is located approximately 10 miles north of the city of Franklin in Robertson County, Texas. The FGD Ponds are located approximately 2,500 feet northwest of the OGSES power generation units (**Figure 1**). Construction of the OGSES began in the mid-1980s; however, plant construction was suspended in the mid-1980s prior to completion. OGSES construction resumed in 2007 and the plant was commissioned in 2010. The OGSES is expected to remain in operation for the foreseeable future, depending on future power demands.

## 2.1 Site Hydrogeology and CCR Monitoring Well Network

The OGSES is located in the outcrop area of the Eocene-aged Wilcox Group (Barnes 1970), which is divided into three formations in the region: the Calvert Bluff, Simsboro, and Hooper Formations (in order from youngest to oldest). The FGD Ponds are completed in the Calvert Bluff Formation, which consists of unconsolidated to moderately consolidated clay and silt, with various amounts of interbedded sand and lignite.

Based on soil borings completed at the Site, the geology near the FGD Ponds generally consists of an upper zone of relatively thick, interbedded sand and clay strata underlain by a lower zone of interbedded silty to clayey sand and well sorted sand (PBW 2017). The uppermost groundwater-bearing unit (GWBU) occurs under unconfined conditions within the shallow interbedded sand units of the Calvert Bluff Formation. Groundwater elevations have generally been highest southeast of the FGD Ponds and relatively flat in the vicinity of the FGD Ponds. Since CCR monitoring began in 2015, the inferred groundwater flow direction at the Site has been to the east-northeast toward Twin Oak Reservoir, which borders the FGD Pond area to the north and east.

The CCR groundwater monitoring well network at the FGD Ponds was established in 2015 using Site monitoring wells screened in the uppermost GWBU (FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, FGD-8, FGD-11, and FGD-12). A map of the CCR groundwater monitoring network is provided on **Figure 1**.

# 3.0 CCR GROUNDWATER SAMPLING AND ANALYSIS PROGRAM

The CCR Rule establishes groundwater sampling and analysis criteria that are designed to create consistency and ensure that monitoring results provide accurate representations of groundwater quality at the CCR groundwater monitoring wells. The groundwater monitoring program at the FGD Ponds consists of a combination of detection monitoring of Appendix III constituents in accordance with 40 CFR §257.94 and assessment monitoring of Appendix IV constituents in accordance with 40 CFR §257.95. The current CCR groundwater monitoring program includes the sampling and analysis of cobalt (an Appendix IV constituent) and satisfies the sampling and analysis requirements of the MNA monitoring program.

# 4.0 MNA MONITORING PROGRAM

Routine groundwater monitoring is required to verify that the MNA component of the selected Site remedy is achieving the site-specific groundwater remediation objectives. The MNA monitoring well network will be the same as the CCR monitoring network, and includes the CCR wells listed in Section 2.1 and shown on **Figure 1**. The assessment monitoring program groundwater samples, which are collected semi-annually, will be used to assess the effectiveness of the MNA remedy in addressing SSLs observed at the Site.

## 4.1 MNA Groundwater Sampling Procedures

This section describes groundwater sampling and analysis procedures to comply with the requirements of 40 CFR §257.90 - §257.95 of the CCR Rule and to additionally satisfy requirements of the MNA monitoring program.

### 4.1.1 General Groundwater Sampling Procedures

Prior to collecting groundwater samples, each well is inspected for signs of damage to the well protective casing and well pad. Each field instrument is calibrated according to the manufacturer's instructions prior to use. Special care should be exercised to prevent contamination of the groundwater and extracted samples during the sampling activities. The primary way in which such contamination can occur is contact with improperly cleaned equipment. To prevent such contamination, all non-dedicated sampling equipment is thoroughly cleaned before and between use at different sampling locations.

### 4.1.2 Groundwater Level Measurements

Groundwater levels are measured prior to purging the wells. Using a pre-cleaned water level meter, the groundwater surface is measured from the casing datum to the nearest 0.01-foot. Total depth measurements should also be collected periodically to assess potential occlusion of the well screen.

### 4.1.3 Well Purging and Sampling

Well purging and sampling are conducted using either a submersible pump, peristaltic pump, or other similar device in accordance with standard low-flow sampling procedures. The sampler withdraws water in a manner that minimizes stress (drawdown) to the system to the extent practicable. When the pump intake is located within the screened interval, the water pumped is drawn in directly from the formation with little mixing of casing water or disturbance to the sampling zone. Thus, sample results are more representative of the constituents present in the groundwater than when pumping at higher rates.

Purging rates during sample collection are generally performed at 0.5 liters per minute (L/min) or less. Field parameters (pH, temperature, conductivity, turbidity, dissolved oxygen (DO), and oxidation-reduction potential (ORP)) are measured to evaluate when the well is adequately purged. pH, DO, and ORP are also considered key MNA parameters important for evaluating geochemical conditions in the groundwater-bearing unit. Turbidity in the samples should be minimized as much as possible by using minimal pumping rates, dedicated equipment whenever possible, and positioning the intake for the sample tubing or submersible pump off of the bottom of the well.

At least three field measurements should be taken during the course of purging the well. If the parameters have not stabilized at that time, field measurements and purging will continue until two consecutive readings have stabilized to within the following limits:

- Temperature: +/-1° C
- pH: +/-0.1 pH units
- Conductivity: +/-10%
- Turbidity: +/- 10%
- Dissolved oxygen: +/- 10%
- Oxidation-reduction potential: +/- 10%

Sample extraction is accomplished by using the pump that was previously used to purge the well. The sample bottle is filled directly from the pump line. The pumping rate and parameter measurements are recorded on groundwater sampling forms in the field. If a well goes dry during purging, sampling is performed after the well has sufficiently recharged to allow sample collection. Groundwater samples are not filtered in the field prior to collection in accordance with Section 257.93(i) of the CCR Rule.

### 4.1.4 Chain-of-Custody Control

Samples are collected in laboratory-supplied containers and chain-of-custody procedures are followed to establish a written record concerning sample movement between the sampling site and the testing laboratory. Each shipping container has a chain-of-custody form completed by the sampling personnel packing the samples. The chain-of-custody form for each container is completed and sealed in the shipping container.

## 4.2 MNA Analytical Procedures

The laboratory analytical methods are appropriate and commonly utilized U.S. Environmental Protection Agency (EPA) methodologies, or other similar standard methodologies. Typical methodologies used to analyze the MNA constituents are presented below:

- Cobalt by EPA Method SW6010/6020 (evaluated during each MNA sampling event).
- General geochemical parameters (evaluated periodically):
  - Major cations: calcium, magnesium, potassium, and sodium by EPA Method SW6010/6020;
  - Major anions: chloride and sulfate by Standard Method E300; and
  - Alkalinity (bicarbonate, carbonate, hydroxide, and total) by Standard Method M2320.

## 4.3 MNA Data Assessment

The MNA monitoring program is a long-term performance monitoring program designed to confirm concentration reductions and document trends due to attenuation mechanisms. The MNA program will assess the effectiveness of the remedy by:

- Evaluating whether cobalt concentrations are present in groundwater at SSLs above the GWPS.
- Evaluating long-term trends in cobalt concentrations in CCR wells where SSLs have been identified to demonstrate that the groundwater plume is stable or decreasing and not expanding; and
- Evaluating geochemical parameters measured in the field (e.g., pH, DO, and ORP) during each sampling event and periodically collecting the general geochemistry parameter data listed in Section 4.2 to assess changes to the general geochemical conditions of the aquifer.

Per 40 CFR §257.98(c), the selected remedy will be considered complete when: (1) The owner or operator of the CCR unit demonstrates compliance with the GWPS established under 40 CFR § 257.95(h) has been achieved at all points within the plume of contamination that lie beyond the groundwater monitoring well system established under 40 CFR § 257.91, (2) Compliance with the GWPS established under 40 CFR § 257.95(h) has been achieved by demonstrating that concentrations of constituents listed in appendix IV to this part have not exceeded the GWPSs for a period of three consecutive years using the statistical procedures and performance standards in 40 CFR § 257.93(f) and (g), and (3) All actions required to complete the remedy have been satisfied.

## 4.4 Reporting

A summary of the MNA data assessment will be included in the *Annual Groundwater Monitoring and Corrective Action Report* each year. The report will: 1) confirm whether the groundwater plume is stable, shrinking, or expanding; 2) contain data summaries including Appendix III and Appendix IV constituent concentrations and geochemical data summaries, and 3) evaluate the general effectiveness of attenuation processes with trend analysis and other statistical evaluations of the data, as appropriate.

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# Signature Page

**Golder Associates Inc.**

Roberta Russell
*Senior Geologist*

William Vienne
*Senior Consulting Hydrogeologist*

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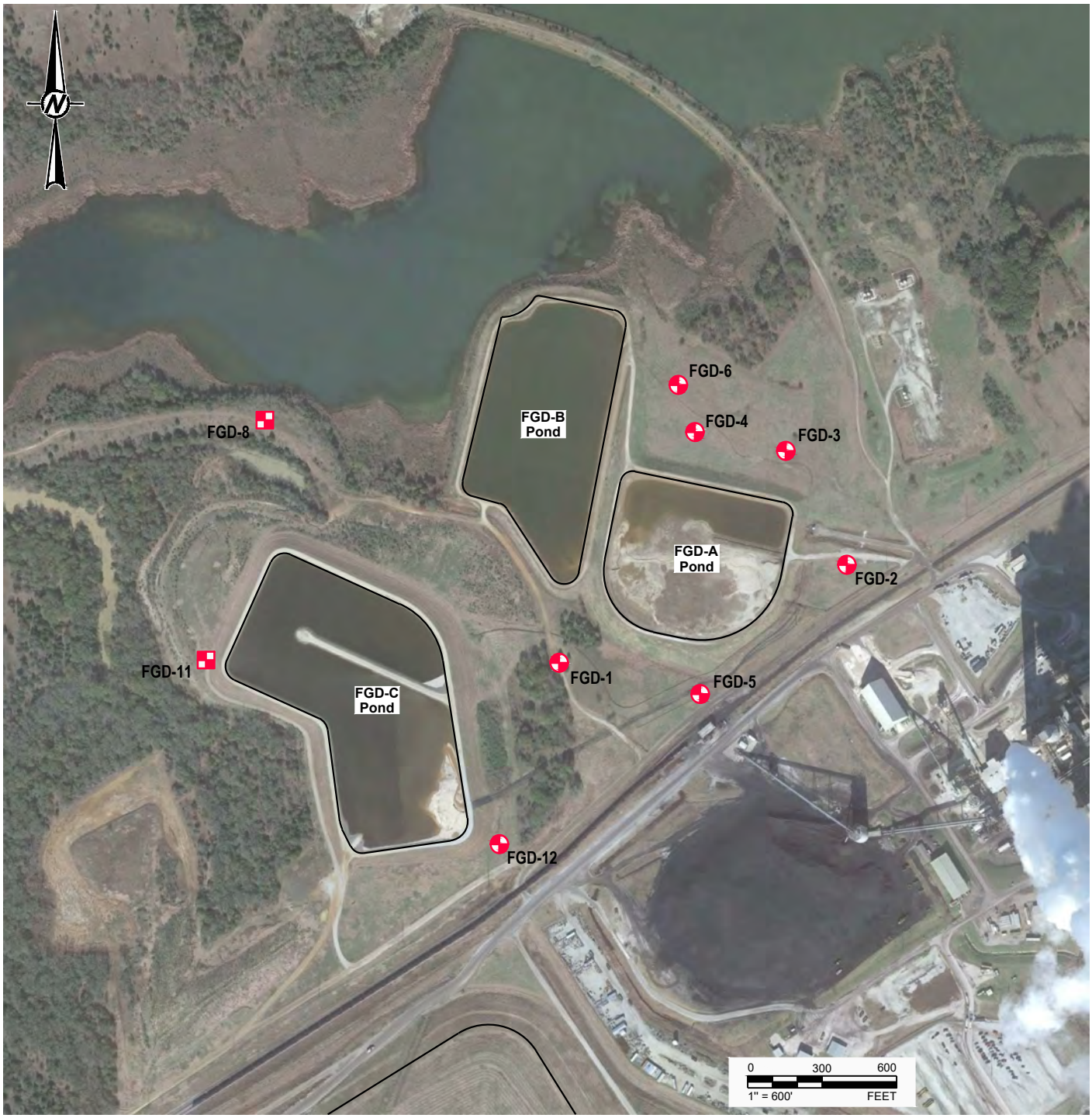


**LEGEND**

- DOWNGRADIENT CCR MONITORING WELL
- BACKGROUND CCR MONITORING WELL

**REFERENCE(S)**

BASE MAP TAKEN FROM GOOGLE EARTH IMAGERY DATED 12/2/18.

APPENDIX F Revision 1 November 21, 2022

CLIENT
LUMINANT

PROJECT
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

TITLE
**DETAILED SITE PLAN - FGD POND AREA**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-01-23 |
| DESIGNED | AJD |
| PREPARED | AJD |
| REVIEWED | WFV |
| APPROVED | WFV |

| PROJECT NO. | REV. | FIGURE |
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Path: \\texarkanadata\Projects - Round Rock_2019\19122262 - Luminant\F - Oak Grove\ | File Name: FIG 1 - Detaile Site Plan (FGD Pond Area).dwg
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# APPENDIX G – CLOSURE AND POST-CLOSURE CARE

**Closure Plan – Ash Landfill 1**
**Closure Plan-Addendum No. 1– Ash Landfill 1**
**Closure Plan – FGD Ponds**
**Closure Plan-Addendum No. 1 – FGD Ponds**
**Post-Closure Plan – Ash Landfill 1**
**Post-Closure Plan – FGD Ponds**

CLOSURE PLAN

# CLOSURE PLAN

# ASH LANDFILL 1

## Oak Grove Steam Electric Station

LUMINANT

**Submitted To:** Luminant
1601 Bryan Street
Dallas, TX 75201

**Submitted By:** Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

Professional Engineering Firm
Registration Number F-2578

**October 2016**

**Project No. 1648164**

Golder Associates


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Appendix A Alternate Final Cover – Infiltration Rate Comparison

# 1.0 INTRODUCTION

## 1.1 Purpose

The "Standards for Disposal of Coal Combustion Residuals (CCR) in Landfills and Surface Impoundments" (40 Code of Federal Regulations (40 CFR) Part 257, Subpart D), effective October 19, 2015, requires that existing CCR units have a written Closure Plan prepared in accordance with §257.102(b). This Closure Plan provides the following information for the Oak Grove Steam Electric Station's (OGSES's) CCR landfill identified as Ash Landfill 1.

- A description of steps necessary to close CCR unit and any point during the active life, including:
  - A description of how CCR unit will be closed;
  - A description of how the final cover will meet the performance standards§257.102(d), and the methods used to install the final cover;
  - An estimate of maximum inventory of CCR ever on-site during the active life of the CCR unit;
  - An estimate of largest area requiring final cover at any time during the CCR unit's active life; and
  - A schedule, including steps, major milestones, durations.

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## 1.2 Site Background

The OGSES generates bottom ash, fly ash, boiler slag and flue gas desulfurization (FGD) sludge (gypsum) during electricity generation. Flyash and bottom ash generated at the facility (other than that amount that is sold/beneficially used in accordance with the CCR regulation), is handled in a dry manner and deposited in Ash Landfill 1.

This Closure Plan addresses the existing CCR landfill, Ash Landfill 1, at the OGSES. A separate Closure Plan addresses the existing CCR surface impoundments (FGD-A, FGD-B, and FGD-C Ponds).

The location of the existing CCR units at the OGSES are shown on Figure 1.

## 2.0 DESCRIPTION OF CLOSURE [§257.102(b)(1)(i)]

Ash Landfill 1 will be closed in-place and capped with a final cover system. Cell 1 of Ash Landfill 1 received final closure in 2015.

## 2.1 Final Cover System [§257.102(b)(1)(iii)]

Ash Landfill 1 is lined with a 3-foot thick compacted clay with a hydraulic conductivity less than 1 x $10^{-7}$ cm/sec and the remainder of the cells will be closed with an alternate final cover meeting the requirements of §257.102(d)(3)(ii)(A) through (C)[1]. Specifically, the final cover system over Ash Landfill 1 will:

- Achieve an equivalent reduction in infiltration as §257.102(d)(3)(i)(A) and (B); i.e.
  - Have a permeability less than or equal to the permeability of bottom liner system or natural subsoils or no greater than 1 x $10^{-5}$ cm/sec, whichever is less;
  - Include an infiltration layer with a minimum 18 inches of earthen material;
- Include an erosion layer providing equivalent protection from wind or water erosion as specified in §257.102(d)(3)(i)(C); i.e.
  - Include an erosion layer containing a minimum 6 inches of earthen material and capable of sustaining native plant growth; and
- Accommodate settling and subsidence.

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The final cover system for Ash Landfill 1 will be comprised of (from the top to bottom):

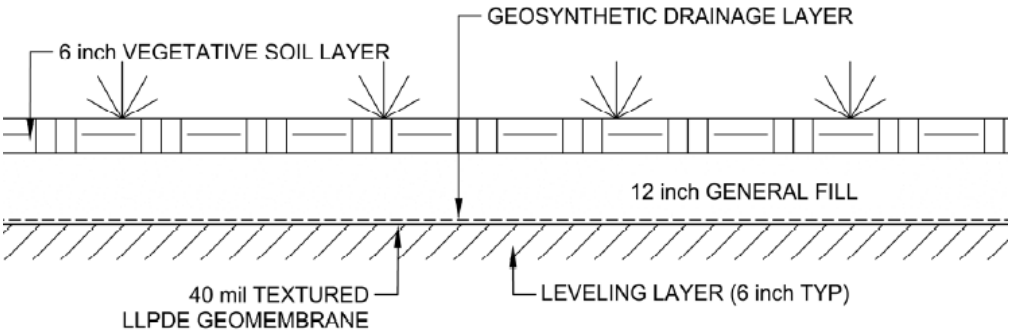
- 18-inch erosion layer consisting of 12 inches of general fill overlain with 6 inches of soil capable of supporting native vegetation;
- Geosynthetic drainage layer; and
- 40-mil linear low-density polyethylene (LLDPE) textured geomembrane.

The proposed alternate final cover replaces the soil infiltration layer with a geomembrane. Since infiltration is limited to potential defects in the geomembrane, the infiltration through the proposed cover will be lower than through a soil infiltration layer. A comparison of infiltration rates to demonstrate that an equivalent reduction in infiltration is included in Appendix A.

The final cover system for Ash Landfill 1 is illustrated below.

[1] The CCR Rule references (f)(3)(ii)(A) through (D), but this appears to be a typo.

**Ash Landfill 1 Final Cover System**




### 2.1.1 Final Cover Design and Performance

Table 1 describes how the final cover system meet the performance standards in §257.102(d).

**Table 1 - Performance Standards**

| Standard | Discussion |
|---|---|
| Control, minimize or eliminate post-closure infiltration, releases of CCR, leachate, or contaminated run-off | Geomembranes are very effective barriers to infiltration and contact with CCR. Liquid will be removed from the CCR prior to final cover construction. |
| Preclude future impoundment of water sediment, or slurry | Any pipes leading to the landfill will be removed or abandoned and the final cover will be sloped to drain surface water. |
| Include measures for major slope stability | The textured geomembrane will improve interface shear strength and the geosynthetic drainage layer will prevent development of hydrostatic forces in the overlying erosion layer. |
| Minimize maintenance | Routine maintenance will consist of mowing the vegetative cover. Other anticipated maintenance activities are limited to repair of erosion rills, and placement of fill in depressions. |
| Complete in time consistent with good practice | The proposed final cover systems is routinely used at waste containment facilities. Well-developed industry experiences in installing such final cover systems will ensure most efficient construction time. |

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### 2.1.2 Methods and Procedures

The final cover system design, particularly the final cover grades, will be re-evaluated prior to initiation of final closure, based on the actual CCR grades at the time of closure. The final cover will be installed in accordance with a construction quality assurance (CQA) plan, which will be developed prior to commencing the work. The CQA plan will require monitoring of final cover construction to ensure that the final cover system will meet the design intent and conforms to the performance standards.

As described in Section 4.3 of the Closure Plan, a certification that the final cover system meets the requirements of §257.102(d)(3)(iii) will be provided by a qualified professional engineer, prior to initiation of final closure.

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## 3.0 CCR QUANTITY [§257.102(b)(1)(iv-v)]

The approximate capacity of Ash Landfill 1 is 15.6 million cubic yards.

Final cover was placed over Cell 1 of Ash Landfill 1 in 2015. It is anticipated that Cell 2 will be closed in 2017. The remaining cells, Cells 3 and 4, are anticipated to reach capacity in approximately 2023. The final cover for these two cells cover an area of approximately 68 acres, which represents the largest area of the CCR unit ever requiring final cover.

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## 4.0 CLOSURE COMPLETION SCHEDULE [§257.102(b)(1)(vi)]

As mentioned above, Ash Landfill 1 is anticipated to reach capacity in 2023 and completion all closure activities are anticipated to occur in 2023-2024. Note that these estimates may vary depending on the future CCR volumes and the other operational factors.

### 4.1 Commencement of the Closure Plan [§257.102(e)]

In accordance with §257.102(e), commencement of the Closure Plan will occur as specified in either timeframe defined below:

- No later than 30 days after the date on which either:
  - The CCR unit receives the known final receipt of waste; or
  - The last known CCR is removed for beneficial use.

- Within 2 years of either:
  - The CCR unit last receives waste; or
  - The last CCR is removed for beneficial use.

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Initiation of closure work may be extended two years with documentation in accordance with §257.102(e)(2)(ii) that there is reasonable likelihood that the CCR unit will accept wastes in the foreseeable future or CCR will be removed from the unit for beneficial use.

Closure of a CCR unit has commenced if waste placement has ceased and any of the following are completed (§257.102(e)(3)):

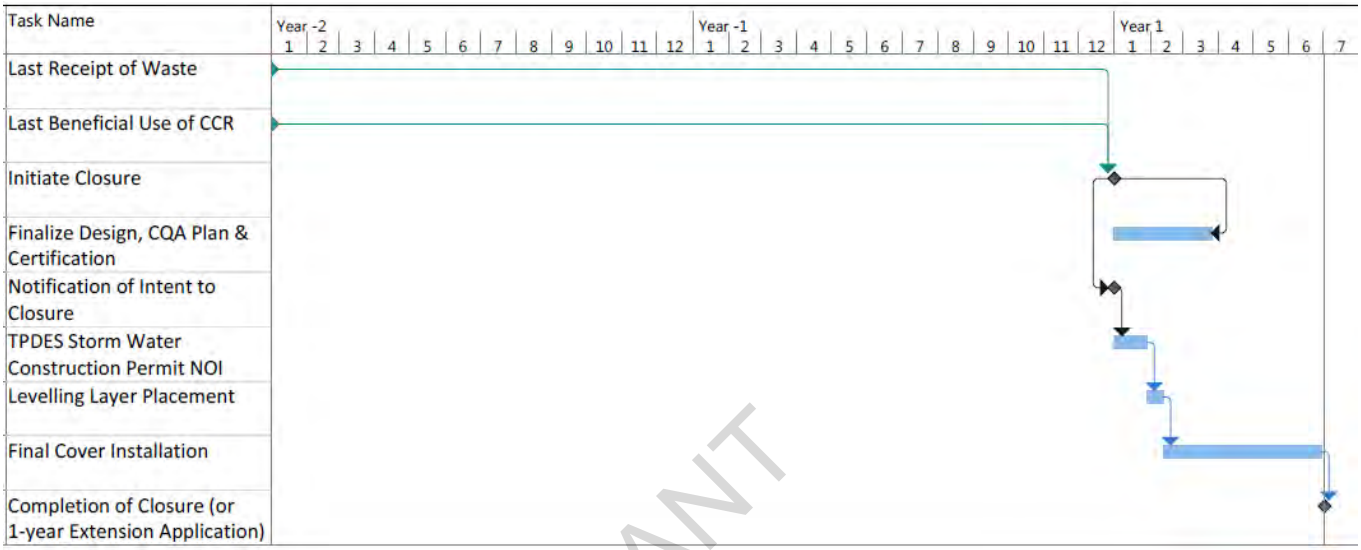
- Taken any steps necessary to implement steps in the Closure Plan;
- Submitted a completed application for any required state or agency permit or permit modification; or
- Taken any steps necessary to comply with prerequisite state standards to initiate or complete the closure of a CCR unit.

### 4.2 Completion of Closure Activities [§257.102(f)]

Closure of Ash Landfill 1 must be completed within 6 months of commencing closure. Completion of closure may be extended up to a maximum of 2 years via 1-year increments with documentation in accordance with §257.102(f)(2)(i) that, due to factors beyond the facility's control (e.g. significant weather delays, time required for dewatering CCR, delays due to state permitting or approval, etc.), it is not feasible to complete the closure within the required timeframe. An extension may also apply if the alternative closure requirements should apply to the CCR units in accordance with §257.103.

A Gantt chart illustrating the sequential steps of the CCR unit closure process, including identification of major milestones and estimated timeframes to complete each closure phase, is provided below.

**Final Closure Schedule**

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### 4.2.1 *Closure Certification*

A certification from a qualified professional engineer verifying that closure has been completed in accordance with the Closure Plan must be obtained in accordance with §257.102(f)(3).

## 4.3 Notification of Intent to Close CCR Unit [§257.102(g)]

No later than the date of final closure initiation, a notification of intent to close the CCR unit must be prepared. The notification must include certification by a qualified professional engineer that the final cover system meets the requirements of §257.102(d)(3)(i) or (ii).

## 4.4 Notification of Closure Completion [§257.102(h)]

No later than 30 days after of completion of closure, a notification of closure of a CCR unit must be prepared. The notification must include certification by a qualified professional engineer that closure was completed in accordance with the Closure Plan.

## 4.5 Deed Notations [§257.102(i)]

Following closure of the CCR unit, a certified notation on the deed to the facility or site property, or on some other instrument that is normally examined during title searches, that will in perpetuity notify any potential purchaser of the property that the land has been used as a CCR unit and that future uses of the land are

restricted will be filed and recorded in the deed records of the office of the County Clerk of Robertson County.

A notification will be placed in the facilities operating record within 30 days of recording a notation to the deed to the property.

## 4.6 Closure Recordkeeping [§257.102(j)]

The owner or operator of the CCR unit must comply with the closure recordkeeping requirements specified in §257.105(i), the closure notification requirements specified in §257.106(i), and the closure internet requirements specified in §257.107(i).

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## 5.0 CONCLUSION

This Final Closure Plan has been prepared by Golder Associates Inc. to describe the steps necessary to close the existing Ash Landfill 1 at OGSES at any point during the active life of the CCR unit with recognized and generally accepted good engineering practices.

If further information from Golder, please contact the undersigned at (281) 821-6868.

**GOLDER ASSOCIATES INC.**

William E. Gordon, PE
Senior Engineer

Jeffrey B. Fassett, PE
Associate Geotechnical Engineer

JBF/VK

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## 6.0 CERTIFICATION

I hereby certify that this Closure Plan has been prepared in general accordance with normally accepted civil engineering practices and in accordance with the requirements of 40 CFR 257.102.

Jeffrey B. Fassett, PE
Golder Associates Inc.
Firm Registration Number F-2578

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**REFERENCE(S)**
AERIAL PHOTO SOURCED FROM GOOGLE EARTH PRO DATED 2016

10/10/16

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

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1" = 800' FEET

CLIENT
LUMINANT POWER
OAK GROVE

CONSULTANT
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2016-09-29 |
| DESIGNED | VK |
| PREPARED | TNB |
| REVIEWED | MX |
| APPROVED | JBF |

PROJECT
2016 COAL COMBUSTION RESIDUALS
ENGINEERING SERVICES

TITLE
**GENERAL SITE MAP**

PROJECT NO. 1648164 | REV. ---- | FIGURE 1

APPENDIX G-Revision 1 November 21, 2022

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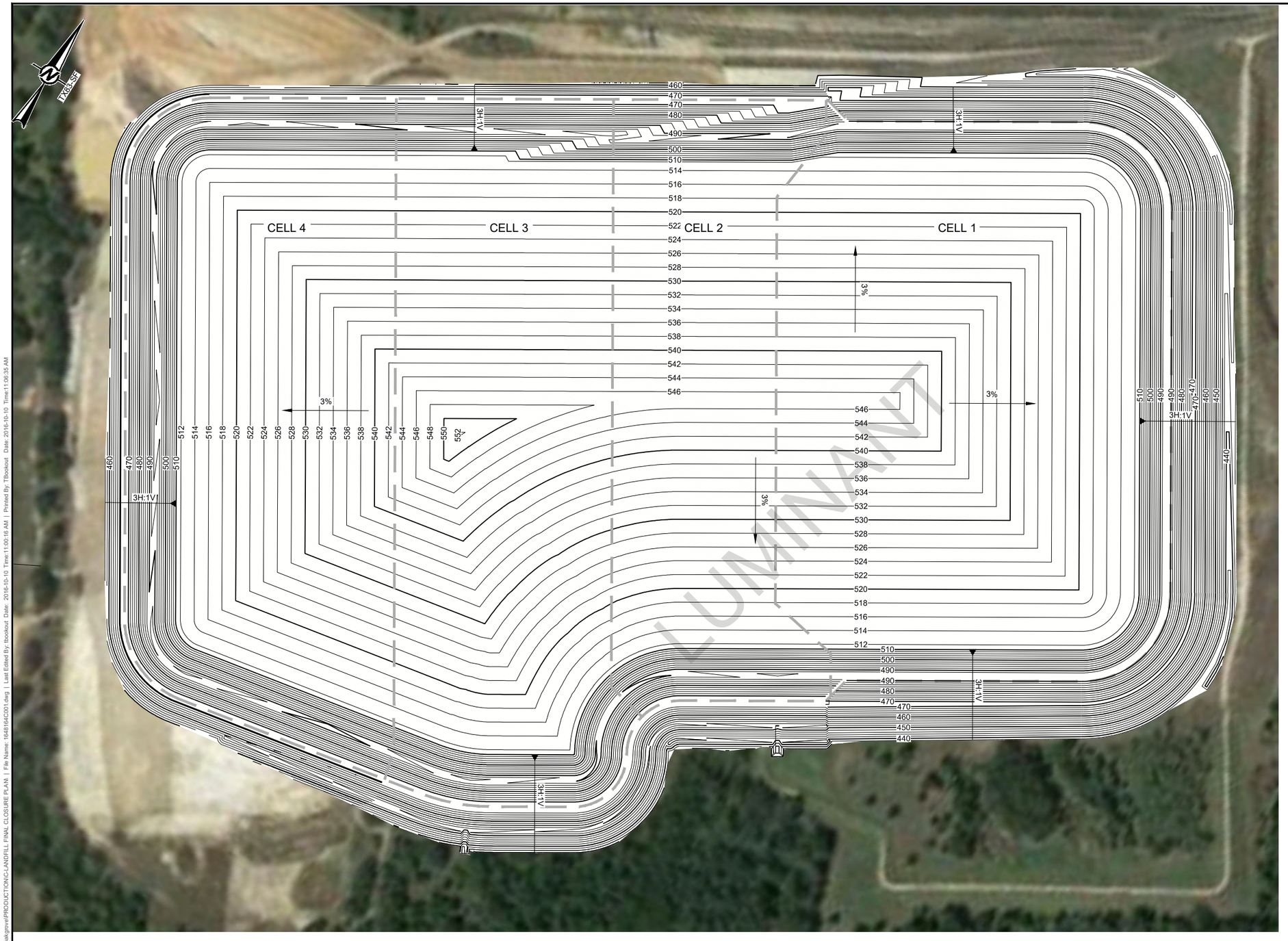


**LEGEND**

430 — FGD ASH LANDFILL 1 FINAL COVER MAJOR CONTOURS

426 — FGD ASH LANDFILL 1 FINAL COVER MINOR CONTOURS

**REFERENCE(S)**

AERIAL PHOTO SOURCED FROM GOOGLE EARTH PRO DATED 2016

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER
10/10/16

Professional Engineering Firm
Registration Number F-2578

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CLIENT REVIEW

0 150 300
1" = 300' FEET

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OAK GROVE

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Golder Associates

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| YYYY-MM-DD | 2016-09-29 |
| DESIGNED | VK |
| PREPARED | TNB |
| REVIEWED | MX |
| APPROVED | JBF |

PROJECT
2016 COAL COMBUSTION RESIDUALS
ENGINEERING SERVICES

TITLE
**FINAL COVER GRADING PLAN**
**ASH LANDFILL 1**

PROJECT NO. 1648164 | REV. ---- | FIGURE 2



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# APPENDIX A
# ALTERNATE FINAL COVER – INFILTRATION RATE COMPARISON

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# CALCULATIONS

| | | | |
|---|---|---|---|
| **Date:** | 9/26/2016 | **Made by:** | JBF |
| **Project No.:** | 1648164 | **Checked by:** | MX |
| **Subject:** | Alternate Final Cover - Infiltration Rate Comparison | **Reviewed by:** | JBF |
| **Project Short Title:** | OGSES - Landfill Final Cover Plan | | |

## OBJECTIVE

Compare the infiltration rate through a "prescriptive" final cover system with the infiltration rate through the alternate final cover system proposed for use in Ash Landfill 1.

## GIVEN

The prescriptive final cover infiltration layer consists of a minimum 18-inch thick layer of earthen material with a permeability less than or equal to the permeability of the bottom liner. Ash Landfill 1was lined with a clay layer with a permeability of $1 \times 10^{-7}$ cm/s. The alternate final cover system will replace the earthen material infiltration layer with a geomembrane. In addition, the proposed alternate final cover includes a geosynthetic drainage layer above the geomembrane.

## METHOD

Estimate the infiltration rate through the earthen material infiltration layer using Darcy's equation. Estimate the infiltration through the geomembrane infiltration layer using the Giroud Equation (Ref. 1). Compare the infiltration rate through earthen material infiltration layer to the geomembrane infiltration layer.

**Infiltration Through 18-inch earthen Infiltration Layer**

Darcy's Equation

$Q = kiA$

where:

- Q = Leakage rate
- k = hydraulic conductivity
- i = hydraulic gradient = (h+t)/t
- h= head
- t = thickness
- A = area

Infiltration Layer Properties

| | | |
|---|---|---|
| k = | 1.00E-07 | cm/s |
| t = | 1.5 | ft |
| h = | 0.5 | ft (erosion layer saturated) |
| i = | 1.33 | |
| A = | 1 | acre |

**Q = 123 gal/acre/day**

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# CALCULATIONS

| | | | |
|---|---|---|---|
| **Date:** | 9/26/2016 | **Made by:** | JBF |
| **Project No.:** | 1648164 | **Checked by:** | MX |
| **Subject:** | Alternate Final Cover - Infiltration Rate Comparison | **Reviewed by:** | JBF |
| **Project Short Title:** | OGSES - Landfill Final Cover Plan | | |

**Infiltration through geomembrane**

Giroud's Equation Ref 1

$Q = C[1+0.1(h/t_s)^{0.95}]a^{0.1}h^{0.9}k_s^{0.74}$

where:

C = 0.21 for good contact
1.15 for poor contact

h = head (m)

$t_s$ = thickness of underlying soil component (i.e. grading layer) (m)

a = area of hole ($m^2$)

$k_s$ = hydraulic conductivity of underlying soil (m/s)

Geomembrane & Subgrade Properties

| | | |
|---|---|---|
| C = | 1.15 | (conservative) |
| h = | 0.2 | in (approximate thickness of drainage layer) |
| $t_s$ = | 0.5 | ft |
| a = | 1 | $cm^2$ (equivalent to a 0.44 inch diameter hole - conservative) |
| $k_s$ = | 1.00E-03 | cm/s (conservative for site soils) |
| Number of Defects = | 2 | per acre (conservative for good installation quality) |

**Q =** 1.58E-06 $m^3$/sec/acre
**36 gal/acre/day**

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## CONCLUSION

Based on this analysis, the infiltration rate through a geomembrane final cover system will be less than the infiltration through a 1.5-ft thick infiltration layer with permeability of 1 x $10^{-7}$ cm/s.

## REFERENCE

1) Giroud, J.P., "Equations for Calculating the Rate of Liquid Migration Through Composite Liners Due to Geomembrane Defects", Geosynthetics International, Vol. 4, Nos. 3-4, pp. 335-348, 1997.

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

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| Africa | + 27 11 254 4800 |
| Asia | + 852 2562 3658 |
| Australasia | + 61 3 8862 3500 |
| Europe | + 356 21 42 30 20 |
| North America | + 1 800 275 3281 |
| South America | + 56 2 2616 2000 |

solutions@golder.com
www.golder.com

**Golder Associates Inc.**
**500 Century Plaza Drive, Suite 190**
**Houston, TX 77073 USA**
**Tel: (281) 821-6868**
**Fax: (281) 821-6870**


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Engineering Earth's Development, Preserving Earth's Integrity

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REPORT

# CLOSURE PLAN ADDENDUM NO. 1

*Oak Grove Steam Electric Station - Ash Landfill 1*
*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

Submitted by:

**WSP GOLDER**

1601 S MoPac Expressway
Suite 325D
Austin, Texas, USA 78746
+1 737 703 3900

31404097.007

November 2022

# PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by WSP Golder under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that Addendum No.1 to the Closure Plan for Ash Landfill 1 at the Oak Grove Steam Electric Station has been prepared in accordance with the requirements of 40 C.F.R. §257.102(b).

Patrick J. Behling, P.E.
Principal Engineer
WSP Golder
Texas Firm Registration No. 22771

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**3.0 REFERENCES** ..... 3

# DOCUMENT REVISION RECORD

| Issue No. | Date | Details of Revisions |
|---|---|---|
| **Revision 0** | October 2016 | Original Document |
| **Addendum 1** | November 2022 | Added confirmation that landfill cap slope stability will be modeled using site-specific geotechnical data during final closure design |

# 1.0 INTRODUCTION

On behalf of Oak Grove Management Company LLC (Luminant), WSP Golder (Golder) has prepared this Addendum No. 1 to the Closure Plan for Ash Landfill 1(ALF1) located at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas (hereafter, the "Site"). Coal Combustion Residuals (CCR) including flue gas desulfurization (FGD) wastewater and bottom ash generated as part of OGSES operation are managed in ALF1. ALF1 is regulated as an Existing CCR Landfill under 40 C.F.R. § 257, Subpart D (the "CCR Rule").

The original Closure Plan for ALF1 was prepared in October 2016 in accordance with 40 C.F.R. §257.102(b) and placed in the OGSES operating record in accordance with 40 C.F.R. §257.105(h)(10) (Golder, 2016). This Addendum No. 1 updates the Closure Plan to reflect the following:

- Confirmation that the slope stability of the ALF1 cap/cover system will be modeled using site-specific geotechnical data during design of the final closure of the landfill.

## 2.0 LANDFILL CAP/COVER SYSTEM SLOPE STABILITY MODELING

ALF 1 is the primary disposal facility for CCR generated at the OGSES and consists of four landfill cells (Cells 1 through 4), each constructed with a 3-foot thick compacted clay liner (hydraulic conductivity ≤ $1\times10^{-7}$ cm/sec). The landfill is constructed above-grade and is surrounded by earthen perimeter berms that extend 10 to 20 feet or more above ground surface. The perimeter berms are also provided with a 3-foot thick compacted clay liner on the interior face of the berms.

A final cap/cover system will be constructed over the CCR in ALF1 as part of unit closure as described in the 2016 Closure Plan (Golder, 2016). The final cover system for ALF1 as described in the 2016 Closure Plan consisted of the following (from bottom to top):

- Minimum 6 inches of select fill on top of CCR to serve as levelling layer/cap subgrade;
- 40-mil linear low-density polyethylene (LLDPE) textured geomembrane;
- Geosynthetic drainage layer; and
- 18-inch erosion layer consisting of 12 inches of general fill overlain with 6 inches of soil capable of supporting native vegetation.

The ALF1 Closure Plan will be updated to include cap/cover system slope stability modeling using site-specific geotechnical data during design of the final cap/closure system for the landfill.

# 3.0 REFERENCES

Golder Associates (Golder), 2016. Closure Plan – Ash Landfill 1, Oak Grove Steam Electric Station. October.

CLOSURE PLAN

# CLOSURE PLAN

# FGD PONDS

## Oak Grove Steam Electric Station

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**Submitted To:** Luminant
1601 Bryan Street
Dallas, TX 75201

**Submitted By:** Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

Professional Engineering Firm
Registration Number F-2578

**October 2016**

**Project No. 1648164**

Golder Associates


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Appendix A Alternate Final Cover – Infiltration Rate Comparison

# 1.0 INTRODUCTION

## 1.1 Purpose

The "Standards for Disposal of Coal Combustion Residuals (CCR) in Landfills and Surface Impoundments" (40 Code of Federal Regulations (40 CFR) Part 257, Subpart D), effective October 19, 2015, requires that existing CCR units have a written Closure Plan prepared in accordance with §257.102(b). This Closure Plan provides the following information for the Oak Grove Steam Electric Station's (OGSES's) CCR Impoundments identified as flue gas desulphurization (FGD) Ponds FGD-A, FGD-B, and FGD-C.

- A description of steps necessary to close CCR unit at any point during the active life of the CCR unit, including:
  - A description of how CCR unit will be closed;
  - A description of how the final cover will meet the performance standards §257.102(d), and the methods and procedures used to install the final cover;
  - An estimate of maximum inventory of CCR ever on-site during the active life of the CCR unit;
  - An estimate of largest area requiring final cover at any time during the CCR unit's active life; and
  - A schedule, including steps, major milestones, durations.

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## 1.2 Site Background

The OGSES generates bottom ash, fly ash, boiler slag and flue gas desulfurization (FGD) sludge (gypsum) during electricity generation. The following surface impoundments, shown on Figure 1, are in operation at the OGSES:

- FGD-A Pond;
- FGD-B Pond; and
- FGD-C Pond.

The Closure Plan addresses the existing CCR surface impoundments at the OGSES. A separate Closure Plan addresses the existing ash landfill (Ash Landfill 1).

## 2.0 DESCRIPTION OF CLOSURE [§257.102(b)(1)(i)]

The existing surface impoundments at the OGSES will be closed in-place and capped with a final cover system. The final cover design will vary depending on the existing lining system within the CCR surface impoundment. The components of the final cover for each CCR surface impoundment are presented in Section 2.3.

The final cover grades will depend on conditions present at closure. Conceptual final cover grades are presented on Figure 2.

### 2.1 Removal of Liquid and Stabilization of CCR [§257.102(d)(2)]

Prior to construction of the final cover, the surface impoundments will be dewatered by constructing dewatering sumps and actively pumping liquid from the impoundments. Free liquids removed from the impoundments will be managed in accordance with applicable regulations.

It is anticipated that, once dewatered, CCR within the surface impoundments will have sufficient strength properties to accommodate and support the proposed closure grades. If the dewatered CCR materials do not have the strength to accommodate earthwork equipment and/or fill material required to meet the closure grades, then the CCR material will be stabilized as necessary prior to closure construction.

Inlet pipes along the crest of the surface impoundments will be removed. Below-grade inlet and outlet pipes will be abandoned by filling with grout, “flowable fill” or other methods.

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### 2.2 Grading Layer

A grading layer will be placed over the dewatered/stabilized CCR material to achieve closure grades. The grading layer will be placed below the final cover system to allow the final cover systems described in this section to meet the grades as shown on Figure 2 – Final Cover Grading Plan,. Once the grading layer has been placed to its design grades, the final cover system will be installed.

Based on an evaluation of the contents of FGD-A (Golder, 2013), the CCR material consists predominantly of silt-size particles with 5 to 40% sand and typically less than 10% clay (< 5 microns). Once fill placement begins, Golder anticipates some consolidation of the CCR will occur; but expects that the majority of the settlement will occur during or shortly after closure construction (due to the noncohesive nature of the CCR and fill materials), thus, limiting long term subsidence.

### 2.3 Final Cover System [§257.102(b)(1)(iii)]

The components of the final cover system will depend on the existing liner system within the CCR surface impoundment. As described in the following sections, the final cover system in FGD-A will differ from the final cover system in FGD-B and FGD-C.

### 2.3.1 FGD-B & C Ponds Final Cover Design

FGD-B and FGD-C Ponds are lined with a composite liner system (consisting of a 2-foot thick compacted clay liner with a hydraulic conductivity (k) of 1 x $10^{-7}$ cm/sec or less, and a 60-mil high density polyethylene (HDPE) geomembrane) and will be closed with a composite final cover system meeting the requirements of §257.102(d)(3)(i)(A) through (D). Specifically, the final cover system over FGD-B and FGD-C Ponds will:

(A) Have a permeability less than or equal to the permeability of bottom liner system or natural subsoils or no greater than 1 x $10^{-5}$ cm/sec, whichever is less;

(B) Include an infiltration layer with a minimum 18 inches of earthen material;

(C) Include an erosion layer containing a minimum 6 inches of earthen material and capable of sustaining native plant growth; and

(D) Accommodate settling and subsidence.

The final cover system for FGD-B and FGD-C will be comprised of (from the top to bottom):

- 18-inch erosion layer consisting of 12 inches of general fill overlain with 6 inches of soil capable of supporting native vegetation;
- Geosynthetic drainage layer;
- 40-mil linear low-density polyethylene (LLDPE) textured geomembrane; and
- 18-inch thick soil infiltration layer with a permeability of 1 x $10^{-5}$ cm/sec or less.

The final cover system for FGD-B and FGD-C is illustrated below.

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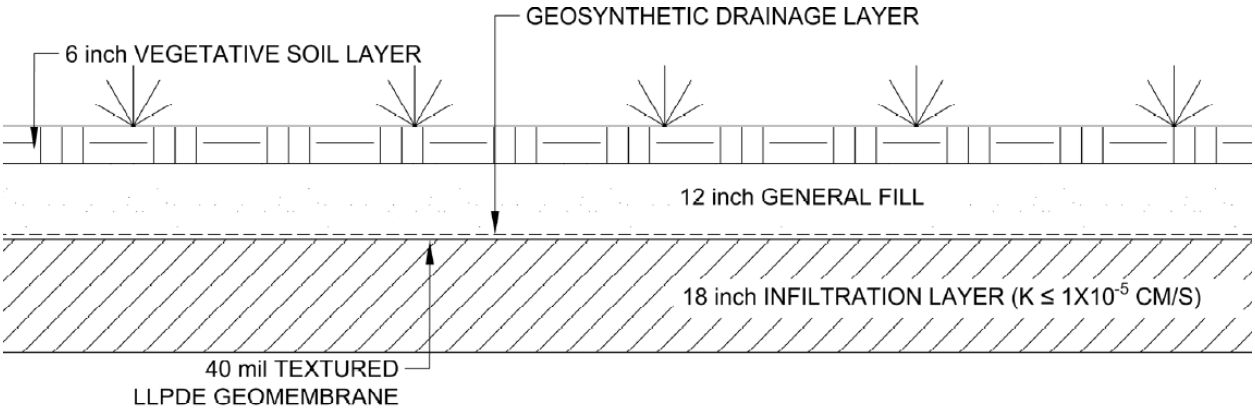
**Final Cover System – FGD-B & FGD-C**



### 2.3.2 FGD-A Pond Final Cover Design

FGD-A Pond is lined with a 3-foot thick compacted clay with a hydraulic conductivity less than 1 x $10^{-7}$ cm/sec and will be closed with an alternate final cover meeting the requirements of §257.102(d)(3)(ii)(A) through (C)[1]. Specifically, the final cover system over FGD-A Pond will:

- Achieve an equivalent reduction in infiltration as §257.102(d)(3)(i)(A) and (B) (See Section 2.3.1 above);
- Include an erosion layer providing equivalent protection from wind or water erosion as specified in §257.102(d)(3)(i)(C); and
- Accommodate settling and subsidence.

The final cover system for FGD-A will be comprised of (from the top to bottom):

- 18-inch erosion layer consisting of 12 inches of general fill overlain with 6 inches of soil capable of supporting native vegetation;
- Geosynthetic drainage layer; and
- 40-mil linear low-density polyethylene (LLDPE) textured geomembrane.

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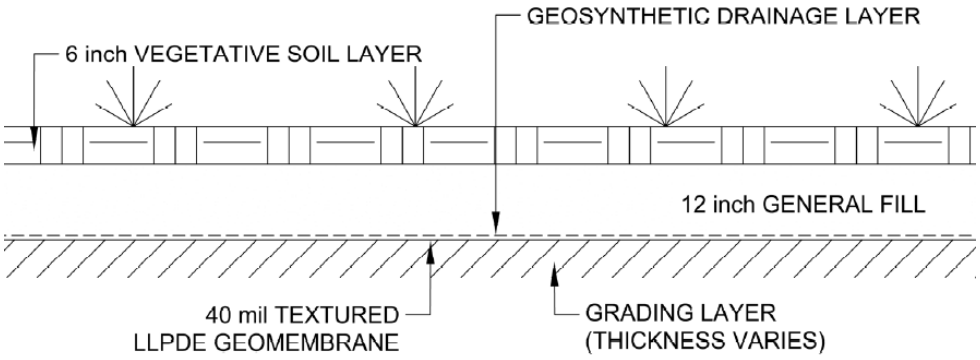
The proposed alternate final cover replaces the soil infiltration layer with a geomembrane. Since infiltration is limited to potential defects in the geomembrane, the infiltration through the proposed cover will be lower than through a soil infiltration layer. A comparison of infiltration rates to demonstrate that an equivalent reduction in infiltration is included in Appendix A.

The final cover system for FGD-A Pond is illustrated below.

**Final Cover System – FGD-A Pond**




[1] The CCR Rule references (f)(3)(ii)(A) through (D), but this appears to be a typo.

### 2.3.3 Final Cover Design and Performance

Table 1 describes how the final cover systems meet the performance standards in §257.102(d).

**Table 1 - Performance Standards**

| Standard | Discussion |
|---|---|
| Control, minimize or eliminate post-closure infiltration, releases of CCR, leachate, or contaminated run-off | Geomembranes are very effective barriers to infiltration and contact with CCR. Liquid will be removed from the CCR prior to final cover construction. |
| Preclude future impoundment of water sediment, or slurry | The pipes leading to the surface impoundments will be removed or abandoned and the final cover will be sloped to drain surface water. |
| Include measures for major slope stability | The textured geomembrane will improve interface shear strength and the geosynthetic drainage layer will prevent development of hydrostatic forces in the overlying erosion layer. |
| Minimize maintenance | Routine maintenance will consist of mowing the vegetative cover. Other anticipated maintenance activities are limited to repair of erosion rills, and placement of fill in depressions. |
| Complete in time consistent with good practice | Both proposed final cover systems are routinely used at waste containment facilities. Well-developed industry experiences in installing such final cover systems will ensure most efficient construction time. |

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### 2.3.4 Methods and Procedures

The final cover system design, particularly the final cover grades, will be re-evaluated prior to initiation of final closure, based on the actual CCR grades at the time of closure. As discussed in Section 2.1, the strength properties of the CCR materials present at that time will be evaluated and addressed in the final design of the final cover system and an amended closure plan. The final cover will be installed in accordance with a construction quality assurance (CQA) plan, which will be developed prior to commencing the work. The CQA plan will require monitoring of final cover construction to ensure that the final cover system will meet the design intent and conforms to the performance standards.

As described in Section 4.3 of this Closure Plan, a certification that the final cover system meets the requirements of §257.102(d)(3)(iii) will be provided by a qualified professional engineer, prior to initiation of final closure.

## 3.0 CCR QUANTITY AND AREA [§257.102(b)(1)(iv-v)]

For the purposes of this closure plan, in-place closure of CCR within the surface impoundments is based on the assumed volume of CCR (solids) being limited to 50 percent of the total capacity of the impoundment. The final cover surface area will be approximately equal to the total area within the crest of the surface impoundment as listed in Table 2.

The approximate maximum CCR volume and maximum final cover area over the active life of the CCR unit for each surface impoundment are summarized in Table 2.

**Table 2 – Approximate CCR Volume and Area**

| Surface Impoundment | Total Capacity (acre-ft) | CCR Volume (cy) | Final Cover Area (acre) |
|---|---|---|---|
| FGD-A | 172 | 138,500 | 9.0 |
| FGD-B | 104 | 83,500 | 11.2 |
| FGD-C | 218 | 176,000 | 15.2 |

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## 4.0 CLOSURE COMPLETION SCHEDULE [§257.102(b)(1)(vi)]

The timeframe for initiation final closure of the CCR units depends on several factors and is unknown; therefore, the year in which all closure activities will be completed is unknown.

## 4.1 Commencement of the Closure Plan [§257.102(e)]

In accordance with §257.102(e), commencement of this Closure Plan will occur as specified in either timeframe defined below:

- No later than 30 days after the date on which either:
  - The CCR unit receives the known final receipt of waste; or
  - The last known CCR is removed for beneficial use.

- Within 2 years of either:
  - The CCR unit last receives waste; or
  - The last CCR is removed for beneficial use.

Initiation of closure work may be extended two years with documentation in accordance with §257.102(e)(2)(ii) that there is reasonable likelihood that the CCR unit will accept wastes in the foreseeable future or CCR will be removed from the unit for beneficial use.

Closure of CCR unit has commenced if waste placement has ceased and any of the following are completed (§257.102(e)(3)):

- Taken any steps necessary to implement steps in the Closure Plan;
- Submitted a completed application for any required state or agency permit or permit modification; or
- Taken any steps necessary to comply with prerequisite state standards to initiate or complete the closure of a CCR unit.

## 4.2 Completion of Closure Activities [§257.102(f)]

Closure of each surface impoundment must be completed within 5 years of commencing closure. Completion of closure may be extended 2 years with documentation in accordance with §257.102(f)(2)(i) that, due to factors beyond the facility's control (e.g. significant weather delays, time required for dewatering CCR, delays due to state permitting or approval, etc.), it is not feasible to complete the closure within the required timeframe. An extension may also apply if the alternative closure requirements should apply to the CCR units in accordance with §257.103.

A Gantt chart illustrating the sequential steps of the CCR closure process, including identification of major milestones and estimated timeframes to complete each closure phase, is provided below.

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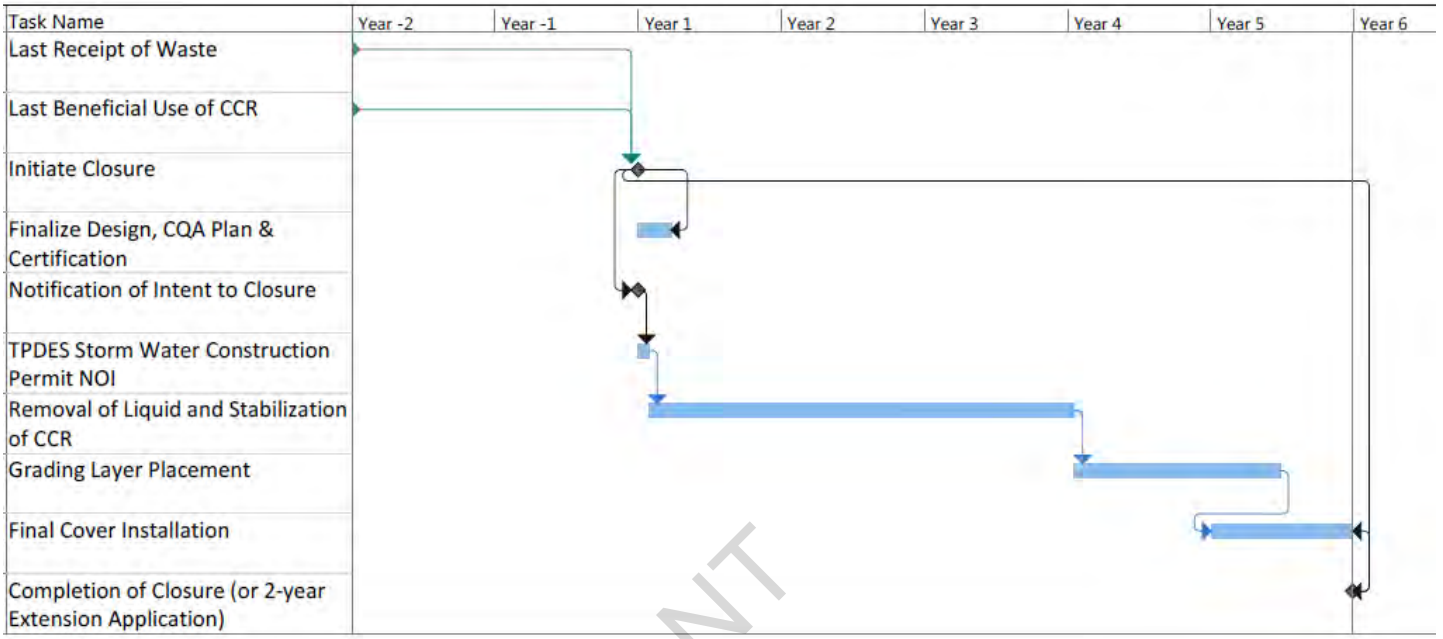
**Final Closure Schedule**

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### *4.2.1 Closure Certification*

A certification from a qualified professional engineer verifying that closure has been completed in accordance with the Closure Plan must be obtained in accordance with §257.102(f)(3).

## 4.3 Notification of Intent to Close CCR Unit [§257.102(g)]

No later than the date of final closure initiation, a notification of intent to close the CCR unit must be prepared. The notification must include certification by a qualified professional engineer that the final cover system meets the requirements of §257.102(d)(3)(i) or (ii).

## 4.4 Notification of Closure Completion [§257.102(h)]

No later than 30 days after of completion of closure, a notification of closure of a CCR unit must be prepared. The notification must include certification by a qualified professional engineer that closure was completed in accordance with the Closure Plan.

## 4.5 Deed Notations [§257.102(i)]

Following closure of the CCR unit, a certified notation on the deed to the facility or site property, or on some other instrument that is normally examined during title searches, that will in perpetuity notify any potential purchaser of the property that the land has been used as a CCR unit and that future uses of the land are restricted will be filed and recorded in the deed records of the office of the County Clerk of Robertson County.

A notification will be placed in the facilities operating record within 30 days of recording a notation to the deed to the property.

## 4.6 Closure Recordkeeping [§257.102(j)]

The owner or operator of the CCR unit must comply with the closure recordkeeping requirements specified in §257.105(i), the closure notification requirements specified in §257.106(i), and the closure internet requirements specified in §257.107(i).

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## 5.0 CONCLUSION

This Final Closure Plan has been prepared by Golder Associates Inc. to describe the steps necessary to close the existing CCR surface impoundments at OGSES at any point during the active life of the units with recognized and generally accepted good engineering practices.

If further information from Golder, please contact the undersigned at (281) 821-6868.

**GOLDER ASSOCIATES INC.**

William E. Gordon, PE
Senior Engineer

Jeffrey B. Fassett, PE
Associate Geotechnical Engineer

JBF/WEG

LUMINANT

## 6.0 CERTIFICATION

I hereby certify that this Closure Plan has been prepared in general accordance with normally accepted civil engineering practices and in accordance with the requirements of 40 CFR §257.102.

Jeffrey B. Fassett, PE
Golder Associates Inc.
Firm Registration Number F-2578

LUMINANT

## 7.0 REFERENCES

Golder Associates Inc. 2013, Report on Engineering Evaluation of Strategies for Removal of Accumulated Solids in FGD-A Pond - Oak Grove SES, Robertson County, Texas.

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**REFERENCE(S)**
AERIAL PHOTO SOURCED FROM GOOGLE EARTH PRO DATED 2016

10/10/16

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

0 400 800
1" = 800' FEET

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CONSULTANT
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2016-09-29 |
| DESIGNED | VK |
| PREPARED | TNB |
| REVIEWED | MX |
| APPROVED | JBF |

PROJECT
2016 COAL COMBUSTION RESIDUALS
ENGINEERING SERVICES

TITLE
**GENERAL SITE MAP**

PROJECT NO. 1648164 | REV. ---- | FIGURE 1

APPENDIX G-Revision 1 November 21, 2022

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**LEGEND**

430 FGD POND FINAL COVER CONTOURS

**REFERENCE(S)**

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10/10/16

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

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1" = 300' FEET

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CONSULTANT
Golder Associates

| | |
|---|---|
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| PREPARED | TNB |
| REVIEWED | MX |
| APPROVED | JBF |

PROJECT
2016 COAL COMBUSTION RESIDUALS
ENGINEERING SERVICES

TITLE
**FINAL COVER GRADING PLAN FGD PONDS**

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 1648164 | ---- | 2 |



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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
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# APPENDIX A
# ALTERNATE FINAL COVER – INFILTRATION RATE COMPARISON

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# CALCULATIONS

| | | | |
|---|---|---|---|
| **Date:** | 9/26/2016 | **Made by:** | JBF |
| **Project No.:** | 1648164 | **Checked by:** | MX |
| **Subject:** | Alternate Final Cover - Infiltration Rate Comparison | **Reviewed by:** | JBF |
| **Project Short Title:** | OGSES - SI Final Cover Plan | | |

## OBJECTIVE

Compare the infiltration rate through a "prescriptive" final cover system with the infiltration rate through the alternate final cover system proposed for use in FGD-A Pond.

## GIVEN

The prescriptive final cover infiltration layer consists of a minimum 18-inch thick layer of earthen material with a permeability less than or equal to the permeability of the bottom liner. FGD-A was lined with a clay layer with a permeability of $1 \times 10^{-7}$ cm/s. The alternate final cover system will replace the earthen material infiltration layer with a geomembrane. In addition, the proposed alternate final cover includes a geosynthetic drainage layer above the geomembrane.

## METHOD

Estimate the infiltration rate through the earthen material infiltration layer using Darcy's equation. Estimate the infiltration through the geomembrane infiltration layer using the Giroud Equation (Ref. 1). Compare the infiltration rate through earthen material infiltration layer to the geomembrane infiltration layer.

**Infiltration Through 18-inch earthen Infiltration Layer**

Darcy's Equation

$Q = kiA$

where:

- Q = Leakage rate
- k = hydraulic conductivity
- i = hydraulic gradient = (h+t)/t
- h= head
- t = thickness
- A = area

Infiltration Layer Properties

| | | |
|---|---|---|
| k = | 1.00E-07 | cm/s |
| t = | 1.5 | ft |
| h = | 0.5 | ft (erosion layer saturated) |
| i = | 1.33 | |
| A = | 1 | acre |

**Q = 123 gal/acre/day**

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# CALCULATIONS

| | | | |
|---|---|---|---|
| **Date:** | 9/26/2016 | **Made by:** | JBF |
| **Project No.:** | 1648164 | **Checked by:** | MX |
| **Subject:** | Alternate Final Cover - Infiltration Rate Comparison | **Reviewed by:** | JBF |
| **Project Short Title:** | OGSES - SI Final Cover Plan | | |

**Infiltration through geomembrane**

Giroud's Equation Ref 1

$Q = C[1+0.1(h/t_s)^{0.95}]a^{0.1}h^{0.9}k_s^{0.74}$

where:

C = 0.21 for good contact
1.15 for poor contact

h = head (m)

$t_s$ = thickness of underlying soil component (i.e. grading layer) (m)

a = area of hole ($m^2$)

$k_s$ = hydraulic conductivity of underlying soil (m/s)

Geomembrane & Subgrade Properties

| | | |
|---|---|---|
| C = | 1.15 | (conservative) |
| h = | 0.2 | in (approximate thickness of drainage layer) |
| $t_s$ = | 1 | ft (conservative) |
| a = | 1 | $cm^2$ (equivalent to a 0.44 inch diameter hole - conservative) |
| $k_s$ = | 1.00E-03 | cm/s (conservative for site soils) |
| Number of Defects = | 2 | per acre (conservative for good installation quality) |

**Q =** 1.58E-06 $m^3$/sec/acre
**36 gal/acre/day**

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## CONCLUSION

Based on this analysis, the infiltration rate through a geomembrane final cover system will be less than the infiltration through a 1.5-ft thick infiltration layer with permeability of 1 x $10^{-7}$ cm/s.

## REFERENCE

1) Giroud, J.P., "Equations for Calculating the Rate of Liquid Migration Through Composite Liners Due to Geomembrane Defects", Geosynthetics International, Vol. 4, Nos. 3-4, pp. 335-348, 1997.

Professional Engineering Firm
Registration Number F-2578

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| | |
|---|---|
| Africa | + 27 11 254 4800 |
| Asia | + 852 2562 3658 |
| Australasia | + 61 3 8862 3500 |
| Europe | + 356 21 42 30 20 |
| North America | + 1 800 275 3281 |
| South America | + 56 2 2616 2000 |

solutions@golder.com
www.golder.com

**Golder Associates Inc.**
**500 Century Plaza Drive, Suite 190**
**Houston, TX 77073 USA**
**Tel: (281) 821-6868**
**Fax: (281) 821-6870**


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Engineering Earth's Development, Preserving Earth's Integrity

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**REPORT**

# CLOSURE PLAN ADDENDUM NO. 1

*Oak Grove Steam Electric Station - FGD Ponds*
*Robertson County, Texas*

Submitted to:

**Oak Grove Management Company LLC**

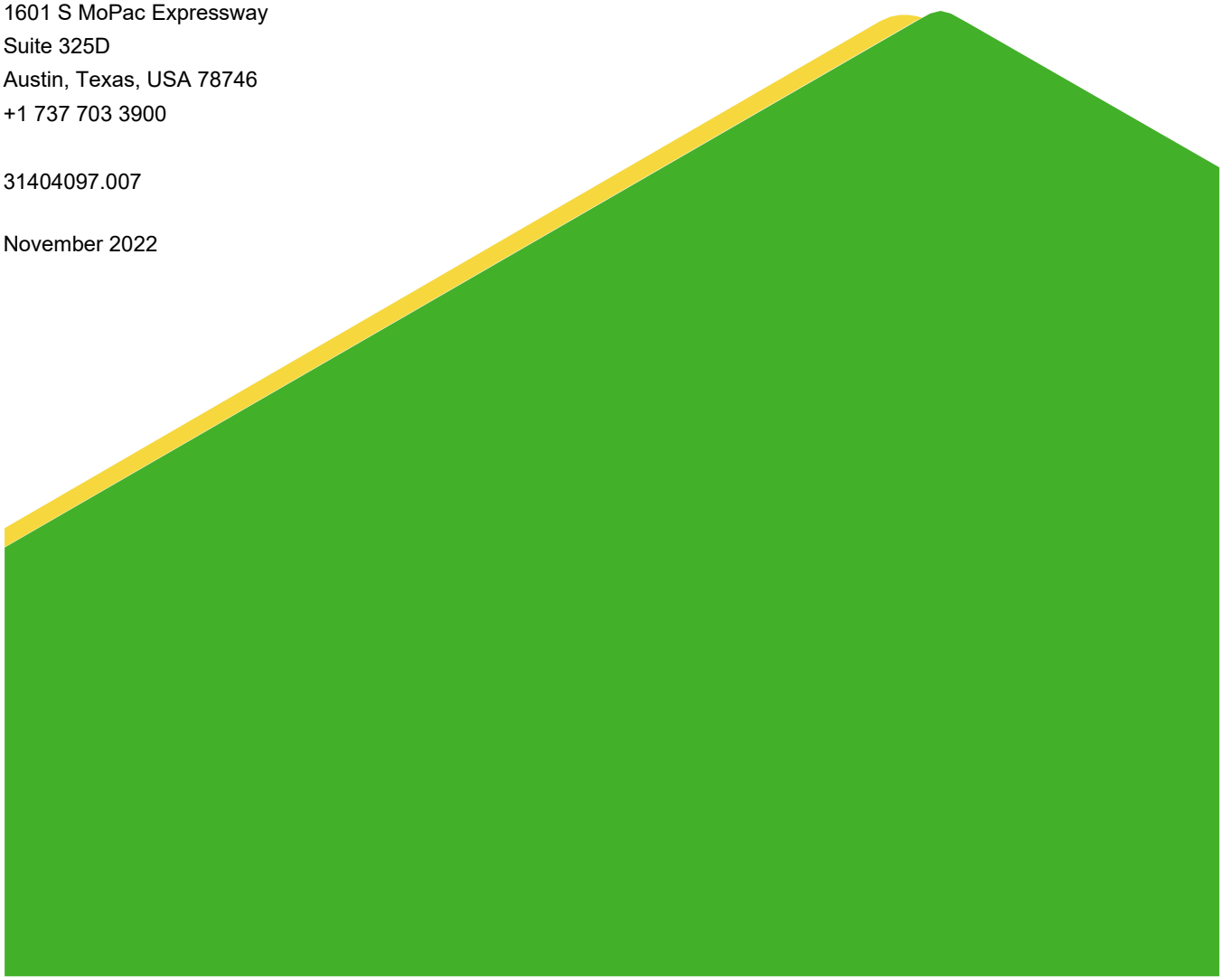
Submitted by:

**WSP GOLDER**

1601 S MoPac Expressway
Suite 325D
Austin, Texas, USA 78746
+1 737 703 3900

31404097.007

November 2022



# PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by WSP Golder under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that Addendum No.1 to the Closure Plan for the FGD Ponds at the Oak Grove Steam Electric Station has been prepared in accordance with the requirements of 40 C.F.R. §257.102(b).

Patrick J. Behling, P.E.
Principal Engineer
WSP Golder
Texas Firm Registration No. 22771

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# DOCUMENT REVISION RECORD

| Issue No. | Date | Details of Revisions |
|---|---|---|
| **Revision 0** | October 2016 | Original Document |
| **Addendum 1** | November 2022 | Revised configuration of final cap/cover system for FGD-A and added confirmation that cap slope stability will be modeled using site-specific geotechnical data during final closure design |

# 1.0 INTRODUCTION

On behalf of Oak Grove Management Company LLC (Luminant), WSP Golder (Golder) has prepared this Addendum No. 1 to the Closure Plan for FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the "FGD Ponds") located at the Oak Grove Steam Electric Station (OGSES) in Robertson County, Texas (hereafter, the "Site"). Coal Combustion Residuals (CCR) including flue gas desulfurization (FGD) wastewater and bottom ash generated as part of OGSES operation are managed in the FGD Ponds. The FGD Ponds are regulated as Existing CCR Impoundments under 40 C.F.R. § 257, Subpart D (the "CCR Rule").

The original Closure Plan for the FGD Ponds was prepared in October 2016 in accordance with 40 C.F.R. §257.102(b) and placed in the OGSES operating record in accordance with 40 C.F.R. §257.105(h)(10) (Golder, 2016). This Addendum No. 1 updates the Closure Plan to reflect the following:

- Revisions to the configuration of the final cap/cover system for FGD-A due to a retrofit of the FGD-A liner system; and
- Confirmation that the slope stability of FGD Pond cap/cover systems will be modeled using site-specific geotechnical data during design of the final closure of the impoundments.

# 2.0 FGD POND CAP/COVER SYSTEMS AND SLOPE STABILITY MODELING

The FGD Ponds are constructed above grade and are surrounded by engineered earthen dikes that extend to approximately 25 feet above surrounding ground level. A final cap/cover system will be constructed over the CCR in the FGD Ponds as part of unit closure as described in the 2016 Closure Plan (Golder, 2016).

The final cover system for FGD-B and FGD-C described in the 2016 Closure Plan consisted of the following (from bottom to top):

- 18-inch thick soil infiltration layer with a permeability of 1 x $10^{-5}$ cm/sec or less;
- 40-mil linear low-density polyethylene (LLDPE) textured geomembrane;
- Geosynthetic drainage layer; and
- 18-inch erosion layer consisting of 12 inches of general fill overlain with 6 inches of soil capable of supporting native vegetation.

A different final cover system configuration was proposed for FGD-A in the 2016 Closure Plan. The final cap/cover system for FGD-A has been revised to be similar to the cap/cover systems for FGD-B and FGD-C due to a retrofit of the FGD-A liner system. The final cap/cover system for FGD-A will now consist of the following (from bottom to top):

- 18-inch thick soil infiltration layer with a permeability of 1 x $10^{-5}$ cm/sec or less;
- 40-mil LLDPE textured geomembrane;
- Geosynthetic drainage layer; and
- 18-inch erosion layer consisting of 12 inches of general fill overlain with 6 inches of soil capable of supporting native vegetation.

The proposed final cap/cover systems for FGD-A, FGD-B and FGD-C comply with the requirements of 40 C.F.R. §257.102(d)(3)(i)(A) through (D):

(A) Have a permeability less than or equal to the permeability of bottom liner system or natural subsoils or no greater than 1 x $10^{-5}$ cm/sec, whichever is less;

(B) Include an infiltration layer with a minimum 18 inches of earthen material;

(C) Include an erosion layer containing a minimum 6 inches of earthen material and capable of sustaining native plant growth; and

(D) Accommodate settling and subsidence.

The FGD Pond Closure Plan will be updated to include cap/cover system slope stability modeling using site-specific geotechnical data during design of the final cap/closure systems for the FGD Ponds.

# 3.0 REFERENCES

Golder Associates (Golder), 2016. Closure Plans – FGD Ponds, Oak Grove Steam Electric Station. October.

POST-CLOSURE PLAN

# POST-CLOSURE PLAN

# ASH LANDFILL 1

## Oak Grove Steam Electric Station

LUMINANT

**Submitted To:** Luminant
1601 Bryan Street
Dallas, TX 75201

**Submitted By:** Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

Professional Engineering Firm
Registration Number F-2578

**October 2016**

**Project No. 1648164**

Golder Associates


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# 1.0 INTRODUCTION

## 1.1 Purpose

The "Disposal of Coal Combustion Residuals (CCR) from Electric Utilities rule" (40 Code of Federal Regulations (40 CFR) Part 257), effective October 19, 2015, requires that existing CCR units closed in accordance with §257.102 must meet the requirements of §257.104 – Post-closure care requirements. In accordance with §257.104(d), this Post-Closure Plan provides the following information for the Oak Grove Steam Electric Station's (OGSES's) CCR landfill identified as Ash Landfill 1.

- A description of the required post-closure monitoring and maintenance activities and the frequency at which these activities will be performed;
- The name, address, telephone number, and email address of the person or office to contact about the facility during the post-closure care period; and
- A description of the planned uses of the closed unit property during the post-closure period. Post-closure use of the property must not disturb the integrity of the final cover, liner, or any other component of the unit containment system, or the function of the monitoring systems.

Post-closure care must be conducted for 30 years after the CCR unit has been closed.

## 1.2 Site Background

The OGSES generates bottom ash, fly ash, boiler slag and flue gas desulfurization (FGD) sludge (gypsum) during electricity generation. Flyash and bottom ash generated at the facility (other than that amount that is sold/beneficially used in accordance with the CCR regulation), is handled in a dry manner and deposited in Ash Landfill 1.

The Post-Closure Plan addresses the existing CCR landfill at the OGSES. A separate Post-Closure Plan addresses the existing surface impoundments (FGD-A Pond, FGD-B Pond, and FGD-C Pond).

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## 2.0 POST-CLOSURE MONITORING AND MAINTENANCE PLAN [§257.104(d)(1)(i)]

Monitoring and maintenance activities will be performed to maintain the integrity and effectiveness of the final cover system as specified in §257.104(b)(1). During the post-closure monitoring and maintenance period of the site, the final cover of the closed CCR unit will be inspected at the frequency indicated in Table 1 below.

**Table 1 – Post-Closure Care Maintenance**

| Post-Closure Care Maintenance Item | Frequency of Inspections | Types of Deficiency Conditions to be looked for during inspections |
|---|---|---|
| Final Cover Condition | Annually | Inspection for vegetation, erosion, settlement, ponding water, and functionality and the surface water drainage system |
| Vegetation | Annually | Erosion rills and depressions, vegetative stress |
| Drainage structures | Annually | Sediment and debris build up, component damage, blockages, erosion, ponding of water in non-designated areas, excessive vegetative growth |

Each monitoring and maintenance activity will be documented and include the date, components and items monitored, name of the individual performing the monitoring/maintenance, a description of the deficiencies observed (if any), maintenance/repairs performed (if any), and related information.

At a minimum, maintenance will be performed as needed prior to the next scheduled inspection.

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## 3.0 GROUNDWATER MONITORING

As specified in 257.104(b)(3), groundwater monitoring activities will continue throughout the post-closure care period in accordance with §257.90 through §257.98. All groundwater monitoring wells that are part of the groundwater monitoring network will be monitored and maintained during the post-closure care period in accordance with the Groundwater Sampling and Analysis Plan, which will be finalized and placed in the Operating Record by October 17, 2017.

If at the end of the 30-year post-closure care period, groundwater assessment monitoring is being performed at the unit in accordance with §257.95, post-closure care of the unit must continue until the unit has returned to groundwater detection monitoring under §257.95.

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## 4.0 FACILITY CONTACT INFORMATION [§257.104(d)(1)(ii)]

**Table 2: Contact Information**

| | |
|---|---|
| **Name** | Luminant - Environmental Services |
| **Address** | 1601 Bryan St., Dallas, Texas 75201 |
| **Telephone Number** | 214-875-8654 |
| **Email** | CCRPostClosurePlan@Luminant.com |

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## 5.0 POST-CLOSURE LAND USE [§257.104(d)(1)(iii)]

Post-closure use of the property will not disturb the integrity of the final cover, liner system, or any other component of the containment system, or function of the monitoring system in accordance with §257.104(d)(1)(iii) unless necessary to comply with the maintenance requirements of this subpart or as otherwise provided as allowed under this subpart.

Post-closure land use is anticipated to be undeveloped/unchanged and the area will be deed recorded and deed restricted to prevent disturbance of the closed waste management unit.

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## 6.0 NOTIFICATION OF COMPLETION OF POST-CLOSURE CARE PERIOD [§257.104(E)]

No later than 60 days following completion of the post-closure care period, a certification will be prepared by a qualified professional engineer verifying that the post-closure care has been completed in accordance with this Post-Closure Plan.

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## 7.0 CONCLUSION

This Post-Closure Plan has been prepared by Golder Associates Inc., to describe post-closure monitoring and maintenance activities, to provide contact information, and to describe land use after the post-closure period.

**GOLDER ASSOCIATES INC.**

Varenya Kumar
Staff Engineer

Jeffrey B. Fassett, PE
Associate Geotechnical Engineer

JBF/VK

LUMINANT

## 8.0 CERTIFICATION

I hereby certify that this Post-Closure Plan has been prepared in general accordance with normally accepted civil engineering practices and in accordance with the requirements of 40 CFR §257.104.

Jeffrey B. Fassett, PE
Golder Associates Inc.
Firm Registration Number F-2578

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**REFERENCE(S)**
AERIAL PHOTO SOURCED FROM GOOGLE EARTH PRO DATED 2016

10/10/16

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| DESIGNED | VK |
| PREPARED | TNB |
| REVIEWED | MX |
| APPROVED | JBF |

PROJECT
2016 COAL COMBUSTION RESIDUALS
ENGINEERING SERVICES

TITLE
**GENERAL SITE MAP**

| PROJECT NO. | REV. | FIGURE |
|---|---|---|
| 1648164 | ---- | 1 |

APPENDIX G-Revision 1 November 21, 2022

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solutions@golder.com
www.golder.com

**Golder Associates Inc.**
**500 Century Plaza Drive, Suite 190**
**Houston, TX 77073 USA**
**Tel: (281) 821-6868**
**Fax: (281) 821-6870**


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POST-CLOSURE PLAN

# POST-CLOSURE PLAN

# FGD PONDS

## Oak Grove Steam Electric Station

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**Submitted To:** Luminant
1601 Bryan Street
Dallas, TX 75201

**Submitted By:** Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

Professional Engineering Firm
Registration Number F-2578

**October 2016**

**Project No. 1648164**


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# 1.0 INTRODUCTION

## 1.1 Purpose

The "Disposal of Coal Combustion Residuals (CCR) from Electric Utilities rule" (40 Code of Federal Regulations (40 CFR) Part 257), effective October 19, 2015, requires that existing CCR units closed in accordance with §257.102 must meet the requirements of §257.104 – Post-closure care requirements. In accordance with §257.104(d), this Post-Closure Plan provides the following information for the Oak Grove Steam Electric Station's (OGSES's) CCR Impoundments identified as flue gas desulphurization (FGD) Ponds FGD-A, FGD-B, and FGD-C.

- A description of the required post-closure monitoring and maintenance activities and the frequency at which these activities will be performed;
- The name, address, telephone number, and email address of the person or office to contact about the facility during the post-closure care period; and
- A description of the planned uses of the closed unit property during the post-closure period. Post-closure use of the property must not disturb the integrity of the final cover, liner, or any other component of the unit containment system, or the function of the monitoring systems.

Post-closure care must be conducted for 30 years after the CCR unit has been closed.

## 1.2 Site Background

The OGSES generates bottom ash, fly ash, boiler slag and flue gas desulfurization (FGD) sludge (gypsum) during electricity generation. The following surface impoundments, shown on Figure 1, are in operation at the OGSES:

- FGD-A Pond;
- FGD-B Pond; and
- FGD-C Pond.

The Post-Closure Plan addresses the existing CCR surface impoundments at the OGSES. A separate Post-Closure Plan addresses the existing ash landfill (Ash Landfill 1).

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## 2.0 POST-CLOSURE MONITORING AND MAINTENANCE PLAN [§257.104(d)(1)(i)]

Monitoring and maintenance activities will be performed to maintain the integrity and effectiveness of the final cover system as specified in §257.104(b)(1). During the post-closure monitoring and maintenance period of the site, the final cover of the closed CCR unit will be inspected at the frequency indicated in Table 1 below.

**Table 1: Post-Closure Care Maintenance**

| Post-Closure Care Maintenance Item | Frequency of Inspections | Types of Deficiency Conditions to be looked for during inspections |
|---|---|---|
| Final Cover Condition | Annually | Inspection for vegetation, erosion, settlement, ponding water, and functionality and the surface water drainage system |
| Vegetation | Annually | Erosion rills and depressions, vegetative stress |
| Drainage structures | Annually | Sediment and debris build up, component damage, blockages, erosion, ponding of water in non-designated areas, excessive vegetative growth |

Each monitoring and maintenance activity will be documented and include the date, components and items monitored, name of the individual performing the monitoring/maintenance, a description of the deficiencies observed (if any), maintenance/repairs performed (if any), and related information.

At a minimum, maintenance will be performed as needed prior to the next scheduled inspection.

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## 3.0 GROUNDWATER MONITORING

As specified in 257.104(b)(3), groundwater monitoring activities will continue throughout the post-closure care period in accordance with §257.90 through §257.98. All groundwater monitoring wells that are part of the groundwater monitoring network will be monitored and maintained during the post-closure care period in accordance with the Groundwater Sampling and Analysis Plan, which will be finalized and placed in the Operating Record by October 17, 2017.

If at the end of the 30-year post-closure care period, groundwater assessment monitoring is being performed at the unit in accordance with §257.95, post-closure care of the unit must continue until the unit has returned to groundwater detection monitoring under §257.95.

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## 4.0 FACILITY CONTACT INFORMATION (§257.104(d)(1)(ii))

**Table 2: Contact Information**

| | |
|---|---|
| **Name** | Luminant - Environmental Services |
| **Address** | 1601 Bryan St., Dallas, Texas 75201 |
| **Telephone Number** | 214-875-8654 |
| **Email** | CCRPostClosurePlan@Luminant.com |

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## 5.0 POST-CLOSURE LAND USE (§257.104(d)(1)(iii)

Post-closure use of the property will not disturb the integrity of the final cover, liner system, or any other component of the containment system, or function of the monitoring system in accordance with §257.104(d)(1)(iii) unless necessary to comply with the maintenance requirements of this subpart or as otherwise provided as allowed under this subpart.

Post-closure land use is anticipated to be undeveloped/unchanged and the area will be deed recorded and deed restricted to prevent disturbance of the closed waste management unit.

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## 6.0 NOTIFICATION OF COMPLETION OF POST-CLOSURE CARE PERIOD (§257.104(e)

No later than 60 days following completion of the post-closure care period, a certification will be prepared by a qualified professional engineer verifying that the post-closure care has been completed in accordance with this Post-Closure Plan.

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## 7.0 CONCLUSION

This Post-Closure Plan has been prepared by Golder Associates Inc., to describe post-closure monitoring and maintenance activities, to provide contact information, and to describe land use after the post-closure period.

**GOLDER ASSOCIATES INC.**

Varenya Kumar
Staff Engineer

Jeffrey B. Fassett, PE
Associate Geotechnical Engineer

JBF/VK

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## 8.0 CERTIFICATION

I hereby certify that this Post-Closure Plan has been prepared in general accordance with normally accepted civil engineering practices and in accordance with the requirements of 40 CFR §257.104.

Jeffrey B. Fassett, PE
Golder Associates Inc.
Firm Registration Number F-2578

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**REFERENCE(S)**
AERIAL PHOTO SOURCED FROM GOOGLE EARTH PRO DATED 2016

10/10/16

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

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1" = 800' FEET

CLIENT
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OAK GROVE

CONSULTANT
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**500 Century Plaza Drive, Suite 190**
**Houston, TX 77073 USA**
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# APPENDIX H – FINANCIAL ASSURANCE

## Post-Closure Care Cost Estimate

# TECHNICAL MEMORANDUM

**DATE** October 28, 2022 **Project No.** 31404097.007

**TO** Mr. Eric Chavers
Luminant

**FROM** Patrick J. Behling, PE/Will Vienne, PG **EMAIL Patrick.Behling@wsp.com**

**OAK GROVE POWER PLANT**
**FGD PONDS AND ASH LANDFILL 1**
**POST CLOSURE CARE COST ESTIMATES**

Oak Grove Management Company LLC (Oak Grove) owns and operates the Oak Grove Steam Electric Station (OGSES) located approximately ten miles north of Franklin in Robertson County, Texas. Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operation. The CCRs are managed at the FGD Ponds (FGD-A, FGD-B and FGD-C) and Ash Landfill 1 (ALF1).

These CCR Units are regulated under 40 CFR 257, Subpart D (the "Federal CCR Rule") and 30 Texas Administrative Code (TAC) Chapter 352 (The "TCEQ CCR Rule"). In accordance with 30 TAC §352.201, Luminant is required to submit an application to TCEQ to obtain a registration for each of these CCR Units. WSP Golder (Golder) has been retained by Luminant to assist with preparation of Post Closure Care Cost Estimates (PCCEs) for the FGD Ponds and ALF1 in accordance with §352.1101. This technical memorandum presents the PCCEs estimated by Golder for these units. The PCCEs were prepared using TCEQ Technical Guidance Documents TG-30 and TG-31 and related documents.

## 1.0 CCR Unit Closure Assumptions

The PCCEs were prepared based on the following closure assumptions for the OGSES CCR Units:

- FGD Ponds:
  - FGD-A, FGD-B and FGD-C managed as one CCR Unit
  - CCR Unit Closure:
    - Closure in Place with vegetated, low permeability cap
    - Cap Areas:
      - FGD-A Cap Area: 9 acres
      - FGD-B Cap Area: 11.2 acres
      - FGD-C Cap Area: 15.2 acres
      - Total: 35.4 acres
  - Groundwater Closure:
    - Monitored Natural Attenuation (MNA) with MNA Groundwater Monitoring
    - Continuation of Detection and Assessment Monitoring for Groundwater
    - Nine (9) monitoring wells sampled semi-annually
- Ash Landfill 1:
  - CCR Unit Closure:
    - Closure in Place with vegetated, low permeability cap
    - Cap Area: 128 acres

- Groundwater Closure:
  - No evidence of a release to groundwater to date
  - Continuation of Detection Monitoring for Groundwater
  - Six (6) monitoring wells sampled semi-annually

## 2.0 Post Closure Care Cost Assumptions

The following general assumptions were incorporated into the PCCEs:

- Post Closure Care Period. A post-closure care period of 30 years is assumed in accordance with 30 TAC §352.1241 and 40 CFR § 257.104(c).
- CCR Unit Inspections. Weekly and annual inspections of the CCR Units are required under §352.831 and §352.841. It is assumed that these inspections will continue throughout the Post Closure Care Period.
- Final Cover Maintenance. It is likely that some level of maintenance/repair will be required for the final cover systems used to close the CCR Units. The PCCEs include the following assumptions for final cover maintenance/repair:
  - Years 1-5 After Closure - it is assumed that erosion damage on 5% of the cap soil will be repaired each year. The thickness of each repair is assumed to average 6 inches of soil. In addition, the repaired areas will be revegetated.
  - Years 6-30 After Closure - it is assumed that erosion damage on 5% of the cap soil will be repaired three times during this period. The thickness of each repair is assumed to average 6 inches of soil. In addition, the repaired areas will be revegetated.
  - Estimated engineering/mobilization costs associated with the repairs/revegetation are included in the PCCEs.
  - Annual mowing costs for the final cover are included in the PCCEs.
- General Site Maintenance. Maintenance of run-off/drainage structures, access roads, fencing, signs, etc. are included in the PCCEs.
- Groundwater Monitoring. Semi-annual groundwater monitoring in accordance with the Federal/TCEQ CCR Rules (detection monitoring or assessment monitoring) is on-going for the units. It is assumed that the current groundwater monitoring program will continue throughout the Post Closure Care Period. It is also likely that maintenance of the monitoring well system at the units will be required during the post closure care period. The PCCEs assume that one monitoring well will be replaced every 10 years at each CCR Unit.

  In addition, the FGD Ponds incorporate MNA as a groundwater remedy as part of closure. For these CCR Units, it is assumed that MNA analyses will be included in the semi-annual groundwater monitoring events.
- One Time Post Closure Care Costs. The following on time activities associated with post closure care are included in the PCCEs:
  - Deed Notices/Surveys
  - Monitoring Well Plugging and Abandonment
- Contingency. A 10% contingency factor is included in the PCCEs.
- All costs are in 2021 dollars.

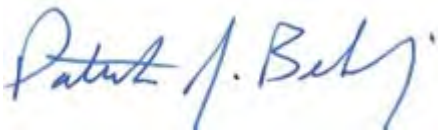
## 3.0 Post Closure Care Cost Estimate

Based on the assumptions listed above, the 30-Year post closure care cost estimates for the OGSES CCR Units are as follows (see Tables 1 and 2 for details):

- FGD Ponds: $2,168,817
- Ash Landfill 1: $2,326,837

It should be noted that the PCCEs presented herein are considered Opinions of Probable Cost and represent Golder's best judgement based on the assumptions stated, information available at the time the estimates were prepared, and Golder's experience with similar sites. The PCCEs are susceptible to variations in future cost of materials, labor, and equipment and should not be considered guaranteed maximum prices for post closure care activities.

Please do not hesitate to contact us if you have any questions or comments.



Patrick J. Behling, P.E.
Director, Environmental Engineer

Will Vienne, P.G.
Senior Consultant, Austin Team Lead

# TABLES

**Table 1**

**Oak Grove Steam Electric Station - FGD Ponds**
**Post Closure Care Cost Estimate - 30 TAC 352.1101**

| Item | Unit | Rate | Quantity | Cost/Event | No. of Events | 30-Year Cost |
|---|---|---|---|---|---|---|
| CCR Unit Inspections (Annually) | LS | $15,000 | 1 | $15,000 | 30 | $450,000 |
| Final Cover Maintenance | | | | | | |
| - Erosion Repair, 6-inch avg. thickness, 5% of cap per year, Years 1-5 | CY | $5 | 1,428 | $7,139 | 5 | $35,695 |
| - Erosion Repair, 6-inch avg. thickness, 5% of cap, 3 times, Years 6-30 | CY | $5 | 1,428 | $7,139 | 3 | $21,417 |
| - Revegetation, 5% of cap area per year, Years 1-5 | AC | $1,500 | 1.8 | $2,655 | 5 | $13,275 |
| - Revegetation, 5% of cap area, 3 times, Years 6-30 | AC | $1,500 | 1.8 | $2,655 | 3 | $7,965 |
| - Engineering/Mobilization for Final Cover Repairs/Revegetation Events | LS | $10,000 | 1 | $10,000 | 8 | $80,000 |
| - Mowing, per year | AC | $150 | 35 | $5,310 | 30 | $159,300 |
| General Site Maintenance (Annually) | | | | | | |
| - Run-off/Drainage Structures | LS | $2,000 | 1 | $2,000 | 30 | $60,000 |
| - Access Roads, fencing, signs, etc. | LS | $1,000 | 1 | $1,000 | 30 | $30,000 |
| GW Monitoring (Annually) | | | | | | |
| - Detection Monitoring - Semi-annual Collection/Analysis, (9 MWs, 1 Dup) | EA | $500 | 10 | $5,000 | 60 | $300,000 |
| - Assessment Monitoring - Semi-annual Analysis, (9 MWs, 1 Dup) | EA | $350 | 10 | $3,500 | 60 | $210,000 |
| - MNA Monitoring - Semi-annual Analysis, (9 MWs, 1 Dup) | EA | $200 | 10 | $2,000 | 60 | $120,000 |
| - Annual Report (Including MNA) | LS | $15,000 | 1 | $15,000 | 30 | $450,000 |
| - Monitoring Well Maintenance (1 MW replaced every 10 years) | EA | $5,000 | 1 | $5,000 | 3 | $15,000 |
| One Time Post Closure Care Costs | | | | | | |
| - Deed Notices/Surveys | LS | $10,000 | 1 | $10,000 | 1 | $10,000 |
| - Monitoring Well Plugging and Abandonment | EA | $1,000 | 9 | $9,000 | 1 | $9,000 |
| | | | | | Subtotal 30-Year Post Closure Care Costs: | $1,971,652 |
| | | | | | Contingency (10%): | $197,165 |
| | | | | | **30-Year Post Closure Cost Estimate:** | **$2,168,817** |

**Notes:**
1. All Costs in 2021 Dollars
2. SY - square yard
3. CY - cubic yard
4. EA - each
5. AC - acre
6. M - month
7. Gal - gallons
8. See Technical Memorandum for cost assumptions

**Table 2**

**Oak Grove Steam Electric Station - Ash Landfill 1**
**Post Closure Care Cost Estimate - 30 TAC 352.1101**

| Item | Unit | Rate | Quantity | Cost/Event | No. of Events | 30-Year Cost |
|---|---|---|---|---|---|---|
| CCR Unit Inspections (Annually) | LS | $15,000 | 1 | $15,000 | 30 | $450,000 |
| Final Cover Maintenance | | | | | | |
| - Erosion Repair, 6-inch avg. thickness, 5% of cap per year, Years 1-5 | CY | $5 | 5,163 | $25,813 | 5 | $129,067 |
| - Erosion Repair, 6-inch avg. thickness, 5% of cap, 3 times, Years 6-30 | CY | $5 | 5,163 | $25,813 | 3 | $77,440 |
| - Revegetation, 5% of cap area per year, Years 1-5 | AC | $1,500 | 6.4 | $9,600 | 5 | $48,000 |
| - Revegetation, 5% of cap area, 3 times, Years 6-30 | AC | $1,500 | 6.4 | $9,600 | 3 | $28,800 |
| - Engineering/Mobilization for Final Cover Repairs/Revegetation Events | LS | $10,000 | 1 | $10,000 | 8 | $80,000 |
| - Mowing, per year | AC | $150 | 128 | $19,200 | 30 | $576,000 |
| General Site Maintenance (Annually) | | | | | | |
| - Run-off/Drainage Structures | LS | $4,000 | 1 | $4,000 | 30 | $120,000 |
| - Access Roads, fencing, signs, etc. | LS | $2,000 | 1 | $2,000 | 30 | $60,000 |
| GW Monitoring (Annually) | | | | | | |
| - Detection Monitoring - Semi-annual Collection/Analysis, (6 MWs, 1 Dup) | EA | $500 | 7 | $3,500 | 60 | $210,000 |
| - Annual Report | LS | $10,000 | 1 | $10,000 | 30 | $300,000 |
| - Monitoring Well Maintenance (1 MW replaced every 10 years) | EA | $5,000 | 1 | $5,000 | 3 | $15,000 |
| One Time Post Closure Care Costs | | | | | | |
| - Deed Notices/Surveys | LS | $15,000 | 1 | $15,000 | 1 | $15,000 |
| - Monitoring Well Plugging and Abandonment | EA | $1,000 | 6 | $6,000 | 1 | $6,000 |
| | | | | | Subtotal 30-Year Post Closure Care Costs: | $2,115,307 |
| | | | | | Contingency (10%): | $211,531 |
| | | | | | **30-Year Post Closure Cost Estimate:** | **$2,326,837** |

**Notes:**

1. All Costs in 2021 Dollars
2. SY - square yard
3. CY - cubic yard
4. EA - each
5. AC - acre
6. M - month
7. Gal - gallons
8. See Technical Memorandum for cost assumptions